Laurent Filliettaz
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Francophone Perspectives of Learning Through Work

Conceptions, Traditions and Practices

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Professional and Practice-based Learning

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Professional and practice-based learning brings together international research on the individual development of professionals and the organisation of professional life and educational experiences. It complements the Springer journal *Vocations and Learning: Studies in vocational and professional education*.

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- analytical explications of those processes that support learning at an individual and an organisational level.
- understanding how learning experiences and educational processes might best be aligned or integrated to support professional learning.

The series integrates research from different disciplines: education, sociology, psychology, amongst others. The series is comprehensive in scope as it not only focusses on professional learning of teachers and those in schools, colleges and universities, but all professional development within organisations.

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Series Editors' Introduction for Francophone Conceptions of Learning Through Practice Book

One of the key goals for the book series *Professional and Practice-Based Learning* is to illuminate and explain the processes of learning through occupational practice. As such, it seeks to draw upon a range of disciplinary conceptions and contributions. So, earlier contributions to this series have offered accounts from sociological, cultural, psychological and philosophic traditions. In their ways, each of these contributions has assisted in informing, broadening and nuancing our understanding of practice-based learning experiences and how these are considered, captured and valued from these perspectives. Most, but not all, of these contributions have their origins in the Anglophone world. That is, the authors have engaged with orthodoxies, conceptions and precepts founded within Anglo-Saxon and English spoken traditions. Indeed, these are the dominant traditions for scientific writing, and with the increasing movement towards English as the primary language for scientific publication, this dominance is set to grow. However, one of the great disadvantages of a strongly Anglophone focus on scientific publication, there alone much of the publishing houses, editors, reviewers and contributors being native English speakers and coming from countries such as the United Kingdom, the United States, Canada and Australia, is that perspectives from other cultural and linguistic traditions may struggle to be given voice or even be visible, there alone granted legitimacy. Indeed, it would seem that there is also a timeliness now to consider other perspectives. That is, there is a great danger that in the shift to focus in English, and through an English-dominated publishing provision, other perspectives will be ignored and rendered redundant and invisible. Consequently, contributions that offer perspectives from these traditions stand to make particularly important contribution through this book series.

Offered here is an edited volume that illuminates and explains Francophone traditions and conceptions of learning through practice. The contributions in this volume are from Switzerland, Canada as well as France. What is proposed here is not just a single Francophone tradition for conceptions of learning through and for work. Instead, there are a set of culturally privileged elements that, in some instances, have their origins in French republicanism and are subject to variations

brought about by historical, institutional and cultural factors within France, Switzerland and Canada. So, whereas there are conceptions such as ergonomics and professional didactics that have origins in the Francophone world, these are nuanced in particular ways. Some of that nuancing is associated with national and institutional imperatives, and others are associated with different kinds of engagement with traditions and conceptions beyond the Francophone world. What is evident, however, is a particularly strong focus on the act of practice and a broader conception of a relationship between work and learning than that found in much of the Anglophone literature that often emphasises either personal or workplace-related processes and outcomes. At its heart, the Francophone traditions and conceptions emphasise the act of work, the engagement with the worker in that work and analysis of that engagement and its consequences (e.g. learning). Frequently offered is a very situated set of considerations and analyses. Importantly, focuses on situation go beyond an objective analysis of work-in-action in specific physical and social contexts, to include the situated nature of how individuals come to engage with what is being manifested in those contexts, that is, how and on what bases do these individuals act. This emphasis is evident not only in the focus on the potential harmful effects of work on the person and that body but also the kind of methodologies and procedures adopted to understand the relations between work and learning. Moreover, and building on this emphases, a number of contributions focus on considering the worker only as an active and critical meaning-maker, but also through their bodily engagement within and to account for the consequences of their work. Consequently, this focuses on the personal stand as being point of analyses which are emphasised in the methodologies and investigative procedures that make this emphasis quite distinct. It follows, therefore, that there are many fresh insights advanced through the contributions to this edited monograph. It is quite likely that many outside of the Francophone world will be both surprised and interested in the extent and complexity of the accounts provided in these contributions and also the kinds of conceptions that have long existed to explain the relations between work and learning. In this way, this edited monograph makes an important contribution to the book series and, more broadly, our understanding of learning through practice.

February 2015   Christian Harteis and Hans Gruber

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Chapter 1
An Introduction to Francophone Perspectives of Learning Through Work

Laurent Filliettaz and Stephen Billett

1.1 The Concern of Learning Through Practice Across Cultural Traditions

Learning associated with occupations, and the educational and practice-based experiences that support it, is currently the subject of increased interest and attention in the fields of educational, psychological, sociological and business management research and teaching. In all these fields, how young and mature adults come to learn outside of educational settings in workplaces and the outcomes of those experiences have become relevant to a range of personal, workplace and governmental priorities. Consequently, they are being increasingly researched and evaluated as environments in which to support or augment educational processes associated with the initial development of occupational capacities and their ongoing development across working lives. It follows then that in different ways across nation states, and particularly those with advanced industrial economies, these settings are becoming seen as being important sites for learning by governments, employer organisations, professional bodies and unions who are commonly concerned with developing and sustaining competent workforces and workers to meet important personal, workplace and national social and economic goals.

So, distinct policies and practices are being enacted across nation states, often driven by related sets of concerns about preparing graduates for the workplace, sustaining workers' capacity across lengthening working lives and engaging

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educational processes with what happens in workplaces beyond them. However, why is it necessary or helpful to have a book that focuses on Francophone conceptions of learning through work? The idea came from the editors' shared concern that in an increasingly Anglophone world, important perspectives that have their origins outside of that world were largely unknown and, therefore, not contributing to the field of discussion, policy and practice. Filliettaz's overall motivations to bring together a range of Francophone perspectives were premised on concerns that the current body of research dedicated to understanding learning through and for occupational practice appears to be unnecessarily diverse and insufficiently reconciled and integrated. Across various disciplinary, linguistic and cultural contexts, specific methodological, theoretical and organisational avenues have been elaborated in response to the challenges of practice-based learning. Yet, this elaboration has often progressed without reference to the diversity and richness of approaches available across these fields of inquiry. For instance, in the Francophone context of adult and vocational education, many research projects have been undertaken to understand what and how workers learn in the everyday circumstances of their professional practice. Yet, the focus and framing of these enquiries have been diverse and practices in the Francophone world have been labelled in different ways: professional didactics (Pastré et al. 2006), ergonomics (Rabardel 1995), clinics of activity (Clot 1999, 2008), course of action (Theureau 2004, 2006), etc. These approaches have emerged in different locations of the Francophone area (i.e. France, Canada, Belgium, Francophone Switzerland) and provide distinct yet potentially complementary responses to the challenges of learning through and for professional practice.

Moreover, these enquiries and their particular perspectives have addressed a wide range of important research questions: How do workers learn from each other in workplaces? How do they understand and conceptualise in its all the work practices they are engaged with? How do they cope with the multiple and often contradictory expectations, requirements and procedures they are facing in workplaces? What sorts of skills and competencies are required for contemporary workplaces, characterised by an increasing role of technology, rapid changes and complex tasks? How can the kinds of technical skills and embodied practices required for performance at work be learnt and shared? How can collective activity be transformed through dialogues in work settings? How can workplace simulation be used in training? What sorts of training environments can be designed to assist the learning of the various kinds of knowledge required to become a competent worker? Collectively, since the late 1980s, these research questions have been addressed in a range of occupational fields, such as the health sector, agriculture, engineering, the food-processing industry, humanitarian organisations and education, to name but some which are represented in this text.

But importantly, the research perspectives adopted in the Francophone context have come to comprise specific traditions, some of which are widely shared internationally, whereas others have acquired a strong visibility only in French-speaking countries and in some cases only in one country. Together, these traditions, however, have generated and adopted a specific theoretical lens for

conceptualising the relations between learning and work. They have also developed a range of concepts and methods through which to investigate how adults learn in, for and through work and how this learning may be supported and enhanced in training practices. These tools have been widely adopted in those countries, and expertise in their enactment and reporting has been likewise developed. However, these conceptions are largely unknown outside of the Francophone world and are often inaccessible to the English-speaking audience. Yet this audience often ignores traditions that have emerged and developed outside the Anglophone area. Within the English-speaking community, issues related to learning through and for practice have mainly adopted a sociocultural perspective and have been investigated recently under the umbrella of 'workplace learning' (Billett 2001; Tynjälä 2008). Hence, Francophone and Anglophone traditions have evolved as parallel elaborations, with little connections and lacking mutual understanding.

Billett's motivation for involvement with this edited monograph came from the realisation that there was a long-standing and particular tradition about learning in, through and for work within Francophone countries that appeared to be largely unrepresented in the Anglophone literature. As with his own work, understandings about learning through work have largely drawn upon traditions, conceptions and theoretical orientations that are strongly shaped by and represented and privileged in Anglophone literature. Hence, becoming aware by French-speaking colleagues that traditions such as 'professional didactics' and 'ergonomics' are commonly used in the Francophone world revealed a significant gap in this field of enquiry available to any speakers. It emerges from the contributions to this volume, that a characteristic feature of this tradition is to conceptualise learning through practice in its own terms and qualities and not in comparison with what occurs in educational institutions (i.e. references to informal, non-formal education, etc.), which is often the case in Anglophone accounts. Although arising inadvertently, inevitably, such approaches generate interest in and focus attention upon the Francophone traditions that are their genesis and have fostered, developed and sustained them despite an increasingly Anglophone-dominated scientific discourse. Not the least of concerns to promote Francophone traditions and perspectives are those associated with the dominance of this academic publications increasingly being through English-language media. Francophone scholars are now being pressed to publish in English language journals that are seen as the most prestigious in their fields. However, more than facing the challenge of being pressed into writing in English, French-speaking researchers might experience the press of adopting the kinds of theoretical traditions (i.e. those from the English-speaking world) with which the reviewers and readership of those journals are familiar and comfortable. It is also perhaps understandable in such circumstances, in a quest to have their work published, that a younger generation of Francophone scholars and research students may look to Anglophone theoretical traditions rather than Francophone ones to secure publication.

Consequently, there emerges a risk in this shift to publishing in English and in such journals, not only for the Francophone traditions but all of those outside English-speaking countries. That risk is about indigenous conceptions, practices

and orientations being displaced, not because of lack of merit or worthiness, but because they are not represented in English and/or Anglophone literature and idioms. It also means that these conceptions, practices and representation may become lost or at least be unavailable to the English-reading world and potentially discarded in their own. For instance, without the efforts of Philipp Gonon (Gonon 2009b), the contributions of the early German promoter of vocational education Georg Kerschensteiner may well remain unknown and inaccessible to Anglophone audiences. This includes the influence that German models of vocational education had on debates in the United States about what should constitute the American approach to vocational education (Gonon 2009a), for instance. So, there is at least as much merit in explicating the Francophone traditions, practices and approaches to learning through practice.

1.2   The Genesis of This Book Project

The project for this book is to mitigate against any discarding of these Francophone conceptions of learning in and through work and their traditions and practices through engaging with and elaborating them for English-reading audience. Importantly, this engagement and elaboration also serve to assist, understand and appraise the particular contributions of the Francophone world to the contemporary discussions about learning through and for work and identify how they might complement or augment traditions and practices from other cultures and traditions. Beyond these specific purposes is a need for the essence of these approaches to be explicated and made available to Anglophone scientific audiences that which might not otherwise occur.

To secure these aims, the specific contributions to this book: (a) describe and discuss theoretical, methodological and practical issues related to learning through practice in the traditions of the Francophone area and compare these with those of other cultural contexts; (b) identify conceptual bases, empirical applications and implications of Francophone research on the topic of learning through and for professional practice; (c) provide the English-speaking research community with a sound and comprehensive account of the origins and histories of these contributions and presentations of recent findings and developments; and (d) build the platform for increased collaboration and joint understanding between researchers representing diverse disciplinary perspectives within various cultural contexts. However, there is no claim that the contributions to this book provide an exhaustive account of these topics in the Francophone world. They have, instead, been selected as they illustrate perspectives and traditions that have become orthodox within the French-speaking research community and because they can be seen as a fruitful basis for developing a mutual understanding between and across these research traditions.

To realise these objectives and prepare for the book, a collaborative and dynamic set of activities took place over three years. First, most of the selected authors

attended an international workshop dedicated to the topic of learning through work in March 2012 at the University of Geneva. Based on the presentations that took place during this workshop, topics for book chapters were identified and assigned to each author. The group of authors produced draft chapters during autumn 2013 and then met again in Geneva, in February 2014.[1] The second workshop was dedicated to an in-depth discussion of each chapter and aimed to tease out key ideas lying at the core of Francophone traditions of learning through work. To connect these reflections to broader considerations coming from Anglophone traditions, four scholars with diverse geographical, cultural and disciplinary backgrounds were invited at the workshop as discussants: Simone Volet (Murdoch University), Geoffrey Gowlland (University of Oslo), Raymond Smith (Griffith University) and Charlotte Wegener (University of Aalborg). The role of discussants was to bring an external perspective on the work discussed and to identify possible connections between cultural traditions on learning through work. After the second workshop, authors and discussants revised, rewrote and refined their chapters during the European spring of 2014. Subsequently, the chapters were reviewed, and further rounds of revisions and editing followed. The outcomes of this process are found in the chapters of this edited monograph.

The contributions of the book are organised under two sections. The first section – Conceptualising the Links Between Learning and Practice – comprises 7 chapters presenting and illustrating distinct but complementary conceptions that have emerged in Francophone academic fields about the relations between learning and practice and a commentary chapter. The conceptions on learning are defined and explained by drawing on a range of disciplinary bases (i.e. work psychology, anthropology, vocational didactics and organisational sciences). The second section of the book – Conceptualising the Links Between Training and Work – comprises 6 chapters dedicated more specifically to the relations between occupational training and work and a commentary chapter. There is also a summary chapter at the end of this section. The authors of these chapters present theoretical considerations, methodological approaches and empirical findings about how training practices in educational programs and in workplace settings can be effectively based on a fine-grained understanding of work. As noted, each section of the book concludes with a critical discussion of the preceding chapters. In each, a scholar with broadly based international expertise on conceptions of learning in practice discusses and responds to the contributions in the chapters and draws links between these conceptions and the broader literature accessible in the field.

As a means of introducing and providing an overview of the contributions of this book, some foreshadowing is warranted here.

1.3   Mapping the Field of Francophone Perspectives on Learning Through Work

An important place to commence is through outlining what are the origins and the peculiarities of the Francophone perspectives on learning through and for work. That is the focus for the following chapter which provides an overview of the field of Francophone research on learning through work and is intended as a platform for presenting a delineation of this field. Entitled Conceptualising and Connecting Francophone Perspectives on Learning Through and for Work, the chapter commences by presenting a range of research traditions that have secured important places within the French-speaking research community and also explains the disciplinary background underlying these traditions, through identifying key premises and concepts and specific research and training methods that have emerged in that particular context. Adopting a cultural historical approach, the chapter also attempts to illuminate the specific conceptions of learning these traditions are built upon and have contributed to promote in the French-speaking world. Three research traditions are selected and described by its authors, Laurent Filliettaz, Stephen Billett, Etienne Bourgeois, Marc Durand and Germain Poizat, in relation to their distinct historical and cultural backgrounds and key ideas and methodological focuses: (1) Francophone ergonomics and work analysis; (2) language use, in connection to work and learning; and (3) collective and organisational dimensions to learning through practice.

The first of these three traditions comprises what is referred to as Francophone ergonomics and the accompanying epistemology of the so-called work analysis. The historical and disciplinary origins of emergence of the Francophone tradition of ergonomics are presented, along with its central concepts, contributions to methods and applications in the field of vocational and professional training. Secondly, the particular tradition of language use in relation to work, training and learning is elaborated. These issues have acquired considerable visibility within Francophone research and have developed into a specific research tradition, which reflects the unique Francophone conceptualisations. An overview of the main research topics that have emerged within this tradition and key contributions to vocational and professional training issues are presented in this chapter. The third tradition is that referring to learning in connection with specific organisational contexts. Here, the social dimensions of learning are foregrounded and contributions from Francophone researchers and their alignment with other research traditions are illustrated, particularly those widely disseminated in the Anglophone world. The final section of the chapter draws together a range of ideas which have emerged beyond and across these specific research traditions, and that can be seen as having played an influencing role on the ways questions related with learning through and for work have been addressed in the Francophone world.

1.4   Conceptualising the Links Between Learning and Practice

Having set the scene for these traditions through this chapter, it leads to the contributions that comprise the first of the two major sections: entitled Conceptualising the Links Between Learning and Practice.

The first chapter (Chap. 3) in this section is entitled Stimulating Dialogue at Work: The Activity Clinic Approach to Learning and Development by Laure Kloetzer, Yves Clot and Edwige Quillerou-Grivot. This chapter presents key concepts for what is referred to as the Activity Clinic approach and one of its developmental methodologies, cross self-confrontation interviews. The Activity Clinic approach is grounded in Vygotskian cultural-historical psychology. Accordingly, the authors consider individuals' activities as inherently social and mediated by cultural artefacts, which are at the same time used and transformed by individuals who engage with them. This approach, whilst well known in the Anglophone world, is also inspired by French ergonomics, with its attention to activity as it is performed by the workers, and by work psychopathology. In short, it is advanced as an interventionist methodology to transform work, primarily as a developmental methodology. The first part of the chapter introduces core concepts of this approach which includes a description of the cross self-confrontation methodology. This description and analysis is supported by data collected during an intervention within the car manufacturing industry, aimed at supporting the prevention of work-related musculoskeletal disorders (WRMSDs). In the second part, learning and development in this type of developmental intervention is captured and characterised. Learning through work, therefore, is primarily envisioned in relation to development. In this approach, researchers focus primarily on actions to help develop workers' power to act within their professional milieu, on their organisation and upon themselves. However, a critical analysis of the developmental research process shows that it generates and, indeed, necessitates learning on the part of those workers who are the object of these interventions. In the final section of the chapter, the dynamic character of activity development is highlighted.

Emphasising on learning through different kinds of participation in practice settings, in the next chapter (Chap. 4) – Learning by Participating: A Theoretical Configuration Applied to French Cooperative Day Care Centres – Gilles Brougère connects two distinct areas and kinds of participation, that is, of early childhood education (particularly for children under the age of three) and also adult education in a framework where there is no explicit educational objective. Using the concepts of participation, community of practice and repertoires of practices, this chapter reports an investigation of the participatory practices within parent-run cooperative day care centres. The findings indicate differences of modalities of participation between the day care centres, with some limitations and obstacles, but full participation with no visible differences between the participation of parents and professionals, in others. These day care centres can be seen as communities of practice, where the shared repertoire of practice is an important aspect with a dynamics of

learning for parents, workers and children. The chapter illustrates the development
of knowledge in practice in relationship to the diversity of the families comprising
these parents and their children. It appears from the analysis presented that a shared
repertoire arises from a cultural negotiation that is largely implicit and can best be
explained in terms of interpersonal or person-to-person relationships and rarely at
the level of the day care centre as a whole. In this way, the norms, values and
practices are largely informed and appropriated through interpersonal relationships
rather than through the expression of some situational-based mediation. In sum, it is
through their participation (whose modes, linked to the affordance of each day care
centre, vary) that parents learn and negotiate their practices and likewise
transforming their repertoire of practice. This is also true of workers and children,
thereby making parent-run cooperative day care centres particularly remarkable
kinds of communities of practice with particular learning effects.

An even more microanalysis of how learning arises through practice is advanced
in Blandine Bril's chapter entitled Learning to Use Tools: A Functional Approach
to Action. Tool use here is considered a privileged entry point for understanding the
nature of learning through action. The aims of this chapter (Chap. 5) are twofold:
firstly, examining the process of individual skill learning from a functional point of
view and, secondly, examining how the context (the 'field of promoted action') is
organised in ways that can facilitate the learning process. It is held that when
engaging in functional goal-directed actions, the actor is not simply directed
towards the goal but rather directed by the goal itself. Thus, it is the work goals
to be achieved that specify the demands that must be fulfilled and in some ways
scope of what might be learnt through securing those goals. In the chapter, it is held
that functional actions are not specified by bodily movements, as such, but by the
ability to solve particular motor problems posed by the environment where the work
tasks are conducted. Here, it is suggested that to understand these goal-directed
activities, it is necessary to differentiate amongst four layers of parameters: (1) func-
tional parameters, (2) control parameters, (3) regulatory parameters and (4) move-
ment parameters. The functional parameters specify the task and are independent of
the actor. This applies regardless of whether the actor is a human or a non-human or
a robot actor. The layer of control parameters specifies the functional parameters
and these are able to be controlled by the actors. Finally, the control parameters are
set up through different possible strategies that are person dependent, that is, vary
amongst actors who engage in different kinds of bodily movements in tool use. The
learning process is based on an exploratory activity that progressively drives
learners to discover and master the functional parameters of the task. It is proposed
that this learning process arises in and through a 'field of promoted actions' which
organises the experience of learners. Consequently, the tutor's role is in organising
the experience of the learners through setting up and securing their engagement in
the field of promoted actions and assisting in adjusting this field of promoted
actions to the learners' level of skills. So, here though is a highly situationally
constrained set of goal-directed actions yet which are inevitably enacted in person-
dependent ways.

We live in a world filled with material objects and, certainly, the workplace and occupational training are no exception, proposes Germain Poizat in his chapter (Chap. 6). Entitled Learning Through Interaction with Technical Objects: From the Individuality of the Technical Object to Human Individuation, his chapter proposes that examining the 'beingness' of technical objects within the context of occupational education and training needs to be taken seriously as a contribution to thinking, acting and learning. The claim here is that when objects are freed of their status as mere artefacts – that is, as things having undergone even the slightest human transforming action – and are, instead, granted the status of *technical object*, their decisive role in work as an expansive activity, as an ongoing process of growth, can be understood. Like the Kloetzer et al. chapter, his case draws on some precepts from Francophone perspectives but also uses the concepts of appropriation and individuation in building the case that are drawn from other traditions. The case is advanced through four interrelated discussions. First, assumptions of the enactive approach are presented and how these assumptions differ from objectivist ontology is described. Then, the concepts of *mode of existence* and beings of technology in order to then explain a specific conception of technical objects are examined. Third, the constitutive role of artefacts in learning and development is discussed. Finally, some consequences for educational research are raised in the final section. Throughout, the ineptness of having the subject–object dichotomy is used to claim that the heuristic nature of hybridity makes human beings 'technical beings', the necessity to explore seriously the 'beingness' of technical objects, because of the (1) individuation that characterises the transformation of human activity, (2) the key role of techniques in defining standards and training contents, (3) the centrality of appropriation as the fundamental transformation in the activity of actors in training and (4) the potential value of conceived training design as *technical invention*. Such a wide-ranging genetic interpretation of the relationship between humans and their environment is proposed as a means to build future adult education provisions that engages with both social and technological transformations and their appropriation in a perspective that takes into account the centrality of individuation.

Philippe Lorino's chapter – Learning as Transforming Collective Activity Through Dialogical Inquiries – also emphasises human meaning making, albeit as a dialogical process. This chapter (Chap. 7) holds that learning is an intrinsic aspect of every conscious, purposeful activity in which individuals engage. That activity is viewed as dialogical – activity is addressed through and acquires its meaning from the interacting situation – and mediated by different types of semiotic mediations (e.g. language, tooling, information systems, procedures). All mediations are ultimately held to be referenced to one final mediation, i.e. socially recognisable and meaning-making habits. Also, when unpredicted situations disrupt habits, then multiple and partly invisible inquiries lead to their transformation to allow activity continuation. In this way, activity, habits and inquiries are all proposed as being dialogical and weaving the threads of a collective sense-making narrative. Learning is, thus, defined here as the continuous transformation of habits and of their combination into sense-making cross-functional narratives through dialogical

inquiries. Inquiries can be felicitous, meaning that they succeed in reweaving the threads of collective activity, or infelicitous. One key issue thus is identifying the conditions of felicity. This approach is illustrated by the case of an electricity company. The implementation of an integrated management information system (ERP) disrupted existing professional habits without providing the conditions for felicitous inquiries, leading to an organisational crisis. In the light of this case, it is advanced that a key condition of organisational learning is to view collective activity not only in its 'directly performing' dyadic dimension (e.g. A transforms B) but also in its mediated triadic dimension (e.g. A means C by transforming B), that is, giving due consideration not only to 'what people actually do' but also to 'what people actually mean by doing what they do', with three mediating dimensions. It is proposed that this approach to organisational requires establishing the adequate communities of practice, to transform professional habits and identities, and communities of process, to redesign cross-functional inquiries and the cross-functional narrative coherence of processes.

Continuing this focus on work and interactions, Frédérik Matte and François Cooren propose that tensions or contradictions experienced in workplace settings need to be viewed as either something to be resolved individually or as a constitutive aspect that people have to learn to deal with collaboratively. In their chapter (Chap. 8) – An 'On-the-Go' Approach to Dealing with Organizational Tensions – they explore the latter perspective through describing how dealing with specific tensions on a daily basis can be conceptualised as an 'on-the-go' approach towards learning (and collaborating). This approach, they hold, is built upon everyday dialogues in and through work but also fosters a process of co-construction of knowledge. Mobilising what they refer to as ventriloquial perspective on interaction, the chapter identifies and analyses everyday communicative practices (hence, the on-the-go approach) that enable workers in the humanitarian organisation Médecins sans Frontières (MSF)/Doctors Without Borders to learn how to deal with a specific tension that arises as being ubiquitous in their discussions. These tensions often arise from the need for an emergency-oriented approach to work whilst adopting a more long-term perspective during the implementation of missions around the world. The authors set out to demonstrate using empirical data how an experienced and an inexperienced MSF member both deal with and learn from such a tension in their daily activities, building on it whilst simultaneously incarnating it in one interaction at the time through their interactions. Organisational learning (OL) is sometimes envisaged as a communicative achievement. More centrally, the authors claim that organisational learning is occurring subtlety during the everyday mundane interactions that comprise individuals' work-based interactions, implying in the process an evaluation mechanism where the situation itself contributes as a third party to that remaking of the organisation's norms and values and the same time promoting individuals' learning.

Geoffrey Gowlland provides both a summary and an evaluation of the contributions of this section to a discussion on the relations between learning and work. Entitled Discussion: Francophone Approaches to Learning Through Practice, his chapter (Chap. 9) discusses six contributions that arise from his reading of the

contributions in this section and through drawing parallels and highlighting differing viewpoints across chapters. Gowlland identifies the two notions of 'intentions' and 'tensions' as running through these contributions, and these serve as a starting point to reflect on the significance of the approaches contained in the contributions to this section. He notes that several papers identify tensions as sources of learning in the workplace. The dimension of intentionality meanwhile arises in other contributions and points to the necessity to understand the actions of individuals with reference to their motivations, goals and ideas about themselves. These questions are addressed in the context of reflections that tackle three major themes in the theory of practice: 'community', 'environment' (both physical and social) and 'morality' or 'ethics'. He concludes that a commonality in the approach of the papers is that learning is defined as fluid, open ended, goal- and intention-directed and a positive outcome of the daily tensions and disruptions of working life.

1.5   Conceptualising the Links Between Training and Work

The contributions in the second section of this book commonly focus on links between training and work, that is, the educational dimensions of learning through work.

The first contribution authored by Patrick Mayen directly addresses an essentially Francophone conception and tradition – Vocational Didactics: Work, Learning and Conceptualization. In this chapter (Chap. 10), he describes and discusses vocational didactics and, in particular, focuses on elaborating on account of one of its principal characteristics: conceptualisation in action. Vocational didactics is situated within the field vocational education for young people and adults alike. It is geared towards both research and action, that is, seeking to address the tasks, problems and issues that are specific to vocational education and its further development as an important sector of education. Vocational didactics is not a discipline in its own right. Instead, Mayen holds that it is a process defined by a perspective on matters of vocational education and specific principles, concepts and methods that give it coherence. In the first part of this chapter, it is proposed that vocational didactics, along with its intentions, principles and concepts, grant an important place to the question of conceptualisation. The second part illuminates all of this through describing and discussing two cases of work analysis and training design under a vocational didactics approach. Both cases emphasise the central importance of conceptualisation in action and how it can be advanced.

The theme of work activities as being central to realising effective vocational education provisions is also exercised within the chapter by Marc Durand and Germain Poizat entitled An Activity-Centred Approach to Work Analysis and the Design of Vocational Training Situations. In their chapter (Chap. 11), they present an activity-based theoretical framework for pursuing two key objectives. These are, firstly, to understand the social practices of work and training and, secondly, to inform the design of innovative vocational training methods. It is part of a tradition

of inquiry and research that has come to be known as 'French ergonomics'. In this tradition, the analysis focuses on the articulation of work prescription and real work. Work prescription encompasses the set of explicit and implicit instructions in job specifications, as well as the constraints linked both to organising production and to management, further by going beyond the task analysis of the Anglophone approach. These prescriptions encompass and contribute to specifying the work objectives and the social and material conditions for their accomplishment in through work. In contrast, real work is what workers actually do when they work. It is a type of human activity, which is conceptualised as a holistic theoretical object that can account for the individual and collective meaning and organisation of vocational practices and their transformations. The first part of the chapter presents an approach to work and vocational training that centres on the analysis of human activity. It falls within the theoretical framework of course of action, which is based on the postulate of enactment. Excerpts of actual cases are used to illuminate the theoretical premises, all of which are taken from enquiries into work and training in a variety of work settings. In the second part, the authors describe the procedural aspects of this research tradition. They also present the notion of spaces for encouraged actions as an instrument for training interventions in connection with an elaboration of hypotheses and theoretical elements mentioned above. In their conclusion, Durand and Poizat propose wide-ranging purposes for which work analysis could be directed in the field of training.

Sylvie Ouellet and Nicole Vézina use a specific work context to elaborate the contributions of the ergonomic approach in that chapter (Chap. 12) entitled Activity Analysis and Workplace Training: An Ergonomic Perspective. Drawing upon the research in French-speaking communities in Canada, they claim that when companies need to provide training, experienced employees are most often given the task of passing on their skills, which have largely been acquired through practice. These skills relate to performance of the work activity (e.g. movements, sensorimotor perception, planning), the characteristics of the material to be processed, the tools used and working conditions that need to be taken into account. Yet, many authors report the difficulties that workers have in articulating (i.e. describing and formalising) their working methods when questioned about them. This, of course, raises questions about how effectively the passing on of 'know-how' occurs during training courses. It follows therefore that this chapter discusses and demonstrates how ergonomic analysis of a manual work activity was able to make accessible trade skills stored as 'embedded knowledge' so that they could be incorporated into the content of training. Minute analysis of working movements, followed by clarification meetings, illuminated and identified the reasoning underlying movements and mental reference points that workers call upon to attain production and health preservation objectives.

Laurent Veillard's chapter focuses on the conception of alternance in French tertiary education. Since the end of the eighties, 'alternance' training courses, consisting in combining and sequencing learning experiences in an educational institution with those in workplaces, developed quite well in France, especially at the tertiary level. Consistent with these training aims, an important pedagogical

question about this type of course is how to organise the workplace learning phases to optimise effective learning opportunities. A possibility is to develop a pedagogical partnership between the training and working institutions in order to take into account both the workplace learning specificities and the pedagogical aims and organisation of the training course. In his chapter (Chap. 13) – entitled University-Corporate Partnerships for Designing Workplace Curriculums: The Case of a French Work-Integrated Training Program at Tertiary Level – Veillard addresses this issue within the specificities of the French educative context, where the vocational education system is historically mainly based on school teaching situations. Historical factors and institutional arrangements can be used to explain why the workplace learning culture is still weak in France comparatively to others countries like Germany, Switzerland or Australia. However, proposed here are ideas from both Francophone and Anglophone concepts that can assist in considering and organising pedagogical collaborations between scholar (or academic) and productive institutions. Based on these concepts, two case studies in a master course (in production management) are used to illustrate different aspects and issues of such collaborations to organise workplace learning between a tertiary institution and two of its professional partners. The final part of the chapter is dedicated to a more general discussion, from the findings of the two case studies and other additional studies, on the ways of improvement of this type of collaboration in the Francophone world.

Recent literature in the field of workplace learning has stressed the importance of guidance in the process of learning in and from practice. Workers do not only learn just by conducting specific tasks individually; they learn when adequate resources are afforded to them and when more experienced workers are able to assist them in their practice. Hence, in their chapter (Chap. 14), entitled Learning Through Verbal Interactions in the Workplace: The Role and Place of Guidance in Vocational Education and Training, Laurent Filliettaz, Isabelle Durand and Dominique Trébert propose that there is considerable importance in elaborating the specific qualities of guidance at work and understanding how novice workers engage with these resources. In this particular context, the chapter advances two main considerations. The first is that a close examination of the conditions under which mentors and students engage in face-to-face interactions provides a relevant theoretical basis for exploring the relational interdependences between these actors. These interdependences may be described and analysed as 'interactional participatory configurations'. The second consideration advanced here is that recent research in the Francophone world provides useful insights for investigating these issues. It does so by borrowing concepts from a wide range of disciplinary traditions, such as anthropology, sociology, sociolinguistics and discourse analysis. These resources, it is proposed, offer complementary contributions to the understanding about the processes of participation and guidance in vocational and professional learning as it occurs in the workplace. Transcripts of video data collected in the field of vocational training of early childhood educators are used as empirical illustrations of the proposed analytical frame.

The chapter by Etienne Bourgeois, Julie Allegra and Cecilia Mornata (15), entitled Transmission and Individuation in the Workplace, aims at better understanding what conditions and through what processes does transmission in a given occupation allow for individuation (instead of mere reproduction). To put it simply, individuation is to be understood here as the process through which novices in a given occupation gradually find their own personal way of thinking and doing things whilst incorporating the knowledge and practices being transmitted to them by the reference model. This view is based mainly on the French concept of 'subjectivation', as elaborated by Richard and Wainrib. In educational contexts, individuation implies some gradual detachment of learners from the reference expert model at four levels: (1) cognitive, (2) behavioural, (3) affective and (4) related to identity. The chapter examines the role of 'macro' factors (i.e. related to the nature and evolution of the profession itself and its context) and 'micro' factors (i.e. related to learners' interactions with their trainers and peers). This discussion is based mainly on two exploratory studies currently conducted at the University of Geneva. The first study focuses on the transmission process with experienced farmers who are converting to organic farming in Belgium and in France. This study highlights mainly 'macro' factors of individuation. The second study deals with transmission in the context of students enrolled in a university master's degree program in developmental psychology. This second study highlights primarily 'micro' factors of individuation.

Simone Volet provides an overview of this second section entitled On the Articulation of Training and Work: Insights from Francophone Research Traditions. Her chapter (Chap. 16) examines the conceptualisation of work activity that forms the foundation of Francophone perspectives on training and work and reviews empirical work grounded in these perspectives. The chapter commences by identifying and discussing the three fundamental assumptions about the nature of work activity and workplaces as legitimate sites of learning and training that underpin Francophone research related to the articulation of training and work: (1) actual work activity cannot be reduced to the prescribed task; (2) any work activity includes a productive and a constructive component; and (3) work activity affords the creation of rich learning opportunities for improved practice. The six empirical studies that have addressed the above assumptions are illustrated and scrutinised with reference to other bodies of literature concerned with workplace learning. Also identified across studies from the Francophone research traditions are common innovative methodological aspects of research. The final section of the chapter elaborates novel contributions of Francophone research. The aim here is to enhance the links between these contributions and the overall body of literature on learning through and for practice. She proposes that by conceptualising work activity and professional practices as enabling environments for training within the complexity of real-life, interactive and dynamic situations and providing empirical support for this claim, research from Francophone research traditions makes a unique contribution to the literature on workplace learning and also that on vocational, professional and training research. It is also claimed that the dissemination of this work in the Anglophone research community offers fresh possibilities for

cross fertilisation and mutual enrichment, conceptually, methodologically and educationally.

The concluding chapter (Chap. 17) in this edited monograph by Stephen Billett, Raymond Smith and Charlotte Wegener is something of a reprise. Entitled Understanding Learning for and Through Work: Contributions from Francophone Perspectives, it offers a discussion on what the chapters add to the field of workplace learning through the accounts of Francophone traditions and conceptions of learning through and for work and the practices they report were used to understand more fully these processes of learning. It identifies and elaborates from an Anglophone perspective four distinctive qualities of the contributions within this edited monograph. These are, firstly, that there is no single or unitary Francophone tradition or conception of learning through practice. This quality is highlighted through outlining something of the diversity of what constitutes Francophone perspectives and some accounting of the origin of these distinct conceptions. The case made is that although there are cultural and linguistic traditions across the Francophone world, there are also localised historical and cultural factors that promote difference and diversity within these accounts. Secondly, and regardless, there is an emphasis across the contributions on physically, socially and personally situated activity which stands as being distinct within Francophone accounts. This situatedness goes beyond an objective analysis of work in action in specific physical and social contexts (actions of workers), to include the situated nature of how individuals come to engage with what is being manifested in that context (e.g. how and on what bases they act). Thirdly, there is a pattern of contributions considering the worker as the person not only as an active and critical meaning-maker, but also through their bodily engagement within and to account for the consequences of their work. Further, these emphases on the personal stand to make some of the contributions in this book quite distinct. Fourthly, the means for understanding and organising support for learning through work seem distinct. The two sets of qualities just above suggest that traditions of professional didactics and ergonomics, in particular, emphasise the situation and body and seem quite culturally distinct. They seem more analogous to laboratory and encounter sessions from the Anglophone world than what would be used in that world to organise work-based learning experiences. It is these four conceptions that are discussed in terms of what they contribute to the field of work and learning.

References

Billett, S. (2001). *Learning in the workplace: Strategies for effective practice*. Crows Nest: Allen and Unwin.

Clot, Y. (1999). *La fonction psychologique du travail*. Paris: Presses universitaires de France.

Clot, Y. (2008). *Travail et pouvoir d'agir*. Paris: Presses universitaires de France.

Gonon, P. (2009a). Efficiency' and 'vocationalism' as structuring principles of industrial education in the USA. *Vocations and Learning: Studies in Vocational and Professional Education, 2*(2), 75–86.

Gonon, P. (2009b). *The quest for modern vocational education: Georg Kerschensteiner between Dewey, Weber and Simmel* (Vol. 9). New York: Peter Lang.

Pastré, P., Mayen, P., & Vergnaud, G. (2006). La didactique professionnelle. *Revue Française de Pédagogie, 154*, 145–198.

Rabardel, P. (1995). *Les hommes et les technologies: une approche cognitive des instruments contemporains*. Paris: Armand Colin.

Theureau, J. (2004). *Le cours d'action. Méthode élémentaire*. Toulouse: Octarès.

Theureau, J. (2006). *Le cours d'action. Méthode développée*. Toulouse: Octarès.

Tynjälä, P. (2008). Perspectives into learning at the workplace. *Educational Research Review, 3*, 130–154.

Part I
Conceptualising the Links Between Learning and Practice

Chapter 2
Conceptualising and Connecting Francophone Perspectives on Learning Through and for Work

Laurent Filliettaz, Stephen Billett, Etienne Bourgeois, Marc Durand, and Germain Poizat

2.1 Perspectives and Traditions of the Francophone World

This chapter offers an overview of the field of Francophone research on learning through work and is intended as a platform for presenting a delineation of this field. Research on learning through work tends to privilege cultural and historical factors. Whilst this privileging is not always formulated explicitly in the chapters within this volume, this premise needs to be acknowledged to appraise the particular contributions of Francophone researchers. This privileging of cultural and historical factors is, however, useful for the reader to establish connections between chapters and across the different Francophone perspectives they propose. More specifically, this chapter presents a range of research traditions that have secured important places within the French-speaking research community, as illustrated in the following chapters. This overview aims at explaining the disciplinary background underlying these traditions and identifying key premises and concepts and specific research and training methods that have emerged in that particular context. The chapter also attempts to illuminate the specific conceptions of learning these traditions are built on and have contributed to promote.

To achieve that outcome, three research traditions are described, in relation to their historical and cultural backgrounds, key ideas and methodological focuses. The first of these three traditions comprises what is referred to as Francophone ergonomics and the epistemology of the so-called work analysis. The historical and

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disciplinary origins of emergence of the Francophone tradition of ergonomics are presented, along with its central concepts, contributions to methods and applications in the field of vocational and professional training. Second, a focus is placed on the tradition of language use in relation to work, training and learning. These issues have acquired considerable visibility within Francophone research and have developed into a specific research tradition. An overview of the main research topics that have emerged within this tradition and key contributions to vocational and professional training issues is presented below. The third tradition is that referring to learning in connection with specific organisational contexts. Here, the social dimensions of learning are foregrounded and contributions from Francophone researchers are illustrated, and their alignment with other research traditions, and particularly those widely disseminated in the Anglophone world. The final section of the chapter draws together a range of ideas which have emerged beyond and across these specific research traditions, and that can be seen as having played an influencing role on the ways questions related with learning through and for work have been addressed in the Francophone world. To introduce this elaboration of Francophone traditions and their essential qualities, it seems appropriate to commence with the particularly distinct conception of ergonomics and the central role of work analysis.

2.2 Francophone Ergonomics and the Tradition of Work Analysis

A relatively new approach to vocational and professional training grew out of the concern that scientific knowledge about work is a necessary condition for designing effective training programmes. This approach is premised on the assumption that training practices should be based on, or should be concurrent with, scientific analyses of work. Research in this field, thus, focuses on the object of work (i.e. what needs to be done and therefore learned), learning the work (i.e. what is learned) and the modalities through which learning occurs at work (i.e. how it is learned). This tradition provides guidelines for the design of learning environments and programmes (Durand 2011). This research stream is generally ascribed to the scientific tradition identified as "French-language ergonomics" or "French-speaking ergonomists" (Daniellou 2005; De Keyser 1991, 1992; Guérin et al. 2007). In this chapter, it is referred to as Francophone ergonomics. In what follows, the main features of this approach are introduced, explained and illustrated.

2.2.1 Francophone Ergonomics and Its Relations with Taylorism

The scientific study of work owes much to the pioneering research of Frederick Winslow Taylor who sought to understand and organise work at the Bethlehem Steel Corporation (De Keyser 1991, 1992; Taylor 1911). Three major advances can be attributed Taylor's approach. Firstly, he asserts the need for a rigorous analysis of work and the importance of the link between science and work. Like many scientists of his time (e.g. physicists, chemists, biologists and others), all of whom were confident in the power of reason to subjugate nature for human benefit, Taylor was convinced that science could solve all the problems related to work. Despite the fact that this position today has been dismissed as unrealistic, it is thanks to "Taylorism" that the science of work emerged as a legitimate research field. Secondly, Taylor also insisted on the purpose of his research being the objective underlying the study of work was to improve work efficiency and organisation, and this type of approach developed in parallel with research in the human and social sciences and real-life changes as they occur in the organisation of work. It is noteworthy that his desire to transform the organisation and conditions of work through scientific management, although much criticised for being alienating, remains a valid pursuit for Francophone ergonomists (De Montmollin 1981). Thirdly, Taylorism brought the "human factor" of work to the fore, where it could then be explored. This aspect is developed below insofar as it constitutes an important point of difference between Taylor and his European successors.

Taylor's studies were quickly known and disseminated across Europe. But, it was only after the end of the Second World War that Francophone ergonomics acquired institutional visibility. In many countries, the Marshall Plan helped to cope with the urgent need to rebuild what the war had destroyed. All areas of society were in turmoil, and particularly the industrial production system in many countries, where the needs for modernisation of environments and working methods and productivity improvements were great. Exchanges were then developed with the USA, whose technological advance and control of management companies or large projects had increased during the war. French engineers were sent on missions to the USA to appropriate the American expertise in "managing people at work".

Teiger and Lacomblez (2013) describe how the French mission called "Psychotechnique", which took place in 1952, allowed Jean-Marie Faverge to discover the Human Engineering Research which was part of the "information processing approach" still undeveloped in Europe at that time (Faverge 1954). This approach inspired chapters in the seminal book entitled *L'analyse du travail* (*Work Analysis*), written with André Ombredane in 1955, which contributed to found French ergonomics. In 1956, another international and interdisciplinary mission involving physiologists, psychologists, engineers, project managers and union representative, entitled "Adaptation du travail à l'homme" (Adaptation of work to humans), was attended by some of the main actors who would base European ergonomics. Their report (Murrell 1959) contained the outline of an action plan

(including research) to meet the goal of "adapting the work to humans" and not the reverse. This report was followed by various initiatives that gave rise to a European tradition in ergonomics which was structured and developed in quite a different way from the Anglophone human factor approach.

In France and Francophone countries, ergonomics was oriented towards: (1) designing work conditions based on real work analysis and (2) studying the potentially harmful effects of work on health. At this time, ergonomics was a part of a broad policy of national independence, and it was expected to contribute to achieving the following three objectives in the perspective of production improvement and productivity gains: (1) modernisation of the production system in its technical and organisational dimensions, (2) fight against workplace accidents and safety and (3) workers selection and accelerated vocational training to better match workplace requirements. However, Taylorian precepts have been central to Francophone ergonomics in the sense that, as De Montmollin (1984) noted, an "ergonomist is a good Taylorist", but under the condition that Taylorism is given a "human face" (De Montmollin 1981). A major difference lies in the conceptualisation of the human factor in North American and European traditions. In the American scientific and professional culture, the human factor is often associated with the idea of human errors, which leads to systematic attempts to reduce its weight or presence in work performance, hence the rise of the field of human resource development, largely based in the USA. In French-speaking Europe, at a theoretical level, the human factor has been distinguished from another essential component of work: the *task* to be accomplished. Hence, the human factor has been associated with ideas of resourcefulness, inventiveness and intelligence in work situations, even in the simplest and most basic cases. The human factor, thus, came to be conceptualised as a source of excellence and a potential resource for production and profit (Dejours 2010).

The Francophone ergonomic tradition can be further characterised by two methodological considerations. The first is that empirical research on work undertaken since the second half of the twentieth century in the field of ergonomics recurrently showed that workers never do exactly what they were asked or instructed. Rather than seeing this as a limitation, Francophone ergonomics attempted to conceptualise such a gap and developed from the basic distinction between what should be done, the *prescribed task* or work, and what workers do, the *actual work* (Amalberti et al. 1991; Ombredane and Faverge 1955; Leplat and Hoc 1983). This distinction is of major importance as the gap between prescribed and real work has been interpreted as demonstrating: (1) that workers have autonomy and creativity, in that their work cannot be reduced to the instructions, directions or procedures that define their jobs, and (2) that both prescribed and real work need to be systematically analysed to understand workplace practices and requirements.

The second consideration is that Francophone ergonomics is both a scientific and an applied or interventional discipline. It produces knowledge about work and also aims at transforming work situations. Several authors even see ergonomics as a "technology" (De Montmollin 1967, 1991; Pinsky 1992; Pinsky and Theureau 1987; Wisner 1983, 1995a, b, 1997). Francophone ergonomists aim not only to

make work more efficient but also safer and more healthful, by adapting the work to
the people (Metz 1960), rather than adapting the people to work as it is prescribed in
instructions and by the organisation of tasks (Daniellou 1996, 2005). In this respect,
ergonomics has inherited from Taylorism an ultimate concern with work analysis:
improving workplace conditions and the organisation of work, rather than only
producing knowledge about work. Also, what is apparent here is that whilst
ergonomic and work analysis has come to be seen as essentially Francophone
conceptions, their origins are influenced by the Anglophone world. However,
these influences have also given shape to deep transformations, the Francophone
conceptions of Taylorism being now conceptualised differently in Anglophone and
Francophone traditions.

2.2.2   Work Analysis as Method Beyond the Laboratory

The recognition of a gap between *prescribed work* and *real work* prompted ergon-
omists to abandon their laboratories and instead enter workplaces so that they could
better observe, measure and record what was happening authentically (Laville
et al. 1972; Wisner 1985). With the advent of miniaturised recording devices,
remote data transmission and video and digital broadcasting, work requirements
can be more easily scrutinised via energy cost calculations based on remote
measurements of respiratory gas exchange, detailed movement analysis via
video-image processing and electromyographic recordings of workers in action.
Moreover, as work became ever more dematerialised, intellectual and collective,
methods of data collection and analysis became also more cognitive and commu-
nicative, with greater reliance on methods from cognitive sciences and linguistics
(e.g. Borzeix and Fraenkel 2001; Grosjean and Lacoste 1999; Pavard 1994;
Theureau 2004a, b). Through these processes, work analysis has clearly taken an
increasingly "pragmatic turn" and favoured on-site observation. Ergonomists
became very much aware of the need for a familiarisation period in work settings,
both for themselves and for those they observe. By conducting participant obser-
vation and, sometimes, even by contributing actively to job performance, they must
become familiar to the others so as to ensure optimal study conditions of work
activities.

Yet field observation, even when participatory, still does not provide complete
access to all dimensions of work experiences. Ergonomists have, therefore, devel-
oped research procedures that involve their participants in two different and
complementary ways. That is, workers inform researchers both passively, by
allowing themselves to be observed, and also actively, by answering questions
designed to prompt descriptions, comments and explanations about the
unobservable components of their work. Unfortunately, even this type of informa-
tion collection is sometimes not sufficient for scientific analyses. In part, this is
because components of work activities may not be fully conscious or reflected on
and sometimes because language skills are insufficient to secure valid and reliable

communication between workers and researchers. As a consequence, Oddone et al. (2008) devised a procedure called the "Instructions to the Double" (*instruction au sosie*) in the context of FIAT factories in Torino. In this procedure, workers did not have to describe their work – a task they found difficult. Instead, they were asked to talk to researchers as if they would be replacing next day on the job. Workers then gave their virtual doubles all the information needed to ensure that "no one would notice any difference" between work performed by the worker and its double. This procedure proved to be particularly productive and efficient. It helped to bring to visibility the sorts of tacit knowledge that are particularly difficult to observe or to access reflexively.

Another procedure utilised by ergonomists was inspired by the field of human ethology (Von Cranach et al. 1982). Originally called "confrontation", this method consisted of having actors watch video recordings of the actions performed by other actors and asking them to comment on and explain what they had seen. The procedure was then extended to include "self-confrontation", in which they provided comments and information about their own actions. During self-confrontation interviews, individuals watch recordings of their own actions, describe their goals or intentions at that time, point out causal links between seemingly discrete and elementary acts, explain the meaning they ascribe to these acts and so on. This procedure was greatly enriched when adopted in the ergonomic approach. An initial enhancement comprised in developing methods to ensure greater precision in what participants in self-confronted interviews actually say (Theureau 2004a, 2010). In some cases, this concerns the expression of workers' experience during the recorded activity; and in other cases, the concern was about the analysis aided by researchers or addressed to them. A second improvement consisted in gaining greater precision in the modes of prompting and supporting the interviewees, which depends on whether researchers want a neutral expression of the past experience or a reconstruction and development of the experience as mediated by the language (Mollo and Falzon 2004). Self-confrontation interviews served also as the basis for confronting two individuals performing the same job. By recording work activities performed by several different workers, structured interview settings enabled collective forms of analyses, encouraging workers to address variations, discrepancies and controversies in the ways work activities were conducted. This later interview method was developed in particular in the field of the Clinic of Activity approach, under the label "cross-self-confrontations" (Clot et al. 2001; Kloetzer et al. 2015).

The particular methods developed by ergonomists to address the problems of work understanding and transformations are part of Francophone-specific research designs, sometimes called collaborative investigations. Collaborations between researchers and practitioners last from several weeks to several years and are motivated by a shared interest in workplace intervention and knowledge elaboration. Such research designs are predicated on cooperation between people with very different types of expertise (scientific vs. professional) but with equal value and dignity. Such collaborative research designs often go beyond mere job analysis and focus on deeper dimensions of professional practices, such as the very culture of the

action or the job category. For some authors, collaborations between researchers and workers sharing the same objectives of knowledge building and transformation have the potential to initiate new social spaces for reshaping the relationships between scientific research and social practices (Schwartz 1998). Aligned with this orientation to inquiry is a focus on activity.

2.2.3 Activity as a Source of Unity and Diversity

These technical and methodological developments have also been driven by theoretical advances, particularly in regard to the definition of work as an object of research, that is, when it is conceptualised as a complex and demanding social practice that can be rigorously investigated when it is observed in context and not decomposed into a series of elementary processes. These principles led to adopt the category of *activity* as a fundamental concept and unit of analysis for studying real work in relation to prescribed work. It is certainly difficult to define work *activity* in a way that is both precise and consensual. However, it is possible to propose that work *activity* is what people do when they are engaged in a job task. Although this definition is obviously rather vague, it has two merits. It reflects the idea of work as being made up of many interrelated dimensions, and it also allows for a broad range of theoretical bases to account for the meaning and dynamic organisation of activities.

Certainly, the Russian historico-cultural perspective in social sciences has been an important source of inspiration for Francophone ergonomists. Theoreticians such as Leontiev, Galperin, Talyzina and Rubinstein, as well as Bakhtin and Vygotsky, are seen as major contributors to this perspective. Many concepts and ideas of these authors have exerted an influence on ergonomic research to an extent that can only be briefly mentioned here. These contributions include the (1) distinctions between action and operation in activity, (2) mediated character of human activity, (3) essential cultural dimension of work activity, (4) complete and total engagement in work as a source of both growth or empowerment and suffering or alienation, (5) importance of collective forms of understanding work (even individual work), (6) the contradictory or conflicting nature of realities faced by workers within production systems, etc.

Other influences have also been powerful. For instance, the traditions of information processing, Piaget's cognitive constructivism on practical reasoning, the analysis of interactions based on conversational analysis or ethnomethodology and the study of individual and collective achievements from a cognitive anthropology perspective, inspired in part by the paradigm of situated action/cognition, have all been salient. Importantly, Francophone researchers have not just unquestioningly borrowed these concepts. Instead, they have adapted and used them to develop theoretical elaborations and traditions. In what follows, three main traditions will be briefly outlined, as illustrations of the diversity and richness of work analysis as it can be conceptualised from an ergonomic perspective. These traditions do not

produce an exhaustive picture of the theoretical landscape. Instead, they focus on perspectives that have been particularly relevant for vocational and professional training, as illustrated by the chapters gathered in this volume.

The first tradition can be identified as Professional or Vocational Didactics. Mainly inspired by the work of Piaget, Professional Didactics focuses on cognition and cognitive invariants of experienced professionals. It also investigates the dynamic processes through which objects transform into instruments for action during work (Pastré 2007; Rabardel 1995; Rabardel and Pastré 2005; Rabardel and Beguin 2005). These cognitive constructs are naturally developed over the course of long periods of time and are considered as pragmatic concepts that can be used to organise work practices. These pragmatic concepts are what novices need to learn to become competent professionals (Pastré et al. 2006). Within this book, Mayen's chapter illustrates the Professional Didactics tradition (Mayen 2015).

The second tradition is known as the Clinic of Activity approach. Inspired mainly by Vygotsky and Bakhtin, this approach emphasises the importance of the historical and cultural dimensions of work and positions the work of each individual as the personal expression of a collective and impersonal genre (Kloetzer et al. 2015). Methods of work analysis, combined with the presence of researchers in the workplace, trigger processes of work narration and job-related controversy during cross-self-confrontations. These mechanisms are seen as being developmental processes through which workers internalise the rules and norms underlying the job, whilst still creating their own version of that work practice (Clot 1999, 2009; Clot and Kostulski 2011; Kostulski 2011).

The "course-of-action" approach can be seen as a third tradition inspired by Francophone ergonomics. The course-of-action approach is based on the enactive perspective of Maturana and Varela (1987) and the assumption that any practice gives rise to experience, that is, the individuals' processing of experiences that is partially expressible in self-confrontation (Theureau 2004a). Within this framework, the unit of analysis is the coupling between activity and situation, with activity being considered as autonomous and self-constructive (Durand 2008, 2011, 2013; Poizat et al. 2013). This approach has led researchers to conceptualise activity transformation in terms of appropriation and/or individuation (Durand and Poizat 2015 volume; Poizat 2015).

To these three traditions, it is possible to add the interactional and multimodal perspective that emanates from studies by the Language and Work network (Borzeix and Fraenkel 2001). Research conducted in this tradition focuses on interactions in workplaces and their contributions to learning (Filliettaz et al. 2015; Veillard 2015). Although somewhat separate from the general context of Francophone ergonomics, it is rooted in important theoretical and methodological traditions, including linguistics, ethnomethodology, conversation analysis and workplace studies. Section 3 in this chapter elaborates the contributions of this specific tradition of understanding of learning through work.

2.2.4 Work Analysis and Its Contributions to Vocational Training

Francophone ergonomists became interested in vocational training very early on (De Montmollin 1974; Ombredane and Faverge 1955; Teiger and Lacomblez 2013). By the 1980s, specialists in vocational and professional education had engaged with both scientific and technological orientations developed by ergonomists. Today, researchers and practitioners in vocational and adult education are the forefront for developing original and complementary studies combining work analytic methods with training practices. These studies can be specified by the following characteristics: (1) they address real work practices, with a focus on human activity; and (2) they hypothesise that human activity has productive and constructive sides. Activity is *productive* in the sense that it transforms the physical world and produces visible material outcomes. It is also *constructive* in so far as it transforms workers' internal worlds, their beliefs, knowledge, dispositions and the repertoire of resources they need for working; (3) these studies adopt and adapt specific tools and methods, such as self-confrontation interviews and modelling; (4) they enact participatory research designs that take into account experienced workers and vocational trainers' perspectives and knowledge of including their adjustments to training problems; and (5) they extend the frame of reference of ergonomics to project management and to the ergonomics of training (Poizat and Durand 2014). This growing body of research has taken shape in various configurations that explore different ways for combining work analytic approaches with training and learning processes. In what follows, the orientations underlying these configurations will be briefly overviewed.

2.2.4.1 Work Analysis for Training

The first configuration accounts for the fact that, from their earliest studies, ergonomists became involved in training practices and saw their contribution as preceding and informing the processes and intended outcomes of training (Montmollin 1974). For representatives of Professional or Vocational Didactics, for instance, the ergonomic analysis of work conducted with experienced workers aims at deciphering work-related knowledge and elaborating learning contents that will be, as a second step, used for training purposes. For instance, for training pilots or engineers, it is important to have a detailed understanding of the sorts of knowledge required at work, before designing training programmes that will consist of sharing this knowledge with newcomers. Hence, the typical, invariant and shared components of activity are identified by work analysis and, therefore, provide contents for training courses. Although initially motivated by purposes associated with effective application, such empirical research has provided trainers with evidence that it is relevant to adapt training to the real work and learning processes observed in the field. The regularities observed in the work of different individuals or the same

individual in diverse situations are seen as indications of the competencies – or the elements underlying the here-and-now activity – resulting from practice and/or learning and determining the performance level in job-related tasks (Samurçay and Pastré 1995, 2004; Ouellet and Vézina 2015; Vidal-Gomel and Samurçay 2002).

2.2.4.2   Work Analysis as Training

In a second configuration, researchers quickly acknowledged that through being involved in work analytic practices, workers experienced gains in terms of knowledge construction and performance. These positive transformations have been interpreted differently, depending on various theoretical frameworks. They have been conceptualised as (1) providing greater awareness, understanding and cognitive appreciation of the activity by workers themselves (Pastré 2011); (2) comprising a formal narrative that elicits and ensures a gain in intelligibility; (3) "putting into words" that allows for narrative, distancing and reflexivity (Clot 2009); and more generally (4) a better understanding of the self in action and as an inherent condition to knowledge acquisition (Falzon 2013). What these traditions have in common is the assumption that work analyses should not only be regarded as a condition preceding training but also as training practices as such, in which learning and practitioners' development may arise.

2.2.4.3   Work Analysis as Long-Term Inquiry About Learning and Training

A third research configuration emerged as long-term inquiries about the development of vocational and professional training. This focus has resulted in research on transformations in work activities over the longer term instead of a focus on the present. Procedures to predict activity and track it backwards over various time-scales have been explored. These investigations address work and training situations where transformations have occurred, whether assisted or not (Chaliès et al. 2004, 2008; Filliettaz 2012; Mayen 2000, 2012; Veillard 2015). Iterative research designs have been developed that closely combine work analysis with training practices, in what has become known as the ergonomics of training situations (Bailly et al. 2014; Durand 2013; Horcik and Durand 2011; Horcik et al. 2014).

2.2.4.4   Work Analysis as Design-Based Research

Finally, a fourth configuration that seems to be emerging today could be summarised as design-based research. This configuration simultaneously convenes activity analysis, design and training through iterative loops. This configuration is characterised by two aspects: (1) it recognises and exploits the two simultaneous and interdependent facets of human activity (i.e. production and construction), and

(2) it assumes that there is a mutual structuring and inherent link between empirical research and technological research, oriented towards training design (Durand 2008). This means that the same assumptions underlie both empirical and technological researches and that the two programmes validate or invalidate each other. One of the main objectives is to create and extend knowledge about developing and sustaining innovative learning environments either in the workplace or in training. There are two challenges associated with carrying out design-based studies as defined here: (1) researchers endorse simultaneously research and design roles, and (2) new forms of collaborative partnerships evolve between researchers and practitioners. For instance, mixed groups of informants are used to prompt the transformation in activities and activity organisation through a process of concurrent design and the expansion and transmission of innovation as the object and objective of collaborative investigation. This configuration opens a new field for research and practice, located somewhere between the design of work environments and capacitating organisations (Lorino et al. 2011; Lorino 2015) and the design of vocational training that can accommodate the intermediate hybrids of work/training (Poizat and Durand 2014).

2.3   Francophone Perspectives on Language, Work and Learning

When scrutinising the circumstances in which work activities are conducted, not only as "plans" or "tasks" but as "real actions", ergonomists and work analysts notice that talk and other forms of language use may play a considerable role in how an individual engages in work activities. Consequently, the conditions under which these forms of language use could be understood, described and interpreted attracted considerable attention within the Francophone research community dedicated to learning and work. In the mid-1980s, a number of linguists with diverse disciplinary backgrounds began to actively contribute to the research programme of a "scientific study of work" and developed collaborations with specialists of various disciplines such as ergonomics, work psychology, organisational sociology, anthropology or economics. A formal interdisciplinary network emerged from these collaborations, entitled "Language and Work" (*langage et travail*), and officially accredited by French academic research organisations. Over more than two decades of existence, the Language and Work network delivered important research outcomes on a wide range of topics related to language use in the workplace and empirically grounded in a diverse range of empirical fields (Boutet 1995; Borzeix and Fraenkel 2001; Grosjean and Lacoste 1999; Pène et al. 2001). In what follows, the contributions of this network are briefly summarised in a non-exhaustive way.

The first contribution of this research tradition was to operationalise what has been identified as a "linguistic turn" in the ergonomic analysis of work (Boutet 2001). This turn recognises both the presence and the key contributions from

language use to the planning, the accomplishment and the reflexive interpretation of work-production activities. Language is not absent from the workplace. It is through engaging in communicative events that individuals plan their work, coordinate their contributions to production tasks with other workers, solve problems, keep memories of their decisions, assess the results of work, engage in reflexive reasoning, etc. From that standpoint, language can be seen as a constituent and constitutive part of work, according to the expression coined by Boutet (2001) – *la part langagière du travail*.

The recognition of language use as a constitutive part of work should not be regarded as given and self-evident. However, it is a relatively recent historical and cultural construct that is closely related with evolutions that have occurred in modern times about the organisation of work. Herein lies a second important contribution from the Language and Work network to the ergonomic analysis of work. By adopting a sociological and historical perspective on the role and place of language use in workplaces, representatives of this research tradition emphasised numerous and significant changes in work organisations, which had a direct impact on how language has been perceived. As mentioned by Boutet (2008), language use was not acknowledged as a productive resource in a Taylorian production system. It was seen as a mere distraction and prohibited from the large manufactures and factories that developed after the industrial revolution in the nineteenth century. The labour had to "do the work" and not "talk". The situation rapidly changed after the oil and energy crisis in the early 1970s, when a service-oriented economy progressively took over in Western societies and when a "new work order" was established. It was then commonly expected that workers should be able to cooperate with colleagues, have literacy skills, adapt to norms and procedures that may take written or oral forms and be able to cope with unpredicted "events". Being a competent worker in such a work context also required the ability to mobilise and to develop "communicative competences" (Zarifian 2001). These requirements and expectations have increased considerably in recent times, known as the "globalised new economy". Influenced by the rise of new technologies, a growing number of work-production tasks have quickly become "dematerialised" and now take the shape of symbolic actions in which workers produce and interpret "signs" and engage in a constant meaning-making process. In many respects, the contemporary workplace no longer sees language use as a peripheral ingredient but as a production resource and as a mediating tool through which professional practice occurs. These changes have significant consequences in terms of vocational and professional education, which has to prepare and adapt the workforce not only to specific technical and work-related skills but also, more widely, to multilingual, globalised and language-mediated professional practices (Mourlhon-Dallies 2008).

In recognising the configuring role of language in contemporary workplaces, representatives of the Language and Work tradition have also highlighted the multiple *functions* endorsed by linguistic resources in workplaces. These functions include practical, social as well as cognitive dimensions of work practice (Lacoste 2001) and can be seen as being fivefold. First, language use at work has often been reported as serving practical functions. Through engaging in discourse and

interactions, workers "get things done", and they plan and anticipate future actions, perform them and provide accounts and evaluations about past events. Second, linguistic resources are also used by workers as resources for accomplishing the social dimensions of professional practices. They are means through which workers position themselves in groups, endorse specific identities, produce or reproduce cultural communities or establish power relations. Linguistic resources as they are used in the workplace discourse and interactions also serve cognitive processes related to memory, problem solving and learning. It is by engaging in discourse and interactions that workers share and negotiate a joint understanding of the world (i.e. intersubjectivity), that they take decisions and reflect on their experiences and that they may learn from more experienced workers.

A fourth significant input from the Language and Work network was to endorse an interventionist perspective adopted by the ergonomic tradition. From that standpoint, research on professional practice was designed as a means for bringing change and addressing work organisation issues, as they are experienced and formulated by workers themselves. Workplaces are not merely seen as sites for data collection and descriptive analysis but as an institution in which workers engage practically, subjectively and emotionally and where specific needs may emerge. The role of a research-intervention design is then to identify these needs, to shape the demands that may emerge from these needs and to develop methods that can fruitfully respond to these demands. Considering that demands emanating from work organisations often have direct or indirect connections with language use, representatives of the Language and Work network contributed, in an interdisciplinary perspective, to ergonomic interventions. These interventions addressed a wide range of issues, in diverse professional contexts. For instance, they contributed to understand service encounters in the public sector, the role of cooperation and coordination in the work of nurses (Grosjean and Lacoste 1999) or the specific nature of language use in call centres (Boutet 2008).

Finally, contributions from the Language and Work perspective underline the richness, the complexity and the diverse ways through which language use may be related to work activities. Building upon early distinctions introduced by ergonomists, language was seen as being used "at", "as" and "about" work (Lacoste 2001). Language may be used "at" work when it interrelates with practical actions and physical interventions in the material world. Language may be used "as" work in situations where professional practice is primarily accomplished through communicative events. Language can also be used "about" work when it produced anticipatory, contemporary or retrospective accounts about work activities.

In what follows, each of these diverse forms of contributions from language use to work activities and learning is presented in more detail.

2.3.1   Language Use as a Resource for Accomplishing Work

One first way to understand the role and place of language in connection to work is to recognise the "performative" dimension of language use. Referring back to the founders of linguistic pragmatics (Austin 1975; Searle 1969), language should not only be regarded as a medium for "describing" the world but as a tool for performing "speech acts" and accomplishing intentions that may transform the world. Applied to workplace contexts, these ideas have contributed to fostering a specific perspective on language use, in which the production of talk or writing is conceptualised as a resource for "doing" work in settings where a plurality of participants are co-present and have to engage in forms of coordination.

These ideas have been widely shared amongst discourse and interaction analysts, inspired by a wide range of Anglophone research traditions. These include interactional sociolinguistics (Gumperz 1982), the ethnography of speaking (Hymes 1984) and mediated discourse analysis (Scollon 2001). These traditions view language not only as a way of conveying information from speakers to recipients but as a historical and culturally shaped medium through which individuals take actions, achieve cooperation, align identities and participate in social events. In observing the concreted actions amongst participants and describing how they communicate and interact, discourse and interaction analysts examine what individuals produce together, what they hold each other accountable for and how they make sense of actions of others. In doing so, they identify patterns of practice that make visible what members need to know, produce and interpret to participate to work-production tasks in an appropriate way. A wide range of analytic concepts have been elaborated within these traditions, for instance, that of *performativity*, *indexicality*, *sequential organisation* or *multimodality*. These concepts have been designed to account for the situated, collective and dynamic nature of work activities and to understand how language use, combined with other semiotic resources, is contributing to the joint accomplishment of work. Whilst not defined here, they are presented in detail in Filliettaz et al. (2015) within this volume.

Importantly, specific methodological requirements are associated with the study of language use "at" or "as" work. These requirements relate to how empirical data may be collected, processed and interpreted for research and intervention purposes. Empirical data is central for discourse and interaction analysis in the sense that they constitute the primary material on which the analysis is based. Data can consist of written, oral and multimodal accounts of behaviour through which individuals accomplish social practices in specific contexts. Discourse and interaction analysts usually do not artificially produce the data they are putting under scrutiny. They collect these data in the natural conditions in which they occur and conduct field work to gain access to such data. For capturing the indexical, dynamic and multimodal nature of situated interactions, discourse and interaction analysts have progressively come to use video recordings for research purposes (Erickson 2004; Heath et al. 2010). Video recordings of naturally occurring talk in interaction capture the fine-grained details of how interaction unfolds, its relations with specific

material and practical arrangements and the complex range of semiotic resources used and combined by participants. The analysis is based on transcripts and the audio-video recordings they refer to. This analysis is highly qualitative, and based not only on the contents expressed in the data. Details regarding the unfolding process of interaction are also seen as offering meaningful cues for understanding how these contents are understood by participants themselves. From there, analytic interpretations are based both on a general ethnographic understanding of the contexts in which data was collected and on the qualitative properties of these data and their dynamic unfolding.

Within the Francophone world, a wide range of research topics have been investigated recently using a discourse and interaction analytic lens. Researchers have explored different facets of the role and place of language use "at" and "as" work. One first domain of investigation consists in exploring the material and dynamic conditions in which workers accomplish joint forms of actions in workplaces and coordinate their participation to such actions. Numerous studies, for instance, stress the role of fine-grained coordination processes in various work contexts such operating rooms (Mondada 2006), business meetings (Mondada 2005), handovers in nursing (Grosjean and Lacoste 1999) or industrial companies (Filliettaz 2008). Decision-making processes in the workplace have also been extensively investigated within this tradition. Grosjean and Mondada (2004) bring together studies that stress the role of negotiations in workplace activities and that analyse the conditions in which these negotiations occur, in diverse professional environments, such as service encounters, shops or public administrations. Studies by Grusenmeyer and Trognon (1997) also describe how workers accomplish shared forms of reasoning in nurses' handovers, and how these shared forms of reasoning are accomplished in and through dialogues. Another area of research has focused on interpersonal and relational dimensions in workplace contexts. Studies addressing this topic have primarily investigated service encounters, whether in retail stores (Kerbrat-Orecchioni and Traverso 2008; Filliettaz 2006) or call centres (Boutet 2008). They highlight that interpersonal relations at work are often asymmetrical and that language use plays an important role in the ways participants handle these asymmetries (Laforest and Vincent 2006). Finally, written forms of language use have also been taken into consideration. Studies by Fraenkel (2001) show, for instance, that writing in workplace contexts should not be regarded exclusively in terms of static written productions (i.e. written texts) but as dynamic processes that is closely interrelated with professional practices themselves. Similar to talk, written forms of work activities are collectively produced and the result of a dynamic and situated accomplishment.

2.3.2   Language Use as a Resource for Analysing Work

When ergonomists started to undertake systematic and fine-grained analyses of work activities, it was often observed that the sorts of knowledge that underlie

professional practices are sometimes difficult to identify and to categorise. As mentioned above, this body of knowledge is not easily intelligible for external observers. Workers themselves often experience difficulties in explaining what they do and what constitutes their expertise. There are good reasons for this difficulty. This knowledge tends to be embodied in gestures and technical actions, but is often not consciously present in workers' minds and, therefore, not easily accessible nor able to be articulated through their utterances. This issue is well illustrated in Ouellet and Vézina's contribution to this volume (Ouellet and Vézina 2015), when they note that the specific kind of knowledge developed by expert workers in the meat-processing industry cannot be simply inferred declaratively from observation or spontaneous interactions with workers.

As also mentioned earlier, specific interview procedures have been developed and refined within the tradition of Francophone ergonomics in attempts to overcome these difficulties. Known as "self-confrontation interviews", "instruction to the double" or "explanation interviews", these procedures have aimed at gaining access to practice-based knowledge by placing workers in situations where they are invited to comment on situated work activities through structured and guided interview techniques. These methods are not transparent from language use but are deeply mediated by the ways semiotic resources may be used not only "at" work but also "about" work. Interestingly, these methods are also closely aligned with specific epistemological backgrounds and have developed particular conceptions in respect to how language may contribute to the intelligibility of work activities. In what follows, elements of these theoretical conceptions are explained, and different aspects of language use "about" work are explored.

A key premise within this tradition is that language use can be regarded as a *meaning-making process*. For the "course-of-action" approach (see Durand and Poizat 2015; Poizat 2015), for instance, self-confrontation techniques aim to identify meaningful action units, which are defined as "signs". These signs reflect workers' subjective experiences and how they are able to identify what they see as relevant elements of their work environments. Meaningful action units emerge in self-confrontation interviews, as the result of a combination between real work activities as they are accomplished and observable, and interpreted activities, as they are commented by workers through language use.

A second aspect of language use that deserves attention in the context of work-analysis interviews is what linguists or specialists in communication, following Jakobson (1960), have termed the "referential function of language". Many scholars in the tradition of work analysis consider language as a "descriptive" tool but also as a means for representing or referring to elements of the context in which it is used. For Bronckart et al. (2004), for instance, work activities become interpreted through the mediation of language use. It is by producing discourses "about" work and by referring to specific work activities that workers display interpreted versions of their praxis. These interpretations may take various "shapes", depending on the contents of the interviews and the linguistic resources used to refer to such contents. For instance, work activities can be framed in discourses about work as "situated actions" that occur in a single specific context,

or as "typifications" that are seen as having a more general validity, going beyond the immediacy of single instances.

Language use "about" work is often inherently "dialogical" in the sense that it is collectively and dynamically produced by participants as they engage in work-analysis interviews. Here lies another important specificity of language use as it is conceptualised in work analysis. Representatives of the Clinic of Activity approach have explicitly insisted on this aspect of the role of language in ergonomic interventions (see Kloetzer et al. 2015). As mentioned in the work of Kostulski (2011), for instance, the dynamic unfolding of dialogues in self-confrontation interviews can be seen as an intersubjective process through which participants share perceptions, engage in controversies, negotiate local agreements, etc. A relation of isomorphic nature is being postulated between the unfolding structure of dialogues and the cognitive and social aspects of collective reasoning that emerge from these dialogues.

It should also be added that work-analysis interviews are not only "dialogical" in the sense that they are jointly accomplished through "dialogues" but because they are shaped by broader pre-existing cultural and historical constructs. This refers to a specific conception of "dialogism", borrowed in particular from the work of Bakhtin (Clark and Holquist 1984), and that borrowing has strongly influenced various perspectives and traditions in Francophone research on learning through work. One of Bakhtin's key premises was to consider that discourses are not locally invented by speakers or writers, as they engage in specific actions. Instead, these discourses are using "genres" as models and frames. They are also polyphonic in the sense that they respond to other discourses already produced or anticipate discourses that may occur in the future. In sum, these discourses are involved in a dialogical process in which participants engage with cultural and social resources that are beyond the sphere of influence of local and isolated individuals. Applied in the context of work activity analyses, Bakthin's dialogical perspective has often been used to show how much workplaces are framed by numerous and sometimes conflicting social norms. Particularly illustrative of this tradition is Matte and Cooren's contribution to this volume (Matte and Cooren 2015). These authors make visible how the discourses produced by professionals working for humanitarian organisations are not only voicing their own actions but also a wide range of other institutional voices that are often contradictory and create permanent tensions between values, beliefs, interests and ideologies. Similar considerations are present in the chapter by Lorino (2015), where organisational changes are conceptualised as influenced by how workers engage in a process of "dialogical inquiries" that evolves over time and as members of workplaces have to transform their routines and habits.

2.3.3 Language Use as a Resource for Learning and Development

When underlining the role and place of language "at", "as" or "about" work, Francophone researchers also produced numerous considerations about how the accomplishment or the reflexive understanding of work activities may be seen as resources for learning and training. Specific conceptions of learning and professional development emerged from these considerations, often closely connected with sociocultural learning theories. In what follows, the specific contributions from a linguistic perspective on work activities to the field of Francophone vocational and professional (i.e. work) training are briefly summarised.

A topic that first attracted close attention amongst Francophone researchers was vocational and professional *training and learning*, seen from the perspective of language use. Representatives of Professional Didactics (Mayen 2012, 2015; Pastré et al. 2006) have long investigated this issue and have largely contributed to establish the idea that learning processes, as they arise in workplaces or in vocational training contexts, are deeply shaped by language use, for three main reasons: firstly, because, as mentioned earlier, language use is present in the vast majority of work activities and plays a configuring role in most of professional practices; secondly, because language use can be seen as playing an important role in the work of teachers, trainers, mentors or workplace supervisors and the ways they share their knowledge with learning workers; and, thirdly, because language is conceptualised as a mediating tool through which cultural knowledge associated with practice may be shared, acquired and interiorised by participants.

These ideas are closely aligned with a historico-cultural framework that stresses the collective and distributed nature of learning processes and the configuring role of "the others" in the ways individuals expand their zone of proximal development (Vygotsky 1978) through the mediation of "scaffolding dialogues" (Bruner 1983; Wood et al. 1976). By applying Vygotsky's and Bruner's ideas on an ergonomic analysis of work activities, scholars in the field of Professional Didactics brought interesting insights to the study of mentoring and guidance in workplace and vocational learning. For instance, Savoyant (1995) investigated the specific ways through which professional knowledge is shared between experienced workers and newcomers in the workplace. His research stressed the implicit nature of these forms of transmission and the differences that characterise these forms from school teaching practices. In a similar perspective, Mayen (2002) analysed vocational training interactions in the agricultural sector, as they take place between apprentices and skilled workers in a wide range of institutional settings. He observed that scaffolding dialogues are present not only in vocational schools or in formal assessment practices but also in ordinary work activities as they are accomplished in workplace contexts. Elaborating on these ideas, recent research conducted by Kunégel (2011) in the occupation of car mechanics identified and described the specific actions mentors take when guiding apprentices in work-production tasks. Kunégel also described how forms of cooperation between mentors and apprentices

evolve over time, as apprentices become more competent and autonomous in their tasks (see Filliettaz et al. 2015). All these research findings tend to elaborate how language use and verbal interactions exert influences on what is often referred to as learners' zone of proximal development and the real conditions under which guided forms of learning are accomplished in practice.

By adopting a similar historico-cultural perspective, other traditions in Francophone research on learning through work have focused their investigations not so much on learning and shared knowledge but on psychological development. As explicitly mentioned by Kloetzer et al. (2015), the Clinic of Activity approach views learning as a form of development. It is through their capacity to develop their activities in workplaces that workers may learn and address the many and often conflicting demands and challenges of work, at both physical and mental levels. From that standpoint, work activity analysis and the diverse self-confrontation interview techniques associated with an ergonomic approach are conceptualised as resources for sustaining development processes in contexts where obstacles have been identifies. From a Clinic of Activity perspective, workers engage in a triple form of dialogue when they are invited to collectively comment on their work activities in so-called cross-self-confrontation interviews (Clot 2005). At an *interpersonal* level, they negotiate their perceptions about how work activity is being carried out or how it could have been carried out differently. At a *transpersonal* level, they engage in a "dialogical" process following a Bakhtinian account, in which they confront their perceptions to collective and historical constructs developed by specific "trades". And, finally, at an *intrapersonal level*, they reintegrate these perceptions and transform them through the mediation of interactions with other workers. It is by navigating through these diverse levels of dialogues that the means by which workers engage with their activities can evolve in a dynamic process and that issues related to security and health may be fruitfully addressed. In elaborating the resource that language provides as a means to explain learning and development resides one specific contribution of verbal interaction to the development of adults in workplace contexts.

2.4 Social and Organisational Dimensions to Learning

2.4.1 Learning as an Inherently Social Process

Several contributions collected in this volume directly address the social dimension of workplace learning, taking place in various social settings, such as block-release vocational training, alternating school-based formal training and practical internships in various organisational settings (Veillard; Bourgeois et al. 2015), large business firms (Lorino 2015), cooperative day-care centres (Brougère 2015), humanitarian organisations (Matte and Cooren. 2015) or various informal and formal learning settings in the field of organic agriculture (Bourgeois et al. 2015).

The social dimension of learning on focus in the research reported in those contributions is dealt with at several levels: macro cultural context, organisational context and social interactions (with peers, supervisors, tutors, etc.).

At the (macro) cultural level, Bourgeois et al. (2015) show that the prevailing mode of transmission and learning in a given occupational area, to a large extent, depends on the evolution and the prevailing pattern of professional practice and knowledge in the area (continuity *vs.* break from tradition, loose *vs.* tight modelling, single *vs.* multiple modelling, loose *vs.* tight professional community, etc.). Brougère (2015) analyses parent-run cooperative children's day-care centres as communities of practice, with different actors (i.e. parents and professional educators) negotiating different repertoires of practices and meanings, in particular about educational and caring practices and beliefs.

At the organisational level, Lorino (2015) views organisations as combining, on the one hand, "communities of practice" (e.g. technicians or accountants or purchasers), that is, in Wenger's (1998) sense, a community sharing common professional practices and culture ("professional genre"), and, on the other hand, "communities of process", that is, a community of people from different professional cultures but cooperating towards common work goals and process. Work activity in organisations is inherently collective, involving both communities of practice and communities of process in interaction. On the other hand, learning is viewed as inherent in activity: when facing a problematic, unexpected or novel situation in the course of its activity, the work collective (i.e. both communities of practice and of process) engages in an inquiry to form a so-called community of inquiry. The outcome of this inquiry process, whether successful or unsuccessful, depends upon various types of factors, including organisational ones, such as managerial conditions and work organisation. Likewise, Brougère (2015) sees the day-care centre organisation as a community of practice and accordingly relates learning in that workplace to participation in the community of practice: the actors' (parents and professional) opportunities for learning depend on their actual mode of participation in the community of practice and the other way around. Matte and Cooren (2015) also view learning in organisational settings as an inquiry process, mostly triggered by the experience of "organisational tensions" to be solved. Veillard (2015), drawing on Billett's (2006) typology, associates the observed discrepancies between the "intended", "actual" and "experienced" curricula to differences in the school setting and the workplace (companies where trainees do their practical internships).

The social dimension of learning in the workplace is also addressed in terms of social (interindividual) interactions. Lorino (2015) insists on learning as a "dialogical" process involving organisational members with different styles (within a community of practice sharing a common professional "genre") and/or functions and positions (within a community of process), making the inquiry process "heterological", thereby creating potential for learning. Supervisor-trainee relationships are the focus of Bourgeois et al.'s (2015) study of psychologist trainees. They show that learning, and more specifically "individuation" in the learning process, depends on several characteristics of the relationship between the individual

trainees and their supervisors. These authors also emphasise the role of the group's support in the training and in workplace settings, particularly in terms of "psychological safety". Matte and Cooren (2015) focus on some specific aspects of social interactions in learning and more specifically on peer-to-peer interactions. In particular, they examine the role of what they call "ventriloquial" dialogue in learning in organisational settings such as a big humanitarian organisation.

In conclusion, what is striking in most of these contributions is the central assumption that (workplace) learning is inherently social, albeit as Billett (2014) infers the personal character of that socially derived learning. It is viewed as embedded in activity, which is itself viewed as inherently collective, as an essentially dialogical process or as participation in a community of practice. This social dimension is typically dealt with either from a historico-cultural perspective (with the notion of community of practice as a key concept) deeply rooted in the Vygotskian and neo-Vygotskian traditions or from a more Francophone-oriented anthropological perspective, focusing on learning and transmission in various occupational areas. Those contributions also share the assumption that learning is always somehow essentially a transformation process – transformation of practices, beliefs, representations of the world ("narratives") or "habits". Moreover, learning implies that such a transformation is socially recognised and valued as such. Such an emphasis on the social dimension of learning does not mean that its individual and subjective dimension is not taken into account. This is clearly the case in Matte and Cooren's (2015) study, looking as learning from the point of view of the individual "interactants" involved in a dialogical activity. Likewise, Bourgeois and his colleagues focus on the "individuation" process, that is, the process through which the individuals gradually differentiate themselves from the reference model in a vocational transmission context. However, even in these cases, individual learning is viewed as always operating within the framework of interactions with others (significant persons or a community the individual belongs to or identifies with).

2.4.2 Theoretical, Conceptual and Disciplinary Frames of Reference

The theoretical and conceptual references in those contributions are quite varied. Some of them are strongly grounded in the Vygotskian (Vygotsky 2012) and neo-Vygotskian (Wertsch 1991), emphasising the historico-cultural dimension of learning. Likewise, the theory of community of practice (Lave and Wenger 1991; Rogoff 1990; Wenger 1998) is widely referred to. Dewey (1938), with his theory of inquiry, valuation and experience, also appears as a central reference to account for learning as a (collective) inquiry process responding to problematic situation met in the course of the work activity. The organisational dimension of learning is addressed in reference to general organisational theory (e.g. Simon 1965), theory

of organisational learning (Antonacopoulou and Chiva 2007; Clegg et al. 2005; Elkjaer 2004; Gherardi et al. 1998) and organisational communication (Bisel et al. 2012; Brummans et al. 2014. The assumption of learning as a dialogical process is mostly grounded in Bakhtin's work (Todorov 1984), as well as Erving Goffman's on interaction rituals and presentation of self (Goffman 1959, 1967). Theories of activity, both French (Clot 1999; Clot and Faïta 2000; Rabardel 2005) and Soviet, are also a major source of inspiration in some of those contributions that approach learning as essentially inherent in human activity. The individuation process in learning is addressed mostly from a psychoanalytical point of view (Bion 1979; Delannoy 1997; Kaës 2011; Richard and Wainrib 2006; Winnicott 1971). Last but not the least, the anthropological/ethnographic French literature on transmission in various occupational areas (Burnay 2011; Burnay and Klein 2009; Chevallier 1991; Delbos and Jorion 1984; Dolbeau 2012; Nizet et al. 2009) is also a central reference in some of those contributions. Collectively, workplace learning is approached in those contributions clearly from a range of disciplinary perspectives. These include French anthropology, French and Soviet theories of activity, sociology of organisation (both French and British), psychoanalysis and psychology of learning and micro-sociology and psychology of social interactions. However, apart from a few exceptions (i.e. French theory of activity, French anthropology of occupational transmission and French psychoanalysis), the origins of the theoretical backgrounds of those contributions are predominantly Anglophone.

If there is any Francophone specificity in the research presented here, it lies in how these ideas have been taken up and engaged in the French milieu or macro cultural context as discussed above. For instance, how these traditions come to be articulated is in some ways peculiar: for example, psychoanalysis and psychology of learning to account for the individuation process in workplace learning or theory of activity, theory of communication and sociology of organisation to account for some aspects of organisation learning. Beyond that, the prevailing theoretical assumptions underlying that research on workplace learning presented in those contributions (i.e. strong emphasis on the social dimension of learning, close link between activity and learning, systematic articulation between the individual and collective dimensions of learning, emphasis on interactions between individual engagement and affordances in workplace learning, etc.) are quite consistent with how workplace learning is approached in the Anglophone research literature today.

2.4.3   Empirical Research Methods and Fields

The theoretical developments proposed by those contributions are all grounded in qualitative empirical research, conducted with different methods. Organisational ethnographic case study (i.e. mostly based upon various types of interviews and direct observation) is the most represented method in those contributions. One of them uses a longitudinal design (i.e. Veillard 2015) and another uses a comparative design contrasting data from two distinct empirical fields (i.e. Bourgeois

et al. 2015). The research presented in those contributions was conducted on a wide variety of professional fields, mostly in organisational settings (big business firms, agriculture, block-release vocational training and professional education programmes, humanitarian NGO and day-care centres).

2.5 Key Ideas Beyond Specific Traditions

This overview of recurrent features of the chapters collected in the book demonstrates how Francophone perspectives and traditions on learning through work are clearly not disconnected from other traditions as they are enacted internationally in the relevant field of research. Moreover, Francophone research does not appear as a unified and homogeneous set of ideas. Instead, it evolves in many different directions, sometimes in close connections with theoretical and methodological elaborations developed and applied in the English-speaking world.

However, beyond the specific traditions they are aligned with and to which they contribute, the perspectives advanced in this book promote key ideas that are necessary to have in mind when engaging effectively with the Francophone research literature. These ideas are sometimes formulated explicitly, sometimes implicitly, and they convey a range of principles that attempt to go beyond binary and clear-cut dichotomies. In what follows, these principles are briefly articulated.

Firstly, a precept that underlies most of the research traditions advanced in this book is of tight relations amongst activity, learning and "subjectivity". Work activities cannot be disconnected from the individuals who do the work and their subjective and personal engagement in workplace environments. From that standpoint, the perspective of the "subjects" – the workers themselves – is seen as a salient feature that drives both ethical and theoretical considerations of the Francophone perspective. From an ethical standpoint, a particular concern is directed towards the benefits workers may gain in the sorts of knowledge produced about their practices. And from a theoretical standpoint, as pointed earlier in this chapter, work activities are not conceptualised as a strict application of norms, procedures and routines but individuals' personal engagement in complex, dynamic and, sometimes, problematic situations. It is through this process of subjective engagement that learning and development arise.

A specific conception of research with regard to practice derives from the above-mentioned precept. For most of researchers contributing to this volume, research is neither disconnected nor radically distinct, from practice itself. Rather than producing research "about" or even "for" practitioners, the purpose driving a number of traditions illustrated in this volume emphasises research designs that can be enacted also "with" practitioners themselves and in which those practitioners have an active role (Cameron et al. 1994). Collaborations between researchers and practitioners, in this perspective, are not conceptualised as outcomes that can be applied or "transferred" to practice. Instead, they need to be negotiated and dynamic processes, based on explicit or implicit demands emerging from

practitioners. From that standpoint, workplaces are not only an object of description and analysis; they are also transformed through research interventions.

This later point has important consequences with regard to how one conceptualises the links between "research methods" and "research results". For most authors enacting an interventionist research design, results are not conceptualised as an outcome of empirical material, collected and analysed through the lens of a specific methodological frame. Procedures, it is proposed, are seen as tools through which interventions and change occur. They are intrinsically associated with the production of knowledge but also, most importantly, with learning and development outcomes for those who participate.

Finally, specific ways of combining vocational training and work emerge from Francophone traditions, which are far more complex than a linear and clear-cut delimitated set of practices. Most of the contributors to this volume do not assume that vocational training precedes work experience and that learning is a prerequisite for work. Learning, it is proposed, can take various forms depending on the cultural, institutional and practical contexts in which it is enacted. Workplace activities can be explicitly integrated in vocational training curriculum (see Veillard 2015), and training contents can be identified and categorised through a detailed analysis of real work activities (see Mayen 2015; Ouellet and Vézina 2015). As stressed by most chapters, workers very often engage in learning experiences in the workplace, but they also do so when specific conditions are afforded to them. What Francophone research does, in close connection with other traditions and perspectives, is then to contribute to the understanding of these conditions and to how these can best be supported and promoted.

References

Amalberti, R., de Montmollin, M., & Theureau, J. (Eds.). (1991). *Modèles en analyse du travail*. Bruxelles: Mardaga.

Antonacopoulou, E., & Chiva, R. (2007). The social complexity of organizational learning: The dynamics of learning and organizing. *Management Learning, 38*(3), 277–295.

Austin, J. L. (1975). *How to do things with words*. Oxford: Oxford University Press.

Bailly, M.-C., Durand, M., Goudeaux, A., Horcik, Z., & Poizat, G. (2014). Analyse du travail et formation: une technologie innovante. *Education Permanente*, n°HS-6, 20–27.

Billett, S. (2006). Constituting the workplace curriculum. *Journal of Curriculum Studies, 38*(1), 31–48.

Billett, S. (2014). Mediating learning at work: Personal mediations of social and brute facts. In C. Harteis, A. Rausch, & J. Seifried (Eds.), *Discourses on professional learning: On the boundary between learning and working* (pp. 75–93). Dordrecht: Springer.

Bion, W. R. (1979). *Aux sources de l'expérience*. Paris: Presses Universitaires de France.

Bisel, R. S., Messersmith, A. S., & Kelley, K. M. (2012). Supervisor-subordinate communication hierarchical mum effect meets organizational learning. *Journal of Business Communication, 49*(2), 128–147.

Borzeix, A., & Fraenkel, B. (Eds.). (2001). *Langage et Travail, communication, cognition, action*. Paris: CNRS Éditions.

Bourgeois, E., Allegra, J., & Mornata, C. (2015). Transmission and individuation in the workplace. In L. Filliettaz & S. Billett (Eds.), *Francophone perspectives of learning through work: Conceptions, traditions and practices*. Dordrecht: Springer.

Boutet, J. (Ed.). (1995). *Paroles au travail*. Paris: L'Harmattan.

Boutet, J. (2001). La part langagière du travail: bilan et évolution. *Langage et Societe, 98*, 17–42.

Boutet, J. (2008). *La vie verbale au travail: des manufactures aux centres d'appel*. Toulouse: Editions Octarès.

Bronckart, J.-P., Bulea, E., & Fristalon, I. (2004). Les conditions d'émergence de l'agir dans le langage. *Cahiers de linguistique française, 26*, 345–369.

Brougère, G. (2015). Learning by participating: A theoretical configuration applied to French cooperative day care centres. In L. Filliettaz & S. Billett (Eds.), *Francophone perspectives of learning through work: Conceptions, traditions and practices*. Dordrecht: Springer.

Brummans, B. H. J. M., Cooren, F., Robichaud, D., & Taylor, J. R. (2014). Approaches in research on the communicative constitution of organizations. In L. L. Putnam & D. K. Mumby (Eds.), *Sage Handbook of organizational communication*. Thousand Oaks: Sage.

Burnay, N. (Ed.). (2011). *Transmission, mémoire et reconnaissance*. Fribourg: Presses Universitaires de Fribourg.

Burnay, N., & Klein, A. (Eds.). (2009). *Figures contemporaines de la transmission*. Namur: Presses Universitaires de Namur.

Bruner, J. S. (1983). *Child's talk: Learning to use language*. Oxford: Oxford University Press.

Cameron, D., et al. (1994). The Relationship between researcher and researched: Ethics, advocacy and empowerment. In D. Graddol, J. Maybin, & B. Steirer (Eds.), *Researching language and literacy in social context* (pp. 18–25). London: Open University.

Chaliès, S., Ria, L., Trohel, J., & Durand, M. (2004). Knowledge construction and articulation of courses of action by preservice teachers and cooperating teachers during post-lesson interviews. *Teaching and Teacher Education, 20*, 765–781.

Chaliès, S., Bertone, S., Flavier, E., & Durand, M. (2008). Effects of collaborative mentoring on the articulation of training and classroom situations: A case study in the French school system. *Teaching and Teacher Education, 24*, 550–563.

Chevallier, D. (Ed.). (1991). *Savoir faire et pouvoir transmettre*. Paris: Editions de la Maison des sciences de l'homme.

Clark, K., & Holquist, M. (1984). *Mikhail Bakhtin*. Cambridge, MA: Harvard University Press.

Clegg, S. R., Kornberger, M., & Rhodes, C. (2005). Learning/becoming/organizing. *Organization Science, 12*(2), 147–167.

Clot, Y. (1999). *La fonction psychologique du travail*. Paris: Presses universitaires de France.

Clot, Y. (2005). L'autoconfrontation croisée en analyse du travail: l'apport de la théorie bakhtinienne du dialogue. In L. Filliettaz & J.-P. Bronckart (Eds.), *L'analyse des actions et des discours en situation de travail. Concepts, méthodes et applications* (pp. 37–55). Louvain-la-neuve: Peeters.

Clot, Y. (2009). Clinic of activity: The dialogue as instrument. In A. Sannino, H. Daniels, & K. D. Gutiérrez (Eds.), *Learning and expanding with activity theory* (pp. 286–302). Cambridge, MA: Cambridge University Press.

Clot, Y., & Faïta, D. (2000). Genres et styles en analyse du travail: Concepts et méthodes. *Travailler, 4*, 7–42.

Clot, Y., & Kostulski, K. (2011). Intervening for transforming: The horizon of action in the clinic of activity. *Theory & Psychology, 21*, 681–696.

Clot, Y., Faïta, D., Fernandez, D., & Scheller, L. (2001). Entretiens en autoconfrontation croisée: une méthode en clinique de l'activité. *Education Permanente, 146*, 17–25.

Daniellou, F. (Ed.). (1996). *L'Ergonomie en quête de ses principes*. Toulouse: Octarès.

Daniellou, F. (2005). The French-speaking ergonomists' approach to work activity: Cross influences of field intervention and conceptual models. *Theoretical Issues in Ergonomics Science, 6*, 409–427.

De Keyser, V. (1991). Work analysis in French language ergonomics: Origins and current research trends. *Ergonomics, 34*, 653–669.

De Keyser, V. (1992). Why field studies. In M. Helander & M. Nagamachi (Eds.), *Design for manufacturability: A systems approach to concurrent engineering and ergonomics* (pp. 305–316). London: Taylor & Francis.

De Montmollin, M. (1967). *Les systèmes Hommes-Machines: Introduction à l'ergonomie*. Paris: Presses universitaires de France.

De Montmollin, M. (1974). *L'analyse du travail : préalable à la formation*. Paris: Armand Colin.

De Montmollin, M. (1981). *Le taylorisme à visage humain*. Paris: Presses universitaires de France.

De Montmollin, M. (1984). Actualité du taylorisme. In M. de Montmollin & O. Pastré (Eds.), *Le taylorisme* (pp. 13–32). Paris: La découverte.

De Montmollin, M. (1991). Analysis and models of operators' activities in complex natural life environments. In J. Rasmussen, H. B. Andersen, & N. O. Bernsen (Eds.), *Human-computer interaction* (pp. 95–112). London: Erlbaum.

Dejours, C. (2010). *Le facteur humain*. Paris: Presses universitaires de France.

Delannoy, C. (1997). *La motivation. Désir de savoir, désir d'apprendre*. Paris: Hachette.

Delbos, G., & Jorion, P. (1984). *La transmission des savoirs*. Paris: Editions de la Maison des Sciences de l'Homme.

Dewey, J. (1938). *Logic. The theory of inquiry*. New York: Holt.

Dolbeau, M. (2012). *La mémoire du métier. Maréchal-ferrant : un passé retrouvé*. Paris: L'Harmattan.

Durand, M. (2008). Un programme de recherche technologique en formation des adultes. *Education & Didactique, 2*, 69–93.

Durand, M. (2011). Self-constructed activity, work analysis, and occupational training: An approach to learning objects for adults. In P. Jarvis & M. Watts (Eds.), *The Routledge international handbook on learning* (pp. 37–45). London: Routledge.

Durand, M. (2013). Human activity, social practice and lifelong education: An introduction. *International Journal of Lifelong Education, 32*, 1–13.

Durand, M., & Poizat, G. (2015). An activity-centred approach to work analysis and the design of vocational training situations. In L. Filliettaz & S. Billett (Eds.), *Francophone perspectives of learning through work: Conceptions, traditions and practices*. Dordrecht: Springer.

Elkjaer, B. (2004). Organizational learning the 'third way'. *Management Learning, 35*(4), 419–434.

Erickson, F. (2004). Origins: A brief intellectual and technological history of the emergence of multimodal discourse analysis. In P. Levine & R. Scollon (Eds.), *Discourse and technology: Multimodal discourse analysis* (pp. 196–207). Washington, DC: Georgetown University Press.

Falzon, P. (Ed.). (2013). *Ergonomie constructive*. Paris: Presses universitaires de France.

Faverge, J.-M. (1954). *Méthodes statistiques en psychologie appliquée*. Paris: Presses universitaires de France.

Filliettaz, L. (2006). Asymétrie et prises de rôles. Le cas des réclamations dans les interactions de service. In M. Laforest & D. Vincent (Eds.), *Les interactions asymétriques* (pp. 89–112). Québec: Editions Nota bene.

Filliettaz, L. (2008). Compétences professionnelles et compétences langagières en situation de risque : La régulation langagière d'un « événement » en milieu industriel. *Langage et Societe, 125*, 11–34.

Filliettaz, L. (2012). Affording learning environments in workplace contexts: An interactional and multimodal perspective. *International Journal of Lifelong Education, 32*, 107–122.

Filliettaz, L., Durand, I., & Trébert, D. (2015). Learning through verbal interactions in the workplace: The role and place of guidance in vocational education and training. In L. Filliettaz & S. Billett (Eds.), *Francophone perspectives of learning through work: Conceptions, traditions and practices*. Dordrecht: Springer.

Fraenkel, B. (2001). La résistible ascension de l'écrit au travail. In A. Borzeix & B. Fraenkel (Eds.), *Langage et travail. Communication, cognition, action* (pp. 113–142). Paris: CNRS.

Gherardi, S., Nicolini, D., & Odella, F. (1998). Toward a social understanding of How people learn in organizations: The notion of situated curriculum. *Management Learning, 29*(3), 273–297.

Goffman, E. (1959). *The presentation of self in everyday life*. New York: Doubleday Anchor Books.

Goffman, E. (1967). *Interaction ritual. Essays in face-to-face behavior*. Chicago: Aldine Publishers.

Grosjean, M., & Lacoste, M. (1999). *Communication et intelligence collective: le travail à l'hôpital*. Paris: Presses universitaires de France.

Grosjean, M., & Mondada, L. (Eds.). (2004). *La négociation au travail*. Lyon: Presses universitaires de Lyon.

Grusenmeyer, C., & Trognon, A. (1997). Les mécanismes coopératifs en jeu dans les communications de travail: un cadre méthodologique. *Le Travail humain, 60*(1), 5–31.

Guérin, F., Laville, A., Daniellou, F., Duraffourg, J., & Kerguelen, A. (2007). *Understanding and transforming work. The practice of ergonomics*. Lyon: Anact Network Edition.

Gumperz, J. (1982). *Discourse strategies*. Cambridge: Cambridge University Press.

Heath, C., Hindmarsh, J., & Luff, C. (2010). *Video in qualitative research. Analysing social interaction in everyday life*. London: Sage.

Horcik, Z., & Durand, M. (2011). L'ergonomie de la formation par simulation: une démarche pilote de conception en formation d'infirmiers anesthésistes. *Activités, 8*, 173–188.

Horcik, Z., Savoldelli, G., Poizat, G., & Durand, M. (2014). A phenomenological approach to novice nurse anesthetists' experience during simulation-based training sessions. *Simulation in Healthcare, 9*, 94–101.

Hymes, D. (1984). *Vers la compétence de communication*. Paris: Hatier-Credif.

Jakobson, R. (1960). Closing statement: Linguistics and poetics. *Style in language, 350*, 377.

Kaës, R. (2011). Désir de former, formation par le groupe et transmission des savoirs. In R. Kaës & C. Desvignes (Eds.), *Le travail psychique de la formation* (pp. 1–35). Paris: Dunod.

Kerbrat-Orecchioni, C., & Traverso, V. (Eds.). (2008). *Les interactions en site commercial*. Lyon: ENS Editions.

Kloetzer, L., Clot, Y., & Quillerou-Grivot, E. (2015). Stimulating dialogue at work: The activity clinic approach to learning and development. In L. Filliettaz & S. Billett (Eds.), *Francophone perspectives of learning through work: Conceptions, traditions and practices*. Dordrecht: Springer.

Kostulski, K. (2011). Development of activity through reflection: The case of the public prosecutor's lapsus linguae. *Journal of Organizational Change Management, 24*, 191–210.

Kunégel, P. (2011). *Les maîtres d'apprentissage. Analyse des pratiques tutorales en situation de travail*. Paris: L'Harmattan.

Lacoste, M. (2001). Peut-on travailler sans communiquer ? In A. Borzeix & B. Fraenkel (Eds.), *Langage et travail* (pp. 21–53). Paris: CNRS.

Laforest, M., & Vincent, D. (Eds.). (2006). *Les interactions asymétriques*. Québec: Editions Nota bene.

Lave, J., & Wenger, E. (1991). *Situated Learning. Legitimate peripheral participation*. Cambridge: Cambridge University Press.

Laville A., Teiger C., & Duraffourg J. (1972). Conséquences du travail répétitif sous cadence sur la santé des travailleurs et les accidents. Rapport final, no 29, Collection du Laboratoire de Physiologie du Travail et d'Ergonomie du Conservatoire National des Arts et Métiers, Paris.

Leplat, J., & Hoc, J.-M. (1983). Tâche et activité dans l'analyse psychologique des situations. *Cahiers de Psychologie Cognitive, 3*, 49–63.

Lorino, P. (2015). Learning as transforming collective activity through dialogical inquiries. In L. Filliettaz & S. Billett (Eds.), *Francophone perspectives of learning through work: Conceptions, traditions and practices*. Dordrecht: Springer.

Lorino, P., Tricard, B., & Clot, Y. (2011). Research methods for non-representational approaches to organizational complexity: The dialogical mediated inquiry. *Organization Studies, 32*, 769–801.

Matte, F., & Cooren, F. (2015). Learning as dialogue: An 'on-the-go' approach to dealing with organizational tensions. In L. Filliettaz & S. Billett (Eds.), *Francophone perspectives of learning through work: Conceptions, traditions and practices*. Dordrecht: Springer.

Maturana, H. R., & Varela, F. J. (1987). *The tree of knowledge: The biological roots of human understanding*. Boston: Shambhala Publications.

Mayen, P. (2000). Interactions tutorales au travail et négociations formatives: Formes et dispositifs de la professionnalisation. *Recherche et formation, 35*, 59–73.

Mayen, P. (2002). Le rôle des autres dans le développement de l'expérience. *Education permanente, 151*, 87–107.

Mayen, P. (2012). Les situations professionnelles: un point de vue de didactique professionnelle. *Phronesis, 1*, 59–67.

Mayen, P. (2015). Vocational didactics: Work, learning and conceptualization. In L. Filliettaz & S. Billett (Eds.), *Francophone perspectives of learning through work: Conceptions, traditions and practices*. Dordrecht: Springer.

Metz, B. (1960). Adaptation du travail à l'homme. Rapport général sur la Conférence internationale de Zurich (2–6 mars 1959), projet no 6/07 E. Paris: O.E.C.E.-Organisation Européenne de Coopération Économique.

Mollo, V., & Falzon, P. (2004). Auto- and allo-confrontation as tools for reflective activities. *Applied Ergonomics, 35*, 531–540.

Mondada, L. (2005). L'ordre interactionnel et l'ordre institutionnel comme des accomplissements pratiques des membres dans le temps. *Médias et culture, 2*, 85–119.

Mondada, L. (2006). La compétence comme dimension située et contingente, localement évaluée par les participants. *Swiss Journal of Applied Linguistics, 84*, 83–119.

Mourlhon-Dallies, F. (2008). *Enseigner une langue à des fins professionnelles*. Paris: Didier.

Murrell, K. F. H. (Ed.). (1959). *Adaptation du travail à l'homme. Recherches américaines et européennes sur les conditions du travail dans l'industrie*. Paris: Organisation Européenne de Coopération Economique.

Nizet, J., Van Dam, D., & Dejardin, M. (2009). Les limites de la transmission familiales chez les viticulteurs bio alsaciens. In N. Burnay & A. Klein (Eds.), *Figures contemporaines de la transmission* (pp. 347–358). Namur: Presses Universitaires de Namur.

Oddone, I., Re, A., & Briante, G. (2008). *Esperienza operaia, coscienza di classe e psicologia del lavoro*. Torino: Einaudi.

Ombredane, A., & Faverge, J.-M. (1955). *L'analyse du travail*. Paris: Presses universitaires de France.

Ouellet, S., & Vézina, N. (2015). Activity analysis and workplace training: An ergonomic perspective. In L. Filliettaz & S. Billett (Eds.), *Francophone perspectives of learning through work: Conceptions, traditions and practices*. Dordrecht: Springer.

Pastré, P. (2007). La didactique professionnelle: origines, fondements, perspectives. *Travail et Apprentissages, 1*, 9–21.

Pastré, P. (2011). *La didactique professionnelle*. Paris: Presses universitaires de France.

Pastré, P., Mayen, P., & Vergnaud, G. (2006). La didactique professionnelle. *Revue Française de Pédagogie, 154*, 145–198.

Pavard, B. (1994). *Systèmes coopératifs: de la modélisation à la conception*. Toulouse: Octarès.

Pène, S., Borzeix, A., & Fraenkel, B. (Eds.). (2001). *Le langage dans les organisations. Une nouvelle donne*. Paris: L'Harmattan.

Pinsky, L. (1992). *Concevoir pour l'action et la coopération*. Berne: Peter Lang.

Pinsky, L., & Theureau, J. (1987). *L'étude du cours d'action: Analyse du travail et conception ergonomique*. Paris: CNAM.

Poizat, G. (2015). Learning through interaction with technological objects: From the individuality of the technical object to human individuation. In L. Filliettaz & S. Billett (Eds.), *Francophone perspectives of learning through work: Conceptions, traditions and practices*. Dordrecht: Springer.

Poizat, G., & Durand, M. (2014). Un programme de recherche en ergonomie de formation: Illustration par le cas des techniciens en radiologie médicale. Actes du 49ème congrès international de la Société d'Ergonomie de Langue Française, La Rochelle, France.

Poizat, G., Salini, D., & Durand, M. (2013). Approche énactive de l'activité humaine, simplexité, et conception de formations professionnelles. *Education Sciences & Society, 4*, 97–112.

Rabardel, P. (1995). *Les hommes et les technologies: une approche cognitive des instruments contemporains*. Paris: Armand Colin.

Rabardel, P. (2005). Instrument, activité et développement du pouvoir d'agir. In P. Lorino & R. Teulier (Eds.), *Entre connaissance et organisation : l'activité collective* (pp. 251–265). Paris: La Découverte.

Rabardel, P., & Béguin, P. (2005). Instrument mediated activity: From subject development to anthropocentric design. *Theoretical Issues in Ergonomics Science, 6*, 429–461.

Rabardel, P., & Pastré, P. (Eds.). (2005). *Modèles du sujet pour la conception: dialectiques, activités, développement*. Toulouse: Octarès.

Richard, F., & Wainrib, S. (2006). *La subjectivation*. Paris: Dunod.

Rogoff, B. (1990). *Apprenticeship in thinking: Cognitive development in social context*. New York: Oxford University Press.

Samurçay, R., & Pastré, P. (1995). La conceptualisation des situations de travail dans la formation des compétences. *Éducation Permanente, 123*, 13–31.

Samurçay, R., & Pastré, P. (Eds.). (2004). *Recherches en didactique professionnelle*. Toulouse: Octarès.

Savoyant, A. (1995). Guidage de l'activité et développement des compétences dans une entreprise d'insertion. *Education permanente, 123*, 91–99.

Schwartz, Y. (Ed.). (1998). *Reconnaissances du travail*. Paris: Presses universitaires de France.

Scollon, R. (2001). *Mediated discourse: The nexus of practice*. London: Routledge.

Searle, J. R. (1969). *Speech acts: An essay in the philosophy of language*. Cambridge: Cambridge University Press.

Simon, H. A. (1965). *Administrative behavior*. Cambridge: Cambridge University Press.

Taylor, F. (1911). *The principles of scientific management*. New York: Harper.

Teiger, C., & Lacomblez, M. (2013). *(Se) former pour transformer le travail*. Laval: Presses de l'Université de Laval.

Theureau, J. (2004a). *Le cours d'action: Méthode élémentaire*. Toulouse: Octarès.

Theureau, J. (2004b). L'hypothèse de la cognition (ou action) située et la tradition d'analyse du travail de l'ergonomie de langue française. *Activités, 1*, 11–25.

Theureau, J. (2010). Les entretiens d'autoconfrontation et de remise en situation par les traces matérielles et le programme de recherche « cours d'action ». *Revue d'Anthropologie des Connaissances, 4*, 287–322.

Todorov, T. (1984). *Mikhail Bakhtin: The dialogical principle* (Theory & history of literature). Minneapolis: University of Minnesota Press.

Veillard, L. (2015). University-corporate partnerships for designing workplace curriculum: Alternance training course in tertiary education. In L. Filliettaz & S. Billett (Eds.), *Francophone perspectives of learning through work: Conceptions, traditions and practices*. Dordrecht: Springer.

Vidal-Gomel, C., & Samurçay, R. (2002). Qualitative analyses of accidents and incidents to identify competencies. The electrical systems maintenance case. *Safety Science, 40*, 479–500.

Von Cranach, M., Kalbermatten, U., Indermühle, K., & Gugler, B. (1982). *Goal directed action*. London: Academic.

Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Cambridge: Harvard University Press.

Vygotsky, L. S. (2012). *Thought and language*. Cambridge, MA: MIT Press.

Wenger, E. (1998). *Communities of practice. Learning, meaning and identity*. Cambridge: Cambridge University Press.

Wertsch, J. V. (1991). *Voices of the mind*. Cambridge, MA: Harvard University Press.

Winnicott, D. W. (1971). *Playing and reality*. London: Psychology Press.

Wisner, A. (1983). Ergonomic or anthropotechnology: a limited or wide approach to working conditions in technology transfer. In *Communication at the first international conference on ergonomics in developing countries*, Lulea, Sweden.

Wisner, A. (1985). *Quand voyagent les usines. Essai d'anthropologie*. Paris: Syros.

Wisner, A. (1995a). Situated cognition and action: Implication for ergonomics work analysis and anthropotechnology. *Ergonomics, 38*, 1542–1583.

Wisner, A. (1995b). The irruption of new technologies: a new challenge for ergonomics and anthropotechnology. *Journal of Human Ergology, 24*, 45–55.

Wisner, A. (1997). *Anthropotechnologie. Vers un monde industriel polycentrique*. Toulouse: Octarès.

Wood, D., Bruner, J. S., & Ross, G. (1976). The role of tutoring in problem solving. *Journal of Child Psychology and Psychiatry, 17*, 89–100.

Zarifian, P. (2001). *Objectif compétence*. Paris: Editions Liaisons.

Chapter 3
Stimulating Dialogue at Work: The Activity Clinic Approach to Learning and Development

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3.1 Introduction

When entering work environments, psychologists face complex social situations and may wish to transform them. The Activity Clinic team has been answering requests for intervention at work in a variety of settings for the last 15 years, including those associated with public services (i.e. mail carriers from the French postal services, technicians and drivers in the national railway company, teachers at schools, public prosecutors in courts, surgeons in hospitals), private companies (i.e. factory workers, managers, and executives in a multinational electric corporation and in the automobile industry), trade unions, and associations (boxers and divers from sports associations). Requests for interventions may be formulated by managers in the companies, by trade unions, or by mixed institutions such as the French CHSCT (Committees for Hygiene, Security, and Work Conditions). Workplace health is amongst the most widespread issues leading to intervention requests, but professionals may also request our support when they feel that their activity is evolving so quickly and profoundly that they face new situations or problems without the collective capacities to discuss and deal with them. Moreover, vocational training, based on activity analysis, is also a common case for intervention, in which the practitioners collectively look for ways to master the complexity of their work. In all cases, our goal as researchers is to support the development of the collective capacities of practitioners by stimulating types of dialogue at work that allow for a close analysis of the real work activity. Dialogue is a core component of our methodologies, which can be called dialogical

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frameworks. That is, frameworks based on structured dialogues and aimed at further developing dialogue horizontally, between workers, and vertically, between workers and higher levels of the hierarchy.

The Activity Clinic approach is grounded in Vygotskian cultural-historical psychology: We consider the activity of individuals as inherently social and mediated by cultural artefacts, which are at the same time used and transformed by individuals. This approach is also inspired by French ergonomics, with its attention to activity as it is performed by workers and by work psychopathology. In short, it is an interventionist methodology aimed at transforming work, a developmental methodology, as defined by Kloetzer and Seppänen (2014, p. 1):

> Developmental methodologies share a critical focus on development in social and work practices ... and some specific features: (a) they build on mediation by signs and tools, (b) they aim at analyzing and transforming social practices, (c) they associate practitioners in the collective analysis and transformation of these social practices, (d) the research designs created are dialogical frameworks, based on a complex blend of data collected on everyday work activity and dialogues triggered by these data, (e) in these dialogical frameworks, analyzing everyday work activity is not a goal per se, but a way to trigger transformation, as experience is mediated and transformed into an object of inquiry, and (f) the researchers, besides supporting the interpretations of the practitioners, also try to support the development of these interpretations, thus leading to change and learning.

The goal of this chapter is to present Activity Clinic concepts and one of its developmental methodologies, cross self-confrontation interviews, which are at the core of this approach to learning and development. In the first part, we introduce core concepts and describe the cross self-confrontation methodology. This presentation is supported by data collected during an intervention within the automotive industry, aimed at supporting the prevention of work-related musculoskeletal disorders (WRMSDs). Selected extracts of dialogues in different contexts of cross self-confrontation interviews are presented.

In the second part, we characterise learning and development in this type of developmental intervention. Learning through work is primarily envisioned here in relation to development. Researchers focus primarily on actions to help develop the workers' power to act within their professional milieu, on their organisation, and upon themselves. However, a critical analysis of the developmental research process shows that it generates and requires some learning on the part of professionals. At first, learning appears to be an effect of our collaboration. Workers report or demonstrate learning by appropriation of the dialogical frameworks initially implemented by the researchers. They also report or demonstrate learning about significant aspects of their work activities: about problems, conflicts, or concepts and people, tools, or rules. Learning results here from a secondary, self-reflective view of habits, common constraints, and proven resources, the discussion of which is promoted by the dialogical framework. Learning finally appears at the organisational level, as the goal of our action: an organisational process of integrating controversy about the quality of work as a way to preserve the meaning of the collective activity, health, and engagement of the workers and of the relevance of the professional activity for the larger society.

In the last part of the chapter, we highlight dynamics for activity development.

3.2   Presentation of the Activity Clinic: A Clinical Approach for Action

3.2.1   Introduction to the Case

The intervention discussed in this work was initiated by the Organisation and Methods Department of a subcontractor in the automotive industry, which wanted to understand the effects of new assembly lines on occupational risks for workers. This required an interdisciplinary study of the work of operators in modular manufacturing units, in collaboration with ergonomists. These units assemble components on car bumpers. They deliver their production in "synchronised workflow" to the car manufacturer, using tightly coupled, "just-in-time" production methods. Some workers had been declared unfit because of lumbar pain, and the company decided to investigate the long-term effects of these production methods on employee health. Managers wished to increase their knowledge about the work of the operators, the occupational risks, and the prevention of WRMSDs.

After extensive observations of the activity and the conducting of an ergonomics diagnosis, it was decided to pursue the intervention using a cross self-confrontation methodology to engage the workers of the factory and their managers in WRMSDs prevention strategies (Quillerou-Grivot 2011; Kloetzer et al. 2014; Quillerou-Grivot and Clot 2013). Faced with operator health issues, this intervention focused on the following question: How to disseminate discussion of the problems raised through co-analysis of work to different levels of the company?

3.2.2   Cross Self-Confrontation: A Three-Step Process Interweaving Two Clinical Tracks

The intervention interweaves two tracks to create a dialogical framework for "conflictual collaboration" (Trentin 2012) within the company. The first track is focused on conducting a clinical co-analysis of the work activities with a group of volunteers. The detailed analysis of actual work activities with volunteer subjects, who constitute the associated research group, is the vital first step required to question the organisational procedures and requirements in a documented and constructive way. On the second track, this detailed co-analysis, jointly performed with the workers within the steering committee formed for the intervention, triggers and constrains the discussions between managers, workers, and the health and production experts who design the work organisation. The clinical co-analysis with workers becomes a tool to transform the conditions of the dialogue at all hierarchical levels in the company. This approach of two interweaving tracks aims to maximise the possibilities for the development of the activity, for the health of the workers, and for transformations in the work situation (Quillerou-Grivot and Clot 2013). However, we are confronted by the complexity of human activity and

work organisations, and complete success in these objectives is quite uncertain. This methodology has now been well documented in French (Clot et al. 2000; Clot 2008) and in English (Clot 2009; Kloetzer 2013; Kostulski and Kloetzer 2014) and used in different fields. Therefore, we illustrate only some key features here.

3.2.2.1 First Track: Performing a Joint Analysis in an Associated Research Group

The methodology here relies largely on a group of volunteer workers, involved in the research, called an "associated research group" (Oddone et al. 1977/1981). The collaborative and collective dimension is critical throughout the intervention process. At the very beginning of the research, workers interact with researchers at the workplace, while researchers observe the activity. With their questions and way of observing, the researchers attempt to place the workers in the position to observe their own activity. At a later stage, some workers engage themselves formally in the research and come to discuss their activity in a structured way. They collectively choose relevant work sequences to analyse, which are subsequently filmed in the workplace. The analysis is conducted through repeatedly confronting the workers with these video clips, which they comment on during simple and cross self-confrontations interviews.

Simple and cross self-confrontation interviews focus on the comparison of individual ways of performing tasks. With special focus on their variations, they open the door to new questions and reflections. The co-analysis, as it is conceived here, leads the subjects to enter into a "deferred dialogue" (Quillerou-Grivot and Clot 2013) on the conflicts of their real work activity, to discover the range of each person's own and others' ways of performing tasks. This deferred dialogue organises a systematic comparison of these contrasted ways of operating, thus exteriorising them as objects for use in preparing new possibilities for action. The activity of one then can be mirrored in the activity of others. This time for analysis is thus dedicated to "transform past experience into an instrument for dealing with future experiences" (Clot 2008, p. 148).

Lastly, the researchers and volunteers jointly select video clips of the activity and of the interviews featuring debates about important aspects and conflicts of the work. These videos are arranged in a final form, a film-based multi-voiced report, which is presented to a wider audience consisting of other colleagues, managers, as well as the steering committee. In doing so, the researchers aim to articulate the controversies on the work activity and disseminate them within the organisation. Workers demonstrate here that they are experts regarding their work organisation. Their dialogues, as recorded in the methodological framework, may then fuel the reflection process in the steering committee.

In our case here, the associated research group assembled 10 workers, mostly temporary personnel (i.e. 6 out of 10 volunteers). Even though operators need to work in collaboration to meet production goals, this requirement is at the same time inhibited by massive reliance on temporary personnel and high turnover (each week

at least one new temporary worker joins a team of 12–15 operators). In this work environment, health problems remain "taboo" due to fear of job loss, especially given the existence of major interpersonal conflicts amongst operators. Faced with these difficulties in the company, a proposal was made to help a team restore its collective functioning. The primary difficulty in this intervention was the need to encourage reflection about the work amongst participants who were mostly temporary workers. Throughout the intervention, we continued to ask ourselves this question: "Is it possible to intervene despite the instability of the team of operators and the temporal requirements of our methodology?" Nevertheless, we attempted to keep a grip on the intervention framework for those temporary workers to be able to develop reflection about the job and on health issues.

The work co-analysis methodology was deployed over 18 months, in several phases:

– The initial phase of observation (pen and paper) to lead the participants to perceive their ways of operating when alone or in relation with others, of which they were often not conscious (typical comments from the start of the intervention: "but what we do is easy", "we do everything the same way", and "our work is in the post description"), and to encourage requests to perform an analysis of the work.
– The second phase of assembling a group of volunteers for the analysis, centred around four different tasks (e.g. carrying bumper bars to assembly line, bumper inspection at the start of the line, mounting of bumpers by two operators in tandem, and replenishment of parts), and conducting simple self-confrontation followed by cross self-confrontation, both of which are based on film recordings.
– The final phase of synthesising the elements of work analysis and video editing to select certain work situations as topics of analysis, followed by selection of cross self-confrontation dialogues; the resulting film was then shown to the entire team of workers and the members of the intervention's steering committee.

The data, which have been video-recorded and form the basis of this joint analysis, consist of ten interviews in simple self-confrontation (lasting between 1 and 1.5 h each), seven interviews in cross self-confrontation (lasting between 1 and 2 h each), and eight meetings of the associated research group (lasting 1–1.5 h each).

To show the function of these dialogues about a specific action used to perform a task, we present below a short extract transcribed from a cross self-confrontation interview with a female operator (02), a male operator (01), and the researcher (R) on the way of inspecting bumpers at the start of the line; at this moment, they are watching a video clip of the female operator inspecting the bumpers. This is a cross self-confrontation between two operators who are recognised as experts in the task by the members of their team. Before performing co-analysis, exchanges between the two operators had been difficult and impossible because of disagreements that they had not managed to articulate there, let alone discuss. However, during their involvement in the analysis of their work, they finally agreed to

confront one another through the medium of their filmed actions. Here is an extract from that cross self-confrontation:

R: And the inspection points, the sequence you follow, are they the same?
01: No, we don't inspect them in the same way [whispering].
02: No.
R: That is to say?
02: We don't start at the same place and maybe don't move through the same positions.
01: You tend more [pointing at O1 and then towards the film, while gazing at the screen] to finish with the faceplate.
02: Yeah.
01: As for me, I finish with the. . .
02: Yeah, I start on the side [lifts left hand], yeah.
R: Always on the same side?
01: That's. . . that's different [looking at the film clip]
02: Hmm, no, that can change. . . there, it's true [designating the video]; I always start on the left.
01: Yeah, me, too, I always start on the left, but see how you finish with the faceplate; it seems as if you didn't even look at it at all [laughing] . . . while I, I start [waves hand] on the side and then continue, at last, no . . . I don't know anymore. It's. . .
R: We'll look at it.
01: Yeah, that doesn't give the same impression at all.

In this extract, operator 02 realises that her colleague, operator 01, does not use the same approach to the task even though they work every day in the same team. This moment of discovering subtle, but essential, differences between them regarding a specific work action is crucial. The analysis returns them to the level of the *real of the activity* (Clot 1999), allowing them to detach themselves from the procedure during the analysis session and to resume focus on the procedure afterwards. After the cross self-confrontation sessions, this point was actually the subject of debate by operators, to decide whether or not to show their different approaches to the steering committee. This debate occurred during discussions about putting together a video showing part of the bumper assembly process, followed by dialogues featuring disputes between operators and thus showing, in their own voices, the initiatives they had taken in performing tasks, and the complexity and richness of their occupation. The extract shown above was eventually selected by the operators and researchers for inclusion in the final film to be viewed by members of the steering committee.

Researchers pose the same questions to operators and to themselves: "How will you continue this work that you do together?" and "Think about the future: how will that be of use for you?" (questions for which there are no responses that can be

determined in advance but which could open people up to other possibilities for action in everyday work, starting especially with collective resources, and play a major psychological role for health in the workplace). The work of the clinic with the operators is a means to develop their activity over time, which provides possibilities for acting on oneself or on others. For sure, this work of co-analysis is not sufficient by itself and is not presented as the solution to all the problems. The operators have already experienced that "The collective is never a given at the outset; it always needs to be created and maintained" (Bournel-Bosson 2010, p. 228). These developments remain fragile and insufficient unless they are supported by the directors and production designers of the company.

3.2.2.2   Second Track: Orchestrate Professional Controversy Within the Organisation

The work of the steering committee is initiated from the very beginning and runs in parallel to the work with the subjects. In the steering committee, the multi-voiced film produced from the joint analysis is a critical means to change the frame and forms of dialogue between workers and managers. This dialogue is initiated by introducing new objects into the dialogue: The work activities, analysed and commented in their concrete details, reveal the hidden, frequently conflictual, dimensions of the everyday work. In doing so, the researchers aim to articulate the controversies related to the work activity and disseminate them within the organisation.

In the case here, a series of meetings was programmed. The film was presented in the third meeting, with commentary by the researchers. In the fifth meeting, five workers were invited to discuss how this joint analysis could be exploited and pursued within the company. This last meeting thus provided a forum for collective reflection on a programme to involve operators in company work design projects.

The following is an extract in which three managers (the project manager, who is the sponsor, the production manager, and the HR director), a supervisor, and three operators discuss the procedural steps for the visual inspection of bumpers (which specify steps leading from the top – what they call the faceplate – to the sides of the bumpers):

> Project manager: *I would like to jump back to this point, because I have a question that we already raised the last time, but which concerns me – it's me leading the project; [post descriptions] define a means, well, define a procedure, a function: "We start on the left side, we do this, and then the rest of it. . .", and now we realise, based on what we've seen and what you've brought up, that above and beyond this, there are small, big, and medium-sized people, and then, what's more, there are even different ways*

(continued)

of functioning from one person to another, and me, I would like to make the most of this, because it is not always necessarily the case that we listen to you [the operators] . . . you, who we just saw on the screen a few minutes ago, what do you think of these manuals, of these instructions that we provide for you in a largely ready-made form, and which you sometimes interpret – you, what do you think about that?

Operator O2: *[. . .] we would say that it's a base, how they want us to function, but afterwards with the range of different people we have here, it might work for some but not for others. Afterwards, it's the interpretation that's necessary; we have to keep them in common as we said before to see the way to do it . . . we could say . . . because between me and O1, we don't have the same approach and that's . . . we would say that in fact it's the same thing.*

Production manager: *Could we say that the result is the same in the end?*

Operator O2: *That's it, the result . . . we could base it on the binders but we have a hard time respecting them to the letter.*

Operator O1: *It's more in the sense of not imposing the sequence, the more I think . . . in the sense . . . we would say . . . of identifying each part of the bumpers, the faceplate, the edges, the end caps . . . I want to say that bumpers are all made the same way, they all have a faceplate, an end cap, and grilles, so . . . afterwards I think that for the operator, the fact of having – to say to him, well, here you have the faceplate, you have the faceplate to inspect, you have the end cap, the edges, fine . . . we'd say it simplifies the task for him, by telling him there's that point, that point to inspect – you have all of those points to inspect, and afterwards you organise yourself to do it in the way that you feel is best for you . . . that . . . that leaves the person free to choose the steps he takes and how he looks at what he needs to inspect.*

HR manager: *It's more a matter of giving a mission by saying here's this, that, that, and that to inspect, and it's you who . . . the way to . . .*

Operator O1: *That's it, like that, it's still. . .*

Operator O3: *Maybe at the beginning . . . no, we're shown to the letter in training how it has to be done; afterwards, little by little the person is going to see how we do it and unconsciously do it like us, and at the end of the day, it works just as well as what was specified . . . and to know that there's a possibility despite them [post descriptions] to try to have small changes like that, small solutions.*

Operator O3: *Or to do it in partnership with another operator.*

Operator O2: *Like this for example.*

HR manager: *If everyone does it differently, we have to revisit it [the post description]*

> Supervisor: *Me, I think otherwise . . . me, I have two night-time trainers; we must have a common base, because some people, I've already noticed – I don't want to be rude – but if we let them work in the way they think best, they'll think of a certain way and it won't always be right . . . because when we're caught up in work and, well, we don't always have an objective view of what we're doing, I find that we can quickly arrive at stupid conclusions. Personally I always try to avoid that and to keep . . . because I think the procedure has been well designed in the sense that we start with the faceplate: It's the principal area, and if we start on the sides and the faceplate is no good, well we can remove the bumper. This way we gain loads of time. According to people at any given time, we don't learn the same way; for sure physically we don't all have the same arms [laughs]; not everyone is like S, you could say that he's picking up a leaf, like that. But it's true in terms of the ways of hauling things and so on. I understand we are all sized differently; we try to make the posts ergonomic and all, but me, I think that the inspection procedures, things like that, they need to be hyper-structured.*

Here, during a steering committee meeting, there is further discussion amongst operators about the question of procedures and training of new employees, followed by a supervisor's input. How operators and management continue to develop the debate about the work can become a means to address their activity conflicts, no longer only with people from the line but also with managers and company leaders. This exchange has positive results as, after the meeting, discussions amongst members of operational and functional management take place. They all attempt, from the perspective of their function in the company (design, purchasing, sales, HR, etc.) to pursue several trains of thought. For us, as external contributors, the objective is not to solve the issue but rather to guide the development of the dialogue, of its protagonists as well as its key points. This includes being able to identify new ways of thinking about the work and to make them tangible, without bypassing the *real* and the challenges it poses. And in the steering committee, the operators who are present, and prepared beforehand by the collective work of analysis, stand to gain authority in their work and suddenly gain legitimacy to contribute to the work of production designers and management. The transposition of dialogue amongst operators to a dialogue with management that occurs throughout the process then transforms the analytical mechanism of the intervention potentially leading to its adoption as a dynamic at different levels of the company. In this way, there is a mechanism to find and test potential solutions for work quality and workplace health issues on a day-to-day basis.

3.2.3   Development of What? Real Activity and the Dynamic Architecture of the Trade

The work analysis that we produce is not a focus per se in our research. Instead, it comprises a mediation, useful insofar as it enables workers to view their activity differently, to transform organisational problems into new resources to develop their own activity, and to renew the links amongst the different dimensions of the architecture of their trade (Clot 2008). The entryway and unit of analysis for this transformation of obstacles into resources for development is the *work activity of the subject*, seen as a "water drop", which presents all characteristics of the whole work activity in a small, manageable form, thereby enabling scientific abstraction while keeping the properties of the whole phenomenon under study (Vygotsky 1934/1997, p. 500). This section, therefore, presents our theoretical assumptions regarding development by introducing the core concept of "activity" (and activity development), as well as highlighting the multidimensional and dynamic architecture of the trade.

3.2.3.1   Development of the Activity: Real Activity, a Realm of Other Possibilities for Action

Activity here exceeds the observable actions of the subjects: It also includes invisible psychological dimensions. Following Vygotsky, who wrote that "behaviour is a system of victorious reactions . . . at every moment, the individual is full of unrealized possibilities" (Vygotsky 1999, pp. 266–267), work activity is seen as compromises amongst (1) what is required of the workers and what they think they should do in the situation, (2) between the meaning and the effectiveness of the action, and (3) between what has to be done and what else could be done (Clot 1999). Human action is the result of subjective arbitration between several possible actions. These tensions, compromises, and unrealised possibilities led us to keep the effective dimension of the unrealised activity within the activity (Clot 1999). It follows that there is a need to consider what is actually realised as well as what could have been, could be, or will be realised in the worker's subjective activity. Therefore, Clot (1999) distinguishes, on one hand, the *realised activity*, which is what the worker does and which is observable by its result, and, on the other hand, the *real of activity* which refers to the unrealised possibilities described by Vygotsky (1999). The real of activity refers to what workers don't do although they would like to, what they do without succeeding, what they abandon doing, what they think they would do under different conditions, or even what they do to avoid doing what is expected of them. The *real of activity* is full of unresolved conflicts, which are entry points for development dynamics (Clot 2008).

   When conceived with such psychological depth, the activity can be schematised as a tetrahedron placing the subject (vertex S in the schema below) in relation to the objects (Leontiev 1975/1984, vertex O in the schema below) of his or her activity
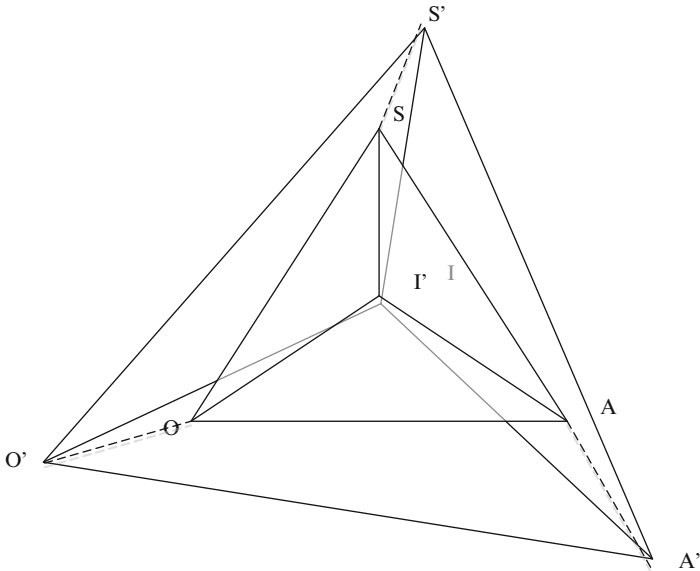
Fig. 3.1 Activity in development (Inspired by Clot 1999)

and to the others to whom the activity is addressed (vertex A in the schema below). These relations are mediated by technical and psychological tools, including the work tools, procedures, and collaboration rules.

This schema of the work activity highlights the directions through which some development may occur: Expansion of the objects and others in the activity, as well as of the tools mediating action, may lead to development of the psychological subject as well as the collective activity.

Comparing our model with Engeström's activity system (Engeström 1987), we can in a mental exercise reduce the larger triangle of the activity system to the simpler version in Fig. 3.1 by folding its corners (Fig. 3.2).

This mental exercise highlights that the collective dimensions, which are explicitly stated in the activity system, are present as mediations in the psychological activity of the subject which is our "entry door into the analysis" (Fig. 3.3).

The collective activity of work analysis during the intervention process may open new doors on the world – new possibilities to renew behaviours. From the Activity Clinic perspective, systemic dialogism is a result of preliminary, localised dialogues in each of the working groups involved: These dialogues prepare the extension of the dialogue in the organisation. The development of the system is not immediate but mediated by the development of each working group (Clot 2009) and by the development of the dialogue within and amongst these working groups.
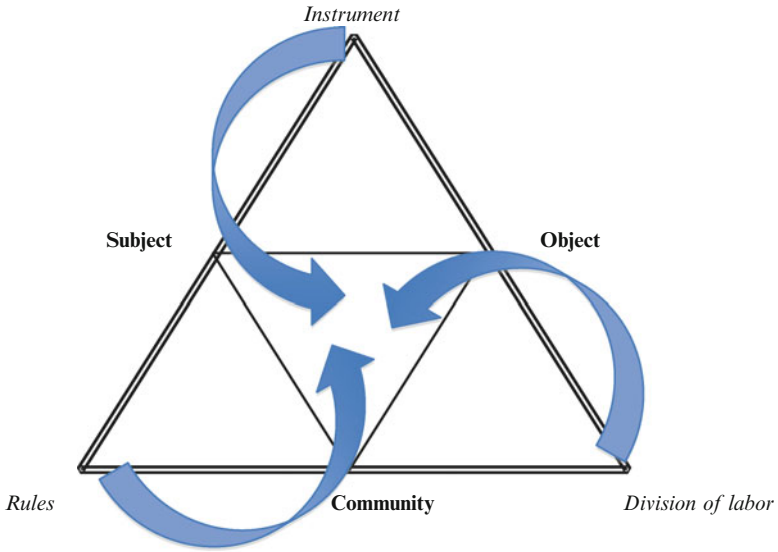
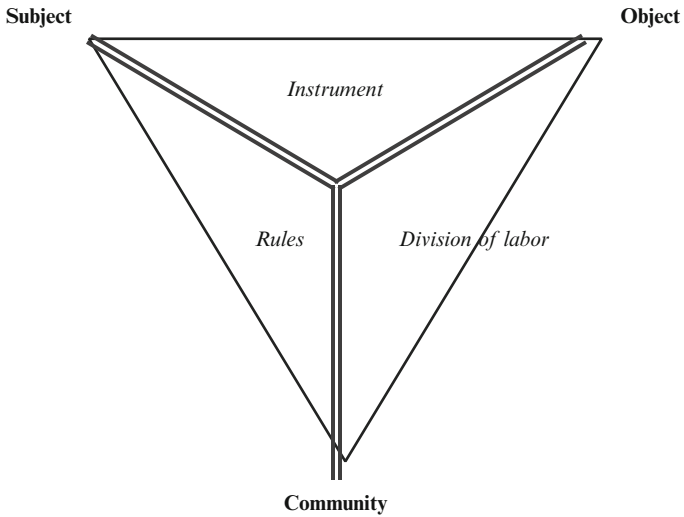**Fig. 3.2** From the activity system to the subjective activity

Fig. 3.3 Outcome: the collective dimensions as mediations in the psychological activity of the subject

3.2.3.2 Development of the Trade in its Four-Dimensional, Dynamic Architecture

Looking at the sequences above, we can identify different directions in which development may happen. More precisely, four dimensions are simultaneously at play. The *personal* dimension of the work activity refers to the specific way one is performing one's activity, according to one's specific skills, knowledge, history, life story, professional experience, preferences, moods, expectations, worries, goals, hopes, and desires. The quality of their professional actions qualifies them as "good professionals", or, from the French perspective, one who merits the professional title. However, these workers do not work alone: One's work activity is addressed to present, past, and future colleagues, peers, team members, managers, customers, mentors, and experts – all potential addressees of the professional action.

The trade then has an *interpersonal* dimension. It remains alive – or dies – amongst workers and within each of them due to the dynamics of interpersonal exchanges on what to do, to say, to abandon, or to approach differently. But these professional exchanges are not built from scratch. That is, they cannot be fully understood solely from the current context of shared activities. The background of these exchanges is, instead, the history of the professional milieu, the collective memory providing each worker with resources for present action and anticipation of the future. When it exists, transpersonal memory is available for all. It refers to the unofficial organisation of work, as constructed and transmitted by teams in the culture and history of the work setting. It includes the *professional genre* (Clot 1999), that is, the usual ways of acting and interacting, speaking, doing, and relating to people and things in a professional way that are established in a specific work environment. Such a historical heritage functions both as a collective constraint on, and a collective resource for, individual action. The transpersonal dimension is a binding characteristic across generations and individuals, always at risk of disappearing if it is not reconstructed in the course of personal and interpersonal activities. Finally, the trade is not only instantiated in these personal, interpersonal, and transpersonal dimensions but also in an impersonal way, through the diverse elements of the official work organisation – career profiles, social laws organising work and retirement, job profiles, collective conventions, definition of tasks, procedures, processes, operating rules, evaluation standards, performance indicators, professional training, collaboration rules, and division of labour – all define a wholly impersonal world, different from situated practice or collective history, which is stored mostly in written form within organisations and institutions. In ergonomics terms, this codified form refers to the task, what one has to do, as distinct from the activity, what one is doing (Leplat and Hoc 1983). The impersonal dimension of the trade plays an extremely important psychological role. That is, to structure and evaluate what one is doing, to collaborate, and to imagine what one could become and do in the future. This is the dimension that comes into discussion

in the last sequence that we presented, that is, should the control procedures be changed to accommodate the variability of individual ways of proceeding or not?

According to this model, development may happen in the personal, interpersonal, transpersonal, or impersonal dimensions of the activity (including the formal and informal, explicit and tacit work organisation), on subjects, objects, work relations, work settings, or work tools (Clot 2008; Kostulski and Clot 2007). In this model, all four dimensions are bound together, but antagonisms may provoke a loosening of these bonds. The feeling of sharing the same experience at work may disappear due to interpersonal conflicts. A trade that is deprived of transpersonal mediation may degenerate into destructive opposition between a personal, solitary work exercise, and impersonal, spurious work injunctions from the organisation, with all workers at risk of work depersonalisation. Our action in the Activity Clinic implements dialogical frameworks in the company to counteract the processes that loosen the bonds amongst the dimensions and restore the dynamics of this four-dimensional architecture, using the developmental methodology described below.

3.3 Learning and Development in Cross Self-Confrontation

In these interventions, learning is primarily tackled in relation to development. The researchers focus primarily on action, to help workers develop their power to act within their professional milieu, on the organisation, and upon themselves. However, a critical analysis of the developmental research process shows that it generates and requires learning on the part of the workers. First of all, learning refers to an experiential process during cross self-confrontation analysis. Through the interactions with the researchers and with their colleagues in the cross self-confrontation framework, workers experience that their work activity, in its smallest details, can be an object of interest, surprise, and thought. They also experience the forms and value of professional controversy. Subsequently, learning takes place in the cross self-confrontation interviews and in the associated research group, which function as a zone of proximal development, enabling each of the workers to relate differently to his or her own work by seeing things differently – through the eyes of others. Lastly, learning is expected at the organisational level: The genre of dialogue that we call controversy is disseminated through the organisation to transform in depth the organisation of the work.

3.3.1 Learning as an Experiential Process

3.3.1.1 Experiencing Work as an Object of Interest and Thought

Learning initially results from in situ collaboration with researchers, in this account. At the very beginning of the research, workers interact with researchers in the workplace, while researchers observe the activity. Through their questions and way of observing, the researchers attempt to place the workers in a position to observe their own activity. In this approach, the sustained presence of researchers in the workplace is not required to be unobtrusive so as to avoid biasing the observations of the work activity but instead functions as a methodological tool to engage workers in observation of their own work activity (Simonet et al. 2011). The researchers' goal is to promote discussions on the precise gestures used to perform tasks. Such engagement in analysis of work activity is initially mediated by researcher's presence, viewpoints, interests, and questions that serve to prepare the ground for the next steps of the intervention. Posing questions generates fewer answers than do expressions of interest and surprise, as the Activity Clinic perspective is:

> less about questioning to get a definitive answer than about generating a space to elicit a greater range of questioning among the people under observation. (Simonet et al. 2011, p. 113)

Such serious interest and curiosity about the concrete work activity are further demonstrated at all steps of the intervention process: in the dialogical framework of cross self-confrontation as well as in the meetings of the steering committee.

3.3.1.2 Experiencing Shared History in Professional Controversy

In the research process, workers may also have another significant experience: to encounter the power of professional controversy. In an Activity Clinic, some workers become formal members of the associated research group and begin to discuss their activity in a structured way, as presented above. While selecting work sequences for analysis and during the interviews, they may experience what the researchers are looking for: professional discussions based on comparison of individual ways of performing tasks, with special focus on their variations, which open the door to new questions and reflections. This experience has strong affective consequences. People realise that their problems are shared by their colleagues and that they may reflect together on the difficulties, solutions, and outstanding conflicts in the work activity. The workers may discover that they are not alone in facing the difficulties of their work, that their colleagues share the same problems and questions – sometimes with different answers – and, more profoundly, that the day-to-day professional conflicts they tacitly experience are significant in defining the range of their joint professional actions. They may also discover that all their colleagues face the same dilemmas in the activity. They may also realise that these

dilemmas can be discussed collectively. This emotional experience of sharing the same professional history, conflicts, and questions, which the dialogical framework elicits, is the foundation for revitalising the work collective.

3.3.2 Cross Self-Confrontation as a Zone of Proximal Development

Analysis of work activity and professional controversy also open new possibilities for thinking and action. During the cross self-confrontation interviews and the subsequent discussions in the associated research group, the workers may come to "see things differently" (Vygotsky 1999) and discover new ways to relate to their own work. Workers indicate what they learn: We can identify this in the cross self-confrontation interviews, during the subsequent meetings with their colleagues and during the later discussions with the steering committee. The main demonstrable learning is the appropriation of a genre of discourse, or more precisely of a genre of dialogue, that we call professional controversy.

3.3.2.1 Dialogue as (and in) a Space of Potential Development

Part of our research process is to identify traces of development in the thinking of participants during the cross self-confrontation dialogues. Different methods of analysis are used (Kostulski 2005, 2011a, b; Henry and Bournel Bosson 2008). In particular, we proceed with analyses of interlocutory activities in the dialogical framework (Kostulski 2004, 2005; Kloetzer 2008, 2013; Kostulski and Kloetzer 2014). In some dialogues, we can demonstrate an enhancement of objects of the dialogue, through the development of its instruments and addressees. This dialogue is related to the development of workers' knowledge about the objects, tools, and addressees of their work activity. Here, dialogue serves as a tool to develop thinking on the work activity, thus enabling a space for potential learning. In the cross self-confrontation framework, dialogue itself constitutes a space of potential development. The detailed and comparative analysis of their work activities workers perform can enrich the conversational exchange, leading them to raise arguments, debate them to understand the point of view of their colleagues, and defend their own ways of performing tasks. The need to argue honestly on conflicting aspects of the work activity may induce functional migrations in the dialogue. For example, the discussion may at one point focus on one tool in the work activity, turning this working tool into an argument in the dialogue and, potentially, into an object of the dialogue (Kloetzer and Henry 2010). Such twofold displacement of the function of an element in the work activity – first from the working scene into the dialogue and then from argument in the dialogue to object of the discourse and of the analysis –

places this element in the foreground and the thinking of the workers in a space of potential development.

3.3.2.2   The Associated Research Group as a ZPD

Development within an associated research group is highly social. Workers come to see things differently in the course of exchanges with different partners: the researchers, their colleagues, and members of the steering committee. The associated research group plays a critical role in this process. As highlighted by Holzman in the psychotherapeutic context: "Growth comes from participating in the process of building the groups in which one functions" (Holzman 2009, p. 36). Holzman endorses Vygotsky's view that "qualitative transformation is a collective accomplishment" (Holzman 2009, p. 29), a "collective form of working together" (Vygotsky 2004, p. 202). Holzman defends a developmental learning model in which playful, joint-engagement with the world in early childhood accounts for rapid, qualitatively transformative learning:

> Each instance of learning something is simultaneously an instance of developing as a learner. (Holzman 2009, p. 48).
>
> [Children] learn by doing with others what they do not know how to do, because the group (usually the family) supports such active, creative risk taking and performs with them. Most people have not done this since they were very young, and so they have to relearn how to do it in ways appropriate to being adults. (Holzman 2009, p. 37)

In this view, the zone of proximal development is better seen as a building process and as a collective activity, rather than as a dyadic scaffolding relationship. The associated research group serves as a zone of proximal development in this understanding and as a collective form of working together on the creation of new meanings and environments that enable growth.

3.3.3   Controversy in the Long Run: Learning at the Organisation Level

Learning finally appears at the organisational level as the goal of our action: an organisational process of integration of controversy on the quality of work as a way to preserve the meaning of the collective activity, the health and engagement of workers, and the relevance of the professional activity for the larger society. As is the case with others conducting developmental research in work organisations, we are confronted by the following intervention and research question: How can we move the problems disclosed by the clinical analysis of work activities to different levels of the organisation and support their transformation? Our answer so far is twofold. First, the analysis process can have a long-lasting impact at the organisational level, if it affects the work organisation. On the first track of our

clinical action, professional controversy is aimed at developing the *transpersonal* dimension of the trade. By transferring the controversy into the steering committee, interweaving the paths of trade unions and management, the results of this first development become the means to achieve another goal: the development of the trade in its *impersonal* dimension within the organisation. Second, the intervention process aims at changing the form of dialogue in the organisation, placing professional controversy on the quality of work at its centre. The clinical intervention we conduct with the workers, through detailed co-analysis of their work activities in the associated research group, is interrelated with the intervention we conduct with the experts, managers, and leaders in the steering committee regarding the results of this co-analysis.

3.4   Three Principles for Activity Development

In this last part, we reflect on several principles guiding activity development. Research conducted to date in Activity Clinic interventions has identified three principles for activity development, which we consider in a broad sense as a qualitative transformation implying a new functional organisation, in which affective as well as cognitive elements come into play. These are (1) the appropriation of controversy as a developmental tool by workers and throughout the organisation, (2) the use of affects in a developmental perspective through transferential activity, and (3) the functional development of the work collective.

3.4.1   Appropriation of Controversy as a Developmental Tool

As presented above, the appropriation of controversy as a developmental tool throughout the organisation relies on clinical intervention at two levels of the organisation. These are with workers in the initial observations, cross self-confrontation interviews, and subsequent discussions in the associated research group and also with the steering committee, during informal discussions and formal meetings, in which the dialogical artefacts produced demonstrate the possibilities and value of the genre of dialogue. The co-analysis in cross self-confrontation interviews is a critical step in that process as it mediates the two tracks in this process.

   In recent years, a significant body of research has documented the mechanisms by which this appropriation of controversy in cross self-confrontation may occur (Kostulski and Clot 2007; Kostulski and Kloetzer 2014). We can define controversy as:

   . . . a form of discursive activity, more precisely a deliberative and reciprocal activity that
   deploys opposing arguments in dialogue – arguments with the characteristic of being drawn
   from generic and historical themes within the profession. (Kostulski 2011b, p. 83)

This controversy between peers provides the opportunity for the worker to initiate, develop, and manifest that dialogical form in *inner dialogue*: an internal controversy involving the self or more specifically between the self and the general forms of the professional milieu (Kostulski and Kloetzer 2014). Our methodological frameworks have the function of vivifying dialogical thinking about work, by making use of the interfunctionality of levels of dialogue and the vital function of social relations in the psychological life of the subjects.

However, controversy also calls on processes of functional migration (Clot 2003; Kostulski and Clot 2007; Kloetzer and Henry 2010): A deliberative dialogical activity carried out with a peer becomes the means of stimulating reflection – in a silent conversation with oneself. Interfunctionality of the levels of dialogue and interfunctionality of the analysis and conversational activities in the dialogical framework, therefore, play a critical role in this experience.

3.4.2 Transferential Activity

The second direction explored in our research over the last few years considers the role of affects in the intervention process. Affects may be defined as "the vital discord that arises between the subject's habitual expectations – their preconceived organizing mechanisms (whether physical, cognitive, or subjective) – and the unexpected within the current activity" (Clot 2013; Quillerou-Grivot and Clot 2013). During the intervention process, researchers may be influenced by various events and experience their own subjective activity. Their ability to take into account such affects, surprises, and emotions – and to understand them as reactions to the work situation – enables the researchers to both better understand what is happening in the work situation and to make use of these reactions to trigger thinking on the part of the workers and managers. In Vygotskian terms, when cognitive and affective functional systems are in conflict, each system may turn into a resource for the other. The transferential activity, envisaged as an "activity of 'transport of affects' across the instances that structure all dimensions of work" (Scheller 2014), is a means for the development of new collective, historically situated forms of action.

3.4.3 Functional Development of the Work Collective

In an Activity Clinic intervention, a process of "functional migration" (Vygotsky 2003) of the work collective takes place between the two tracks of our intervention: During the co-analysis, the workers experience the psychological function of the work collective as a resource for individual activity; in the steering committee, we rely on the dialogical artefacts output from the co-analysis phase to trigger and expand controversy within the organisation. The work collective here has another

function, a social function for renewing collective forms of life within the organisation: "This extension of the scope of activity is substantiated in the dialogues on the activity conflicts of workers, when these conflicts become the subject of discussion among process designers and managers. The designers thus have the experience of being affected by the activity of the workers" (Quillerou-Grivot and Clot 2013).

The intervention process is, therefore, conceived as a transpersonal development of the work collective as a whole. This development has a dual function: a psychological function, helping each worker to personalise his or her own work activity, and a social function, helping the organisation to transform the impersonal dimension of the trade. Thus, the role of the work collective shifts during the intervention process, as it becomes a resource for individuals as well as for transformation of the work organisation. This "functional nomadism" (Vygotski 2003; Clot 2008; Kostulski and Clot 2007) both permits and signals new developments to promote health at work, which is defined as production of new power to act on situations (Clot 2008).

3.5   Conclusion

This chapter presents some core concepts in the historical development of the Activity Clinic approach. It has also introduced and discussed the developmental methodology called cross self-confrontation, including the relation between learning and development in the cross self-confrontation framework, and qualifies the cross self-confrontation space as a zone of proximal development (ZPD). The prior section reflects on three principles for activity development identified to date in Activity Clinic research: appropriation of controversy as a developmental tool, transferential activity, and functional development of the work collective. To conclude, we would like to highlight that the relations between learning and development in the cross self-confrontation framework are complex. Although the development of subjects, work situations, work collectives, and work organisations is the focus of our interventions, multidimensional learning precedes development. The learning demonstrated in the framework is not only related to knowledge and skills. It also implies genres of discourse and of dialogue and affective transformations and results in the transfer of the dialogical method to the participants. As stated by Vygotsky, development takes place when subjects begin to use for themselves the forms of action that have primarily been used with them (Vygotsky, 1997, p. 105 [from French trans.]). This transfer from the interpersonal plane to the intrapersonal plane is a critical step to provide subjects' thought processes with new tools for development (Vygotsky 1997). Such dynamics "from outer to inner" (Vygotsky 1997, p. 134) are also central to lifelong learning and development processes. The collective happens to be "the source, the field nourishing the development of higher functions" – also in adulthood (Vygotsky 1997, p. 167). In our research to date, subjective, collective, and

organisational developments are mediated by the development of the functions of work collectives. Following Vygotsky, we acknowledge that collective forms not only constitute external constraints for individuals but inform them internally, thus enabling the full development of the individuals: The collective is truly active within the individual.

References

Bournel-Bosson, M. (2010). Analyse du travail et revitalisation du collectif. *Clinique du travail*, 225–236.

Clot, Y. (1999). *La fonction psychologique du travail*. Paris: Presses universitaires de France.

Clot, Y. (2003). La conscience comme liaison. In L. S. Vygotsky (Ed.), *Conscience, inconscient, é motions*. Paris: La Dispute.

Clot, Y. (2008). *Travail et pouvoir d'agir*. Paris: Presses universitaires de France.

Clot, Y. (2009). Clinic of activity: The dialogue as instrument. In A. Sannino, H. Daniels, & K. Gutierrez (Eds.), *Learning and expanding with activity theory*. Cambridge: Cambridge University Press.

Clot, Y. (2013). L'inter-fonctionnalité des affects, des émotions et des sentiments: pouvoir d'être affecté et pouvoir d'agir. In *Campinas conference*, Brazil, February 2013.

Clot, Y., Faïta, D., Fernandez, G., & Scheller, L. (2000). Les entretiens en auto-confrontation croisée: une méthode en clinique de l'activité. *Pistes, 2*(1), 1–7. http://pistes.revues.org/3833

Engeström, Y. (1987). *Learning by expanding: An activity-theoretical approach to developmental research*. Helsinki: Orienta-Konsultit.

Henry, M., & Bournel Bosson, M. (2008). La vie des mots en analyse du travail. *Activités, 5*(2), 25–38. http://www.activites.org/v5n2/v5n2.pdf

Holzman, L. (2009). *Vygotsky at work and play*. Routledge: Taylor and Francis.

Kloetzer, L. (2008). *Analyse de l'homélie de la messe dominicale: langage et conflits de métier dans l'activité des prêtres. La part de Dieu, la part de l'homme*. Doctoral thesis in Psychology. Paris: CNAM.

Kloetzer, L. (2013). Development of professional concepts through work analysis: Tech diving under the loupe of activity clinic. *Mind, Culture, and Activity, 20*(4), 318–337.

Kloetzer, L., & Henry, M. (2010). Quand les instruments de métier deviennent objets de discours: une condition de l'analyse du travail en autoconfrontation croisée? *Activités, 7*(2), 44–63. http://www.activites.org/v7n2/kloetzer.pdf

Kloetzer, L., & Seppänen, L. (2014). Dialogue and interactions as the "nursery for change". *Outlines: Critical Practice Studies, 15*(2), 1–4.

Kloetzer, L., Quillerou-Grivot, E., & Simonet, P. (2014). Engaging workers in WRMSD prevention: Two Interdisciplinary case studies in an Activity Clinic. *Work: A Journal of Prevention, Assessment and Rehabilitation*.

Kostulski, K. (2004). Développement de la pensée et du rapport à l'autre dans une interlocution:«estce que c'est un endroit pour poser un paquet de contre-rails?». *Cahiers de linguistique française, 26*, 113–131.

Kostulski, K. (2005). Activité conversationnelle et activité d'analyse: l'interlocution en situation de co-analyse de l'activité. In L. Filliettaz & J.-P. Bronckart (Eds.), *L'analyse des actions et des discours en situation de travail. Concepts, méthodes et applications* (pp. 73–108). Peeters: Louvain-la-Neuve.

Kostulski, K. (2011a). Development of activity through reflection: The case of the public prosecutor's lapsus linguae. In D. Nicolini & O. Eikeland (Eds.), Changing practices through reflection. *Journal of Organisation and Change Management, 24*(2), 191–211.

Kostulski, K. (2011b). Formes et fonctions psychologiques des réalisations langagières : vers une Psychologie concrète du langage. Thèse d'Habilitation à Diriger des Recherches. Paris: Université Paris 8.

Kostulski, K., & Clot, Y. (2007). Interaction et migration fonctionnelle: un développement en autoconfrontation croisée. *Psychologie de l'interaction, 23/24*, 73–108.

Kostulski, K., & Kloetzer, L. (2014). Controversy as a developmental tool in Cross Self-Confrontation Analysis. *Outlines: Journal of Critical Practice Studies, 15*(2), 54–73.

Leontiev, A. (1975). *Activité, conscience, personnalité*. Moscou: Editions du Progrès.

Leplat, J., & Hoc, J.-M. (1983). Tâche et activité dans l'analyse psychologique des situations. *Cahiers de psychologie cognitive, 3*(1), 49–63.

Oddone, I., Re, A., & Briante, G. (1977/1981). *Redécouvrir l'expérience ouvrière. Vers une autre psychologie du travail ?* Paris: Editions sociales.

Quillerou-Grivot, E. (2011). *Fonction psychologique et sociale du collectif pour la santé au travail: le cas d'opérateurs de montage automobile*. Doctoral thesis in psychology. Paris: CNAM.

Quillerou-Grivot, E., & Clot, Y. (2013). Trois conditions pour une clinique de l'activité en psychologie du travail: le cas d'une intervention dans une entreprise de logistique automobile. *Activites*, *10*(2), 229–248. http://www.activites.org/v10n2/v10n2.pdf

Scheller, L. (2014). Activity clinic and affects in workplace conflicts: Transformation through transferential activity. *Outlines: Critical Practice Studies, 15*(2), 74–92.

Simonet, P., Caroly, S. & Clot, Y. (2011). Méthodes d'observation de l'activité de travail et prévention durable des TMS: Action et discussion interdisciplinaire entre clinique de l'activité et ergonomie. *Activités*, *8*(1), 104–128. http://www.activites.org/v8n1/v8n1.pdf

Trentin, B. (2012). *La cité du travail, le fordisme et la gauche*. Paris: Fayard.

Vygotsky, L. S. (1934/1997). *Pensée et Langage*. Paris: La Dispute.

Vygotsky, L. S. (1999). Consciousness as a problem in the psychology of behaviour. (N. Veresov, Trad). In N. Veresov (Ed.), *Undiscovered Vygotsky* (pp. 256–281). Frankfurt am Main: Peter Lang.

Vygotsky, L. S. (2003). *Conscience, inconscient, émotions*. Paris: La Dispute.

Vygotsky, L. S. (2004). The collective as a factor in the development of the abnormal child. In R. W. Rieber & D. K. Robinson (Eds.), *The essential Vygotsky* (pp. 201–219). New York: Kluwer Academic/Plenum Publishing.

Chapter 4
Learning by Participating: A Theoretical Configuration Applied to French Cooperative Day Care Centres

Gilles Brougère

This chapter connects two areas, that of early childhood education (particularly for children under the age of three) and adult education in a framework where there is no explicit educational objective. In these two areas, those of preschool education and what we can call, for lack of a better term, informal learning or rather learning in informal situations, I have undertaken separate studies without necessarily always connecting them. In both cases, for the lack of adequate tools within the theories developed in the Francophone world, I have drawn heavily on English-speaking authors, by importing their concepts and elements of their theory while at the same time reconfiguring them, associating them in a specific manner, applying them to objects to which they had not been applied, developing circulation between English and French, but also by proposing and encouraging the French translation of English texts that seemed to be important to me.

4.1 Informal Learning and Early Childhood Care and Education

4.1.1 Learning in Informal Situations

On multiple occasions, I have tried to explore learning said to be 'informal', that which is not linked to the outcome of educational programmes whether they be in schools or linked to adult education (Brougère and Bezille 2007; Brougère 2007;

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Brougère and Ulmann 2009; Brougère 2013). Here again, despite analyses by Delbos and Jorion (1984) that were promising, but never fulfil their promise, Francophone research has rarely taken this dimension into account. Most often it focuses research on schools or, beyond that, the more formal adult education programmes whether or not they are linked to enterprise. Of course, the current trends in professional education and activity analysis show how workplaces can also be a way to transform the subject and learn (Pastré et al. 2006). But the authors highlight the modes that lead to its transformation into intentional and then institutionalised learning, that is,

> when dealing with incidental learning, the purpose of the action is the productive activity and the constructive activity is just an unintended and often unconscious side effect of said productive activity. But learning is such an important activity in humans that they have invented institutions dedicated to its development. (…) so the relationship between productive activity and constructive activity gets reversed: the purpose of the action becomes the constructive activity, which does not mean that the productive activity disappears. (Pastré et al. 2006, p. 156)

More than emphasising modes of informal learning, it is a matter of designing training and in a way formalising it, first through analysis and then through programmes. We very often encounter this method of simultaneously revealing and destroying the informal. Here, we find a link between adult education and early childhood education. Indeed, one of the origins of this is Fröbel's kindergarten. Yet, it is based on the idea that play is educational by nature (based on a metaphysical analysis of childhood and play) not to trust children and their play but to frame it through gifts, (educational) games allowing children to create rich experiences (Brougère 1995).

As such, discovering the informal often leads to formalising it which translates into a strong valorisation of the formal over the informal. This is what led Lave and Packer (2008) to reject this concept since it could only lead to depreciation of what is informal and at the same time a valorisation of what is formal within the framework of a dualistic viewpoint. I am not certain that this is completely true. The works of Jean Lave as well as those of Barbara Rogoff and Etienne Wenger and a few others allow us to leave behind this dynamic of depreciation to embrace learning in formal and informal situations as equivalent from a scientific point of view. However, the Francophone literature has difficulty not valuing the formal and, beyond that, the scholastic. When working on informal learning, as critiqued as the term may be, we have the impression in the French context that we are committing a crime, that of devaluing school, as if highlighting learning processes that occur outside of school will lead one to believe that school is of no use, as if in fact, school is not based on a wealth of learning that takes place outside its walls. This sentiment is perhaps equally true of adult education and the valorisation of qualifications linked to formal or even degree-based education. As such, the legitimate desire to professionalise early childhood occupations can lead to the depreciation of parents' knowledge or that of workers as parents. Must we devalue one to value the other? Can we not consider that each person's learning is due to the interlacing, the play (Brougère 2007) between learning in formal and informal

situations? Learning is not in itself either formal or informal, but instead it is individuals who learn in a variety of situations, some of which were designed for them to learn through and others not. Learning is understood here not as something separate, but as a dynamic of transforming oneself and the world which accompanies certain practices:

> A more complete understanding of the quotidian brings with it an alternative understanding of learning: that learning is ubiquitous in ongoing social activity. It is a mistake to think of learning as a special kind of activity, taking place only at particular times in special places arranged for it. (Lave and Packer 2008, p. 19)

Having mostly explored areas linked to leisure to build a conceptualisation of this learning said to be informal through play and tourism, it seemed that some concepts developed in the English language were particularly suitable even though they could also demonstrate certain limits.

4.1.2 A Theoretical Framework for Viewing Learning in Informal Situations

The concept of participation is held to be central, and it has been developed specifically regarding children by Rogoff and regarding adults by Lave and Wenger (Brougère 2009, 2011; Lave and Wenger 1991; Rogoff 2003; Rogoff et al. 1995; Wenger 1998). It is by participating in communities that we learn. Rogoff (2003) has highlighted the guidance of participation by one's eldest, or experts. Greenfield (2004) has given a very interesting and progressive example of this concerning weaving in a Mayan village. Here, participation occurs within the framework of a group and a community, that is, both the place where the learned activity is performed and the place where it is learned (unlike school settings that distinguish the place of learning from the place of application of what is learned) by observation, imitation and participation through tasks adapted to the skills of the subject. Lave and Wenger (1991) evoke a 'legitimate peripheral participation' to describe this attitude where one is legitimate within the group but not yet able to perform all tasks linked to full participation.

These concepts of a social theory of learning or theory of situated learning, quickly sketched out, allows us to understand how one can learn outside of educational programmes. It highlights the role of communities whether they are those where the children are living or else communities of practice linked to specific and limited enterprises. The concept of community of practice is central for Wenger (1998) in grasping the social context in which participation and reification (construction of long-standing tools, artefacts) may be exercised and produce situated learning.

Participation is at the centre of this new learning paradigm. This is not simply a metaphor as is the case with the concepts of acquisition or transmission of knowledge (in fact, strictly speaking nothing is acquired or transmitted). Instead, there is

actual participation (to take part in an activity with others) that we can highlight by ethnographic methods relying concomitantly on the participation of researchers. This participation allows them to learn in the same way that it allows members of the group to learn. The difference is that ethnographers who openly affirm themselves as such are destined to remain on the periphery. However, this concept deserves further analysis. This is what Billett (2001, 2004) proposes through the two dimensions of engagement and affordance that he highlights. The modes of participation are variable, depending on the connection between the engagement of subjects in the group, the community, and that this group, this community (e.g. the enterprise), offers them to participate or to engage in. Affordance (derived from 'to afford') is that which the situation affords for the participation of the subject. Affordance cannot be thought of objectively, in a general manner for all individuals. This is a relationship between a subject and a situation. Indeed, that which a situation affords for one person in terms of participation may not make sense for another.

It is affordance that allows the engagement (one engages in based on what is offered), but a strong engagement allows one to be offered more (conversely one would offer less to someone who is less engaged). It is the importance of participation defined as such that allows one to grasp the importance or lack thereof of learning.

We have applied these concepts to play (Brougère 2005) which implies participation. The willing, nonmandatory dimension of play highlights the importance of participation, and it is easy to see communities of playful practice unfold around the practice of certain games. This is inclusive of the relationship between engagement of the player and affordance (that which the play situation offers him or her, varying depending on the interests or level of the player). If learning takes place (as evident in the form of learning the game itself, more difficult to demonstrate in the form of learning something other than the game), it is indeed through participation and its modes. One can play grudgingly and not really learn the game. One can engage fully and thus master the game. The interest of play is that it is a situation that concerns both children and adults, allowing us to create a bridge between domains that are often separated. These categories have likewise been applied to tourism as a practice permitting learning, not only of the practice itself but of knowledge beyond that practice. This application leads us to emphasise the importance of guidance which is so prevalent in tourism, but also the limits of the concept of participation which seems to us must be complemented by both the concept of exploration which also emphasises guidance and the relationship between engagement and affordance (Brougère 2013).

Based on the concepts borrowed from proponents of situated learning and from Billett who complements them by according more importance to the individual, subjective dimension of participation and learning (Billett 2008), a set of concepts have been built upon to apply them to areas that are not explored in the English-speaking literature. The concepts have no linguistic or geographical boundaries even if their translation can prove problematic. Here, though some translations do not pose a problem (concepts of participation, of engagement and of legitimate

peripheral participation), others are more precarious in French. The concept of community does not have the same connotations in English (the concept is broader, with fewer overtones) and French. This is why we see it translated as *groupe* in a text by Lave (1991). More generally, by trying too hard to adapt the concepts of Jean Lave to the French language, they lose their coherence and take on new connotations. It seems to us that the uniqueness of the concept of community of practice can be understood by using the term *communauté* in French. The concept of affordance created by Gibson from 'to afford', a neologism in English, can be transferred to avoid difficult translations.

Unlike other areas, we can consider that the transfer is made fairly easily and that we have concepts that work in French, subject to specifying the origin for some of them. Is this, however, a Francophone set of concepts? Probably not quite since it is necessary to refer to English texts, some of which have been translated (some better than others) and others not. But regardless of the origin of the concepts, they have allowed me to develop a theoretical approach that is unique for understanding, among others, the effects of learning leisure activities such as play or tourism. It is by importing concepts developed in English that it is possible to take into account the effects of learning of certain activities where the dominant ideas refer to either myth for play (Brougère 2005) or a simple description lacking analysis for tourism (Brougère 2013).

4.1.3 The Question of Early Childhood Education

Preschool refers doubly to the theoretical dynamic that we have evoked. On the one hand, the institutions are seen as a moment of transition between learning within the family, often carried out in informal situations, and more formal learning. Depending on the system chosen and the age of the child, preschool education is seen as closer to either the 'informal' family side or the 'formal' school side. It is, therefore, a place of confrontation between more formal or less formal education strategies and learning in a living environment without educational formalisations (Brougère 2002).

On the other hand, the staff, as we have emphasised, is caught between a professional view that implies that the exercising of the profession is subject to learning coming from formal training and the idea that personal experience is essential to organise one's activity in this framework. When parents participate in the life of the institution and in caregiving and educational activities, the question, which can otherwise remain invisible, comes to light, whether or not it is the subject of reflection. In this area as well, the theoretical propositions are largely borrowed from the English-speaking literature. We note the absence of a Francophone scientific journal on the subject despite the significant developments in this sector over the past 30 years. In France, we can point out that, on the one hand, the joint training for school teachers from the beginning of preschool (*école maternelle*) to the end of elementary school (2 ½–11 years of age) and, on the other hand, the lack

of university training for day care workers do not promote the development of research and researchers in the field.

While international research has been greatly developed in recent years, particularly by questioning a technocratic view that would make preschool education a result of developmental psychology, the French scientific debate is limited. Admittedly in recent years, a critique of the very strong formalisation of *école maternelle* is beginning to emerge, but it is not strongly backed at international debates. It is within this context we make authors that offer 'new paradigms' to think preschool known in French (Brougère and Vandenbroek 2007). In the first section, entitled *perspectives anglophones*, we have published texts that reveal how the model, which is strongly marked by best practices coming from child psychology, is criticised in the United States and beyond. This is redressed through the reconceptualisation of early childhood education movement as shown by Joseph Tobin; Gunilla Dahlberg and Peter Moss analyse early childhood facilities from a political and ethical point of view, Berry Mayall presents new perspectives put forth by child sociology and Martin Woodhead how we can look at the question of child development differently without linking it to standards coming from the richest countries. Among these perspectives, Barbara Rogoff emphasises the role of participation (especially guided) as access to and learning of cultural repertoires seem absolutely essential (Rogoff et al. 2006).

On this basis, childcare facilities can be considered as political forums, communities of living, with children as actors, having agency, and the workers who are also citizens able to exchange with parents. The political dimension and the ethical position outweigh the psychological approach, the quality being seen as a situated local construction, a discursive practice contextualised and negotiated and not as a universal norm (Dahlberg et al. 2007).

4.2   A Study of Parent-Run Cooperative Day Care Centres

The research presented here, in part, will illuminate how we use the theoretical framework presented above to grasp and comprehend the modes of learning in parent-run cooperative day care centres characterised by the diversity of parents. It will allow us to validate both the heuristic richness of the concepts used and the way they function once associated. But it will also allow us to grasp how the question of learning can be viewed by crossing the boundaries of age (children and adults) and status (professionals and parents). Finally, it will provide a bridge between adult education and early childhood education.

The day care centres studied are part of the French network *Association des Collectifs Enfants Parents Professionnels* (ACEPP)[1] (Association of Children Parents Workers Communities) that brings together close to a thousand childcare

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[1] Visit http://www.acepp.asso.fr/

facilities throughout France and, to a minor extent, Belgium. These facilities have, as their common point and main characteristic, the participation of parents in the leading of activities and/or the management of the day care centre. This national network has set up a programme for the development of parent-run cooperative day care centres in social housing neighbourhoods, with the objective to respect the diversity of practices and values of the families present (Cadart 2006).

This research has enabled us to connect the conceptual framework for learning through participation presented above with questions relating to early childhood education. We would like to at the same time demonstrate the heuristic power of this framework and help to render it more understandably through this example. It is a matter of grasping and understanding the practices destined for children (that which we call pedagogical practices) in parent-run cooperative day care centres marked by the diversity of the public who attends. But through our research, we have for the most part discovered the dynamics of participation and their learning effects on the participants as a whole, parents, workers and children. To this end, we observed the practice toward children, without isolating them from the group in which they reside, and also took an interest in the discourses regarding it.

To do this, we used an ethnographic method by conducting a descriptive case study with participant observation as the primary tool.[2] In a second phase, the implementation of focus groups allowed us to construct a global and comprehensive interpretation of the action, based on the confrontation between people coming from different facilities, whether or not they participated in the observation phase.

The day care centres observed, marked by internal diversity, came from a sample chosen according to several criteria in order to observe extreme differences between intercultural parent-run cooperative day care centres (Group 1 consisting of four day care centres), non-intercultural parent-run cooperative day care centres (Group 2 consisting of three parent-run cooperative day care centres) and group day care centres where parents are not directly involved in the daily life of day care facilities and with a higher number of children per day care (Group 3 consisting of two public day care centres receiving a culturally diverse public).

Our research focused on Group 1 (the other groups having the function of allowing us to identify characteristics of the first group). These are day care centres that, because of their location in poor neighbourhoods and/or their recruitment, receive populations marked by social and/or cultural diversity.

4.3 Participation

In keeping with the theoretical framework mentioned above, the approach focuses on the issue of participation. But here, this concept has the distinction of being both a precept for a theoretical approach and a classificatory basis to describe this type of

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[2] Field research was conducted by Alexandra Moreau, research assistant at EXPERICE at the time that this research was conducted.

day care centre. These are day care centres with parental participation that differ from other facilities (e.g. municipal day care centres) because parents participate in some or even all activities of the day care centre. This differs from the model seen in the day care centres we observed where parents drop their children off in the morning and pick them up in the evening limiting themselves to brief exchanges with workers. Only the adaptation phase has parents spending any time in the day care centre, but not with the goal of participation, but of insertion of their child, which should lead the child to do without his or her parents for the entire day. Finally, the day care centres sometimes have a council with elected parent representatives, but the representative dynamic is not the same as the participatory dynamic (where parents do not represent other parents, at least officially).

The concern here is of moving from a descriptive and classificatory concept of participation to the analysis of observed practices based on the concept of participation. The objective is to show how this works in the four day care centres observed without claiming that it is possible to extrapolate these findings any further. This is especially the case since in terms of participation, they constitute four different cases and that it is not impossible to think that every day care centre would offer a particular configuration concerning the participation of the various participants including parents (in addition to the workers and children).

4.3.1 The Modes of Participation

As such, the modes of participation differ between locations and between individuals. There are day care centres that are more cooperative than strictly parental where participation is limited to the management of the cooperative. They are not in our sample, but interviews allowed us to grasp that there are indeed modes of participation. One of these modes is found in all cooperative day care centres and is of great importance. Indeed, it is a matter of managing the day care centre and of taking part in important decisions, such as recruiting staff and/or families, and in discussions and decisions on the direction of the day care centre.

In most of these parent-run day care centres, parents must participate in activities with the children, with in certain cases the option to substitute it with other modes (e.g. cleaning, maintenance, decorating, grocery shopping, etc.). Depending on the day care centre, the time required varies as does the role played. These duties can be little demanding, reinforcing an adequate framework, parents choosing what they want to do and able in some cases to devote themselves to their child. In other cases, they are essential to the operation of the day care centre, whether it be the replacement of an absent staff member or the official integration of parents in the daily framework of the day care centre (as is the case of the Belgian day care centre sampled). Which activities are allowed and which are prohibited (e.g. changing a child or putting him or her to bed) vary from one day care to another. In general, the observed parents take care for their own child and/or those of others (play with them, read them stories, accompany them on outings, supervise arts and crafts

activities, cuddle them, feed them, etc.) and participate in the preparation of meals (i.e. on-site or from home).

As such, there are many modes of participation. We see some parents stick to roles within the office or perform cleaning tasks, and others do everything that a day care worker would do, thereby having maximum involvement. Others still, without being physically present, contribute to the practice through the furbishing of the facility and the design of teaching materials. To use the categories of Lave and Wenger (1991), some parents limit themselves or are confined by the operation of the day care centre to a 'peripheral participation', where elsewhere, it is a 'full participation' in the extent that the differences between parents and workers are limited. These different attitudes toward participation may be linked to the role of parents in the day care centre and involve all parents, or they can be distributed depending on the parents (e.g. some limiting themselves to a peripheral participation, others engaging in a full participation). Finally, it may be a matter of attitudes in a path that consists of moving from a peripheral participation that allows one to observe, to understand, to imitate (attitudes that are generally adopted while performing one's first set of duties) and, in a word, to learn to a progressively more intense participation.

These modes may also apply to workers, except that they are usually in a full or even central participation. But some may remain more in the background, and many begin when they arrive, by observing, placing themselves at the periphery and following a principle that has no reason to be different from the one mentioned regarding parents. As such, trainees can stand back or get completely involved.

4.3.2   Obstacles and Limitations to Participation

For a parent, there are indeed reasons to limit one's participation, starting with one's availability, feeling of not knowing what to do and fear of being judged, and this is particularly true of immigrant parents or parents that are different in general and mothers raising their child on their own. But workers tell us how a family that begins by mentioning their lack of time finds itself a few months later heavily engaged in all the day care centre's activities. More than an immigrant origin, level of education, being in a couple relationship and not being a single mother are the determining factors.

To avoid a selection process that would have the difficulty of participating eliminates certain parents, perhaps the most vulnerable ones and the most culturally distant from the world of the day care centre, the heads of the day care centres observed offer a variety of modes of participation, which allows each person to find the place that suits him or her. This allows the day care centre to be more open, accepting parents or even more so single mothers who could not engage in (or would not feel able to engage in) a relationship with other children in a public space, under the watch of other parents and workers. But this has the effect of in fact limiting the participation of some. What does this mean, in terms of the distribution

of participation, the determining a priori of places? To whom will the cleaning fall on and to whom will the management of the association be? This variation in the expected participation avoids construction of the day care centre based on parents that are all able to engage to the same extent, which would exclude single-parent families and could lead in certain cases to the seeking of parents with higher education. Hence, a strong tension between the importance given to participation as a driving force in the day care centre and the willingness to limit or even allow one to avoid participation in order to recruit more widely was evident in these cases.

This tension belongs to all participation situations that can be analysed using the concepts of engagement and affordance that we presented above. Depending on their interests, desires and feelings, the observed parents will engage to a greater or lesser extent, and this is a dimension that depends only very partially on the day care centre since the impediment to this engagement can be quite beyond the reach of workers' actions. The question of engagement is not limited to parents. Parent-run cooperative day care centres seem to favour a strong worker engagement, when compared to nonparent-run day care centres. One can also consider that the engagement of the children in the different practices varies.

Though it is difficult to act except very indirectly on the engagement of parents and children, it is, however, possible to ask oneself what is offered to them and what we make available so that they participate and, therefore, are more likely to engage. For example, in some facilities, the lack of a referent person among the workers has the advantage of promoting generalised participation. A referent person promotes the central position of workers and may limit the full participation of those who do not have this status. Elsewhere, this would be the diversity of tasks offered to parents and the ability to invent their own mode of participation that would promote generalised participation. Moreover, the absence of protocols and rules gives parents the opportunity to act as they would at home and, thus, allows for the expression of cultural diversity.

Parent-run cooperative day care centres offer a situation constructed for participation, but this availability varies from centre to centre with obstacles and limitations to the participation of all or of some. The current research, thus, shows how one cannot speak of participation in general; each day care centre or rather each community of children, parents and workers defines to a certain extent what it is to participate but without this always being explicit.

4.3.3 Participation and Diversity

Parental participation makes diversity exist for the child in a real and visible manner:

> Each person manages to bring in the end so many different elements that it's not sure that a solely worker based team could go as far in fact [...]. It is in what we experience, it is in the transmission through both things that we live through, which are visual and which are communicated (A worker)

The diversity referred to in this quote reflects the multiple dimensions that are both cultural and linked to the individual person. Individuals bring something specific through their participation that would not be present otherwise, such as different ways of taking care of children, talking to them and putting them to sleep. This is also the case of the presence of fathers in the day care centres, the majority of which do not have men among the workers. They bring a different practice, most particularly through very dynamic games.

4.4 The Day Care Centre: An Original Community of Practice

4.4.1 The Day Care Centre as a Community of Practice

A community of practice according to Wenger (1998) is a group defined by the act of doing something together within a framework of mutual engagement. The coherence of the community is assured by this common practice. The day care centre is a community of practice (though this is true, a priori, of all day care centres) except that the parent-run cooperative day care centre is not a community of workers and children, but a community of workers, children and parents. What characterises the parents is not that they are the users but that they do with and participate in the practice.

As this concept underlines, parents and workers have a common story because they act together (in the reception and the management of the facility), interact frequently (during the performance of duties and at other times), share knowledge (such as the habits and pace unique to each child) and encounter similar problems (from a technical or relational point of view – particularly in situating oneself in the relationship with the children). Above all, they work together and carry out activities that are in part in common, in part complementary.

The three characteristics of the community of practice according to Wenger are indeed present:

– Firstly, there is 'a mutual engagement' (Wenger 1998, p. 72). Participation entails that the parents as well as the workers and the children engage in practices toward the children, the workers and other parents. Of course, as we have seen, the engagement varies from individual to individual; it may not have been truly chosen (e.g. having not received a spot in a municipal day care centre), but it remains nonetheless present, sometimes very strongly emphasised by the parents met who testify to pleasure and interest in participating.
– Secondly, this is 'a joint enterprise' (Wenger 1998, p. 77), incorporating the day care centre and its purpose, with its functions of watching over, caring for and educating the children being taken on collectively by all members, the workers and the parents, but also the children who play the game by accepting the separation from their parents and other adults who take care of them. The

complementary skills of each member provide mutual support and a sharing of knowledge and know-how.
– Thirdly, it has 'a shared repertoire' (Wenger 1998, p. 82), a set of common practices, of ways of doing and of routines.

4.4.2 Repertoires of Practices

This concept of repertoire of practice was developed by Rogoff:

> to describe the variety of practices with which individuals are familiar, yielding disposition to apply different formats under distinct circumstances. The idea of repertoires of practice addresses the fact that people engage in multiple traditions [...] Through their lives and the different endeavours in which they engage, people develop fluency with a variety of formats for participation. (Rogoff et al. 2006, p. 504)

A repertoire is that which is available to each person, resulting from their past experience, to act in a new situation that is closer or further from situations already encountered. It is linked to options for participation. Participation allows both to activate an element of the existing repertoire and to enrich it with new practices.

Each person likely has (at least) one repertoire of practices (the workers as well as the parents, but also the children). The more diverse the present actors within an organisation are (in this case, the day care centre), the more varied the repertoires of practice are, provided that they are not suppressed. The parent-run cooperative day care centre here is seen as singularly different due to the presence of parents, whether or not they come from different backgrounds. It might have been expected that the more that parents are involved, the more the different repertoires will be present, but likewise, the more the workers show their acceptance, or even the valorisation of different ways of doing things, the more these repertoires will have the opportunity to be mobilised.

The parent-run cooperative day care centres that we observed are spaces of practice (or communities of practice) characterised by the copresence of multiple repertoires with the essential idea that each actor is not defined by a single repertoire, but often several repertoires, which allows for significant variations in practices, depending on the situation, the children and the presence of other adults.

The shared repertoire of each day care centre is the complex combination of different repertoires that are permitted and that can be displayed at the day care centre: this assumes that they are mobilised and in a certain way validated by the other parents and workers. A practice that is considered inappropriate (violence toward a child) would not be part of this repertoire unless the parents disregard the rules and use it regularly without caring about the advice of the workers. This is not what happens. Workers are recognised as having the capacity to assess practices, as shown in interviews with parents, and the slightest statement of reserve regarding a practice is considered by parents as an indication of illegitimacy and implies that

one should remove this practice from the day care centre's repertoire and, perhaps, beyond that, which is that of the home.

Consequently, the parent-run cooperative day care centres studied are seen as complex structures with repertoires of practices linked to the relationship between different communities of practice, starting with the families. Parental involvement is that which leads to the rethinking of the repertoire of the parent-run cooperative day care centre, which is more open than that of nonparent-run day care centres, regarding family practices and their diversity. This openness leads to giving a place to practices brought by immigrant families, but these can sometimes abandon some of their family practices and engage in practices proposed by other families or the workers. Likewise, culturally distant practices can become (such as traditional carrying techniques, techniques for putting a child to sleep observed in some day care centres) practices shared within the day care centre. Behind the community of practice, we can find:

> ... the practices of the community. A shift has therefore come about from the notion of a CoP as the context where learning takes place to consideration of how situated and repeated actions create a context in which social relations among people, and between people and the material and cultural world, stabilize and become normatively sustained. (Corradi et al. 2008, p. 5)

4.4.3 The Desire to Be a Member and Group Identity

These communities of practice, within the framework of the parent-run cooperative day care centres observed, whether or not they are marked by the diversity of their public, seem to generate a sense of belonging and identity. The parents encountered, whatever their origin is (perhaps more than others, such as those that we did not encounter), indeed consider themselves as the members of a community that are experienced not only on a daily basis but also at festive events that render the community more visible.

Through the various observations and interviews of the characteristics of a community of practice, it has been found that individuals become members through participation which is often progressive. One finds oneself first in a peripheral position that allows one to observe; to understand the functioning, the routines, the rituals and the ways of doing; and to gradually take on activities (however, not all participants move toward full participation, and not all day care centres offer such a participation). This participation, even though limited, is nevertheless legitimate because the newcomers have their places and are considered in their uniqueness. They are given the opportunity to feel as members of the group, to take on new responsibilities as they become familiar with the day care centre. This progression in participation can be viewed in two ways: becoming a member, with a transformation of identity (since being member of a community is a component of one's identity, and being a parent in a parent-run cooperative day care centre contributes to this identity), and learning. There is no overlap of the two in the

sense that the persons are not necessarily looking to learn and are not conscious of it. Their objective is to find their place within the group, the day care centre, but in doing so, they transform their mode of participation, which is necessarily to learn.

Numerous programmes and instances reflect this dynamic of the community of practice. As such in one of the day care centres, each new family is assigned a 'referent parent' appointed at a meeting. This 'referent parent' is responsible for sponsoring the new family to facilitate its integration into the life of the day care centre: provides a link to other parents and workers if necessary, answers any questions about life at the day care centre, explains the role of parents, helps in taking on a commission, etc.

Another component of the community of practice is the fact that parents relate to all the children, not only their own. Indeed, the workers we encountered state that at first, parents care mostly for their child then, after some time, take care of the group since they are solicited so greatly by the other children ('In fact, it is the other children that help them with that, they bring them their books', said a worker). This example not only shows the integration of parents into a community of practice that is not only that of the adults but also emphasises the role of the children in the construction of the said community. In interacting with adults who are neither their parents nor day care workers, they actively participate in the construction of the community of practice.

The community of practice is seen as based on a strong reciprocity, each person being able to contribute through his or her own practices. By doing so, in getting closer to what is done at home, one moves away from it at the same time. Indeed, it is very likely that the family practice is marked by a cultural homogeneity, linked to the family culture. The paradox is that at the parent-run cooperative day care centre, in doing 'same as at home', one introduces a diversity factor which gets one further away from the family dynamic. The community of practice of the day care centre, unlike that of the family, is driven by participants who bring different cultural practices, provided that such diversity exists. By affirming its openness to diversity and in accepting family practices, the day care centre creates a specific practice (the practice of this day care as specific community) that is hard to compare to what is done elsewhere.

4.5   Participation and Learning

The concepts of participation and the analysis of its modes, of community and of practice have allowed us to grasp the dynamic at work in the parent-run cooperative day care centres observed. As interesting as it is, this architecture is not limited to its descriptive convenience; it must allow one to understand the dynamics of learning at work.

4.5.1 A Community of Learners or Knowledge-in-Practice

A community of practice, as we have already mentioned, is also a community of learners even if the members are not necessarily aware of it, their goal being to participate better and not to learn. This is what happens in the parent-run cooperative day care centres observed. The parents we met, with varying degrees of enthusiasm, wish to participate to the best of their ability. In doing so, they learn from others (workers, parents, children) to do what needs to be done, ready to adapt to the situation the practices coming from their repertoire.

Here, all forms of learning in informal and little formalised situations can be found: observation, guidance and performing of tasks from the simplest to the more complex. Parents are undoubtedly important guides for new parents, to the point that this was able to be formalised through an 'official' responsibility in some day care centres.

Certainly, they are there in the childcare centre as parents, showing to others certain ways of doing things but able to protect themselves, such as the mother who, speaking of clothing and language, told us how difficult it was in France (compared with the United States and England) to assume her culture in the public space (of which the day care centre is part of). This sentiment may lead immigrants to quickly confine to the domestic space expression of the most striking cultural traits (the most stigmatising) to use their knowledge of the traits of the host country and to therefore pass by unnoticed. Therefore, it is important not to underestimate this and understand that indeed many parents will avoid mobilising what they consider as too far – removed from what is accepted without inquisitive looks by the host country's practices. Nevertheless, the presence of other parents in the same situation, the strength of the relationship with the child (with the 'spontaneity' or the limit of self-control that this entails) and the encouragement from workers may allow one to overcome these barriers to the mobilisation of the repertoire of practices most significant to these parents.

Despite these limits, the presence of parents remains an open door to the diversity of practices. Learning occurs within the context of this diversity. Parents discover ways of doing things other than their own. It is the same for the workers who say they learn from the parents and children. They discover other practices that they can adopt, most often for the child concerned but sometimes beyond that. They especially learn to question their practices, to consider favourably practices that are not consistent with their training. Actually, this distance from the norm, constructed in the expansion of the repertoire of practices specific to the parent-run cooperative day care centre, is an element we have consistently encountered in our observations.

As such, one worker acknowledges having learned a lot from parents, particularly techniques for rocking and carrying children. He/she had been observing families for a long time and came to realise that energetic rocking allowed one to console and put to sleep some children more easily.

This openness, the idea that practices are not fixed based on one point of view linked to worker knowledge, clearly distinguishes parent-run cooperative day care

centres from other day care centres observed. On one side, actions are professionalised to excess, for example, by limiting cuddling and affectionate interactions. On the other, it is able to be more similar to that of the parents, allowing them to construct a community of adults who act in a more similar manner and this even more so when workers are willing to learn from parents, to not consider a priori that they just have to roll out an already developed practice. They develop a knowledge-in-practice 'constructed by practising in a context of interaction' (Corradi et al. 2008, p. 16).

Although there are practices directed toward the children, the latter participate in and can sometimes act as vectors of sharing these practices by imitating them (e.g. in playing), by using them in relationships with other children and by appreciating them for themselves. In contact with adults owning different repertoires, there is the circulation of practices:

> Observation: A worker sits on the mattress next to a baby with whom he is playing. His daughter joins him and alerts him to the fatigue of a child: "Daddy, Teddy's tired. I'm going to put him to bed". The early childcare teacher smiles at the imitation and protection behaviour of his child.

This example and others still (particularly when children try to put babies to sleep by taking them in their arms or when acknowledging that a child is crying) show the acquisition of know-how in children by imitating adults (parents or workers) who attend the day care centre. Children observe the adults around them and reproduce their actions most often with other children than with dolls:

> Observation: Josephine (15 months old) and her mother make their second visit to the day care centre (adaptation period). The idea is to let the child play for a while in the presence of the parent and to leave together. The parent observes her child come into contact with other children and tries to facilitate her social integration by the *in situ* teaching of some rules (do not pull other children's hair, do not take their toys, share your own, take care of the little ones…). The other children take advantage of this situation to exercise the social skills acquired at the day care centre. For example, Claire includes the girl in a reading activity, after having invited her to sit beside her to flip through a book.

Workers can encourage the children to discover appropriately different practices through play. Play has the characteristic of being a practice in itself, but one that relies on another practice to which it refers. Play thus leads both to the development of a shared repertoire of practice between children or between children and adults (depending on the play and the age of the child), but it is also a way to take the caregiving practices aimed at children and in a way to give them, from the point of view of the child, a legitimacy:

> Observation: Djamel and Sidonie play with dolls which they carry from one corner of the room to another under their arm, and then somehow (slow movement) by sticking them under their clothes at the level of their abdomens.
> Watching the game situation, the childcare teacher invites the children to carry the dolls on their backs, and shows them the carrying technique on herself by using a scarf. Very quickly, the children want to imitate the adult and request her help to arrange the dolls on their backs.
> For a good fifteen minutes, the children have fun carrying their dolls this way, making others envious (not enough dolls or scarves).

The community of practice is seen as a learning space for the workers and for the children who also learn from the diversity of experiences. This is also the case for parents who emphasise how much they learn there, most especially from the workers ('It's a little bit like school for the parents, the parent-run cooperative day care centre', said a parent), often thinking that on the other hand, the workers have nothing to learn from the parents. This is probably the paradox of the parent-run cooperative day care centre. Open to the diversity of practices, the day care centre is a place where parents are able to see up close the practice of the workers, to compare it to that of the parents, to understand the dynamic and therefore to be subject to its influence. They certainly learn, but in the sense that learning is always an acculturation. Parents in a nonparent-run day care centre are less subject to the influence of workers, whom they do not see working, even if advice may be given to them so that the child be taken care of in the same way in the day care centre and within the family, but in this case, this implies the alignment of the second to the first.

Despite this practice which influences parents, parents have been able to influence it to the extent that they have taken on parenting practices and attempt to adapt to the specific needs of each child. It is a practice that is done under the watchful eyes of parents, which is a guarantee for them. If they are not present, other parents see what is happening. This visual delegation offers them a security that some do not find in other facilities in which they may fear they do not treat their children the best.

Learning may be seen as more or less asymmetric depending on whether we're listening to the parents or the workers. But it is learning by observation, by adaptation and by appropriation, based on an eventual selection. This would come mostly from an expansion of one's repertoire of practices or the acquisition of a new repertoire of practices, unless the norm comes to interfere.

4.5.2 Truth and Best Practice

Are all practices good? Is the professionals' repertoire superior to that of the parents? We find ourselves faced with a tension that is resolved differently by each of the day care centres observed, but that is far from being discussed or explained.

The worker discourse evokes openness toward other practices, with sometimes a tendency to limit the diversity to individuals based on their culture (in one day care centre, only children who eat at home with their hands can do so at the day care centre) and other times the option to make it a practice for all (such as the African technique for carrying children applied to other children). But this openness faces a limit, the idea that certain practices are not acceptable. Some are not acceptable at all and would be reported. But there was never really any question of this; others are acceptable within the family space (e.g. putting a baby in a position that he or she doesn't master yet), but should not be present in the day care centre.

The boundary between what is and what is not appropriate is difficult to set and varies between day care centres. It refers to several aspects among which we can emphasise the following two main principles: the constraints of a group subject to regulations and the welfare of the child. But these are not objective characteristics. They vary greatly from person to person, but also between facilities. It also depends on the liberties that some may take regarding the rules, certain day care centres recognising and accepting to be within practices that, if we applied certain rules to the letter, could be problematic. An example that is often discussed refers to the constraints regarding meals and hygiene which could make this practice impossible in other day care centres, the preparation of meals by parents in turn making visible a variety of dietary practices and presenting an occasion to learn about these. The need to manage a group will also sometimes impose practices that are not considered as ideal by the workers themselves, but as inevitable. Some describe as such mealtimes that lead to the imposition of constraints, to forbid play that would disrupt it. In this case, parents may avoid this situation and do not participate, making it even more difficult to bring in different practices. Behind best practice, is there not often a hidden practice considered as the only one compatible with the functioning of the group?

Behind the goodness of the child is the attitude of a professional acting as the guardian of his or her well-being, a paradoxical attitude since we can ask ourselves why the child or the parent would not be better guardians. This good is very often elaborated through discourses that develop a truth about the child, discourses coming from the workers' training. Some have taken distance from this discourse, relativising, for example, the concept of autonomy which looses all meaning when faced with the diversity of practices. What's more, workers have often told us that they reject the idea of holding the truth.

The idea remains that there is a best practice somewhere, a truth which implicitly leads to disqualify certain parental practices. As such, parents have heard the rejection of certain practices even if no prohibition was pronounced. Just a word from the worker is sufficient to disqualify the parental practice (saying that she would do otherwise, or inviting one to think about the effects of this practice). As such, a father clearly felt that his practice of counting to encourage the child to do a task more quickly was not considered a best practice (he therefore understood the need to remove it from the repertoire used at the day care centre): this consisted of saying 'I'm going to count to three…'. Depending on its implementation, this can be a strong constraint (if the child is informed of a consequence that is sure to arrive if he or she does not finish by the count of three) or a simple game that consists of demonstrating the adult's power without really exercising it. Hence, the adult will adapt to the pace of the child by stating 'two, two and a half, two and three quarters…' or any other strategy of tacit negotiation. Who can say that this is a bad practice? We see the extent to which the repertoire of best practices is not only a cultural construction that must be analysed but also a construction of a professional practice in opposition to a parental practice.

Another example demonstrates this dynamic, one mother's sentiment that baby talk is not legitimate. This refers to the attitude that consists of inserting the child

from a very young age into a correct and almost adultlike language. But baby talk is an old tradition in the relationship between adults and children indeed belonging to repertoires of practices in different societies. Here again, there is a collision between the world of parental (i.e. amateur?) practices and that of professional practices guided by an educational concern supported by a certain developmental psychology.

It is not a matter of accepting all practices but of asking the question of what it has that a particular practice is rejected or indeed tolerated while being devalued as unworthy of workers. Moving from an actually shared repertoire to an explicitly shared repertoire implies that there can be a debate on the question of the truth and best practice, and this debate only makes sense if the professional attitude is taken into consideration or even questioned.

4.5.3   The Differences Between Professionals and Parents

Our hypothesis is that the question of truth and best practice is not that of the construction of an absolute criterion but that of the construction of a professional attitude. It is because professionals exist, people paid to take care of children, that there can be a truth. Best practice is less that which is constructed by professionals than that which constructs the professional as such.

To ask oneself about best practice is to ask oneself about the difference between professional and parent. That which does not pose a problem in nonparent-run day care centres becomes more complex in our context where the parents participate, perform some or all of the tasks performed by workers, or even take on very significant aspects (management, recruitment) that can sometimes be beyond the scope of workers. All interviewees, parents as well as workers, insist on the difference, evoking the uniqueness of the professional attitude. But depending on the day care centre, the difference is more or less significant, through two dimensions:

– Do the tasks differ? There are day care centres where certain tasks (changing diapers, putting to sleep and more) are reserved for workers, while others do not exclude parents from any task. The parent/worker difference is therefore constructed in a specific manner in each facility.
– Can workers become parents, can parents become workers? Certain regulations prohibit workers from putting their children in the facility, from recruiting parents as workers (unless they withdraw their children from the facility). In other facilities, workers can accommodate their children without this seeming to pose a problem, parents have been recruited.

These two elements show that parent-run cooperative day care centres construct vague delimitations between parents and workers or, in other words, that the construction of a boundary is local and temporary. This was even more true at the beginning of the movement (and is still so today in Belgium where we find one of

the day care centres we observed belonging to the French association) when parents were included in the required legal framework. This, in fact, confers to them the status of 'acting as' a worker at least at the regulatory level. The institutionalisation of day care centres was made on the basis of their 'professionalisation', quality assurance for funders. We, thus, see a tendency which consists of highlighting the need for a professional attitude that is clearly distinct from that of parents. It can hardly be done without valuing the knowledge and practices of workers (how else would one justify their position?), and, therefore, in a certainly indirect manner devaluing the knowledge and practices of parents. This movement is driven by the idea that it is contemptuous to think that being a parent suffices to take care of children. However legitimate this idea might be, because we understand it avoids contempt for childcare workers compared to workers in other sectors, it has effects that we see clearly in the tension in parent-run cooperative day care centres which tell us at the same time that it suffices to be a parent to take care of children, legitimising their full participation, and that this does not suffice, legitimising the professionalism of workers.

An illustration of this tension that can traverse the same person is seen in a worker's annotations in the margins of the day care centre's monograph where he/she works. Faced with a pointed remark that (from the exterior of course) little or nothing in practice differentiates parents from workers, she writes:

> Wow, that's a bit harsh!!! The team "supervises", organizes, . . . the parents suggest things but do not have this "overview". For me, the team is driving the whole dynamic, then the parents insert themselves where they want.

Yet, when it comes to the learning of parents:

> I find that at the day care centre, the idea that parents and workers are equal "there is not one who knows more than the other" is essential. This is the basis of everything, it's what makes it that there is respect from both sides and that communication can occur in both directions. When there is a problem, we can talk about it easily from either side, which does not occur in all facilities. . .

Certainly, we can be different and equal, and it is still possible to show that there is no contradiction between the two points of views. There is a real tension which probably serves the interests of the facility but makes the work complex, for example, by being a professional without using any superiority whatsoever toward parents.

Our research shows that regardless of the position of the day care centre (more or less participation, more or less separation between parental and professional attitude), the parents always adhere to it as a legitimate norm, not finding other positions completely convincing. The consequence is that this is never discussed. Yet, this is the key to the question of sharing of practices, to confront oneself with the question of best practices.

Shared practice entails not only a better understanding of each other but also a mutual respect. One of the workers we encountered who had previously worked in a cooperative day care centre where the parents were just managers observed the differences in the relationship with them. She had the feeling of being

unappreciated because of the lack of contact and relationship with them: 'The parents didn't know us, what's more didn't value us. In a way, we are appreciated much more when they know us and see us working in the facility [. . .]. In comparison here, they get to know all of us individually'. Learning is accompanied by mutual recognition: 'We feel more recognized for our work in the same way that we provide ourselves the means to recognize their skills'.

Each day care centre produces norm and conformation effects regarding the parents, an effect of engagement and the importance of belonging to the community of practice. We can speak of internalisation of the norm which is undoubtedly the reverse of integration within a community of practice that produces significant identity benefits: being a member of such a day care centre is highly valued. Thus, we have been told of parents who find it difficult to leave when their last child leaves the day care centre, and even of one exception allowing a mother to stay.

4.6 Conclusion

Though we have seen the limits of sharing, it remains nevertheless a shared repertoire marked by heterogeneous practices linked to the presence of parents of different cultures respected by the workers. A community of practice is a space for negotiation of meanings. One can consider that the practices that are accepted, integrated into the repertoire, most often in fact result from a negotiation. What we mean by this is that the meaning or the sense of practices, their acceptability and their interest can be negotiated implicitly. Some negotiations are tacit; they result from the action of parents, their analysis of the reception of their action and its eventual transformation. They also refer to the act of not bringing certain practices into the public space of the day care centre.

It appears to us that the shared repertoire is in fact the result of a cultural negotiation which is largely implicit and in any event not explained except in person to person relationships and rarely at the level of the day care centre as a whole.

This is what leads to learning which is often just as tacit even though one may become aware of it on certain points. It is through their participation (whose modes, linked to the affordance of each day care centre, vary) that parents learn and negotiate the practices, likewise transforming their repertoire of practice. This is also true of workers and children, making parent-run cooperative day care centres a particularly remarkable community of practice with the learning effects that Wenger (1998) was able to analyse. It shows how learning is not linked to positions, concerns all members of the day care centre, but equally reveals the tensions linked to different statuses that entail questioning the concepts of truth and best practice.

The theoretical framework of situated learning allows one to bring to light and to take seriously such learning that relates to daily experiences, to the most practical know-how, to knowledge linked to the values and to the life path of some. As Sole and Edmondson (2002, p. 18) wrote, we can see 'the situated and provisional nature

of knowledge, in contrast to a rational-cognitive view of knowledge' (Corradi et al. 2008, p. 20).

In doing so, we come back to the view of Dahlberg et al. (2007) who see parents and children collaborating with professionals to define the educational choices and equally give meaning to the question of quality understood as contextualised.

References

Billett, S. (2001). *Participation and continuity at work: A critique of current workplace learning discourses. Context, power and perspective: Confronting the challenges to improving attainment in learning at work*, Joint Network/SKOPE/TLRP international workshop, 8-10th November 2001, Sunley Management Centre, University College of Northampton. Available at: http://www.infed.org/archives/e-texts/billett_workplace_learning.htm

Billett, S. (2004). Participatory practices: Conceptualising workplaces as learning environments. *Journal of Workplace Learning, 16*(5/6), 312–324.

Billett, S. (2008). Les pratiques participatives sur le lieu de travail: apprentissage et remaniement de pratiques culturelles. *Pratiques de Formation – Analyses, 54*, 149–164.

Brougère, G. (1995). *Jeu et education*. Paris: L'Harmattan.

Brougère, G. (2002). L'exception française : l'école maternelle face à la diversité des formes préscolaires. *Les Dossiers des Sciences de l'Education, 7*, 9–19.

Brougère, G. (2005). *Jouer/Apprendre*. Paris: Economica.

Brougère, G. (2007). Les jeux du formel et de l'informel. *Revue Française de Pédagogie, 160*, 5–12.

Brougère, G. (2009). Une théorie de l'apprentissage adaptée; l'apprentissage comme participation. In G. Brougère & A.-L. Ulmann (Eds.), *Apprendre de la vie quotidienne* (pp. 267–278). Paris: Presses universitaires de France.

Brougère, G., & Ulmann, A. L. (2009). *Apprendre de la vie quotidienne*. Paris: PUF.

Brougère, G. (2011). Apprendre en participant. In E. Bourgeois, G. Chapelle (dir.), *Apprendre et faire apprendre* (pp. 115–124). Paris: Presses universitaires de France.

Brougère, G. (2013). Learning the practice, learning from the practice: Tourist practices and lifelong education. *International Journal of Lifelong Education, 32*(1), 93–106.

Brougère, G., & Bézille, H. (2007). Des usages de la notion d'informel dans le champ de l'éducation. *Revue Française de Pédagogie, 158*, 117–160.

Brougère, G., & Vandenbroek, M. (Eds.). (2007). *Repenser l'éducation du jeune enfant*. Brussels: Peter Lang.

Cadart, M.-L. (2006). *Des parents dans les crèches, utopie ou réalité ? Accueillir la diversité des enfants et des familles dans le réseau des crèches parentales*. Ramonville Saint-Agne: Erès.

Corradi, G., Gherardi, S., & Verzelloni, L. (2008, April). Ten good reasons for assuming a 'practice lens' in organization studies. In *Proceedings of OLKC*, International conference on organizational learning, knowledge and capabilities, Copenhagen, Denmark, 27–30. http://www2.warwick.ac.uk/fac/soc/wbs/conf/olkc/archive/olkc3/papers/contribution312.pdf

Dahlberg, G., Moss, P., & Pence, A. (2007). *Beyond quality in early childhood education and care. Languages of evaluation*. London: Routledge.

Delbos, G., & Jorion, P. (1984). *La transmission des savoirs*. Paris: Editions de la Maison des Sciences de l'Homme.

Greenfield, P. (2004). *Weaving generations together: Evolving creativity among the Mayas of Chiapas*. Santa Fe: School of American Research Press.

Lave, J. (1991). Acquisition des savoirs et pratiques de groupe. *Sociologie et Societes, XXIII*(1), 145–162.

Lave, J., & Packer, M. (2008). Towards a social ontology of learning. In K. Nielsen et al. (Eds.), *A qualitative stance* (pp. 17–46). Aarhus: Aarhus Universitetsforlag.

Lave, J., & Wenger, E. (1991). *Situated learning. Legitimate peripherical participation*. Cambridge: Cambridge University Press.

Pastré, P., Mayen, P., & Vergnaud, G. (2006). La didactique professionnelle. *Revue Française de Pédagogie, 154*, 145–198.

Rogoff, B. (2003). *The cultural nature of human development*. Oxford: Oxford University Press.

Rogoff, B., et al. (1995). Development through participation in sociocultural activity. In J. J. Goodnow, P. J. Mills, & F. Icowl (Eds.), *Cultural practices as context for development* (New directions for child development n° 67, pp. 43–65). San Francisco: Jossey-Bass.

Rogoff, B., et al. (2006). Children's development of cultural repertoires through participation in everyday routines and practices. In J. E. Grusec & P. D. Hastings (Eds.), *Handbook of socialization. Theory and research* (pp. 490–515). New York: The Guilford Press.

Sole, D., & Edmondson, A. (2002). Situated knowledge and learning in dispersed teams. *British Journal of Management, 13*(2), 17–34.

Wenger, E. (1998). *Communities of practice. Learning, meaning, and identity*. Cambridge: Cambridge University Press.

Chapter 5
Learning to Use Tools: A Functional Approach to Action

Blandine Bril

> *L'outil n'est réellement que dans le geste qui le rend techniquement efficace (Leroi-Gourhan 1965, p. 35)*
> *(No tool is complete without the gesture used to put the tool into action. (translation in Tosdevin 2011, p. 354))*

5.1 Tool Use and Learning

How can we define tools? As 'objects that can be temporally attached to our bodies, so as to increase our capacity for action'. This short definition by Gibson (1979, p. 40) could be extended to include devices that 'serve as extensions of [our] limbs and enhance the efficiency with which skills are performed' (Connolly and Dalgleish 1989, p. 985). Tool use has been considered fundamental to hominins for at least 2.6 Ma, maybe more. For centuries, the ability to use tools was considered the hallmark that clearly differentiated humans from the animal kingdom. However, the work of the famous primatologist Jane Goodall with chimpanzees in Tanzania challenged the long-standing belief that only humans could make and use tools (Goodall 1986). Recent research also emphasises the sophisticated level of cognition involved in many species not only when using tools but also when making tools to solve a task. New Caledonian crows, for example, have been shown to be able not only to choose the right tool among a set of different wooden sticks in order to reach otherwise unreachable food but also to manufacture and use 'crochet' tools to probe for insects (Hunt et al. 2006).

The other field of study that has imprinted its mark onto the understanding of tool use comes from neurophysiological studies of apraxic patients' disorders and difficulties in using common tools first discussed in the early years of the twentieth century by H Liepmann (see Goldenberg 2003). These patients lose the ability to conceptualise, plan and execute sequences of actions involving everyday objects and in particular tools (Johnson-Frey 2004; Goldenberg and Hagmann 1998; Goldenberg and Spatt 2009). In recent years, the development of brain imaging

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techniques has largely facilitated and consequently encouraged questioning about the neural basis underlying tool use (Ramayya et al. 2010; Stout and Chaminade 2007) but to the detriment of actual behavioural tool-use analysis.

Ergonomics is the third area where tool use is discussed. However, most often the ergonomic focus on tools concerns mainly the evaluation of tool use in terms of comfort or discomfort, experience of pain, musculoskeletal complaints and more generally trauma disorders (see, e.g. Kuijt-Evers et al. 2005). A particularly recurrent issue is to understand the capabilities of the human hand by measuring the power grip force necessary to use a pair of pliers or a hammer, or to turn a key in a stiff lock (Fransson and Winkel 1991; Sesto et al. 2005; McGorry and Lin 2007).

A new area that expanded in the past two decades concerns the development of tool use in infants (Hernik and Csibra 2009; Lockman 2000; McCarty et al. 1999; Rat-Fischer et al. 2012; van Leeuwen et al. 1994). Tool use in infants is considered a way to access the development of causal thinking in humans, which is considered as the foundation of tool use (Hernik and Csibra 2009; McCormack et al. 2011). Except in the case of ergonomics, the emphasis has mainly been on the conceptual foundation of tool use, the cause-and-effect understanding of the functionally relevant properties of tools. Most of these studies investigate the causal understanding and correlatively the mental representation thought to underlie behaviour. From this perspective, the prerequisite for tool use and the core element of tool use is the ability to understand means–end relationships, whether in humans or animals.

Furthermore, in a recent paper, mostly based on research on brain-damaged patients, Osiurak et al. (2009) gave a very comprehensive and interesting account of the different hypothesis that could account for tool-use skills. Four main sets of hypothesises are examined in this paper: (1) the *gesture engram hypothesis*, where 'motor programming' is associated with the use of a particular tool; (2) the *conceptual knowledge hypothesis*, which emphasises that knowledge of a tool's function is not necessarily tied to action; (3) the *direct inference hypothesis*, which considers the capacity to infer the function of an object from the structure of that object, that is, the capacity to use an unusual object to solve a mechanical problem; and (4) the *causal reasoning hypothesis*, emphasising the understanding of the cause-and-effect process. All these approaches to tool use stress the cognitive basis of tool use. Along these lines, tool use implies 'mental representation' as the foundation of tool-use understanding. Osiurak and colleagues (2009) go one step further, when they propose the *technical reasoning hypothesis*. They suggest distinguishing more clearly between the physical reality of the tool and the technical reality. In other words, the same technophysical object 'does not always provide the technical means suitable for an intended action' (Osiurak et al. 2009, p. 770). This perspective highlights a point of view based on the action and less on the tool.

However, these different hypotheses have so far relied upon the cognitive processes presumably involved in tool use (Vaesen 2012). These different models do not give a complete account of actual behaviour in tool use, as in most of the cases they dismiss the effectuation process that a goal-oriented action necessarily entails. This effectuation process is often taken for granted in cognitive studies,

which are more interested in the planning phase of action than in the execution of tool-use gestures.

In the last decade, there has been a growing interest among anthropologists for craft learning and expertise (Marchand 2010; Downey 2010, 2012; Portisch 2010). Under this approach, the emphasis is placed on what is presented as 'neuroanthropology'. The main claim is that time has come to join anthropology and neurosciences to better understand everyday expert knowledge and learning, including tool-use learning. Along this line, Marchand (2010) has recently stressed the importance of taking into account 'the mutual dependencies between biology, society and environment'. Indeed, this statement is precisely what the French Anthropologist Marcel Mauss in his 1934 famous conference on 'Technique du corps' recommended. There, he developed an approach based altogether on sociology, psychology and biology (Mauss 1936). Interestingly enough very few researchers have followed this advice.

Although this perspective is welcomed, there is an 'odd discrepancy' between this claim and the way it is methodologically implemented. Two main references to neurosciences fuel this perspective: Jeannerod neural simulation theory (see, e.g. Jeannerod 2001) and the mirror neurons theory from Rizzolatti et al. (1996). This is not the place to discuss these theories in details. Nevertheless, some brief insights into these theories may be necessary to clarify why I do not believe it possible to bridge the levels of analysis of neuroscience studies and anthropological studies based on 'apprentice-style fieldwork' as advocated by Marchand (2010). Apprentice-style fieldwork draws upon traditional participant observation usual in ethnology as well as joint activity, i.e. 'learning about practice by practically doing' (Marchand 2010, p. 7). Learning by oneself the craft under study is advocated an ideal way to understand learning processes and learner–teacher relationship (Marchand 2010; Downey 2010, 2012; Portisch 2010). These authors favour some sort of introspection techniques to access their own mental state, feelings, pains, success, mistakes and progress. Reflexion about their learning experience is considered an efficient gateway to the understanding of everyday-life skills acquisition. In addition, most authors emphasise the importance of 'imitation' in this learning process (see in particular Downey 2008, 2010) that they consider directly explained by the so-called mirror neurons (Rizzolatti et al. 1996) and internal simulation processes (Jeannerod 1997, 2001).

My concern here is that there is no critical assessment about the generalisation of results based on very simple and limited experimental tasks usual in experimental neurosciences to multidimensional learning situations that characterise real-life situation. In addition, since the first publications about the mirror system, it has been shown that the brain's response to seeing an action depends not only on previous visual knowledge and experience of seeing the action but also on previous motor experience (Calvo-Merino et al. 2006). These results question the status of the mirror system in the process of learning a novel motor skill. Indeed Byrne and Russon (1998), whose paper on imitation is often referred to in these recent anthropological studies, are aligned with these results. Byrne and Russon suggest that imitation is only likely to rearrange behavioural sequences that were already

mastered by the actor. Imitation is a multifaceted notion encompassing quite various situations. It is necessary to better define what this term refers to before utilising it to explain tool-use learning. I will return to this later.

In the remainder of this paper, I will show that complex motor action such as tool use entails such multifaceted skills that it is difficult to really know what 'motor representation' actually refers to (for a recent in-depth discussion on this question, see Baber et al. 2014).

5.2   Considering a Trivial Example

Before going further, let us discuss an apparently undemanding real-life situation involving simple percussive actions. When I decide to hang up a new painting in my family room, the job appears to be quite easy: hammer a nail in the wall and hang up the painting. However, examining the details of the realisation suggests a quite complex sequence in terms of behaviour. Going through the successive steps needed to reach my goal and immediately things appear less straightforward. The choice of a certain type of nail (its length and section) depends on both the size and weight of the painting and on the structure and material of the wall. Therefore, the choice of the hammer tool in turn depends on the characteristics of the nail and of the wall. If the wall is made of wood, hammering the nail will not require much effort, as the nail will be driven in easily. Yet, if the wall is made of concrete, the necessary force to drive the nail in the wall will have to be much larger. Consequently, the choice of a hammer depends more or less equally on the nail chosen, which itself depends on the size and weight characteristics of the painting and the wall material. However, if no hammer tool is available, a stone may be used as a tool, as long as its shape and hardness are appropriate.

This clear-cut example suggests that carrying out an apparently simple percussive task successfully implies several facets of a complex sequence of actions that could be summarised as follows. First, one must evaluate the material characteristics (weight, size) of the piece to be suspended so as to choose the attributes of the nails that will satisfactorily fix it on the wall. Simultaneously, assessing the properties of the wall also contributes to the choice of the nail (matter, length, section), which will in turn guide the choice of a hammer tool. However, up to now, the action as it is to be performed has been absent from the analysis, only the choice of entities necessary to carry out the task has been considered. To succeed in hammering the nail into the wall, the strike must be sharp and precise, and a certain amount of kinetic energy has to be produced. This means that the hammer strike, an outcome of the movement of the arm, must generate a certain value of velocity at impact on the head of the nail. At that point, the actor may develop different action strategies, either both large and forceful movements, or small and weaker movements, or any possible tactic in between. In one case, this will result in only a few efficient strokes; in the other, many weaker strokes will be necessary. Simultaneously, the actor must position the head of the nail and maintain it fixed so that the

driving in resulting from the strike is correct. The choice of a given strategy may depend on quite a few factors: the strength of actors, their experience with the task, and the level of tiredness, mood or even noise acceptable to the neighbours.

The question is then: what has been necessarily learnt to succeed in such an apparently easy task? As already proposed, the task is not just to drive the nail in the wall. Practically, it refers to a quite long dynamical process involving a whole set of evaluations, assessments, choices, and sensorimotor actions. However, the hammering action performed depends not only on the dexterity of the hammerer but also for the most part on the actor's actual upstream process of evaluations and choices—evaluation of the weight of the painting and the resistance of the wall, choice of the hammer and size of the nail, etc.

5.3   Goal-Directed Action and Tool Use

The limited example discussed above illustrates the strong interplay that exists between all the elements involved in carrying out a simple task such as hammering a nail. An extended view of tool-use action could be generalised and summarised as follows: Acting in everyday life presupposes the capacity to perform goal-directed actions (that may necessitate a tool), that is, the faculty to produce conclusive behavioural sequences that bring the agent nearer to the objective. A distinction is consequently called for between the intentional aspect of the action (the *goal* to be achieved) and its operational aspect (the *manner* in which the goal is achieved).

Reaching the intended goal obviously requires some knowledge of the task at hand. Nevertheless, what does this mean? How can we bridge the gap between the idea 'I want to make such and such' and the behaviour that will allow such production? What are the prerequisite to succeed, that is, what knowledge, skill and dexterity must have been acquired to succeed? To address the issue of what skills are involved in tool use and consequently of what needs to be learnt, we have seen that most studies put forward a cognitive approach stressing the functional understanding of the tool. It is my contention that a functional understanding of a tool's properties is far from sufficient to successfully perform a task involving a tool. To illustrate this point, I will give a personal experience that points to the persisting gap between having the knowledge of the functional principles of a task and of the tools involved and not being able to perform the task successfully. For years now, I have worked in collaboration with other colleagues on hard stone bead-making by Indian craftsmen (Bril et al. 2000, 2005; Nonaka et al. 2010; Roux et al. 1995). We have video-recorded hundreds of sequences of strikes as craftsmen of different levels of expertise made beads of various shapes and sizes; we have recorded the hammer movement and the craftsmen's hand and arm movements, analysed all these data and published quite a few papers on what is expertise. By now, we should have some idea of what it is to be an expert from a behavioural point of view. Yet, I remain unable to knapp a single bead, even of a poor quality! While it is fairly simple to acquire some knowledge about the necessary succession

of operations to carry out the production of a bead, we have shown that the mastery of the technique appears as the corner stone of tool-use skills (Roux et al. 1995; Bril et al. 2010; Nonaka et al. 2010). Indeed, the strategy laid out by the knapper depends to a large extend on the level of control of the elementary action (flake removals). It is the snake that bites its own tail: Failure resulting from inadequate control of the elementary action leads to a more complex continuous decision-making process (Roux et al. 1995).

In the reality of everyday tool use, cognitive approaches do not provide a sufficient account for the full spectrum of phenomena involved in carrying out an action. What has to be understood is how these actions are embodied—how the body and the sensory-motor system, partly by means of the tool, make it possible to reach the desired goal. The reason why the effectuation of the action has been neglected probably comes from the very high value set on the cognitive components of behaviour; on the information processing perspective; on the existence of some kind of 'central representation', 'internal models' or 'motor commands'; and ultimately rests on the belief that the same mechanism accounts for action comprehension and action planning (Hommel 2003). The question here is: what is an internal model, a motor command or a motor programme? A recent paper by Summers and Anson (2009) discussed this question, and the answer is 'we do not know', but everyone still use it. In their detailed discussion, they show that there is no consensus on what a programme is, what it contains and how and where it is created (Summers and Anson 2009). Consequently, should we regard these notions as metaphorical or literal concepts?

The cognitive framework grants 'representations' a causal role (see, e.g. Jeannerod 1997). In this theoretical position, the agent's activity is directly caused by some kind of planning, based on a representation that controls the production of the behavioural sequences. However, two main questions arise. Real life is characterised by the display of continuous unfolding events. Behaviour must, therefore, denote flexibility and adaptability that, along the cognitive framework, would require an overwhelming amount of information besides a huge repertoire of representations. Jeannerod (1997) considers that the main function of planning is to select from a stock of available 'motor schemas' those 'which will have to be performed, relate them to the proper internal and external cues, and organize them into an appropriate sequence' (1997, p. 127).

As a result, the puzzle is how an agent bridges the gap between representation and behaviour—a 'miracle', to use Kunde's terms (2001), though it is often taken for granted. The question is then: How can an abstract representation be translated into a concrete motor behaviour?

To overcome these difficulties, the ecological framework proposes a thoroughly different approach, which I will adopt here. This approach stresses the reciprocal role of the organism and the environment acting as a set of constraints from which behaviour emerges. The action appears as the result of the functional coupling between the organism and the environment. I consider that this holistic 'action system approach' (Reed 1988) is more appropriate to the study of everyday-life skills.

5.4 The Ecological Framework

Originating in the association of Bernstein's (1967) view of motor control, which leaves 'as little as possible residing in the homunculus', and Gibson's (1977) perception/action overtures, the ecological framework offers new foundations from which to apprehend action. The main trait of the ecological perspective is to consider the organism (human or animal) as part of a larger system. The actor is considered to be *participating* in the world, not controlling it. More specifically, it is the two-way relationship between the organism and the environment that is central to the analysis. The environment is described not in physical but in 'ecological terms' (Gibson 1977), and behaviour is viewed as a solution a person engaged in a goal-oriented action has been able to perform owing to the environmental constraints. Behaviour is then considered as an emergent phenomenon. Stable action modes emerge from the dynamics of the organism–environment system, which is, in turn, guided by the information produced by the ongoing action. Gibson (1979/ 1986) expressed it in what has become a notorious maxim: 'We must perceive in order to move, but we must move in order to perceive' (Gibson 1986, 223). Shaw and Wagman (2001) a few years ago rephrased this idea that perception and action are mutually interacting through an information field in the following way:

> Any adequate theory for perception and action linkage should satisfy an intentionality condition—that perceiving refers to acting, and acting refers back to perceiving. Similarly, ecological psychologists generally agree that a circular causality holds between perceiving and acting, where agents perceive how to act to reach a goal and then the acting updates the next goal-specific perceiving, which then updates the next goal-relevant acting, and so on until the goal is reached or the effort aborted. Goal-directed activities conform to a perceiving-acting 'cycle' wherein information and control reciprocate under mutually shared intentions (Shaw and Wagman 2001, p. 905).

Three concepts—(1) degrees of freedom, (2) affordances and (3) constraints to action—are essential for understanding the ecological framework and more specifically for understanding why this approach may be fruitful when discussing issues relating to learning complex actions and more precisely to tool-use learning.

Degrees of freedom: The degrees of freedom of a system refer to the number of independent dimensions to be controlled. The question of the degrees of freedom in movement has been developed by Bernstein (1967; Turvey et al. 1982) to a large extent. Usually, it is considered that the greater the number of degrees of freedom of a system, the more difficult the control. Depending on the level of analysis, the number of degrees of freedom varies greatly. As far as joints are concerned, the upper limbs, for example, are generally considered to have seven degrees of freedom, the whole body about 10^2, but at the level of muscles, the number of degrees of freedom is as high as 10^3 and 10^{14}, if the level of neurons is to be considered. Bernstein viewed the degrees-of-freedom question as central to the understanding of movement coordination and skill. Due to the large number of degrees of freedom in the human body, there is an infinite number of ways to solve any 'everyday-life motor problem'. As a result, it is this great number of

possibilities of action that guarantees the flexibility needed to adapt action to local circumstances (Latash 2000; Latash et al. 2007; Newell 1996; Jordan and Rosenbaum 1989). Depending on the level of analysis, the main question is then: how are these degrees of freedom controlled? How is a system, with an infinite number of possibilities that would be impossible to control, reduced to a controllable system? For Bernstein, learning a (motor) skill consists in progressively mastering the redundant degrees of freedom of the system and 'exploiting' these degrees of freedom of the organism–tool system (Biryukova and Bril 2008; Vereijken et al. 1992).

Affordances: The organism–environment mutuality has been expressed by Gibson (1977, 1979/1986) through the concept of affordance, an original word coined by Gibson himself. An affordance is a relation between an organism—human or animal—and its environment that has consequences for behaviour. However, the properties of the environment constitute affordances only when taken in reference to the action capabilities of the organism. Recent views about affordances insist on the functional utility of the environment (Flash and Smith 2000). In other words, what is perceived of the environment is its potential for action, as well as the potential consequence of action. In return, the intention to perform a specific action constrains information detection. This means that the affordances of the environment may be different from one organism to another and for the same organism from one period to another. Affordances, however, need to be perceived, and, therefore, learning to perceive the information from the environment constitutes a necessary stage in the acquisition process.

More generally, one could put forward the hypothesis that in preparing to carry out an action, the actors' perception of the possibility to act depends on the match between their perception of the environment and abilities, previous experience and level of competence in the domain. An affordance could thus be said to be the objective relations between the properties of the actor (effectivities) and those of the environment with respect to the achievement of a given action.

Constraints on action: We may consider that three sources of constraints combine to provide the boundary conditions to carry out an action: the organism, the task and the environment (Newell 1986, 1996). The organism embraces all the dimensions of people: their physiological, biomechanical, neurological as well as cognitive and affective facets. The task properties refer to its functional properties, that is, to what the organism must produce to successfully reach the goal. Going back to the example of hammering a nail, we consider that the production of a certain amount of kinetic energy produced by the hammer strike is the source of the movement of the nail into the wall. Consequently, to reach the goal, the actor has to find a way to produce the right amount of kinetic energy. Here, the need for a tool appears only if the resources from the body are not sufficient. It is true that using a hammer tool makes the chances of success much larger. The last component, the environment, comprises universal constraints experienced by all living organisms, such as gravity or temperature, and more specific and local constraints such as tools.

Consequently, the capacity to act is shaped by the opportunities offered by the organism relative to a particular task in a particular environment (Smitsman and

Bongers 2001). Tools, which are part of the environmental resources, will be called upon in cases where the resources of the body are not sufficient to achieve the goal. Thus, the tool extends the action capacity of the actor, making it possible to reach the goal, the tool being then an additional resource that expands the capacity of action (Baber 2003, 2006).

In sum, the mastering of a technical skill depends on the capacity of an organism to set up the constraints of the system according to the demands of the task and to mobilise the degrees of freedom of the system adaptively. At a behavioural level, the unfolding of the action may be viewed as an emergent process, at the interface of information available to the organism (affordances) and the set of constraints associated with the task.

To understand what has to be learnt to be able to perform an action, it is then necessary not only to disentangle the different facets of the behaviour but also to understand how these various components work together and what makes a skilled action. Following Bernstein (1996) and Ericsson and Lehmann (1996), a skilled action combines precision, flexibility, adaptation, smoothness, regularity, optimisation and swiftness. In other words, a skilled person is able to carry out an action in any situation and under all conditions. Consequently, the level of 'expertise' refers to the degree attained by each of the level of achievement in the qualities of action listed here.

Also, how can we characterise the abilities of a highly skilled person compared to a poorly skilled person? What specific capacity or aptitude or ability does the skilled person possess that the less skilled does not have? Does the skilled person have a better 'mental representation' of the action of the goal to be reached? Or does the skilled person have an extensive capacity to detect the appropriate information resulting from the ongoing course of action coupled with the ability to incorporate these into his action? In the remainder of this chapter, I suggest that a *functional perspective* (Bril et al. 2009, 2010, 2012; Bril and Goasdoué 2009) on action allows for a better understanding of what has to be learnt to be able to skilfully perform an action necessitating the use of a tool.

At this point, the question of how to describe the complex sequences of actions becomes of practical relevance. The issue to be addressed is how to split the temporal sequence of the agent(s) behaviour.

5.5 Describing Complex Sequences of Actions

To address the dynamics of any technical process, the concept of *chaîne opératoire* coined by the French paleoanthropologist A. Leroi-Gourhan may be helpful to disentangle the complex sequence of behaviours involved in any everyday goal-directed action, be it domestic, technological or craft work. The concept of *chaîne opératoire* originated in Leroi-Gourhan work on material culture (Leroi-Gourhan 1964) and is considered by some authors as 'a good way to bring the tool into action' (Tosdevin 2011, p. 354). It has been applied to a broad spectrum of craft

contexts past and present and is widely used in archaeological work. It aims at describing the operational sequences of actions that characterise any technical work. In this respect, it provides the proper framework for a systematic description of the process of the production of an artefact: 'The chaîne opératoire appears as a succession of phases within which materials, humans –or other sources of energy—, gestures, tools and knowledge can be studied together' (Martinón-Torres 2002, p. 33). The methodological advantage of the *chaîne opératoire* is that of permitting an initial description of the succession of stages involved in a technical process. It commonly describes the whole process between the raw material (the initial stage of the process) and the final product, mentioning both the agents and the materials— including tools—as well as the social context in which the manufacturing process takes place.

However, to really understand what has to be learnt to succeed in any technical work, and in particular when making use of a tool, it is crucial to specify the level of analysis of the agent behaviour. Here, I found extremely relevant the distinction made by the French archaeologist J. Tixier (Inizan et al. 1999; Pelegrin 2005), between 'technique' and 'method' within the knapping process when making a lithic object. Inizan et al. define the method as referring to 'any carefully thought out sequence of interrelated actions, each of which is carried out according to one or more techniques' (Inizan et al. 1999, p. 30). In the framework of the production of lithic artefact, the technique refers to the physical mode of execution of flake detachment (Pelegrin 2005). This distinction appears fundamental to understand tool-use expertise outside of archaeology. Yet to my knowledge, it has not been commonly used in other disciplinary contexts such as ergonomics, psychology or even anthropology. See Box 5.1 in the Appendix for an example of the relationship between *chaîne opératoire*, technique and method.

What we are interested in here is how an agent performs a task that brings into action specific *techniques* and *methods* within a *chaîne opératoire*. We consider that the actual behaviour of an agent performing a task at the level of *one phase* of the *chaîne opératoire* is the 'actualisation' of techniques and methods. The characteristics of real behaviour will depend on the agent skill level and on the features of the environment. We will return to this question later. We have seen that when engaged in a task, it is necessary to differentiate the goal, referring to the intentional aspect of the action 'what to do', and the means, that is, the operational aspect of it, in other words 'how to do it'. Once the goal is set, the means correspond to the succession of actions the actor will perform to reach the goal. To describe the unfolding of the agent behaviour, we will refer to the three different levels of action put forward by Richard (1990).

1. The first level concerns the overall organisation of the task, that is, the way the method(s) is (are) actualised in a succession of subgoals in order to complete the task (see Box 5.2 in the Appendix). Reported to the *chaîne opératoire*, it refers to one phase of the whole process, and usually the actor(s) concerned participates to the entire phase. The unfolding of actions is referred to as the *course of*

actions.[1] In other words, the course of actions corresponds to actual behaviour of an agent who carries out the different operations to solve the task within one phase of the *chaîne opératoire*. To some extent, the chaining of subgoals is constrained by the task, but may nevertheless offer interindividual and intra-individual variations (see, e.g. Roux et al. 1995).

2. The intermediate level expresses the way elementary actions (third level) are chained to form a subgoal. These elementary actions are often (but not necessarily) the same, i.e. hammer strike.

3. The last level, the elementary action, is defined as the minimal action that brings the actor nearer the goal but that cannot be functionally split into parts. Analytically, the elementary action may be divided into parts, but functionally it cannot. In hammering, for example, the elementary action consists in a strike of the hammer. Yet, the movement of the hammer may be split into at least two phases, moving up and down. This level corresponds to the actualisation of the technique, that is, the operational implementation of the technique that is the way an agent performs a movement that allows the action to come into existence. In art and crafts, the use of a tool corresponds to this level of action.

The interesting point here is the following: When planning of action is alluded to, to which level does it refer: the planning of a succession of subgoals, the planning of the succession of elementary actions necessary to carry out a subgoal or the planning of the elementary action? To answer this question, we need to clearly differentiate the levels referred to. The different action planning theories usually refer to a level of action without clearly mentioning the level of action studied. They hardly refer to all three levels simultaneously. Yet, if one wants to understand what a skilled behaviour refers to, what expertise means, a theory linking together the three levels of action as defined here must be elaborated.

In a previous section, we have discussed theoretical approaches to tool use that emphasises the existence of some kind of 'central representation', 'internal models' or 'motor commands'. To what level of action do these 'representations' refer to? The theoretical approach I defend in this chapter stressed the reciprocal role of the organism, the environment and the task acting as a set of constraints from which behaviour emerges. Any changes in one or more of these three systems may produce a different outcome. This difference is particularly explicit in the case of tool use. In the case of hammering, the weight of the hammer, the shape of the hammerhead and the length of the handle are components of the tool that will affect the performance of the actor.

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[1] This notion of 'course of action' must not be confused with the theoretical and methodological framework of 'course-of-action analysis' and 'course-of-action centred design' of Theureau (2002) that integrate different levels of analysis from philosophy, psychology, ergonomics and computer science.

5.6 A Functional Approach to the 'Elementary Action' and More Specifically to the Use of Tools

The functional paradigm implies that we focus on how the action is processed, more precisely on how the functional characteristics of the task are generated through a sequence of interconnected movements in relation to the goal of the task (Biryukova and Bril 2008; Bril et al. 2005). Previous experimental field research[2] emphasised the critical role of the elementary action. The underlying hypothesis was that highly skilled person, whatever the domain, would be better able to transfer their skill to a new situation. When comparing Indian craftsmen of different skill levels making cornelian beads (see Roux et al. 1995; Bril et al. 2000, 2005), the analysis of the course of actions they carry out to knap beads of different shapes revealed that all of them had a fairly good knowledge of the method. What thoroughly differentiated the levels of skill was the capacity of the craftsworkers to precisely adapt to the properties of the task. The adaptation referred here bears on the hardness of the stone, on the dimension of the flakes to be removed and on the characteristics of the tools. In other words, adaptation pertains to the level of the elementary action, i.e. to the technique. We may then hypothesise that the course of action expressing the continuous dynamics between the organism, the tool and the environment reflects the effect of the succession of every one elementary action. Broadly, similar inferences can be drawn for the linking of the elementary actions at level two. The quality of the result of an elementary action will determine its relation with the next. It is then easy to understand that this dynamics of chaining elementary actions and their consequences on the productive process is heavily dependent on the level of mastery of the elementary action that is on the mastery of the technique. This leads to the hypothesis that fine-tuning of the elementary action determines the ability to 'plan' the whole sequence of operations or subgoals necessary to reach the goal. It is not difficult to see that a very good knowledge of the method but no experience in the elementary action will not help achieve anything at all.

Up to now, we have hardly referred to 'gestures' or movements even though when an actor uses a tool, the elementary action results from the arm/hand movement. Indeed, it is not the movements per se which are the focus of the investigation, but rather how the functional actions are rooted in the postures and movements considered as the necessary support of the action (Reed 1988; Bril et al. 2010).

In other words, we consider the behaviour of the actor on the basis of the functional demands that have to be satisfied to succeed in solving the task at the

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[2] A field experiment is based on the following characteristics: First, the participants must be in a situation as close as possible to their everyday activity. Second, the data obtained should allow for analysis of parameters usually studied in laboratory experimental situation.

Task constraints
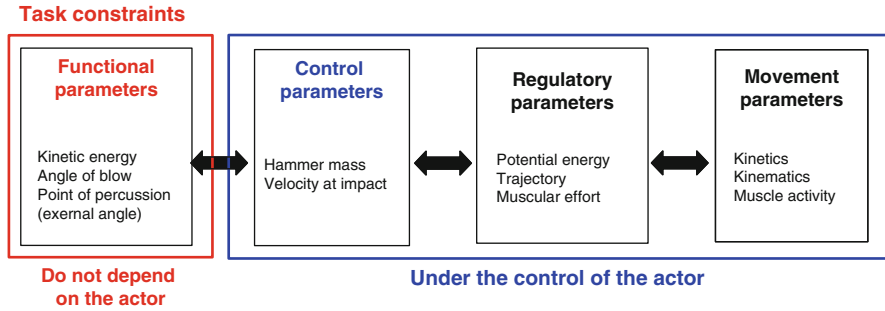
Fig. 5.1 The three-layer system of analysis proposed for percussive actions (stone knapping and nut cracking) (Adapted from Bril et al. 2010, 2012)

level of the elementary action, whoever the actor involved is, be it a person or a robot. That is, we differentiate several layers of parameters, first those constituted by the task constraints and then those under the control of the organism that perform the task, in other words, the control parameters, the regulatory parameters and the movement parameters (see Fig. 5.1) (Bril et al. 2012)

The layer of *functional parameters* specifies the topology of the task, through relevant parameters including both geometrical and dynamical aspects: in the case of percussive actions, they include kinetic energy, point of percussion and the angle of blow. These are *independent of the actor* and apply whether the actor is a human or a non-human or a robot.

To satisfy task constraints, the actor must generate specific values of functional parameters. The actor may do this by using any one of a variety of mutually dependent control parameters, here velocity at impact and hammer mass. These parameters are typically *under the control of the actor*. The actor chose the hammer, i.e. its mass. This choice is personal and depends on many factors specific to each person (his/her experience, hand size, muscular force, etc.). However, as the functional constraint is the kinetic energy at contact, the mass of the hammer chosen will determine the velocity to be produced through the actor movement.

Finally, given a specific hammer, velocity can be regulated through various *strategies that depend on the actor*. As we have seen in the example of hammering a nail, the movement may be either wide, which generates great potential energy and low muscular energy, or the opposite, of small amplitude and requiring high additional muscular energy. *Regulatory parameters* can, therefore, vary between actors depending on the differences in their bodily movements or preferred way to move. Lastly, adapted movements of the arms and hand (and of the whole body) appear as the means to produce regulatory parameters and are indeed the ones that can be recorded. The regulatory and control parameters will be computed from the movement recordings.

When performing an action with a tool, the actor must generate the right values of the control parameters in order to satisfy the functional parameters to succeed in the particular task at hand. In turn, the control parameters are regulated according to individual strategies by means of adapted bodily movements that can vary from one individual to another (Biryukova and Bril 2008; Bril et al. 2010; Parry et al. 2014).

Along this line, it is not the bodily movements as such that are the focus of learning, but how they are produced to achieve the goal of the task. What has to be learnt is how to satisfy the task constraints. In a recent set of experimental studies, we have shown that successful performance was not necessarily correlated with any specific movement pattern of the arm holding the tool (Biryukova and Bril 2008; Parry et al. 2014; Rein et al. 2013).

5.7 Learning or the Necessary Discovery and Mastering of the Functional Characteristics of the Action

We have seen in the introductory section that imitation is repeatedly reported as being central to learning motor skills. If, as we argue here, the movement performed when using a tool is idiosyncratic, it is not the movement that is imitated. This call into question what is referred to when considering imitative behaviour? In other words, what new behaviour is acquired by seeing another actor do it? A particularly insightful discussion may be found in Byrne and Russon's paper 'Learning by imitation' (1998). These authors scrutinise different animal behaviours, commonly viewed as imitation and that stricto sensu are not. The interesting point here is that referring to different levels of behaviour, they show that what is imitated is not at the level of the elementary action itself, but at the level of the elaboration of sequences of coordinated action (p. 674).

These authors discuss situations where the behaviours of an individual acting side by side with a more expert are improperly considered as imitation and that are not. They consider three main categories of situation that may affect the behaviour of the less expert actor: (1) stimulus enhancement, (2) emulation and (3) response facilitation (1998, pp. 669–670). For our purpose, it may be interesting to have a quick look at some of these situations. In the stimulus enhancement situation, the object manipulated by the expert increases the chance of noticing the object, increasing therefore the interest of the observer for that object or place and consequently the probability of manipulating it. Emulation refers to a change of salience of a goal but not on the specific way to reach the goal. In both stimulus enhancement and emulation, the attention of the observer is directed toward a target or a goal. Response facilitation refers to situation when an action may be primed by the observation of an object, or another individual behaviour. In all these cases, the

behaviour is elicited by the observation of another individual behaviour, but is not a 'copy' of that behaviour.

These considerations are akin to N. Bernstein's (1996) recommendation to learners 'to concentrate one's whole attention and will on the quality of the movement outcome, not only at the beginning of training a skill, but also during the later phases, when the skill is 'perfect' (how will it ever be possible to say that perfection has been reached?). One must concentrate on the *whats* of the movement, the *hows* will come later by themselves' (Bernstein 1996, pp. 233–234).

This question of what has to be learnt has been discussed in the previous sections. Hence, before looking at how a skill is learnt, it is necessary to look at what has to be learnt. Following Bernstein, we argue here that what is learnt is not the movement but the capacity to satisfy the functional parameters of the task. As discussed above, imitation viewed as the reproduction of the expert movement is not the key answer to this question. Referring to Bernstein tradition (Vereijken et al. 1992), the clue assignment for the learner is to discover and master the functional constraints of the task by means of any sensorimotor strategies.

Experimental studies on instruction for complex motor task (such as ski simulator or juggling) showed the differential effects of internal versus external focus of attention. Whatever the learning task, doing slalom-ski movement on a ski simulator (Wulf et al. 1998) or juggling with two balls (Zengraf and Munzert 2009), body attention focus (internal) was shown to be detrimental compared to environmental attention focus (ski apparatus movement or ball movement). In both studies, the results of the control group of learners having no instruction were similar to the group having internal focus instruction. These studies prove Bernstein's (1996) advise reasonable when he says to focus on the *whats* of the action, not on the movement.

When facing a goal-directed action, actors must evaluate the current state of the body and the tools needed to succeed in producing the adequate (requested) values of the functional parameters. Once the goal of the action is established, the huge number of degrees of freedom that defines the sensorimotor system allows for many alternatives on how to achieve the goal. This is especially true for labour movements that often involve tool use (Biryukova and Bril 2008). The resources to be allocated to the task are revealed through sensory exploration, visual as well as haptic. The actor must learn the optimal location for the information needed to perform the task (Gibson 1966). In other words, the actor must learn where to look in the context of the task (Hayhoe and Ballard 2005; Nonaka et al. 2010), that is, to develop the capacity to detect the constraints and opportunities for achieving the task.

According to the perspective proposed in this paper, success in performing an action depends on a person's ability to set up the materials to perform the task. These materials bring with them added constraints, which must be negotiated to fulfil the functional demands of the task. The behaviour of learners is interpreted as expressing the way they have produced the mechanical functionality of the task.

Fig. 5.2 Representation of
the learning process:
exploring the action space
and discovering the
properties of the task space

Exploratory activity

Task space

Action space

Objective of learning:
master the task space
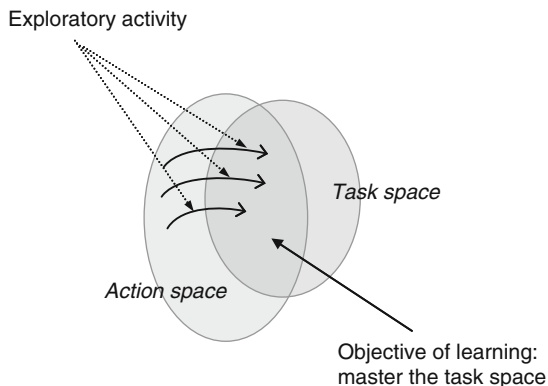
The learning process is then considered as a process of discovering and gradually
mastering the functional properties of the task that necessitates detecting the
information specifying the situation in a specific context and developing enhanced
process of detection (Reed 1993).

The learning process is, therefore, defined as a process of discovering and
exploiting the functional properties of the task, as repetition is often considered
the guarantee that the motor pattern of the action will be imprinted and conse-
quently easily accessible in the future. Following Bernstein (1996) during learning,
one repeats 'not the means for solving a given motor problem, but the process of its
solution, changing and improving the means'. The learner learns 'how to find a
solution to a motor problem, in other words how to act'. This activity 'repeating
without repetition' leads to an exploratory behaviour or to a search strategy among
the vast amount of possible solutions.

This exploration process allows the learner to understand in time the laws that
govern the different types of constraints. Figure 5.2 illustrates this process. The
action space of learners must gradually bring them into the task space, that is to say
in the space where the task constraints will be fulfilled. The goal of this exploratory
activity is 'the detection of and use of available information about affordances'
(Reed 1993). The different periods encountered in the learning process may corre-
spond to different regions of stability (Newell 1989). To each region of stability in
turn corresponds a particular pattern of action, that is to say, different strategies,
some being more efficient than others.

The exploratory activity is mainly based on what Gibson calls the education of
the perceptual system (1966). The novice must learn to perceive. This learning
process involves different types of explorations, such as learning of concurrent
covariation in the external environment, isolating external invariants, perceiving

properties of objects to detect their affordances or developing selective attention (1966, pp. 281–283).

Going back to the example of percussive actions, we have shown that in a stone knapping task, only experts were able to produce the exact amount of kinetic energy, while less experienced knappers, even when they succeeded, were producing far too much kinetic energy. It takes years of practice to find the threshold values of kinetic energy that are adequate to produce the right flake (Nonaka et al. 2010), that is, to have a good control of the control parameters.

5.8 How Does Context Participate in the Exploration Process?

The capacity to find a dynamically sustainable solution is rarely an individual and solitary affair. Everywhere, learning happens with the assistance of other people (Reed and Bril 1996; Rogoff and Gauvain 1984; Rogoff 1990; Vygotsky 1962; Wozniak and Fischer 1993; and many others). Learning is mediated either directly or indirectly by the active role of people and of the arrangement of the environment in what we call the 'field of promoted actions' (Reed 1993; Reed and Bril 1996). The field of promoted actions selectively exposes learners to a subset of opportunities for experience that will change throughout the learning process. It organises the materials as well as the human surrounding of learners. The field of promoted actions is the actual environment of learners where will take place the different learning conditions discussed in the previous sections. To take up the ideas of Gibson (1966, 1979), one of the key roles of the field of promoted action is to promote the 'education of attention' to the necessary information in the exploration process.[3] This means that it must set up situations in which the learner is afforded the possibility of diverse experiences. How education of attention is implemented through the field of promoted action depends mainly on the individual history of exposure to the environment.

A number of chapters in this book discuss the organisation of the various contexts of learning and different modes of interaction that *support* learning. The learning environment must provide learners with opportunities of experience that will make it possible for them to probe the task space in the course of an exploratory activity.

The human environment of learners has been extensively studied, but the material surrounding of the learner is not often explicitly described. Taking the

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[3] In anthropology, Tim Ingold has widely promoted Gibson's ideas about the necessary 'education of attention' in the learning process of cultural skills (Ingold 2000, 2001).

example of jewellers, (Baber et al. 2014) points out how the layout of the workspace of an expert creates an environment that may provide affordances for future actions. The manner the expert jeweller works creates a specific arrangement of the tools in the workspace. This arrangement expresses how they work in terms of affordances as the tools are placed to support particular sequences of (elementary) actions and tool grasps. This layout of the tools surely must support the attention of a learner working alone.

While there are many ways to encourage learning, learning is mediated by the active role of tutors—be they teachers or peers—and more specifically by the scaffolding activity of the tutor. We rely on Granott's (1993) definition which defines the attributes of such an interaction very well:

> Scaffolding corresponds to a **guiding collaborative** interaction between partners with **asymmetric** knowledge and expertise. The guiding partner assists the other's construction of knowledge. In a supportive and approving manner, the guide **subtly directs** the other's observation and activity step by step, while **accommodating** to the other's wishes and ability. (Granott 1993, p. 193)

This 'guided participation' (Rogoff and Gauvain 1984; Rogoff 1990) underlines the mechanism of learner–tutor interaction while a learner tries to solve a task he does not master yet under the supervision of a tutor. The level of support from the tutor and its characteristics must be adapted to the level of mastering/command of the task. The tutor must support and guide the learner in such a way that the learner not only succeeds in solving the task but learns how to solve it. The scaffolding process must facilitate learning by regulating the difficulties encountered by the learner, bringing support through verbal as well as physical intervention. In other words, considering that learning a skill necessitates discovering and mastering the functional properties of the task, the tutor must, through verbal and physical means, orient the learner's attention to the properties of the task.

5.9 Conclusion

Most of the current research on tool use assesses its cognitive bases, little focuses on tool-use behaviour in everyday life. Here, we have presented a perspective based on a functional approach to action, arguing the necessity to refocus analysis not on the tool but on the action that requires a tool. We consider that what has to be learnt is the capacity to solve a functional problem. The action must fulfil the task constraints. This implies the capacity not only to identify these constraints but also to construct action strategies allowing for the production of the right values of the control parameters that will satisfy the constraints of the task. It will appear as a truism to emphasise the fact that experts are better able to adapt their action, which

is to utilise information. High-level experts will be able to constrain mutuality relations between himself and his environment in such a way as to perceive the affordances that is the current properties of the tool/organism system. In other words, experts have a better knowledge of what to look for and how to turn the information perceived into action and movement. Put another way, it is the task constraints that drive the actor toward the goal. What learners must acquire is the capacity to perceive these constraints and in parallel to act within these constraints.

Appendix

Box 5.1. Description of the *chaîne opératoire* for the production of cornelian beads as they are manufactured in Khambhat, Gujarat (India). This chart presents the different stages of a bead manufacture, going from raw material to finished product. For each stage of the manufacturing of the bead, the graph gives vertically the succession subgoals described according to three levels (course of actions, aggregation of elementary actions and elementary action). The details of the knapping stage are given in Box 5.2. The illustration has been adapted with permission from Gerard Monthel drawings in Roux (2000, p 39).

Box 5.2. Description of the relationship between technique and method. The method is the way the technique(s) is (are) actualised within a stage of the *chaîne opératoire*. The chart describes the technique in use in Khambhat to knap cornelian beads (indirect percussion by counter blow). This technique is then actualised to make beads of different shapes. Manufacturing a bead necessitates to go through a succession of subgoals that each requires to produce flakes of different profiles. The right panel gives the two steps necessary to knap an ellipsoidal bead. The right panels illustrate the method to make such a bead, giving the succession of subgoals from rough out to perform. Each arrow represents a strike taking off a flake, hence referring to the actualisation of the technique. What is important to notice here is that the same technique is actualised to produce various flakes (large, small, thin), which is the condition to make a large range of shapes. The illustrations are an adaptation with permission from Gerard Monthel drawings in Bril et al. (2000, p. 224) and Roux (2000, p. 58).

References

Baber, C. (2003). *Cognition and tool-use. Forms of engagement in human and animal use of tools.* London: Tailor & Francis.
Baber, C. (2006). Cognitive aspects of tool-use. *Applied Ergonomics, 37*(1), 3–15.

Baber, C., Parekh, M., & Cengiz, T. G. (2014). Tool-use as distributed cognition: How tools help, hinder and define manual skill. *Frontiers in Psychology, 5*(116), 1–14.

Bernstein, N. A. (1967). *The coordination and regulation of movements*. London: Pergamon Press.

Bernstein, N. A. (1996). On dexterity and its development. In M. L. Latash & M. T. Turvey (Eds.), *Dexterity and its development* (pp. 1–235). Hillsdale: Lawrence Erlbaum Associates.

Biryukova, L., & Bril, B. (2008). Organization of goal directed action at a high-level of motor skill: The case of stone knapping in India. *Motor Control, 12*, 181–209.

Bril, B., & Goasdoué, R. (2009). Du mouvement sans sens au sens sans mouvement. Rôle des finalités et des contextes dans l'étude des comportements moteurs. *Intellectica, 51*(1), 273–293.

Bril, B., Roux, V., & Dietrich, G. (2000). Habiletés impliquées dans la taille des perles en roches dure : caractéristiques motrices et cognitives d'une action située complexe. In V. Roux (Ed.), *Les perles de Cambay – Des pratiques techniques aux technosystèmes de l'Orient ancien* (pp. 211–329). Paris: Éditions de la Maison des sciences de l'homme.

Bril, B., Roux, V., & Dietrich, G. (2005). Stone knapping: Khambhat (India), a unique opportunity? In V. Roux & B. Bril (Eds.), *Stone knapping: The necessary conditions for a uniquely hominid behavior*. Cambridge: McDonald Press.

Bril, B., Dietrich, G., Foucart, J., & Hirata, S. (2009). Tool-use as a way to assess cognition: How do captive chimpanzees handle the weight of the hammer when cracking a nut? *Animal Cognition, 12*, 217–235.

Bril, B., Rein, R., Nonaka, T., Weban-Smith, F., & Dietrich, G. (2010). The role of experience in stone knapping: Expert-novice differences in functional tuning of action constraints. *Journal of Experimental Psychology. Human Perception and Performance, 36*, 825–839.

Bril, B., Smaers, J., Steele, J., Rein, R., Nonaka, T., Dietrich, G., Biryukova, E., Hirata, S., & Roux, V. (2012). Functional mastery of percussive technology in nut cracking and stone flaking: Experimental data and implication for the human brain. *Philosophical Transaction of the Royal Society: Biology, 367*(1585), 59–74.

Byrne, R. W., & Russon, A. E. (1998). Learning by imitation: A hierarchical approach. *Behavioral and Brain Sciences, 21*, 667–721.

Calvo-Merino, B., Grezes, J., Glaser, D. E., Passingham, R. E., & Haggard, P. (2006). Seeing or doing? Influence of visual and motor familiarity in action observation. *Current Biology, 16*(19), 1905–1910.

Connolly, K., & Dalgleish, M. (1989). The emergence of a tool-using skill in infancy. *Developmental Psychology, 25*, 894–912.

Downey, G. (2008). Scaffolding imitation in Capoeira: Physical education and enculturation in an Afro-Brazilian Art. *American Anthropologist, 110*(2), 204–213.

Downey, G. (2010). 'Practice without theory': A neuroanthropological perspective on embodied learning. *Journal of the Royal Anthropological Institute, 16*, 22–40.

Downey, G. (2012). Cultural variation in rugby skills: A preliminary neuroanthropological report. *Annals of Anthropological Practice, 36*(1), 26–44.

Ericsson, K. A., & Lehmann, A. C. (1996). Expert and exceptional performance : Evidence of maximal adaptation to task constraints. *Annual Review of Psychology, 47*, 273–305.

Flash, J. M., & Smith, R. H. (2000). Right strategy, wrong tactic. *Ecological Psychology, 12*(1), 43–52.

Fransson, C., & Winkel, J. (1991). Hand strength: The influence of grip span and grip type. *Ergonomics, 34*(7), 881–892.

Gibson, J. J. (1966). *The senses considered as perceptual systems*. Boston: Houghton-Mifflin.

Gibson, J. J. (1977). The theory of affordance. In R. E. Shaw & J. Bransford (Eds.), *Perceiving, acting, and knowing. Toward an ecological psychology* (pp. 67–82). Hillsdale: Lawrence Erlbaum Associates.

Gibson, J. J. (1979/1986). *The ecological approach to visual perception*. Hillsdale: Lawrence Erlbaum Associates.

Goldenberg, G. (2003). Apraxia and beyond: Life and work of Hugo Liepmann. *Cortex, 39*(3), 509–524.

Goldenberg, G., & Hagmann, S. (1998). Tool-use and mechanical problem solving in apraxia. *Neuropsychologia, 36*(7), 581–589.

Goldenberg, G., & Spatt, J. (2009). The neural basis of tool-use. *Brain, 132*(6), 1645–1655.

Goodall, J. (1986). *The Chimpanzees of Gombe*. Cambridge: Harvard University Press.

Granott, N. (1993). Patterns of interaction in the co-construction of knowledge: Separate mind joint effort, and weird creatures. In R. H. Wozniak & K. W. Fisher (Eds.), *Development in context: Acting and thinking in specific environments* (pp. 183–207). Hillsdale: Erlbaum.

Hayhoe, M., & Ballard, D. (2005). Eye movements in natural behavior. *Trends in Cognitive Science, 9*(4), 188–194.

Hernik, M., & Csibra, G. (2009). Functional understanding facilitates learning about tools in human children. *Current Opinion in Neurobiology, 19*(1), 34–38.

Hommel, B. (2003). Planning and representing intentional action. *Scientific World Journal, 3*, 593–608.

Hunt, G. R., Rutledge, R. B., & Gray, R. D. (2006). The right tool for the job: What strategies do wild New Caledonian crows use? *Animal Cognition, 9*(4), 307–316.

Ingold, T. (2000). *The perception of the environment: Essays in livelihood, dwelling, skill*. New York: Routledge.

Ingold, T. (2001). From the transmission of representation to the education of attention. In H. Whitehouse (Ed.), *The debated mind: Evolutionary psychology versus ethnography* (pp. 113–153). Oxford: Berg.

Inizan, M. L., Reduron-Ballinger, M., Roche, H., & Tixier, J. (1999). Technology and terminology of knapped Stone. Nanterre: CREP.

Jeannerod, M. (1997). *The cognitive neuroscience of action*. Cambridge: Blackwell Publishers.

Jeannerod, M. (2001). Neural simulation of action: A unifying mechanism for motor cognition. *NeuroImage, 14*(1), 103–109.

Johnson-Frey, S. H. (2004). The neural bases of complex tool-use in humans. *TRENDS in Cognitive Sciences, 8*(2), 71–78.

Jordan, M. I., & Rosenbaum, D. A. (1989). Action. In M. I. Posner (Ed.), *Foundations of cognitive science* (pp. 728–767). Cambridge: A Bradford Book.

Kuijt-Evers, L. F., Twisk, J., Groenesteijn, L., de Looze, M. P., & Vink, P. (2005). Identifying predictors of comfort and discomfort in using hand tools. *Ergonomics, 48*(6), 692–702.

Kunde, W. (2001). Exploring the hyphen in ideo-motor action. Commentary of Hommel et al.: Theory of event coding. *Behavioral and Brain Sciences, 24*, 891–892.

Latash, M. (2000). There is no motor redundancy in human movements. There is motor abundance. *Motor Control, 4*(3), 259–260.

Latash, M. L., Scholz, J. P., & Schöner, G. (2007). Toward a new theory of motor synergies. *Motor Control, 11*, 276–308.

Leroi-Gourhan, A. (1964). *Le geste et la parole. Technique et langage*. Paris: Editions Albin Michel.

Leroi-Gourhan, A. (1965). *Le geste et la parole. Mémoire et rythmes*. Paris: Albin Michel.

Lockman, J. J. (2000). A perception-action perspective on tool-use development. *Child Development, 71*(1), 137–144.

Marchand, T. H. J. (2010). Making knowledge: Explorations of the indissoluble relation between minds, bodies, and environment. *Journal of the Royal Anthropological Institute, 16*, 1–21.

Martinón-Torres, M. (2002). Chaîne opératoire: The concept and its applications within the study of technology. *Gallaecia, 21*, 29–43.

Mauss, M. (1936). Notion de technique du corps. *Journal de Psychologie, 3–4*, 365–386.

McCarty, M. E., Clifton, R. K., & Collard, R. R. (1999). Problem solving in infancy: The emergence of action plan. *Developmental Psychology, 35*(4), 1091–1101.

McCormack, T., Hoerl, C., & Butterfill, S. (2011). *Tool-use and causal cognition*. Oxford: Oxford University Press.

McGorry, R. W., & Lin, J. H. (2007). Power grip strength as a function of tool handle orientation and location. *Ergonomics, 50*(9), 1392–1403.

Newell, K. M. (1986). Constraints on the development of coordination. In M. G. Wade & H. T. A. Whiting (Eds.), *Motor development in children: Aspects of coordination and control* (pp. 341–360). Dordrecht: Martinus Nijhoff.

Newell, K. M. (1989). On task and theory specificity. *Journal of Motor Behavior, 21*(1), 92–96.

Newell, K. M. (1996). Change in movement and skill; learning, retention, and transfer. In M. L. Latash & M. T. Turvey (Eds.), *Dexterity and its development*. Marwah: Lawrence Erlbaum Associates.

Nonaka, T., Bril, B., & Rein, R. (2010). How do stone knappers predict and control the outcome of flaking? Implication for understanding early stone tool technology. *Journal of Human Evolution, 59*(2), 155–167.

Osiurak, F., Jarry, C., Allain, P., Aubin, G., Etcharry-Bouyx, F., & Richard, I. (2009). Unusual use of objects after unilateral brain damage: The technical reasoning model. *Cortex, 45*(6), 769–783.

Parry, R., Dietrich, G., & Bril, B. (2014). Tool use ability depends in understanding of the functional dynamics and not specific joint contribution profiles. *Frontiers in Psychology*, *5*, 306. doi:10.3389/fpsyg.2014.00306.

Pelegrin, J. (2005). Remarks about archaeological techniques and methods of knapping: Elements of a cognitive approach to stone knapping. In E. Roux & B. Bril (Eds.), *Stone knapping: The necessary conditions for a uniquely homini behaviour* (pp. 23–33). Cambridge: McDonald Institue.

Portisch, A. O. (2010). The craft of skilful learning: Kazakh women's everyday craft practices in western Mongolia. *Journal of the Royal Anthropological Institute, 16*, 62–79.

Ramayya, A. G., Glasser, M. F., & Rilling, J. K. (2010). A DTI investigation of neural substrates supporting tool-use. *Cerebral Cortex, 20*(3), 507–516.

Rat-Fischer, L., O'Regan, J. K., & Fagard, J. (2012). The emergence of tool-use during the second year of life. *Journal of Experimental Child Psychology, 113*(3), 440–446.

Reed, E. S. (1988). Applying the theory of action systems to the study of motor skills. In O. G. Meijer & K. Roth (Eds.), *Complex movement behaviour: The motor-action controversy*. Amsterdam: Elsevier Science B.V.

Reed, E. S. (1993). The intention to use a specific affordance: A conceptual framework for psychology. In R. H. Wozniak & K. W. Fischer (Eds.), *Development in context – Acting and thinking in specific environments* (pp. 45–76). Hillsdale: Lawrence Erlbaum associates.

Reed, E. S., & Bril, B. (1996). The primacy of action in development. In M. L. Latash & M. T. Turvey (Eds.), *Dexterity and its development*. Mahwah: Lawrence Erlbaum Associates.

Rein, R., Bril, B., & Nonaka, T. (2013). Coordination strategies used in stone knapping. *American Journal of Physical Anthropology*. doi:10.1002/ajpa.22224.

Richard, J. F. (1990). *Les activités mentales – Comprendre, raisonner, trouver des solutions*. Paris: Armand Colin.

Rizzolatti, G., Fadiga, L., Gallese, V., & Fogasi, L. (1996). Premotor cortex and the recognition of motor actions. *Cognitive Brain Research, 3*(2), 131–141.

Rogoff, B. (1990). *Apprenticeship in thinking*. New York: Oxford University Press.

Rogoff, B., & Gauvain, M. (1984). The cognitive consequences of specific experiences. Weaving versus schooling among the Navajo. *Journal of Cross-Cultural Psychology, 15*(4), 453–475.

Roux, V., Bril, B., & Dietrich, G. (1995). Skills and learning difficulties involved in stone knapping: The case of stone bead knapping in Khambhat, India. *World Archeology, 27*(1), 63–87.

Roux, V. (Ed.). (2000). *Les perles de Cambay – Des pratiques techniques aux techno-systèmes de l'Orient ancien*. Paris: Éditions de la Maison des sciences de l'homme.

Sesto, M. E., Radwin, R. G., & Richard, T. G. (2005). Short-term changes in upper extremity dynamic mechanical response parameters following power hand tool-use. *Ergonomics, 48*(7), 807–820.

Shaw, R. E. (1987). Behavior with a purpose [Review of the book Goal-directed behavior]. *Contemporary Psychology, 32*, 243–245.

Shaw, R., & Wagman, J. B. (2001). Explanatory burdens and natural law: Invoking a field description of perception-action. *Behavioral and Brain Sciences, 24*, 849–937.

Smitsman, A. W., & Bongers, R. M. (2001). Tool-use and tool making: A dynamical developmental perspective. In J. Valsiner & K. J. Connolly (Eds.), *Handbook of developmental psychology*. London: Sage.

Stout, D., & Chaminade, T. (2007). The evolutionary neuroscience of tool making. *Neuropsychologica, 45*, 1091–1100.

Summers, J. J., & Anson, J. G. (2009). Current status of motor program: Revisited. *Human Movement Science, 28*, 566–577.

Theureau, J. (2002). Dynamic, living, social and cultural complex systems: Principles of design-oriented analysis. *Revue d'intelligence artificielle, 16*(4-5), 485–516.

Tosdevin, G. B. (2011). Special Issue: Reduction sequence, Chaîne Opératoire, and other methods: The epistemologies of different approaches to lithic analysis. Levels of theory and social practice in the reduction sequence and chaîne opératoire Methods of lithic analysis. PaleoAnthropology 2011, 351–375.

Turvey, M. T., Fich, H. L., & Tuller, B. (1982). The Bernstein perspective: The problem of degrees of freedom and context-conditioned variability. In J. A. Kelso (Ed.), *Human motor behavior: An introduction* (pp. 239–252). Hillsdale: Lawrence Erlbaum Associates.

Vaesen, K. (2012). The cognitive bases of human tool-use. *Behavioral and Brain Sciences, 35*(4), 203–218.

Van Leeuwen, L., Smitsman, W., & Van Leeuwen, C. (1994). Affordances, perceptual complexity, and the development of tool-use. *Journal of Experimental Psychology. Human Perception and Performance, 20*(1), 174–191.

Vereijken, B., Whiting, H. T. A., Newell, K. M., & van Emmerik, R. E. A. (1992). Free(z)ing degrees of freedom in skill acquisition. *Journal of Motor Behavior, 24*, 133–142.

Vygotsky, L. (1962). *Thought and language*. Cambridge, MA: Harvard University Press.

Wozniak, R. H., & Fischer, K. W. (Eds.). (1993). *Development in context – Acting and thinking in specific environments*. Hillsdale: Lawrence Erlbaum associates.

Wulf, G., Shea, C. H., & Whitacre, C. A. (1998). Physical-guidance benefits in learning a complex motor skill. *Journal of Motor Behavior, 30*, 367–380.

Zengraf, K., & Munzert, J. (2009). Effects of attentional-focus instructions on movement kinematics. *Psychology of Sport and Exercise, 10*, 520–525.

Chapter 6
Learning Through Interaction with Technical Objects: From the Individuality of the Technical Object to Human Individuation

Germain Poizat

We live in a world filled with material objects, and certainly, the workplace and occupational training are no exception. Surprisingly, then, research on the role and functions of materiality in our lives has been relatively scant in the educational field (see Fenwick 2010a; Fenwick et al. 2011), just as it has been in the human and social sciences in general (Ingold 2007, 2010; Latour 1994, 1996b). Sørensen (2009) even expresses regret about 'the blindness toward the question of how educational practice is affected by material' (p. 2) suggesting that one consequence is that material objects have come to be treated as mere instruments to advance educational performance. Fenwick (2010a) advances two compelling reasons for a more serious look at materiality within the framework of workplace and occupational studies: First, work practices are today completely entangled within a web of material practices, material objects, technologies, architectural spaces and infrastructures, in ways that are often not even acknowledged in the preoccupation with understanding human activity and meaning making. Second, scrutiny of the sociomaterial realm might help to reveal the dynamics that actually constitute much of everyday life, including learning. If human activity always unfolds in material environment, its worth needs to be more accurately conceptualised and problematised.

Despite the tendency of material objects to 'fade into the background' – and this is indeed one of their main characteristics – this explanation is not sufficient to account for the slight attention given to materiality in the literature. 'How have researchers managed to miss the utter strangeness, the ubiquity, and yes! – the spirituality of the technological world? How have they missed its sumptuous opacity?' These are the questions that Latour (2013) raises in his critique of the Modernity discourse and its accompanying theory of efficacy as the correspondence between the form and

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function of material objects (see also Ingold 2012), a theory that he concludes, prevents us from grasping these objects in all their technical reality.

The purpose here is to show the value of seriously examining the beingness of technical objects within the context of occupational education and training. The idea developed in this chapter is that when objects are freed of their status as mere artefacts – that is, as things having undergone even the slightest human transforming action (Rabardel 1995, p. 59) – and are instead granted the status of technical object or technical individual in Simondon's (1989) meaning of these terms, their decisive role in work as an expansive activity, as an ongoing process of growth, can be understood.

6.1 Some Landmarks in Educational Research

The notion of technical objects can only be understood within a context. Many studies have explored the role of things, materials and artefacts in educational settings (e.g. see the French language works of Adé and de Saint-Georges 2010). Studies from cognitive psychology and anthropology have made major contributions in the field by taking into account the material environment and its role in human cognition (e.g., Hutchins 1995; Lave 1988; Norman 1991; Suchman 1987; Scribner 1986). By extension, learning itself came to be considered as inseparable from the context in which it occurs, and knowledge came to be conceived as being grounded in the world of objects and practices (Brown et al. 1989; Chaiklin and Lave 1993; Lave and Wenger 1991). Lave and Wenger (1991), for example, assumed that learning occurs through the learners' participation in the community of practice in which they secure the material, human and symbolic resources that they need. One of the most well-known concepts derived from these works is the notion of 'cognitive artefacts' introduced by Norman (1991). According to this author, 'A cognitive artefact is an artificial device designed to maintain, display, or operate upon information in order to serve a representational function' (p. 17). The introduction of this notion was a bold attempt to overcome the limitations of the traditional cognitivist view of cognition as taking place 'in the head', but it remains (a) a fundamentally cognitive concept dealing exclusively with information processing and (b) deeply marked by residual Cartesianism. Nevertheless, another point related to the notion of cognitive artefacts is very relevant to the present discussion: artefacts do not change individuals' capabilities. It is the system's cognition that is enhanced, in such a way that the system can accomplish more with the artefact than without it. The cognitive abilities of the person are unchanged.

Another perspective on the use of artefacts was proposed by the 'instrument-mediated activity' approach (Rabardel 2003; Rabardel and Samurçay 2001), which has been particularly appreciated by French-speaking research networks. This theory is close to activity theory and emphasises the importance of not only cognitive, but also social, cultural and developmental aspects of the use of artefacts. In the instrument-mediated approach, the basic ideas of activity theory have been

enriched by the French research tradition in ergonomics and studies on work in general. This approach provides an anthropocentric definition of instruments derived from both cultural–historical theory (Vygotsky 1978) and Piaget's constructivism (Piaget 1970). An instrument is defined as an entity made up of the mix of two types of components: (a) psychological and motor components from the subject and (b) artefactual components that may be material or symbolic. An important consequence of this perspective is the assumption that instruments are not to be confused with or reduced to physical or symbolic artefacts. The positioning of an artefact as an instrument depends on its status within an action. For example, a hammer is not an instrument in itself. A hammer is an artefact. To become an instrument, the hammer must be associated with an organised form of psychological and motor operations by a subject (users or workers). Rabardel (1995) proposed to conceptualise this subject side of the instrument as a 'scheme', in the sense used by Piaget (Piaget and Beth 1961) and Bartlett (1932) and more precisely as a 'utilisation scheme'. When the scheme of 'striking' is associated with a wrench, for example, the wrench is turned into an instrument that has the same function as a hammer. Thus, for these authors (Béguin and Rabardel 2000; Rabardel and Béguin 2005), an instrument not only mediates between a subject and an object, but is also made up of the subject and an artefact.

This instrument-mediated activity approach focuses mainly on the integration of artefacts into the structure of human activities and provides perhaps one of the most elaborated conceptual accounts of such integration with the notion of instrumental genesis. Because the instrument is a mixed entity, *instrumental genesis* consists of two processes distinguished by their orientation (subject oriented vs. artefact oriented). The process of *instrumentation* refers to the subject side of instrumental genesis. It concerns the modification, emergence and development of utilisation and instrumented action schemes: their construction and development through adaptation and the assimilation of new artefacts into already constituted schemes (Rabardel and Béguin 2005). *Instrumentalisation*, on the other hand, concerns the artefact side of instrumental genesis, such as the modification, emergence and development of the instrument's artefactual components: selection, regrouping and production of functions, catachresis, assignment of properties and transformations of the artefact, which continue the artefact's design in usage. This is the process by which the subject enriches the artefact's properties. The appropriation of artefacts as instruments in situations of use is thus conceptualised as an *instrumental genesis* that transforms both the organisation of the subject's activity and the artefact's characteristics (Folcher 2003). The instrumental approach has made a substantial contribution to the field: it has prompted the move from the conception of learning through artefacts to learning as mediated by instruments; another way to state this idea is that learning that is mediated by artefacts has shifted to the development of activity mediated by instruments. The instrumental approach is nevertheless not without shortcomings. While the distinction between artefacts and instruments appears to be sound and intuitively compelling, it is not obvious how to use this distinction in actual research. What operational criteria can be used to identify a concrete tool in a situation of concrete use as either an 'artefact' or an 'instrument'?

As both these approaches suggest, material objects have been traditionally regarded as the set of means that have been designed, produced and used by agents for and in the achievement of the objectives set by these very same agents. Yet this conception of human technology is based on an instrumental and anthropological bias: technology is confined to the register of a means for action, that is, to what can be used in projects of action. It may be time to consider a less anthropocentric approach and to distinguish the objective and objectal nature of technical objects. Technical objects have a mode of existence that is proper to them or perhaps more precise: that is, properly technical. What truly characterises a technical object is its mode of existence. It is not its utility – the purpose it serves – however well calculated and efficient the usage might be. Nor is it the fact that the object is an artefact created by a human – a detail that is in any case insufficiently precise – even when it was created specifically in the goal of being used, being useful and being adaptable for the accomplishment of a task in optimal conditions of efficacy and profitability. Latour (2013) adds that all the subtlety of technics is reduced to nothing if we assume that an object's designated function is carried within the technical object itself: 'If you see in every technology the transmission of efficacy by a "perfectly mastered" tool, and if in addition you assume a creator with the pre-designed form of the technological object in his head that he then applies to inert and unformed matter, well, then you make the material world disappear while giving the impression that it is peopled with technological objects whose materiality has the same character as nature' (Latour 2013, p. 222). He concludes (2013), as did Simondon (1989), that there is only one way to give justice to technical objects: by giving up the distinction between 'Subjects' and 'Objects'. We will see that this break with the dominant objectivist ontology is a key assumption of the enactive framework that guides our work, which explains in part our borrowings from Simondon (1989) and Latour (2013) concerning the study of technical objects.

The remainder of this chapter is organised into three parts: We first review the assumptions of the enactive approach and describe how these assumptions differ from objectivist ontology. We then examine the concepts of mode of existence and beings of technology in order to then explain our conception of technical objects. Finally, some of the consequences for educational research are discussed.

6.2 An Enactive Approach to Activity and Its Transformations

Our research in the field of occupational education and training began several years ago within the framework of an enactive conception of activity and its transformations (e.g. Durand 2008, 2009, 2011, 2013a; Durand and Poizat 2015; Poizat et al. 2013b; Theureau 2003, 2004, 2006). The paradigm of enaction, as presented by several researchers in the field of occupational education and training (e.g. Davis and Sumara 1997; Fenwick 2000, 2003, 2009; Holton 2010; Kupper 2012; Zorn

2006), is based on five premises: (a) autonomy; (b) the embodied, embedded and (c) situated character of cognition; (d) the creation of meaning; and (e) the taking into account of experience in knowledge acquired through cognition. In this chapter, we focus on the first premise, that of autonomy, as founder of the enactive approach.

Derived from biological research, the paradigm of enaction emphasises the phenomenon of self-production (or the autonomous organisation of life), which is termed autopoiesis. All living organisms are held to be autopoietic: although they differ one from the other in structure, they are identical in their organisation (Maturana and Varela 1980). An autopoietic system is organised as a closed network of processes of production of the system components; these processes recursively produce the components and the very network that produced them, and the network specifies the boundary conditions (the topological domain) necessary for the system's ongoing existence as a concrete unity in space (Maturana and Varela 1987; Varela 1979). This mechanism, which is called operational closure, implies that the operational results occur within the boundaries of the system itself. Based on the 'strong' life–mind continuity thesis – that is, the idea that life and mind have a common set of basic organisations (Froese and Di Paolo 2009; Stewart 1996) – the enactive approach deals with cognition as a phenomenon of autopoiesis, according to the postulate that the basic biological processes can be extended to human cognition (Bourgine and Stewart 2004; Froese 2012). Early on, it was also posited that social systems are autopoietic, which gave rise to a few explorations of this notion in the social sciences (e.g. Luhmann 1986).

From this research perspective, human activity is the expression of structural coupling. In other words, the actor is considered to be structurally plastic and continuously interacting with an environment. The interactions between the actor and the environment are recursive in that (a) they are a source of disturbance that brings about transformations in the actor's structure, and (b) they are delimited by the structure itself. These transformations allow the actor to function smoothly and constantly redefine the permissible fields of disturbance in the interactions with the environment (Varela 1979). This ongoing process of selection by the continuous interaction between actor and environment (which causes a certain amount of disruption) is, thus, what we call structural coupling. This coupling is further assumed to be asymmetric in the sense that the actor–environment interactions concern only what the actors have selected as relevant at any given instant. This means that actors do not undergo the prescriptive force of environmental stimuli. Instead, they look for a steady state by eliminating disturbances that they themselves select and by producing changes consistent with their internal organisation.

The actor–environment coupling is the unit of analysis in our research, and we explore the notion of activity as self-constructing and self-developing (Durand 2011, 2013a). On the basis of this general hypothesis, we focus particularly on transformations in activity in relation to issues of education and training. Against this theoretical background, we also examine the place of technical objects in situations of work and training.

6.3 Enaction: A Break with the Dominant Objectivist Ontology in Educational Research

Much educational research is based on an objectivist ontology (e.g. Schuh and Barab 2008). This is implicitly assumed to be so obviously correct that questioning it would be nonsensical. The 'objectivist' position is based on the ontological postulate that objective reality exists and is what it is independently of any relationship with the subject (e.g. Lakoff 1987). Most of us spontaneously adopt an objectivist attitude. Objectivism is so obviously congruent with our everyday common-sense intuition that it is genuinely difficult to imagine a credible alternative. In our most immediate experience, the separation between inside and outside, between 'me' and 'the world', seems to be a given. Objects and others are over there, 'out there,' clearly separate from me, who is right here, with my thoughts, my perceptions and my emotions, all of which seem to be 'inside'. The only alternatives that come readily to mind – such as rank relativism – appear totally unsatisfactory. In the absence of a credible alternative, it is perhaps, therefore, not surprising that whatever the intellectual difficulties, we constantly tend to fall back into the familiar mould of objectivism.

The paradigm of enaction is proposed as a credible alternative to objectivism. With this approach, cognition is not taken for the subjective representation of an ontologically independent objective reality. For example, the computational paradigm in educational research necessarily presupposes an objectivist ontology. That is, it postulates the existence of a definite and referential 'state of things in the real world' that exists and that can be positively specified independently of any relation to the subject. Similarly, the Gibsonian notion of 'direct perception' can be regarded as having objectivist connotations when even affordances are revealed in action. Under the paradigm of enaction, however, information is neither an external object analysed by the actor (as in the theory of information processing) nor an offer from the environment (as in the ecological approach), but it is assumed to be elaborated, constructed and produced in and by the actor–environment coupling, which explains Varela's notion of information (1979). According to Varela, the classical notion of information needed to be reinterpreted as being co-dependent and constructive rather than representational and informative: 'informational events have no substantial or out-there quality; we are talking literally about in-formare: that which is formed within. In-formation appears nowhere except in the relative interlock between the describer, the unit and its interactions' (Varela 1979, p. Xv). Thus, information is neither given nor to be gathered or collected, but is instead constructed by and for the subject in a coupling.

The non-objectivist position defended by the enactive approach is an unusual point of view that can 'make your head spin'. This disorienting feeling is due to the lack of the stable reference points on which we normally anchor descriptions. With autopoiesis, the living organism is not so much a 'thing' as it is a process of engendering itself indefinitely (Stewart 2010). According to this approach, activity is not the expression of a pre-existing or predefined subject adapting itself to a predetermined world. The two

poles of subject and environment in the *living unit–environment* coupling are as much products or expressions of the coupling as they are its source. For this reason, we suggest that the notion of 'modes of existence' should be taken seriously. By taking this notion into account, we are able to remove ontological questions from the search for substance or foundation, thereby avoiding the criticism that we have lost sight of (or failed to see) 'entities'. Neither entity is reified as a 'thing' and both are, instead, understood to be intrinsically ephemeral: here, existence is a pure process of Becoming. To account for technical objects from an enactive perspective means breaking with objectivism in order to focus on the beingness of these objects.

6.4 The Being of Technical Objects

Simondon (1989) and, much later, Latour (2013) endeavoured to bring things to life. Both distanced themselves from an anthropological conception of technology, in which the technical object is thought of as an Object, as opposed to a Subject and strictly in reference to this Subject (in terms of usage, function, etc.): for these authors, the technical object is not merely an instrument conceived, manufactured, produced, or used by a subject or intentional actor. They based their work on the notion of the mode of existence that developed within the French philosophical tradition (e.g., Souriau 1943). One of the postulates of this tradition is that grasping the world does not require that we commence by dividing reality into Subject and Object. From this perspective, Subject and Object, far from being the two elements indispensable for the beginning of reflection, are instead assumed to be the late-appearing effects in a veritable history of modes of existence. This notion of mode of existence allows for an ontology that is not focused on substance and foundations and does not reify entities as things, but that instead conceptualises entities as intrinsically ephemeral in that their existence is a process of Becoming. It eschews the classical assumption of Subject and Object as, respectively, an autonomous subject acting upon and an inert object acted upon.

In 1989, Simondon published a particularly dense work titled *Le mode d'existence des objets techniques* (translation: *The being of technical objects*; see De Boever et al. 2012; Simondon 2009, 2011) in which he sought to understand the essence of technics and technical objects. In this work, the author suggested that a technical object should be defined not as such and such a thing, given *hic et nunc*, but rather as something having a genesis. For Simondon, the fundamental characteristic of a technical object that the analyst must never neglect is its genetic and evolving dimension. He, thus, set out to examine the beingness specific to technical realities and their mode of temporality, two elements that cannot be separated because beingness is expressed primarily in a temporal mode. The genesis of a technical object is an essential part of its being. As an illustration, the petrol engine is not merely a specific, defined engine existing in given time and space: it is also part of an overarching continuity, a long series extending from the very first engines to those which we know today and those which will only be known in the future. Therefore, just as in the case of a phylogenetic sequence, any particular stage of

evolution contains within itself dynamic structures and systems that are at the origin of the evolution of forms.

For Simondon (1989), something is a technical object only because of its relationship to a technical lineage that ranges from an abstract mode to the concrete mode. He thus assumes that a technical object is by definition part of a series of technical objects that function in an increasingly integrated manner. In a technical lineage, the primitive technical object is abstract and close to the logical schema for assembling the most elementary structures, each with a specific function, that make up the original technical idea: in other words, every component of the technical object, or nearly every one, fulfils a specific and distinct function. Over the course of its genesis, the technical object gradually becomes more concrete, more coherent with itself, so that we can eventually observe the convergence of functions within a single structural unit. Simondon (1989) gave as an example the current internal combustion engine, which is a concrete object, or certainly more concrete (or less abstract) than older engines. In older engines, each element came into play at a certain moment in the cycle and, outside of that moment, was expected to have no effect on the other elements (the different parts of the engine being like individuals, with each one stepping in to work in its turn without ever needing to know about the others). The early engine was the logical assembly of individual elements, each defined by its single and total function. Each element could best carry out its particular function by being a perfectly finished instrument completely dedicated to the performance of that function. In this sense, the continuous exchange of energy between two elements could be understood as an imperfection if this exchange was not part of their respective theoretical functioning. In the modern engine, however, each component is not only critical but is also so deeply connected with the other components by reciprocal energy exchanges that it cannot be other than what it is within the system. The shape of the cylinder, the shape and size of the valves and the shape of the piston are all part of the same system in which a multitude of reciprocal causalities exist. And a compression ratio, corresponding to the shapes of these components, requires a determined degree of spark advance. In relation to all the other components of the cycle, the shape of the cylinder head and the metal from which it is made produce a certain temperature in the spark plug electrodes; this temperature in turn affects the characteristics of the ignition and, as a result, the entire cycle.

To continue with this example, Simondon (1989) pointed out that the cylinder head of the internal combustion engine bristles with cooling gills specially developed in the valve region that are subject to intense changes in heat and pressure. In earlier engines, the cooling gills were added on to the cylinder and cylinder head, and, in theory, these cooling gills were geometrically cylindrical: they fulfilled a single function only, that of cooling. In today's engines, these gills have an added mechanical function: they prevent the buckling of the cylinder head under gaseous thrust. In these conditions, it is impossible to distinguish the volumetric unit (the cylinder or cylinder head) from the heat-dissipation unit. If one were to grind or saw off the cylinder gills in an air-cooled engine, the volumetric unit constituted by the cylinder alone would no longer be viable, not even as a volumetric unit; it would buckle under gaseous pressure. In this example, the volumetric and mechanical unit

has become coextensive with the heat-dispersal unit because the structure of the whole is bivalent. These gills, working with currents of air from outside the engine, effect changes in temperature and so constitute a cooling surface. In so far as they are part of the cylinder, these same gills limit the size of the combustion chamber by preserving its shape and making it unnecessary to use as much metal as a non-ribbed shell would require. The development of a single structure is not a compromise, but a concomitance and convergence: a ribbed cylinder head can be thinner than a smooth cylinder head with the same rigidity. In addition, a thin cylinder head allows for more efficient thermal changes than would be possible with a thick one. The bivalent structure of the gill rib improves cooling not only by increasing the heat-change surface (this is the very function of the gill as gill) but also by making possible a thinner cylinder head (and this is the function of the gill as rib).

In *Le mode d'existence des objets techniques*, Simondon (1989) gave many such examples of the genesis of technical objects and posited that they truly have their own mode of being, quite distinct from that of physical matter or living organisms. This mode of existence is first of all to be more or less abstract or more or less concrete, and to be in genesis towards the ever more concrete. Technical objects are therefore characterised by processes of concretisation and functional overdetermination, which give them consistency in terms of evolution and thereby constitute proof that they are not pure utensils.

To understand the being of technical objects, two important points need to be kept in mind. First, Simondon (1989) insisted on the existence of internal necessities that are specifically technical, by which he meant that the articulation of the elements composing a technical object is neither arbitrary nor free: the inventor has no choice but to conform to the requirement of an internal unity that belongs to the technical object itself. This internal unity means that the technical object must be consistent with itself and there must be a convergence of functions within the structural unit. Secondly, an invention is but the mental and psychological aspect of the mode of existence that characterises technical objects: the invention is the subjective correlate of its concretisation, its concretising genesis (Simondon 1989, 2005b). An invention, thus, contributes to the introduction of a new technical essence: it marks the absolute origin of a new technical lineage.

In summary, Simondon (1989) warned that the technical mode of existence of objects should not be confused with their economic, social or psychosocial modes of existence. The existence and the role of economic, social and psychosocial causes are not denied – technical reality is surrounded by a 'halo', a psychosocial matrix – but these external causes are simply distinguished from those causes that are properly technical because they are internal to the object itself. It is therefore useful to distinguish the objective nature from the objectal nature of the technical object. If we consider it objectively – that is, independently of the intentions that led to its production, its actual uses, the representations we have of it, and the values associated with it in economic, social and psychosocial spheres – the technical object appears to have a mode of existence that is properly technical and it is important to grasp this existence. What defines the technical object in its properly technical being is concretisation. What makes an object technical is its very being:

the conditions for its functioning and not considerations of how it can be used and be useful, nor how it is considered socially. Of course, elaborated technical objects may be subject to influences foreign to their objectivity; they may have meaning or a social mode of existence that is not related to their technicity. The objectality of the technical object refers to the way that it can be permeated by the interplay of economic and social relations.

But by becoming thusly permeated, it finds itself tendentiously released from its objective properties. If the technical individual becomes an entity well, this does not mean that it becomes a technical object, but on the contrary it means that it tends to lose the objectivity of its technical being by becoming an objectal object (Chateau 2014). For reality, to become an object is not – or not only – to acquire materiality, which is the basis for objectivity; it is instead the acquisition of a 'halo of sociality'. The objective and objectal aspects of the object thus clash head on. Nevertheless, it is in producing the objectivity of the object's reality that makes objectality possible. Perhaps, it can be concluded that objectality belongs 'to some extent' to the mode of existence of the technical object, in so far as objectality is made possible by the technical object. Perhaps, also, it is even better to consider that objectivity and objectality are the two modes of existence of technical objects: a purely technical mode and an economic, social and psychosocial mode (Chateau 2014).

6.5   Technical Objects vs. Other Modes of Existence

The mode of existence of technical objects also drew the attention of Bruno Latour[1] and was indeed the focus of his anthropological inquiry dealing with the Moderns[2] (Latour 2013).

In his first book, *We Have Never Been Modern* (1993), Latour pointed out the difference between the practices of actors (especially researchers) and their way of reporting these practices. Moderns tend to present themselves as being those who have finally rid themselves of all archaic and natural determinations, those who have managed to separate knowledge from belief. Yet, they do not do what they say they do. There is a hiatus between their practices and their discourse on these

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[1] In educational research, Latour is particularly known for his actor–network theory (ANT) (Akrich 1992; Callon 2001; Latour 1996, 1999, 2005). ANT is now a well-established approach (Fenwick 2010b, 2011a, b; Fenwick and Edwards 2010, 2011; Fenwick et al. 2011; Fox 2005; Johri 2011; Nespor 1994, 2002; Sørensen 2007; Waltz 2006), whose most important contribution to educational analysis has been to foreground the significance of materiality in the educational process. For educational researchers, the actant–rhizome ontology offers an interesting way to recognise the materiality and materialising processes that are central to understanding learning and teaching, educational policy, curriculum and implementation, school reform and other educational issues.

[2] The word is deliberately capitalised. Moderns are those who believe that others believe. The European/Western Moderns can be summed up by the following formula: 'We believe that we know. We know that others believe'.

practices or a mismatch between their day-to-day experiences and the official reports of these experiences that they give. Although Moderns claim to distinguish between objectivity and subjectivity, facts and values, nature and culture, science and politics, the real world and the representations of this world, they never stop creating hybrids, mixing the human and nonhuman, combining the laws of nature and those of politics, and so on. In the field of science and technology studies, examples of this hybridity are rife (Callon 1986; Callon et al. 1986; Latour 1987; Latour and Woolgar 1979). Thus, Latour (1993) stated that Modernity was defined by a trait that is the exact opposite of the practices of those who think of themselves as Moderns. Latour's (1993) definition in fact prompts us to rethink our usual relationships with other cultures, especially the distinction that often made between 'them' and 'us' (European/Western Moderns) because it is based mainly on the idea that 'they' have failed to separate knowledge and society, whereas 'we' have not. This is, indeed, an error on the part of the Moderns, who cling just as tightly to fetishes (especially from science and technology) as these 'others' are thought to (Latour 2009).

In *An Inquiry into Modes of Existence* (2013), Latour pursued his anthropological work and tried to answer the following question: if we have never been Moderns, then what have we been? He then proposed to reconstruct the Modern value system through a vast ethnographic study, underlining from the outset that it was time to drop the opposition between Subject and Object. From his perspective, the problem of the Moderns is that they have organised themselves in order to understand the nature of experience using two templates: Subject and Object. Latour (2013) maintains that the framework of Modernist anthropology needs new ontological templates, and he has opted, in reference to Souriau (1943), for an ontological pluralism and an inquiry into the modes of existence. This orientation, as he argues, sets the stage for a deontology, by which Moderns can enter into contact others (persons or cultures) with diplomacy and without a limitation on the number of beings to relate to or judgments that are preordained by the Subject–Object distinction.

Latour's inquiry (2013) has carried on the work of Simondon (1989) and even exceeded it. He has done so because he found that one of the most surprising aspects of the Moderns is the way they actually deal with technical objects, as opposed to their agreement that these objects are one of the elements that define them most clearly in the eyes of others. In line with Simondon, Latour (2013) is convinced that technical objects should not be confused with what is left in their wake, and he has therefore set out to describe the mode of existence of technological beings.[3] He also continues Simondon's project (1989) of comparing the mode of existence of technical objects with other modes of existence, which he believes is the only

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[3] Latour prefers to speak directly of the mode of existence of technology or technological beings, rather than the mode of existence of technical objects (2013). For him, the difficulty in grasping what a technological being is arises mainly from the problem of the term 'technical object'. Nevertheless, for the sake of simplicity, we will continue to use the term 'technical object'.

way to grasp this additional dimension properly to technical objects. Despite Simondon's great care (1989) in rigorously describing technical objects, he stressed that knowledge about technical objects is insufficient to understand their technicity. What he meant by this is that technical objects need to be known not only as what they actually are, but also through their technicity as modes of relating, for example, humans to the world: that is, through a religious mode, an aesthetic mode and so on. In this sense, Latour's anthropological inquiry (2013) has far outstripped Simondon's work (1989) in seeking to describe all of Modernity's modes of existence. Indeed, his project has been to account for the many ways of being that the science of the Moderns may have crushed. To date, he has identified 15 modes of existence: reproduction, metamorphosis, habits, technique, fiction, reference, politics, law, religion, attachment, organisation, morality, network, preposition and double click.

Concerning the mode of existence of technical objects, Latour (2013) recognised the genius of Simondon's (1989) intuition that the mode of existence of technical objects can only be determined by comparing them to magic, religion, science, aesthetics, practice, ethics and philosophy. For Simondon (1989), the philosophical implications of technical beings could only be fully grasped through a generalised and genetic interpretation of the relationship of humans to the world (p. 154). It is as if it would be impossible to reach the essence of technics only through the genesis of technical objects. In *An Inquiry into Modes of Existence*, the mode of existence of technical objects was thus compared with other modes of existence, like networks, reproduction, reference, metamorphosis, organisation or double click. By passing from one mode to another, Latour (2013) has managed to progressively specify the mode of existence of technical objects.

According to Latour (2013), the mode of existence of technical objects is characterised by (a) transparency, (b) detours and (c) delegations. The first characteristic is a strange presence or absence that is hard to pin down. The role of technical objects, one thus might say, is to blend into the background, to become transparent. The zigzag of technical change is the second characteristic of this mode of existence. Technical changes are difficult to discern because they are never straight: they show many transformations, great heterogeneity in their combinations, and a proliferation of tricky manoeuvres. And their trajectories are further characterised by incredible detours, with beings greatly distanced in the reproduction mode becoming the missing pieces of a puzzle that was never suspected of being quite so ingenious. The last characteristic is delegation, which refers to basing an action on other actions, whether human or nonhuman. Humans delegate (or transfer) actions to technical objects, which themselves are then in a situation of delegating to humans, or to other technical objects, or to materials – Latour (1992) provided an illustration of this principle through the example of door hinges and automatic door closers.

Latour (2013) has written that the mode of existence of technical objects differs from the reproductive mode of existence, which has the goal of maintaining what already exists. Technology is marked by the leaps forward, ruptures and breaks that are specific to technological invention and that imply a noncontinuity with the

material world (see also Simondon 2005b, 2008). One need merely look around to take the measure of the transformations that technology has made others submit to – and that it has given itself as a starting point. Therefore, technical objects have a mode of existence that amounts to a shifting between two other modes: technological invention has a metamorphosis mode, as new capabilities are extracted from beings of reproduction, but unlike beings of metamorphosis, once they are radically transformed, technical objects mimic reproduction by their presence. Thus, at first glance, technical objects appear to be a mixed mode: protean speed in one mode and persistence in the other.

6.6 Additional Assumptions About Technical Objects

Within the framework of our research programme on adult education, the hypothesis that technical objects have their own mode of existence and complete it with two other hypotheses is taken seriously: (a) technical objects are a *mi-lieu* (French play on words, as *mi-* is midway and *lieu* is place, so a place or position that is midway) in the coupling between the actor and the environment, and (b) technology is constitutive and constituent.

The first assumption is based on the idea that human–environment coupling shows certain particularities. It especially implies detours and considerable mediations in comparison with the local and immediate couplings of less complex living beings. Symbolic (especially language) and instrumented (especially technical) registers characterise this coupling. In addition to their own mode of existence, technical objects participate in the coupling between the actor and the environment as a kind of mid-place (*mi-lieu*; Stiegler and Petit 2013). This notion designates a space that is neither interior nor exterior, neither inside nor outside and that is not a simple intermediary either. In other words, technical objects are massively involved in this coupling without being on the actor's side... nor on the environment's side. Referring to technology as a *mi-lieu* also designates a flaw at the origin, this origin always being in the midst of the beginning and the end, the past and the future.

The second assumption is that technology is 'anthropologically constitutive and constituent' (Havelange 2010; Steiner 2010). Technology as anthropologically constitutive and technology as anthropologically constituent are two distinct but complementary paths that share the same ambition to surpass the anthropological and instrumental conceptions of technology. Technology is constitutive in the sense that the technical object can be regarded as an originating prosthesis (Stiegler 1998). Technology in this sense is a supplement that is original. It is not outside of human activity, but is inherent to it: technicity defines humans. The prosthesis does not replace something that once existed and has disappeared, nor is it an auxiliary or something adventitious that can complement or complexify existing capabilities. It is not an extension of the human body: it is the very constitution of this body as human (Stiegler 1998). Technology, as prosthesis, is the original

supplement that can deal with flaws in the qualities, and especially the default of origin, that are specific and native to humans (e.g. Leroi-Gourhan, 1964/1993).

Stiegler (1998) argues that technology is a structure of inheritance and transmission, a structure that supports progressive accumulation with each successive generation. This structure of inheritance and transmission is external and non-biological. Technology operates outside genetic mechanisms and human boundaries (bodily, cognitive and temporal). Expanding on Leroi-Gourhan, Stiegler proposes to distinguish three types of memories out of which the human develops: genetic memory, memory of the central nervous system, and epiphylogenetic memory (language and technology are here amalgamated in the process of exteriorization). The notion epiphylogenesis extends the temporality of life, but by including it in the death, that is to say in 'organised inorganic matter'. It refers to the conservation, accumulation and sedimentation of individual experiences by the organisation of inorganic matter, becoming therefore 'organised inorganic matter'. This transmission and recording of experience beyond the individual memory span is at once the fundamental fact of human existence and of technology. Technology, as third – or tertiary – memory, is constitutive of humanity because it allows not only the storage of human gesture in the material world, but also and especially the transmission of all knowledge and all know-how, embodied in the supports to memory.

To understand the idea of epiphylogenesis, one must understand Stiegler's (1998) criticism of Leroi-Gourhan's concept of externalisation (Steiner 2010). According to Stiegler (1998), the externalisation of the hand and the brain in a tool is not the expression, the movement or the manifestation of an intelligence or humanity already constructed or given. It is, instead, the externalisation by which the interior constitutes itself: this is the paradox in that, classically, externalising presupposes an already constituted interior. However, here, humanity is nothing without its technological (i.e. by tool and symbol) externalisation. The interior is assumed to precede the exterior, but in fact it is constituted by the exterior, which precedes it (Stiegler 1998). In fact there is a co-constitutive movement: no term precedes or is the origin of the other. Havelange (2005) summarises this position as follows: 'Humans are the operators and not the inventors of the technical objects, and all of human evolution has its foundation, not in Homo faber, but in the laws of evolution specific to the technical object grasped in its structural coupling with humans – themselves in constitution' (p. 24).

To consider that technology is anthropologically constituent also means that technical objects play a role in the coupling between the actor and the environment and that this role is constituent (Havelange 2010). This constituent role can be fulfilled in an incorporated manner (when the technical object changes from being in the actor's own world to being in his own body – i.e. becoming physically incorporated and thus transparent) or in a hermeneutic manner (when the technical object participates in the actor's own world but remains tangible). In any case, when they are perceived, technical objects open or capacitate or empower possibilities for agents' actions and their relations with the environment, all while constraining them. This constituent role can be expressed in two directions (Havelange 2010).

The first is the technical constitutivity of knowledge and cognition. A technical object, once in hand, transforms our power of action and perception. The second is the technical constitutivity of the social sphere. Technicity, as the collective but un-experienced memory constantly calling up new practices, plays a role in building communities of practice and more broadly transforms social relations. As part of our thesis, technology is also constituent in so far as it makes things happen. It opens on to the process of becoming and itself becomes a power for engagement in the world once the process of corporeal, cognitive and social integration has begun (Havelange 2010).

It, thus, is possible to break with the anthropological assumptions about technology, which make humans into non-technical givens, creators of technical objects without existence, and which suggest the premise of a separation between human and nonhuman. It is also possible to focus attention on what technique does (to us): the technical object is no longer just an object placed before us, but it becomes that which constitutes – what gives capacity to, what enables, even what causes to happen – and this is not without consequence in the field of education.

6.7 Perspectives in Occupational Training

This reversal in the conception of technical objects has many theoretical and practical implications for research in education. Presented here are three: (a) the usefulness of thinking about training as a triple individuation, (b) the importance of studying the processes of appropriating technical objects, and (c) the possibility of approaching training design as technical invention. These three are selected because of their theoretical and practical contributions to renewed perspectives on education.

6.7.1 The Concretisation of Technical Objects as a Model of Development?

Within the framework of our research, the problem of transforming activity (or, more specifically, learning and vocational development) is approached from the perspective of individuation (see Durand and Poizat 2015). In other words, actors, like technical objects, should not be conceived of as 'already constituted' subjects, but rather as phases in a psychological and psychosocial process of individuation (Simondon 1989, 2005a). Individuals are always incomplete, always becoming, always undergoing individuation. In reality, the concretisation process of technical objects is only a specific case of a far more general process of individuation that concerns many modes of existence. Simondon (2005a) thus analysed the processes of psychological and collective individuation from which individuals (in the

traditional sense of human individuals) and social groups emerge. Two principal differences between technical and human individuation are striking and merit consideration: (a) psychological and collective individuation is not concerned with discontinuous lineages and linking discrete units (technical objects), but is instead concerned with beings having permanence, having identity above and beyond any transformation, and (b) the phases of these beings are self-produced and do not result from a process of external invention.

Simondon's (2005a) concept of individuation and his analysis are equally useful for understanding human development in the workplace and during vocational training and for designing educational support (Durand 2013b; Durand and Perrin 2014; Goudeaux 2013; Goudeaux and Poizat 2013). Three elements in particular are relevant to our work: (a) the concretisation of technical objects is only a particular case of the transformation of modes of existence that can be described as individuation; (b) what may seem to be an object or a subject can be conceptualised instead as a transient stage expressing a dynamic of individuation that is momentarily overwhelming, which suggests that less interest should be given to the products of individuation than to the process of individuation itself; and (c) each phase of the individuation process is greater than itself in the sense that it opens potentially onto subsequent phases and future individuation; it therefore is not stable, but metastable (Simondon 2005a).

Accordingly, Simondon (2005a) argued that if you want to understand an individual being, you need to embed that being in a process in which it is only a phase. For example, the individual atom is thus replaced by a never-ending process of individuation and is considered as an effect of individuation rather than a cause (Simondon 2005a). Here, again, a reversal in the usual objectivist attitude is called for. The assumption is not of subjects who existed before acting and who have perfected identities, but instead of a process of self-constitution from which a being emerges and is momentarily considered as an actor (or an acting subject). The individual is claimed to be the product of this individuation process and not the inverse. The individuation process is not the exterior giving shape to a material or matter that receives it. It is the consequence of the self-transformation in a system locally supersaturated with potential energy that 'takes shape' in a morphogenetic dynamic (i.e. process of emergence of a form) (Simondon 2005a). The term self-construction is used in the sense that order, meaning and organisation are not externally imposed but are self-produced in an unprogrammed manner in such a way that the successive individuations correspond to phases of being that define a drift and not a predetermined path. The phases in these drifts are the successive actualisations of possibilities through transduction processes, that is, by step-by-step propagation. Although still sparse, the first empirical studies on these individuation processes in the workplace and during training show that (a) the components of the activity of skilled workers can be specified only to the extent of the experiences these workers are led to have, (b) appropriation accompanies these experiences, and (c) vocational life courses alternate between structuring and restructuring (Durand 2013b; Durand and Perrin 2014). The process of individuation occurs spontaneously as the expression of the self-construction properties of

living beings, but it can be supported in the work context by identifying the typical sequences in novice career trajectories, as these typical sequences can be effectively exploited in training applications (Ria 2009).

Human individuation, whether individual or collective, is intimately linked to technical objects and our relationships with them (e.g. Goudeaux and Poizat 2013). Technical objects are the 'support and symbol' of what Simondon calls the transindividual (1989, p. 247). The transindividual is in some respects the third phase of being (after the pre-individual and the individuated). This phase implies that the dynamics of individuation can extend beyond individual individuation and also suggests that the weight of the pre-individual remains ever present. The transindividual phase is peculiar in that it is an individual–social phase – that is, neither bluntly social nor purely individual. Part of individual individuation is developing transindividuality in the sense that individual individuation is never the pre-existent, ready-made condition for collective individuation. Trainers deal with these metastable psycho-socio-technical dynamics (Stiegler 1998), and their actions are directed towards transforming activity while taking into account a triple individuation: individual, collective and technical. What 'makes contact' in this context is not the subjects and the finished or delimited artefacts, but rather it is the 'individuation regimes that meet' (Bidet and Macé 2011). Inspired by Simondon's category of the transindividual, Stiegler (1998; Stiegler and Rogoff 2010) proposed the notion of transindividuation to reaffirm the anthropologically constitutive and constituent dimension of technical objects and to emphasise the metastable psycho-socio-technical dynamics that characterise humans. 'Transindividuation' is the transformation of I to we and we to I, and it is correlatively the transformation in the techno-symbolic environment inside of which the Is are able to meet as we (Stiegler and Rogoff 2010). Thus, the concept of 'transindividuation' does not stop with the individuated 'I' or the inter-individuated 'we', but is the process of co-individuation within a pre-individuated milieu, in which both the 'I' and the 'we' are transformed through one another. According to Stiegler (1998), technology has a role in the emergence of the transindividual because the pre-individual milieu is made up of technical objects that participate in this 'metastabilisation' of the psychological and collective co-individuation. Stiegler (1998) thus borrowed the concept of the 'associated milieu' from Simondon to analyse collective individuation in such a way that the history of human individuation is inseparable from the history of technical individuation. Transindividuation, then, is the basis for all social transformation and is therefore a way of addressing what happens within education (Stiegler and Rogoff 2010).

6.7.2 The Appropriation of Technical Objects and Individuation

One of the characteristics of the mode of existence of technology (or that of technical objects) is that technology tends to fade into the background. Therefore,

an essential question is how technical objects are appropriated. At the phenomenal level, technical objects oscillate and change status in the actor–environment coupling; according to the situation, they are (a) technical objects participating in the environment and without meaning for the actor, (b) technical objects clearly that separate from the rest of the environment by the allocation of meaning, or (c) technical objects that disappear from the actor's field of experience because they are progressively integrated by the actor. The concept of appropriation refers to the gradual process of integration into the actor's own world, own body and own culture (Theureau 2011).

The integration of a technical object in the actors' own world (Merleau Ponty, 1945/1962) consists of allocating meaning to it. In this case, integration is accompanied by a change in the object's status, whereby a component in the environment, heretofore irrelevant to the actor, becomes constitutive of the actor's own world: it is identified as meaningful and distinct by the actor and becomes capable of disrupting his or her activity (in the sense that the activity is transformed by the presence of the object and its identification by the actor). As part of the actor's own world, it is a technical object for this actor at that point in time. This appropriation is nevertheless not sustainable: depending on the actor's engagement in the situation and the circumstances, the same technical object (for an observer) may or may not be integrated into the actor's own world.

The integration of a technical object into the actors' own body is a kind of shift from the actors' own world to their own body. This transformation is also unsustainable. For example, a pair of glasses or a tennis racket may first constitute a meaningful entity in an actor's environment (first appropriation by integration into the actor's own world); however, with practice, it will eventually be integrated as a component of the actor's own body. At this point, it escapes the actor's notice or awareness. As it is repeatedly 'used' or frequently 'in hand', it becomes 'un-experienced' because it has been integrated into the body as a means to act, perceive or think. This explains why a person might be looking for his glasses while they are on his nose, or why a tennis player will feel with great finesse the intensity and direction of the forces generated as her racket as it hits the ball but does not at all feel the racket as an entity separate from her moving body. At other times, however, the glasses and the racket may become mere entities in the environment, or they may even disappear from the actor's phenomenal field. Depending on the state of the actor–environment coupling, therefore, technical objects are or are not integrated into the actor's own body. As such, this integration constitutes an in-corporation; it signals the experiential changes in the technical object and its availability for the actor, by its state of transparency to him. These objects, abstract or concrete, are not mechanically and definitively integrated. Their transparency is associated with their availability for action: it makes them available for activity.

Last, integration into the actor's own culture, or in-culturation, is the transformation of a technical object into a constituent of the actor's culture for action. The constituents of an actor's culture are more or less shared among the members of human communities. One's own culture consists of bifaces related to (a) the shared culture of a collective, which is itself defined by shared practices and cultural

sharing, and (b) the heritage of each individual (Giddens 1984). It is both a legacy of past activities and a specification of possible futures. Once integrated into the actor's own culture, technical objects serve as anchors for dealing with current situations to specify them, give meaning to them and define them. Step by step, activity actualises a part of the actors' culture as a means of specifying the incessant events and actions in which they are involved.

The individuation process is articulated by the transformations inherent to appropriation (the passage from the own world to the own body and own culture), which may trigger or accompany individuation, and it is produced by the coordination or integration (or concretisation) of the components of activity, according to modalities that remain to be studied (Durand 2013a). Thus, individuation involves appropriation or, in other words, the change in status of concrete or abstract objects in the actor–environment coupling. This means that (a) the individual is not reducible to one being, since he or she is unfinished and relative, and (b) the individual does not contain the whole being: the future is not an alteration in a completed being, but instead is the very mode of being. A direct consequence is that it becomes essential to take the process of appropriating technical objects seriously, especially when the aim is to develop training devices that are themselves technical or to transform work situations into potential training situations (e.g. Poizat et al. 2013a).

6.7.3   Technical Invention and Designing Training Environments

The consequences linked to this conception of technical objects are all the more striking if we acknowledge the general idea that training is neither an art nor a science, but rather a *technology* – that is, a scientific discipline deeply concerned with design issues and requiring considerable reflection about technical objects (and their mode of existence). Accepting this conception assumes that the relationship between science and training can be defined, and this is not the objective of this chapter. Instead, the chapter is itself an expression of the relationship. Accepting this conception also implies that educational environments themselves can be designed as technical objects. On the basis of this assumption, it may be interesting to find the processes of inventing educational technologies on the idea that these technologies show 'family resemblances' or are embedded in similar technical 'lineages'. This means that researchers should question whether or not these technologies are an extension of what already exists and should explore their genesis to determine how they have been transformed at the level of their internal coherence by spotting processes of concretisation and mastery.

'Technical invention is an intellectual activity of anticipation and simulation' (Simondon 2005b, p. 65), and it can be differentiated from notions of creativity and innovation. Invention is characterised by (a) an 'effective and objective reality' that

is based on the state of the art in scientific and technical knowledge (as opposed to creativity, which is subjective and essentially determined by the subject); (b) the 'anticipation of results' that is as adequate as possible but only partial, given that the anticipated novelty does not yet exist (as opposed to creativity, which has no predetermined result and thus leaves ample room for improvisation); and (c) 'real novelty' that has 'never been seen before' (as opposed to innovation, which is subjectively 'novel') (ibid.). Invention and creativity are often confused. Invention occurs more rarely and more randomly, and it does not correspond to the same mental and social processes (Simondon 2005b, 2008). Creativity is achieved by reconfiguring existing components, whereas invention is more than the act of reconfiguring a given object or situation. Invention is an activity that produces something truly remarkable because of a qualitative leap in thinking, and this is most easily identified in the case of technical production. Contrary to production within a context of creativity, a technical invention does not suddenly spring to life. Invention is instead a process of *concretisation*, according to Simondon (1989), the result and the reflection of a human thought turned towards an object which, in turn, presents or submits technical problems that need to be resolved. From Simondon's viewpoint (2005b), the truth of an invention cannot be found in either its origins or its final instance because an invention is 'one part subjectivity, in the subject or inventor, one part objectivity, in the reality invented' (Chateau 2005, p. 15). This vision of invention is closely linked to the conception of a technical object as 'displaying genesis by concretisation'. An invention is the mental and psychological aspect of a mode of existence that is proper to technical objects; the invention is the subjective correlate of its concretisation, its concretising genesis (Simondon 1989). A relationship of analogy, equivalence and reversibility binds the invention of a technical object and its genesis, as well as the subject's point of view ('psychological') and that of the object of the invention ('technological'). It is this primary balance – this articulation between what belongs to the subject and what belongs to the object – that distinguishes invention from creativity or discovery. The invention as the effective activity of a subject–inventor cannot be known apart from the traces that constitute the invented object and its genesis. But at the same time, the technical object is only adequately known when it is considered in terms of its ontogenesis, and thus as the result of the activity of a subject who is inventing a solution to a problem. An illustration of the invention process is given by Goudeaux and Poizat (2013) in their study of the development in professional activity of theatre prop makers.

In a recent study, Leblanc (2012) showed that the developments in digital learning environments can be understood by first understanding the evolution in the design of video-based training, that is to say, by identifying the relationships of intellectual lineage between the various designers of these environments. But, although these environments are the concretisation of an idea expressed by a designer at a given point in time, the design is always drawn from existing technical objects that become functional parts of the new projected object. Thus, it seems more relevant to understand the process of technical invention through the lineages of objects and more accurate to say that new objects owe their existence less to the

projects of the humans who invent them and more to the objects that pre-exist them. More research in this direction is essential to help trainers to better understand their design work.

6.8   Conclusion

Apart from local exceptions, little research efforts are dedicated to the topic of technics in education. Through this chapter, we hope to have inspired greater thought about the following: the inaptness of the Subject–Object dichotomy, the centrality of appropriation as the fundamental transformation in the activity of actors in training, the key role of technics in defining standards and training contents, the heuristic nature of hybridity that makes human beings 'technical beings', Simondon's (1989) foundational intuition that is to understand technical objects needing to be explored, their modes of existence (and not their essence) and how this intuition has been elaborated and extended to other modes of existence, particularly to the mode of existence of individuals in training, who are really just transient forms expressing individuation. Such a wide-ranging genetic interpretation of the relationship between humans and their environment is needed to build future adult education that engages with both social and technological transformations and their appropriation in a perspective that takes into account the omnipresence of individuation.

References

Adé, D., & de Saint-Georges, I. (Eds.). (2010). *Les objets dans la formation Usages, rôles et significations*. Toulouse: Octarès.

Akrich, M. (1992). The De-Scription of technical objects. In W. E. Bijker & J. Law (Eds.), *Shaping technology/building society: Studies in sociotechnical change* (pp. 205–224). Cambridge, MA: MIT Press.

Bartlett, F. C. (1932). *Remembering: A study in experimental and social psychology*. Cambridge: Cambridge University Press.

Beguin, P., & Rabardel, P. (2000). Designing for instrument-mediated activity. *Scandinavian Journal of Information Systems, 12*, 173–190.

Bidet, A., & Macé, M. (2011). S'individuer, s'émanciper, risquer un style (autour de Simondon). *Revue du Mauss, 38*, 269–284.

Bourgine, P., & Stewart, J. (2004). Autopoiesis and cognition. *Artificial Life, 10*, 327–345.

Brown, J. S., Collins, A., & Duguid, P. (1989). Situated cognition and the culture of learning. *Educational Researcher, 18*, 32–42.

Callon, M. (1986). Éléments pour une sociologie de la traduction: la domestication des coquilles Saint-Jacques et des marins-pêcheurs dans la baie de Saint-Brieuc. *L'Année sociologique, 36*, 169–208.

Callon, M. (2001). Actor network theory. In N. Smelser & P. Baltes (Eds.), *International encyclopedia of the social and behavioral sciences* (pp. 62–66). Oxford: Pergamon.

Callon, M., Law, J., & Rip, A. (Eds.). (1986). *Mapping the dynamics of science and technology*. London: Macmillan.

Chaiklin, S., & Lave, J. (Eds.). (1993). *Understanding practice: Perspectives on activity and context*. Cambridge, MA: Cambridge University Press.

Chateau, J.-Y. (2005). L'invention dans les techniques selon Gilbert Simondon. In G. Simondon (Ed.), *L'invention dans les techniques* (pp. 11–72). Paris: Seuil.

Chateau, J.-Y. (2014). Présentation. In G. Simondon (Ed.), *Sur la technique (1953–1983)* (pp. 1–21). Paris: PUF.

Davis, B., & Sumara, D. (1997). Cognition, complexity, and teacher education. *Harvard Educational Review, 67*, 105–125.

De Boever, A., Murray, A., Roffe, J., & Woodward, A. (Eds.). (2012). *Gilbert Simondon: Being and technology*. Edinburgh: Edinburgh University Press.

Durand, M. (2008). Un programme de recherche technologique en formation des adultes. Une approche enactive de l'activité humaine et l'accompagnement de son apprentissage : développement. *Education et Didactique, 2*, 69–93.

Durand, M. (2009). Mutation des relations travail – formation et transformation des savoirs: une perspective enactive en éducation des adultes. *Raisons Educatives, 13*, 185–200.

Durand, M. (2011). Self-constructed activity, work analysis, and occupational training: An approach to learning objects for adults. In P. Jarvis & M. Watts (Eds.), *The Routledge international handbook on learning* (pp. 37–45). London: Routledge.

Durand, M. (2013a). Human activity, social practices and lifelong education: An introduction. *International Journal of Lifelong Education, 32*, 1–13.

Durand, M. (2013b). Construction of dispositions and development of human activity. *International Journal of Lifelong Education, 32*, 39–55.

Durand, M., & Perrin, N. (2014). Dispositions et transformations de l'activité d'une professionnelle débutante. In A. Muller & I. Plazaola Giger (Eds.), *Dispositions à agir, travail et formation* (pp. 14–31). Toulouse: Octarès.

Durand, M., & Poizat, G. (2015). An activity-centred approach to work analysis and the design of vocational training situations. In L. Filliettaz & S. Billett (Eds.), *Francophone perspectives of learning through work: Conceptions, traditions and practices*. Dordrecht: Springer.

Fenwick, T. (2000). Expanding conceptions of experiential learning: A review of the five contemporary perspectives on cognition. *Adult Education Quarterly, 50*, 243–272.

Fenwick, T. (2003). Reclaiming and re-embodying experiential learning through complexity science. *Studies in the Education of Adults, 35*, 123–141.

Fenwick, T. (2009). Responsibility, complexity science and education: Dilemmas and uncertain responses. *Studies in Philosophy and Education, 28*, 101–118.

Fenwick, T. (2010a). Re-thinking the "thing": Sociomaterial approaches to understanding and researching learning in work. *Journal of Workplace Learning, 22*, 104–116.

Fenwick, T. (2010b). (Un)Doing standards in education with actor-network theory. *Journal of Education Policy, 25*, 117–133.

Fenwick, T. (2011a). Reading educational reform with actor network theory: Fluid spaces, otherings, and ambivalences. *Educational Philosophy and Theory, 43*, 114–134.

Fenwick, T. (2011b). Accountability practices in adult education: Insights from actor-network theory. *Studies in the Education of Adults, 42*, 170–185.

Fenwick, T., & Edwards, R. (2010). *Actor-network theory in education*. London: Routledge.

Fenwick, T., & Edwards, R. (2011). Introduction: Reclaiming and renewing actor network theory for educational research. *Educational Philosophy and Theory, 43*, 1–14.

Fenwick, T., Edwards, R., & Sawchuk, P. (2011). *Emerging approaches to educational research: Tracing the socio-material*. London: Routledge.

Folcher, V. (2003). Appropriating artifacts as instruments: When design-for-use meets design-in-use. *Interacting with Computers, 15*, 647–663.

Fox, S. (2005). An actor-network critique of community in higher education: Implications for networked learning. *Studies in Higher Education, 30*, 95–110.

Froese, T. (2012). From adaptive behavior to human cognition: A review of Enaction. *Adaptive Behavior, 20*, 209–221.

Froese, T., & Di Paolo, E. A. (2009). Sociality and the life-mind continuity thesis. *Phenomenology and the Cognitive Sciences, 8*, 439–463.

Giddens, A. (1984). *The constitution of society: Outline of the theory of structuration*. Berkeley: University of California Press.

Goudeaux, A. (2013). Activity development and invention in the making and use of technical objects in the workplace. *International Journal of Lifelong Education, 32*, 56–67.

Goudeaux, A., & Poizat, G. (2013). Conservation, invention, distribution: Three key processes in the development of the professional activity of prop makers for the theater. *Journal of Workplace Learning, 25*, 521–542.

Havelange, V. (2005). De l'outil à la médiation constitutive: pour une réévaluation phénoménologique, biologique et anthropologique de la technique. *Arob@se, 1*, 8–45.

Havelange, V. (2010). The ontological constitution of cognition and the epistemological constitution of cognitive science: Phenomenology, enaction and technology. In J. Stewart, O. Gapenne, & E. Di Paolo (Eds.), *Enaction: Toward a new paradigm for cognitive science* (pp. 335–359). Cambridge, MA: MIT Press.

Holton, D. L. (2010, May). Constructivism + Embodied cognition = Enactivism: Theoretical and practical implications for conceptual change. In *Communication at the AERA annual conference*, Denver, Colorado.

Hutchins, E. (1995). *Cognition in the wild*. Cambridge, MA: MIT Press.

Ingold, T. (2007). Materials against materiality. *Archaeological Dialogues, 14*, 1–16.

Ingold, T. (2010). Bringing things to life: Creative entanglements in a world of materials. *World, 44*, 1–25.

Ingold, T. (2012). Toward an ecology of materials. *Annual Review of Anthropology, 41*, 427–442.

Johri, A. (2011). The socio-materiality of learning practices and implications for the field of learning technology. *Research in Learning Technology, 19*, 207–217.

Kupper, H. (2012). An enactivist view on developing competence in vocational education. In *Proceedings of the ECER VETNET conference*, Cadiz, Spain.

Lakoff, G. (1987). *Women, fire, and dangerous things: What categories reveal about the mind*. Chicago: The University of Chicago Press.

Latour, B. (1987). *Science in action: How to follow scientists and engineers through society*. Cambridge, MA: Harvard University Press.

Latour, B. (1992). Where are the missing masses? The sociology of a few mundane artifacts. In W. E. Bijker & J. Law (Eds.), *Shaping technology/building society: Studies in sociotechnical change* (pp. 225–258). Cambridge, MA: MIT Press.

Latour, B. (1993). *We have never been modern*. Cambridge, MA: Harvard University Press.

Latour, B. (1994). Une sociologie sans objets ? Remarques sur l'interobjectivité. *Sociologie du travail, 36*, 587–607.

Latour, B. (1996). On interobjectivity. *Mind, Culture, and Activity, 3*, 228–245.

Latour, B. (1999). On recalling ANT. *Actor Network Theory and After, 17*, 93–95.

Latour, B. (2005). *Reassembling the social – An introduction to actor-network-theory*. Oxford: Oxford University Press.

Latour, B. (2009). *On the modern cult of the factish gods*. Durham: Duke University Press.

Latour, B. (2013). *An inquiry into modes of existence*. Cambridge, MA: Harvard University Press.

Latour, B., & Woolgar, S. (1979). *Laboratory life: The construction of scientific facts*. Princeton: Princeton University Press.

Lave, J. (1988). *Cognition in practice: Mind, mathematics and culture in everyday life*. Cambridge, MA: Cambridge University Press.

Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. New York: University Park Press.

Leblanc, S. (2012). *Conception d'environnements vidéo numériques de formation: Développement d'un programme de recherche technologique centré sur l'activité dans le domaine de l'é*

ducation. Note de synthèse pour l'obtention d'une Habilitation à Diriger des Recherches, Université Paul Valéry Montpellier 3, France.

Leroi-Gourhan, A. (1993). *Gesture and speech* (Original work published in 1964). Cambridge, MA: MIT Press.

Luhmann, N. (1986). The autopoiesis of social systems. In F. Geyer & J. Van den Zeuwen (Eds.), *Sociocybernetic paradoxes: Observation, control and evolution of self-steering systems* (pp. 172–192). London: Sage.

Maturana, H., & Varela, F. (1980). *Autopoiesis and cognition: The realization of the living*. Boston: Reidel.

Maturana, H. R., & Varela, F. J. (1987). *The tree of knowledge: The biological roots of human understanding*. Boston: Shambhala Publications.

Merleau-Ponty, M. (1962). *Phenomenology of Perception* (trans: Smith, C.). London: Routledge (Original work published 1945).

Nespor, J. (1994). *Knowledge in motion: Space, time and curriculum in undergraduate physics and management*. Philadelphia: Falmer Press.

Nespor, J. (2002). Networks and contexts of reform. *Journal of Educational Change, 3*, 365–382.

Norman, D. (1991). Cognitive artifacts. In J. Carroll (Ed.), *Designing interaction: Psychology at the human-computer interface* (pp. 17–38). Cambridge, MA: Cambridge University Press.

Piaget, J. (1970). *Genetic epistemology*. New York: Columbia University Press.

Piaget, J., & Beth, E. (1961). *Épistémologie mathématique et psychologie: essai sur les relations entre la logique formelle et la pensée réelle*. Paris: PUF.

Poizat, G., Haradji, Y., & Adé, D. (2013a). When design of everyday things meets lifelong learning. . .. *International Journal of Lifelong Education, 32*, 68–79.

Poizat, G., Salini, D., & Durand, M. (2013b). Approche énactive de l'activité humaine, simplexité et conception de formations professionnelles. *Education, Sciences & Society, 4*, 97–112.

Rabardel, P. (1995). *Les hommes et les technologies, approche cognitive des instruments contemporains*. Paris: Armand Colin.

Rabardel, P. (2003). From artefact to instrument. *Interacting with Computers, 15*, 641–645.

Rabardel, P., & Beguin, P. (2005). Instrument mediated activity: From subject development to anthropocentric design. *Theoretical Issues in Ergonomics Science, 6*, 429–461.

Rabardel, P., & Samurçay, R., (2001, March). *Artifact mediation in learning*. Communication presented at, the international symposium organized by the center for activity theory and developmental work research – New challenges to research on learning, University of Helsinki, Finland.

Ria, L. (2009). Concevoir des formations centrées sur l'analyse de l'activité: le cas de l'enseignement en milieux difficiles. In M. Durand & L. Filliettaz (Eds.), *Travail et formation des adultes* (pp. 217–243). Paris: PUF.

Schuh, K. L. (2008). Philosophical perspectives. In J. M. Spector, M. D. Merrill, J. Van Merrienboer, & M. P. Driscoll (Eds.), *Handbook of research on educational communications and technology* (3rd ed., Vol. 2, pp. 67–82). New York: Laurence Erlbaum.

Scribner, S. (1986). Thinking in action: Some characteristics of practical thought. In R. J. Sternberg & R. K. Wagner (Eds.), *Practical intelligence – Nature and origins of competence in the everyday world* (pp. 13–30). Cambridge, MA: Cambridge University.

Simondon, G. (1989). *Du mode d'existence des objets techniques*. Paris: Aubier.

Simondon, G. (2005a). *L'individuation à la lumière des notions de forme et d'information*. Grenoble: Millon.

Simondon, G. (2005b). *L'invention dans les techniques*. Paris: Seuil.

Simondon, G. (2008). *Imagination et invention*. Chatou: La Transparence.

Simondon, G. (2009). The position of the problem of ontogenesis. *PARRHESIA, 7*, 4–16.

Simondon, G. (2011). On the mode of existence of technical objects. *Deleuze Studies, 5*, 407–424.

Sørensen, E. (2007). STS goes to school. *Critical Social Studies, 9*, 15–28.

Sørensen, E. (2009). *The materiality of learning: Technology and knowledge in educational practice*. Cambridge, MA: Cambridge University Press.

Souriau, E. (1943). *Les différents modes d'existence*. Paris: PUF.

Steiner, P. (2010). Philosophie, technologie et cognition: état des lieux et perspectives. Introduction au dossier. *Intellectica, 1*, 7–40.

Stewart, J. (1996). Cognition = Life: Implications for higher-level cognition. *Behavioural Processes, 35*, 311–326.

Stewart, J. (2010). Foundational issues in enaction as a paradigm for cognitive science: From the origin of life to consciousness and writing. In J. Stewart, O. Gapenne, & E. Di Paolo (Eds.), *Enaction: Toward a new paradigm for cognitive science* (pp. 1–31). Cambridge, MA: MIT Press.

Stiegler, B. (1998). *Technics and time 1: The fault of epimetheus*. Stanford: Stanford University Press.

Stiegler, B., & Petit, V. (2013). *Pharmacologie du Front National – Suivi du Vocabulaire d'Ars Industrialis*. Paris: Flamarion.

Stiegler, B., & Rogoff, I. (2010). *Transindividuation*. Available at: http://www.e-flux.com/journal/transindividuation/. Accessed 28 June 2013.

Suchman, L. (1987). *Plans and situated action*. Cambridge: Cambridge University Press.

Theureau, J. (2003). Course-of-action analysis and course-of-action centered design. In E. Hollnagel (Ed.), *Handbook of cognitive task design* (pp. 55–81). Mahwah: Lawrence Erlbaum.

Theureau, J. (2004). *Le cours d'action: la méthode élémentaire*. Toulouse: Octarès.

Theureau, J. (2006). *Le cours d'action: la méthode développée*. Toulouse: Octarès.

Theureau, J. (2011, Juin). *Appropriations 1, 2 & 3*. Séminaire ErgoIDF, Paris, CNAM.

Varela, F. J. (1979). *Principles of biological autonomy*. New York: North Holland/Elsevier.

Vygotsky, L. S. (1978). *Mind in society*. Cambridge, MA: Harvard University Press.

Waltz, S. B. (2006). Nonhumans unbound: Actor-network theory and the reconsideration of "things" in educational foundations. *Educational Foundations, 20*, 51–68.

Zorn, C. D. (2006, May). *Enactivism and education*. Communication at the annual meeting of the Canadian Society for Studies in Education, Toronto, Canada.

Chapter 7
Learning as Transforming Collective Activity Through Dialogical Inquiries

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In the social sciences, learning has often been conceptualized as an activity per se, reflexive in relation to other activities directly oriented toward the practical transformation of situations. This chapter suggests that learning is an intrinsic aspect of every conscious, purposeful activity. Activity is viewed here as dialogical – that is, activity is addressed through and acquires its meaning from the interacting situation – and mediated by different types of semiotic mediations. These mediational means include language, tooling, information systems, procedures, etc. All of these ultimately are referenced to one final mediation: socially recognizable and meaning-making habits. When unpredicted situations disrupt habits, activity can continue through multiple, partly invisible inquiries, leading to the transformation of habits. Activity is dialogical; these habits are involved in dialogical situations; and the inquiries which make their adaptation possible are also dialogical. Learning is, thus, defined here as *the continuous transformation of habits through dialogical inquiries*. Inquiries can be felicitous, meaning that they succeed in reweaving the threads of collective activity. But, they can also be infelicitous, and one key issue is identifying the conditions of felicity. This approach is illustrated by the case of an electricity company. The implementation of an integrated management information system (ERP) served to disrupt existing professional habits without providing the conditions for felicitous inquiries, leading to an organizational crisis. Attempts were then made to restore the conditions for felicitous inquiries, in particular by establishing the required communities of inquiry to reestablish effective professional habits.

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7.1   Learning Is Embedded in Activity and Activity Involves Learning

7.1.1   The Rationalist Mainstream

Research about organizations is pervaded by the dualisms that have dominated Western philosophy ever since Greek antiquity, for example, mind-body, subject-object, thought-action, individual-society, and agency-structure. Dualism also characterizes much research about learning. Mainstream research (contingency theory, Taylorian rationalism, cognitivism) and common managerial practices (e.g., standards and variances, budget control, management by objectives, knowledge management, etc.) objectify knowledge as a repertory of mimetic representations of reality that are accurate or as accurate as possible (i.e., bounded rationality). Learning within this account is defined as the process of building new representations through information processing. As an object of theorizing, human activity was gradually discarded from the mainstream of organization studies in three key steps. First, Adam Smith (2003/1776) in 1776, in his famous analysis of the division of labor and the pin factory, modeled industrial work as a combination of what he called "operations," i.e., segments of activity which can be accurately and completely reproduced. Acting was, thus, separated from learning – operations are stabilized forms of action, devoid of learning dynamics. Second, 140 years later, Taylor (1972/1911) applied Smith's key idea to the practice of manufacturing, by separating design and execution and transforming Smith's *operations* into *standard tasks* that can be unequivocally formalized, objectified, repeated, and quantified through the equation "activity = measurable time."

In the third step, Herbert Simon announced in 1957 (Simon 1957, p. xlvi) that he would "emphasize decisions and their underlying cognitive processes, while de-emphasizing action." He had earlier drawn inspiration from the pragmatists' analysis of human action, citing Dewey's *Human Nature and Conduct* in 1947 (Simon 1947; quoted in Cohen 2007, p. 776). But, he adopted another rationale in 1957: to benefit from the phenomenal development of computer technologies that he himself had pioneered, it was more appropriate to model organizations as information processors than social activity systems. In replacing substantive with procedural rationality, Simon was admitting that real situations are too complex to be accurately represented. He saved what could be saved in the rationalist view of learning, by shifting the learning process from objectifying/optimizing *action* to objectifying/improving *thought about action*. In the cognitivist perspective, subjects learn as they follow reasoning procedures that allow them to determine effective courses of action in complex and unpredictable situations. An information-based paradigm of organizations, focused on decision-making, information processing, and cognition, thus came to prevail over activity-based views of organization.

Such objectifying views of learning try to reconcile individualism (i.e., learning and knowledge as attributes of individuals) with holism (i.e., learning and

knowledge as attributes of social organizations). Simon's representations are logical (i.e., computable) models that can equally well be based on individual physiological substrates (e.g., human brains) or material substrates (e.g., computers) that can be appropriated by organizations. Learning then appears as a cognitive process which can be subjective (acquiring new mental representations) as well as technological and social (developing artificial systems).

7.1.2 Activity Is Creative

The representational paradigm proved useful to analyze ordinary situations but insufficient to understand innovation, improvisation, crisis management, and all situations involving intense situated learning. In view of such limitations, some scholars have stressed that learning is embedded in socially situated action, directed by goals (Billett 1996, 1998, 2001). Their analysis converges with pragmatist theories of action that question the rationalist separation between repetitive and creative action. From their perspective, human action is *intrinsically creative*, and human creativity is *intrinsically rooted in activity* (Dewey 1916/2005; Joas 1996). This implies that practice and experience play a key role in learning processes. However, it is suggested here that practice and experience should not be understood as the subjective engagement of individuals, but as inherently social and rooted in organized collective activity.

7.2 Practice and Practice-Based Learning Are Not Individual

7.2.1 Practice and Thought Are Dialogical

It is difficult to understand the dynamics of continuous learning if analysis focuses solely on individuals' subjective engagement in activity. As stressed by the pragmatist philosophers Peirce (1979) and Mead (1934) at the beginning of the twentieth century, action and learning are not subjective, but intrinsically dialogical. Thought is always addressed, even in situations of apparently lone meditation, when the Self exposes ideas and acts to the judgment of the "generalized other" (Mead 1934–2006) or the socialized "me": "The 'I' addresses the 'me': *Meditation is dialogue*" (Peirce 1979, pp. 258–259). The theory of dialogism was later developed by Bakhtin (1981), who argues that the visible author of thought and discourse actually shares authorship with multiple indirect authors, that is, the actor to whom one responds, the actor whose future answer is anticipated, the past actors whose experience inspires present discourses, etc. The way of doing things depends not only on who does but also on the addressees of action. Learning, too, is dialogical:

we learn through responses to others and through others' responses. For Vygotsky, the starting point of thought development in the child's learning process is "the social, collective activity of the child" (Vygotsky 1986, p. 228). In work situations, activity is a response and a call to other activities. Its meaning is relational: "in ordinary everyday behavior, in what sense can we examine a talking unless we bring a hearing along with it into account? Or a writing without a reading? Or a buying without a selling?" (Dewey and Bentley 2008, p. 126). The creative or adaptive process of learning results from the permanent, rebounding ping-pong of collective activity, be it called "transaction" (Dewey and Bentley 2008), "circular response" (Follett 1924/1995), "conversation of gestures" (Mead 1934), or "dialogue" (Bakhtin 1981), in which the otherness of others provides an ongoing source of learning through self-distance and reflexivity (Tsoukas 2009).

7.2.2   Practice Has a Social Motive

As stressed by Billett (1996), goals play an important role in learning. But the notion of "goal" is ambiguous. For example, in a railway company, computer engineers are in charge of maintaining the software that is used to manage counter reservations. When achieving this task, do they assist the counter agents or the travelers who want to make reservations? Leontiev (1959–1981) explains the distinction between the immediate *goal* and the final *motive* of action through the example of a tribe out hunting. The beaters shout to make game flee (i.e., immediate goal), so that the hunters can kill animals (i.e., intermediate goal) and the tribe can have food (i.e., final social motive). The more complex the division of labor, the greater the distance between goal and motive. Ultimately, the sense of work is linked with the motive: the beaters can develop sophisticated shouting techniques; however, the sense of their activity rests upon the necessity of food.

7.2.3   Practice Is Socially Organized

This chapter discusses goals and motives, not as psychological intentions, but as social purposes. To meet social motives, inquiring, learning, and acting are embedded in organizations and involve organizational artifacts. The tribal hunt involves division of labor (e.g., beaters, hunters, cooks), tooling (e.g., bows, arrows, drums, etc.), rules, etc. Practices are socially organized, as Lave (1988) reminds us: "What we call cognition is in fact a complex social phenomenon. 'Cognition' observed in everyday practice is distributed – stretched over, not divided among – mind, body, activity and *culturally organized settings*" (1988: 1, quoted by Star 1998, p. 297). Practices are organized and take place in an organization, and, reciprocally, organization shows *within* practices.

To sum up, practice plays a key role in learning processes. It is not strictly subjective and individual, but it is dialogical, socially organized and it targets socially defined motives. Let us now explore the relationship between practice and learning.

7.3   Learning Is a Dialogical Inquiry About Habits

7.3.1   From Activity to Practice: Mediation Through Triadic Signs

Learning is situated, but what does "situation" mean? Dualism tends to describe organizational situations as objective entities, enforced on actors through their physical and preperceptual necessity. In reality, situations are always accessed through semiotic mediations: accounting figures, technical records, coworker's facial expressions, customer's discourse, control screens, etc. Past experience, generic classes of situations, and social conventions are attached to those mediations (Lorino 2001). For example, the accounting system was designed for a certain type of organization, and the control screen was designed on the basis of a specific model of user practices. Mediations connect the singular situation with social and historical experience. They help to define and delineate what is perceived as the "situation," its spatial and temporal boundaries, its participants, and its prominent elements. They precondition the potential perceptions and interpretations. Actors never experience reality as a blank page.

So, how do the respective concepts of "activity" and "practice" relate to the situation? Are they observed, unique behaviors, or social archetypes, "genres" in the Bakhtinian vocabulary (Bakhtin 1986)? Organization scholars hesitate between two views of "practice," either as a social scheme of action – for example, a professional practice – or as a situated and singular occurrence, what people actually do, here and now. Some authors make this distinction explicit, by using different qualifiers such as "*espoused* practice" and "*actual* practice" (Brown and Duguid 1991, p. 41) or "*ostensive* routine" and "*performative* routine" (Feldman and Pentland 2003). However, such dichotomies echo the rationalist "representation" versus "reality" dualism. Schatzki (2002, 2005) characterizes the relationship between activity and practice as a hierarchical *inclusion*, "human activities are inherently *part of* social practices" (Schatzki 2005, p. 468), while other authors (Vygotsky 1986; Clot 2008; Lorino 2005) instead view social practices as generic artifacts that *mediate*, in a semiotic sense (Eco 1985, p. 52), rather than *contain,* situated activity.

What does "mediated" (Wertsch 2007, pp. 178–181) mean here? To be meaningful, situated singular acts must be connected with socially derived generic meanings, based on social experience, through systems of signs such as language, accounting, tooling, etc. As soon as an act refers to something other than the

immediate evidence of a physical transformation of the situation, here and now, as soon as it can be recognized by social beings as *meaning* something, pointing, for example, to antecedents (what happened before?), or to an expected future (what comes next?), or to past similar occurrences (that reminds me of. . .), or to generic uses of a tool (using accounting figures to control budget variances), then the act ceases to be a singular transformation of the world and becomes a sign pointing to classes of meaning. Learning is based on this characterization of singular acts as signs of generic classes. The semiotic mediation (Peirce 1992; Vygotsky 1986) of action is not a contingent external appendix to normal activity, but an intrinsic component of all conscious activity. It links the "meaning (*znachenie*), which reflects a general concept, with a sense (*smysl*), which depends on the context" (Kozulin 1986, p. xvii).

Distinct from Saussure's (1983) definition of a sign as a static signifier/signified dyad, Peirce's (1992) triadic theory of interpretation views the sign as a thing that makes something point to something else, "A *makes* O mean B," leading to the dynamic process of a cascading *semiosis*, moving from O-A to O-B and then to O-C, etc. (Peirce 1931–1958; Eco 1988, 1992). It is thus the constitutive characteristic of a triadic sign to belong simultaneously to a unique situation and to cultural and social classes of meaning, "to convey an *idea* about a *thing*" (Peirce 1998, p. 4), a generic idea about a singular thing: "in addition to denoting objects, every sign signifies characters or qualities. We have a direct knowledge of real objects in every experiential reaction. . . These are directly hic et nunc. But we extend the category and speak of numberless real objects with which we are not in direct reaction" (Peirce 1998; Lorino 2014).

The pragmatist semiotic mediation does not express static classifications, as logical inferences do ("Socrates is a man. . ." = "Socrates belongs to the class of men"), but the dynamic transformation of the situation. If my neighbor starts cutting wood, I understand the situation as "cut wood = log," "cut wood = fire," and "cut wood = heating in winter." In these relationships, the sign "=" does not reflect static equivalences ("log" belongs to the general class of "fuel for the fireplace," "fuel for the fireplace" to the class of "heating resources"), but *active* constructions: "cutting logs" makes "this piece of wood" mean "log," it makes "this piece of wood" mean "fire," etc. The action of cutting triggers meaning and new actions (I can offer to help my neighbor, I can decide to cut wood too, etc.). Maybe, before this act of cutting, no one would have thought of *this* branch as a log.

Signs are anything which introduces meaning into the situation: gestures, facial expressions, words, tone of voice, silences, tools, the strange sound of the engine, and the tense expression of my colleague. Mediation is the core of learning. It extends the temporal and spatial boundaries of the perceptible situation (Bakhtin 1981). It enacts social experience in this particular situation, here and now; it transforms situated unique activity into thinkable, recordable, debatable, and transformable issues.

7.3.2   Habits: The Language of Activity

Processes that are socially meaningful can involve a variety of signs, but they generally refer to some final system of signs – a core language. For example, conversation can involve gestures, and facial expressions, but generally give the central role to natural language. Financial management is based on the accounting language. Hence, the question: does activity involve a specific core language? Is there a language of activity, i.e., socially shared segments of meaning, cut out from the continuum of action (Eco 1988), to transform singular acts into meaningful forms of expression?

"Socially shared segments of meaningful activity," this is the very definition of "habits" in the pragmatist theory of habits (Peirce 1931–1958, 1992; Dewey 1938–1980). Habits are experience-based classes of acts that become, through cultural familiarity, "significant gestures" (Mead 1934, p. 47): "gestures become significant symbols when they implicitly arouse in the individual making them the same responses which they explicitly arouse in other individuals." Significant gestures are acts arousing acts, through habits (Dewey 1922/1957). For example, I see the bus driver moving his arms and eyes in a certain way, and I think "he is *driving*" – there is a generic class of action called "driving" in my culture, which makes some type of activity recognizable and nameable.

Peirce defined *habits* as the "ultimate intellectual interpretant" (Peirce 1998, p. 430), meaning that ultimately, any form of interpretation, for example, the usual meaning of a word or the normal use of a tool, involves habits. In this view, action – not discourse – is the *ultima ratio* of experience (Cohen 2007). As suggested by Peirce (1998), "the real and living logical conclusion *is* habit; the verbal formulation merely expresses it" (p. 418). Habits connect the singularity of any particular action with socially built classes of meaning: "the habits must be known by experience which however exhibits singulars only (...)." Habits introduce the past and the expected future, the final purpose, and other activities taking place elsewhere into the activity in progress. For example, when my neighbor cuts wood, due to the habitual nature of this action, I anticipate future steps (e.g., logs will be stored in the basement, they will be used to make fire), I build the past (e.g., for the last years, every year at the same period, my neighbor cut wood for winter; a few weeks ago, he felled a tree in his garden), I connect this action with other actions (e.g., his wife is emptying and cleaning the basement), etc. Habits make activity recognizable and expectable, an object of communication and critique, of memory and transformation, inhabited by history and society. Like words in Bakhtin's analysis of discourse, habits "have the taste of a profession, a genre, a tendency, a party, a particular work, a particular person, a generation, an age group, the day and hour" (Bakhtin 1981, p. 293). A habit is neither effected activity, "a performative routine," nor an artifact representing activity, "an ostensive routine," like scripts or procedures. It is *dispositional*, "a disposition to act in certain ways on certain conditions" (Peirce 1992, pp. 549–550). Habits can be combined through the syntactic rules of organized activity: coordinating and synchronizing rules (e.g.,

"designing and testing must be synchronized"), normal sequences (e.g., "authorizing takes place before paying"), functional complementarities (e.g., "taking the customer's order" and "scheduling delivery" are complementary), or mutual exclusions (e.g., "purchasing" and "auditing purchases" are not compatible).

7.3.3 Learning Is a Continuous Inquiry About Habits

Eco (1985) stresses that texts are always incomplete – hence the necessary active cooperation of the reader in building the meaning of the text. Just as any text weaves words with blank spaces of "non-told," any activity weaves acts with blank spaces of "non-acted," requiring a specific effort of participants in the situation to actively fill the blanks, make sense, and act in their turn. Through this effort, actors deal with the situation. Like the meaning of speech, the meaning of activity fundamentally depends on the situation (Suchman 1987; Follett 1925–2003). Situations (Suchman 1987; Dewey 1938/1980) are partly uncontrollable and uncertain, and they can defeat habits. In such cases, the course of action is disrupted and the meaning of the situation must be rebuilt, to adapt or recreate habits. This type of social process, triggered by doubt and the difficulty of carrying on acting in the habitual way, corresponds to what pragmatists Peirce (1992) and Dewey (1938/ 1980) and ethnomethodology (Garfinkel 1967) called "inquiry." The inquiry faces a disruptive situation and aims at habit adaptation. It closely interlaces narrative thought, to build a hypothesis defined as a plausible narrative which makes the situation intelligible; logical reasoning, to deduce testable propositions from hypotheses; and experimental action, to test propositions empirically. The inquiry is dialogical: it does not involve a single voice, but multiple voices responding to each other, in the continuous search for meaning. The dialogue outcomes are not predictable for any of the participants. Therefore, unpredictable novelty can emerge from the dialogical exchange. When felicitous, the inquiry generates new habits, which will be tentatively, fallibly activated in the future course of experience.

In summary, habits continuously emerge from activity-focused inquiries, and inquiries are continuously triggered by the need to adapt or reinvent habits in new classes of situations. The learning process can thus be defined as the dialogical and recursive combination of habits and situated inquiries. It is often invisible, since habits are perceived by actors as obvious, and most inquiries are informal and little verbalized. The meaning of collective activity shapes and evolves through the ongoing recursion between inquiries and habits, as described by Mary Parker Follett (1924/1951, p. 38) when reporting her experience of participating in a wage board: "we had to ask each week the changes in the objective situation (of wages and employment); those changes had been brought about by the trend of our deliberations, but also our deliberations were very much affected by these changes. This reciprocal influence, this evolving situation, (is) fundamental for politics, economics and jurisprudence."

7.3.4 Conditions for Felicity in the Learning Inquiry

The philosopher of language Austin (1962) analyzed discourse and utterances. He rejected the notion of "truth" as a correspondence between an utterance and the real situation it describes. He rather analyzed under what conditions an utterance can be "felicitous," i.e., can achieve its practical goals. Similarly the felicity conditions of learning inquiries can be defined as the conditions under which an inquiry can adapt or reinvent habits and allow the continuation of organizational activity. The felicity conditions are mainly organizational, since the inquiring process is organizational. They can be classified as follows:

- *Psychological* conditions (e.g., Austin's "preparatory preconditions"): participants believe that habit adaptation requires a collective inquiry and that the inquiry can be felicitous; they are ready to submit their own practices to examination by others.
- *Ethical* and *political* conditions (e.g., Austin's "sincerity condition"): the inquirers are honestly willing to inquire; they really want to keep on acting together; they really want the inquiry to lead to effective outputs; they are not trying to manipulate the process for strategic reasons; all participants can voice their opinions; the inquiry is not primarily aimed at accusing individuals.
- *Cognitive* conditions (e.g., Austin's "complete execution"): the inquirers have command of a common language which makes mutual understanding feasible.
- *Managerial* conditions (e.g., Austin's "conventionality of procedure" and "appropriate circumstances"): the inquirers are given the necessary means to inquire (time, information, tooling, power), for example, freedom to imagine and explore new solutions, a fairly wide margin of interpretation and room for maneuver; the inquiring procedures are accepted by participants who ensure some level of mutual trust to define and implement together the inquiring rules, roles, goals, and tools.
- Constitution of a *community of inquiry* (e.g., Austin's "appropriate participants"): the inquirers build a community of inquiry (Dewey 1902; 1916–2005; 1938–1980; Shields 2003), which is more than an ordinary working group, and incorporate some form of solidarity, involving the appropriate participants.

To summarize, learning is based on collective inquiries, and the development of inquiring practices requires specific organizational characteristics such as trust, freedom of expression, empowerment of field actors, and community building.

7.3.5 Learning Involves a Process of Valuation Framed by a Narrative Framework

To develop activity, the learning inquiry continuously requires evaluative judgments, responding to the question: "is *this* transformation of practices likely to

achieve fulfillment of our social motives?" The very concept of "learning" assumes some form of evaluative judgment; "changing practice" is not always "learning" – the distinction between "learning" and "changing without learning" is not given; it is contingent on evaluative judgments.

Such evaluative judgments are complex social judgments, which cannot be reduced to automatic measurement of physical data, such as the number of worked hours or the number of wheat kilos produced per square meter. They are a living social practice, embedded in the inquiring process. Dewey (1915) defined this sort of judgment as "valuation," to differentiate it from "evaluation" and "value." Valuation attributes values to something, in the perspective of some purpose, while evaluation compares distinct objects by placing them along a common numerical scale. Dewey shifts the "subject matter from value (or values) to valuation, explicitly considered as an action" (Muniesa 2012, p. 25). In his "valuation" approach, Dewey (1915) tries to overcome the dualist controversy between objective and subjective definitions of value. On one hand, values are not things; only valuing processes can give things the quality of a value (Dewey 1915, p. 516). But on the other hand, Dewey does not conclude from this critique of realistic approaches "that value is subjective, but that it is practical. The situation in which judgment of value is required is not mental, much less fanciful. It is existential, but it exists *as* something whose good or value resides (first) in something to be attained in action and (secondly) whose value depends upon *judgment on what to do*. Value is 'objective,' but it is such in an active or practical situation, not apart from it." (Dewey 1915, p. 516, my emphasis, quoted by Muniesa 2012).

The valuation process is the compass which orients the inquiry of practices toward better accomplishment of social motives. This process requires some kind of narrative thread to make sense of collective activity (Lorino and Tricard 2012): what kind of story does collective activity usually tell the actors themselves ("what story are we involved in by our action?") or other potential audiences? The narrative frame and the valuation process are closely linked: valuation tacitly refers to the archetypical narrative of activity.

To sum up, situated activity is mediated by habits, i.e., socially shared segments of meaningful activity, which link a singular situation of action with cultural and social meanings, the past and anticipated future of the activity in progress, its spatially distant elements. When habits fail to produce the expected results, an inquiry is triggered to adapt or reinvent them. Learning then appears as the continuous recursion between habits and inquiries, embedded in organizational activity. Learning inquiries can be felicitous, meaning that they allow the adaptation of habits and the effective continuation of activity, or infelicitous. The conditions of felicity are psychological, ethical, political, cognitive, and managerial. In particular, a key feature is the constitution of adequate communities of inquiry. We can now illustrate this view of learning processes with a case study.

7.4 EDF Case Study: Communities of Inquiry in Practice-Based Learning

7.4.1 The Context: SAP at EDF

In 2004–2005, when the case study takes place, EDF (Electricité de France) was a state-owned company that (1) produced electricity in nuclear, hydraulic, and thermical plants; (2) transported, sold, and delivered it to customers; and (3) designed and manufactured electricity infrastructures. It had 42 million clients. Sales amounted to 46,9 MM€ in 2004. It employed 161,300 employees. The production capacity of 125 Gwe (74 % nuclear) made it the first producer in Europe. All nuclear reactors were based upon the same technology (i.e., pressurized water), with a high level of standardization.

EDF faced major strategic changes. Until 2005, it was a regulated public service, 100 % owned by the French State. In 2005, it was transformed into a public incorporated company. The majority of shares were still owned by the French state, but a minority had been sold on the financial market. Traditionally, EDF culture had been based on the notion of public interest, technical and economic rationality, nuclear safety as a conspicuous achievement, and the social dialogue with powerful trade unions. The new strategic situation imposed a different agenda. Within deregulated markets, it was necessary to achieve sufficient profits to fund the international development of the company, the expensive dismantling of old nuclear stations, and the development of new types of reactors. Because of the fairly high cost level of the company, cost cutting became a priority, particularly in administrative functions.

The Production and Engineering Branch (PEB) played a key role, as it controlled core nuclear technologies, it was the dominant investor within the group, and it faced the delicate challenge of nuclear dismantling and safety. PEB had defined its own priorities: cost cutting in support functions (e.g., accounting, human resources, information systems), cost cutting in procurements (e.g., spare parts, equipment, and subcontracted maintenance work), and more flexible management practices.

In 2004, EDF Group had started implementing SAP, an ERP (enterprise resource planning) software throughout the company. An ERP system is an integrated management information system, with functional modules (e.g., accounting, purchase management, sales management, etc.) and a shared data base system. The project was ambitious: with several thousands of users, it was one of the biggest SAP platforms in Europe. It was implemented as an integrated solution, covering accounting, control, purchasing and procurements, inventory management, time and activity management, and sales, branch by branch. It was decided to start with PEB. A strong project team had been constituted. It was decided to impose an 80 % standardized version. This decision logically entailed the need to redesign organization and practices (e.g., cross-functional processes) in a significant way, to make them compatible with the standard version of SAP. SAP was seen as a major vector

of change, the opportunity to rationalize organizational practices. A management master plan was defined and imposed to all branches.

The purchasing process of PEB was studied in 2005–2006 through semistructured interviews with approximately 70 persons, analysis of some 100 documents (e.g., minutes of meetings, reports, instructions, procedures, training supports, methodological tools, action plans, etc.), and four meetings of the steering committee, involving two senior managers (i.e., director of PEB Support Services Division and the controller of the corporate purchasing department). EDF employees (i.e., maintenance technicians, maintenance managers, regional and corporate accountants, unit procurement managers, regional and national purchasers, SAP project team members) were interviewed on their working sites (i.e., nuclear plant, hydraulic units, regional offices in Lyon, Paris corporate headquarters). SAP had already been working for one year in PEB purchasing area.

The purchasing process comprised buying parts, equipment, and subcontracted services to maintain power stations, particularly nuclear reactors. It was one of the most important SAP functions at PEB. EDF procurements, excluding fuel (i.e., oil, gas, uranium), amounted to some 7 MM€. A subproject team was established for the purchasing-procurement process. The purchasing process involved three main functional and professional roles: maintenance technicians, purchasers, and accountants.

7.4.2 Organizational Change Meets Difficulties

Before the ERP system was introduced, the maintenance technician would write a purchasing requirement (PR) defining the type of service to purchase in technical terms (e.g., "nondestructive inspection of the tubes of a steam generator"), specifying a site, a time schedule, and a budget. An on-site purchaser would then translate the PR into a call to tender and negotiate a contract on that basis with the selected supplier. The technician briefed the supplier's team, supervised their intervention, and formally accepted the delivered service phase by phase, till the final acceptance. Then payment would be authorized by a maintenance manager. The accountant received and checked the supplier's successive invoices, comparing them with the technician's acceptance documents and the purchaser's contract, and paid the invoices.

EDF's management seized the opportunity of the new system's introduction to reengineer the purchasing process, with three objectives:

- To achieve economies of scale by limiting the number of suppliers, centralizing their selection, developing long-term industrial partnerships, and negotiating three-year "master agreements" with some of them; these master agreements determined the technical characteristics of goods or services to supply, the normal scheduling for each type of service, its segmentation into phases, and intermediate deliverables and payments.

- To reduce administrative costs by having basic purchasing and accounting operations (selection of a master agreement, purchased item code, and account code) carried out by maintenance technicians from the very beginning of the operation; this would free purchasers from routine administrative tasks (coding the contract and the purchased item) and turn them into industrial strategists for expert tasks such as designing the master agreements and managing relations with suppliers; it would also free the accountants from routine tasks such as coding the accounting transaction, turning them into experts controlling accounting, and optimizing cash flow through payment scheduling.
- The number of purchasers and accountants was thus expected to decrease and their average qualification level to increase; as a result, it was decided that they would leave the production sites and be relocated to regional headquarters.

In fact, this type of so-called process reengineering amounts to a complete redesign of collective and individual activity. Considering the extent of these changes, a change management program was implemented. It was based on preliminary impact studies covering four issues (culture, procedures, competences, tools), site by site and function by function, trying to answer such questions as: "how will the new system impact the work methods and competences of the automation maintenance technicians at Civaux nuclear power station?" Workers attended training sessions focusing on utilization of the new software and the knowledge directly required to accomplish new tasks. For example, maintenance technicians attended a basic accounting course, to understand the differences between operational expenses and capital expenditure, purchasing and leasing, and VAT regimes, as all these criteria would affect their new task of selecting accounting codes for cost allocation. Finally, online assistance tools were provided – e.g., a guide to account code selection, an intranet interface with the information system designed to guide technicians' transactions step by step. However, the project ran into serious difficulties. There were no productivity gains, and psychological and social tensions rose.

Both the accountants and the technicians complained that the master agreements were difficult to use because the purchasers who designed them were not familiar enough with either technical operations or accounting rules. The purchasers often divided purchased services into partial components that were neither controllable from a technical point of view nor recognizable (in accounting terms) from a financial point of view. The purchasers and the accountants complained that the technicians frequently made mistakes in selecting master agreements and accounting codes, which generated a heavy workload of "undoing" and "redoing" at the end of the process. The accountants complained that the technicians often failed to complete the delivery acceptances in time. As a result, they received a large number of supplier invoices that they could not pay because the technicians had not yet approved the corresponding services, and they had to deal with complaints from suppliers. But the technicians perceived their new task of formally accepting delivery from not only a technical but also a financial point of view (they had to give the green light for payment) as a disproportionate responsibility in an area that was unfamiliar to them. They claimed that they could never get any help from the

accountants to select the right account or from the purchasers to select the right contract. 50 % of the technicians claimed they were unable to do the elementary accounting and purchasing transactions required of them, though EDF's management were convinced their new tasks were simple and the training had prepared them adequately.

It seems that three dimensions had been underestimated by the corporate leaders: (1) habits point to professional genres and identities, (2) invisible inquiries allow the ongoing adaptation of habits, and (3) habits combine into sensemaking cross-functional narratives. These are now discussed in turn.

7.4.3   Habits Point to Professional Genres

Firstly, activities, through habits, were linked to "professional genres" corresponding to a specific history and a strong identity. What technicians did or did not do when they completed the purchase request (PR) raised issues not only of competence and technical feasibility but also of identity. Many of them considered it important *not to* handle basic accounting or sales data, despite being quite straightforward. By refusing to handle those data, the technicians were implicitly declaring that they were not "bureaucrats," but experts who dedicated most of their time to technical expertise. In the new organization, the technicians often made mistakes in their choice of accounting and purchasing codes. They felt suddenly downgraded from a position as trusted technical experts to a position as untrusted managerial beginners. Senior managers had not realized that simple acts, e.g., selecting an accounting code, could seem fairly straightforward from an operational point of view, but prove much more complex from a symbolic point of view, as signs of social identities.

Meanwhile, their accountant colleagues were traditionally the only holders of the inscrutable language of accounting. By declaring their ignorance of accounting, the technicians were contributing to a definition of the "accountants' genre" as the class of habits handling that language. But, the accountants were now being ordered to abandon the monopoly on their exclusive language.

For purchasers, bargaining with suppliers' sales staff for specific contracts meant that they would provide timely subcontracted services at a competitive price. It also re-demonstrated every day that the purchasers were tough negotiators who could be proud of their bargaining skills. There was a clear role and identity: a good purchaser had to be a tough negotiator. They were now being asked to accomplish more abstract tasks, such as modeling the division of a generic service – e.g., the ultrasonic inspection of a reactor vessel – into partial components, in ways that would allow technicians to control and accept the operational phases of the intervention and the accountant to optimize partial payments from a cash flow point of view. The purchaser was also now expected to acquire strategic expertise about the markets for purchased services, in order to optimize long-term industrial strategy. However interesting these new tasks might be, they had little to do with tough

negotiations; they even tacitly suggested that arm-twisting on individual contracts might well be counterproductive for the development of long-lasting industrial partnerships. In the new perspective, a tough negotiator could become a bad purchaser.

7.4.4 Habits Point to Invisible Inquiries

Secondly, in the previous organization, permanent and often invisible cross-functional inquiries took place to fill the blanks in the formal processes and adapt them to specific situations. When the technicians wrote their PR, they knew that the purpose of it was to explain the technical characteristics of the service to the purchasers and accountants. More or less consciously, she/he designed the PR to address this need, providing the data required to negotiate a contract and select an account in a vocabulary accessible to non-technicians. From time to time, the purchaser needed some more precise information about the technical context of the operation to help with selecting a supplier and writing a contract, e.g., are there other actions in process in the vicinity, calling for specific safety precautions to control the risks of co-activity? Is the service taking place after a serious incident, making some continuity in the selection of operators desirable? The accountant, too, sometimes needed more information from the technician to define the accounting transaction, e.g., is the purchase for normal maintenance, therefore, to be treated as an expense or heavy maintenance to be treated as an investment? Most inquiries were informal and initiated by purchasers or accountants seeking additional technical data from the technicians, and they made sure that their requests could be understood by technicians. Because the technician, the purchaser, and the accountant worked on the same site and had lunch in the same cafeteria, there were many opportunities to meet, talk, and carry on their inquiries.

The new organization put technicians in charge of new administrative tasks, and they often needed to conduct micro-inquiries about the purchasing or accounting context, to select the right master agreement and the right account. But such inquiries were difficult, because the technician was not used to asking precise, intelligible questions concerning purchasing or accounting issues. The inquiry of the past, seeking technical information from an accounting or purchasing perspective, had been replaced by an inquiry seeking accounting and purchasing information from a technical perspective. The roles had changed: the former "questioners" became the "answerers" and vice versa. Furthermore, the purchasers and accountants were now in distant offices, and the technician no longer knew them personally, not even by name. The space-time frame of the inquiry had also changed: spatial proximity was no longer guaranteed; the inquiry now had to take place at the very beginning of the purchasing process. The tools had been transformed too, with introduction of the ERP system and the intranet interface. Actors had been trained to follow new technical procedures, but they had lost their *inquiring habits*: who to call, what questions to ask, how to word them, and where and when inquiring.

7.4.5   Habits Point to Motive-Oriented Cross-Functional Combination of Habits

Thirdly, the value-attribution process, the "valuation," of the collective purchasing activity was traditionally shaped by a tacit shared narrative. Purchasing was perceived as an important but second-tier support process: purchasing to maintain equipment, i.e., the collective activity of purchasing to support the collective activity of maintaining, and maintaining equipment to produce electricity effectively and safely, i.e., the collective activity of maintaining to support the collective activity of producing electricity. Purchasing was primarily considered as an operational issue (i.e., support for operations): get the right service in the right time, to fulfill a one-shot need for a specific, single maintenance intervention. Secondarily, there had to be efficient arm-twisting negotiation to get the lowest prices possible for a given service. Purchasing was then characterized by (1) spatial and political decentralization (i.e., it was a local story, taking place on production sites, embodied in the daily encounters between local actors); (2) hierarchical coordination – accountants, technicians, and purchasers had the same boss; and (3) robust functional roles with clear-cut boundaries, anchored in traditional professions (i.e., everybody knew what a technician or a purchaser was and was not). In the new organization, actors (technicians, purchasers, and accountants) were suddenly being ordered to participate in two *new narratives* that did not easily make sense for them and thus did not easily enable them *to value their action*: (1) the long-range definition and implementation of an industrial strategy with long-term suppliers/ partners and (2) the optimization of corporate cash flows through payment schedules. Many actors reported being left out of the story and did not understand the new roles assigned to them or what "doing a good job" now meant.

These three dimensions of meaning (i.e., professional genres, cross-functional inquiries, and the cross-functional narrative frame of sensemaking and valuation) are connected. Professional genres correspond to generic characters in the narratives. In the same way as the meaning of a fairy tale or a chivalric romance is linked with archetypical characters (e.g., the fairy, the princess, the knight), the narrative combination of habits is linked with professional genres, which establish stable aspects of the narrative – a fairy is always magic, a purchaser is a tough negotiator, an accountant can understand impenetrable accounting language, a technician is a respected technical expert who does not waste time on administrative tasks. In the blanks left by genres, singular situations impose variations and adaptive inquiries, which respond to inquiring habits, e.g., a technician answers purchasers' and accountants' requests, not the other way around. It is, therefore, difficult if not impossible to understand collective activity and/or transform it without taking into account these three interdependent dimensions simultaneously: what new narrative thread, what new professional genres, and what new types of inquiries?

This transformation involves tools too. Significantly, the impact studies had been conducted on a local, functional basis. The intranet interface was exclusively focused on the technician's individual work and was designed to guide technicians

step by step in their new tasks, so that it was interpreted by many of them as "a tool for idiots." The new type of cross-functional collective activity and its narrative meaning were never simulated, rehearsed, or debated in its cross-functional configuration. Training sessions did not target the cross-professional community involved in the purchasing process – i.e., the community of inquiry of the activity system – but individuals restricted to the confines of their professional craft.

7.5 Discussion: The Key Role of the Different Types of Communities of Inquiry

7.5.1 Two Types of Community of Inquiry

In general, there are two types of communities of inquiry in organizations, corresponding to two distinct views of collective practice. On the one hand, a *common* practice is a practice that is partially shared by the community members. It is what defines some common "genre," for example, a functional or professional genre. In this perspective, "communities of practice" – in this case, "communities of technicians," "communities of purchasers," and "communities of accountants" – can analyze common practices to transform them. On the other hand, a *conjoint* practice is a set of individual practices that are different but, due to division of labor, complete each other to form a cross-functional process leading to fulfillment of some final socially meaningful motive. In this perspective, "communities of process" whose members belong to different professional genres – in this case, the "community of the purchasing process" associating technicians, purchasers, and accountants – can assess and reengineer a cross-functional activity system. It must develop a heterological (i.e., plurality of professional genres: Todorov (1984)) dialogue. In both types of communities, each actor's practice is a potential challenge to other actors' practices and feeds the learning inquiry. In the case of communities of practice, the challenge is about *differing* on the basis of *sharing* (identifying different ways, different personal styles, to accomplish the same type of task), while in the case of communities of process, it is about *sharing* in spite of *differing* (harmonizing the different professional contributions to the same collective process). In both cases, the specific challenge may lead to learning.

7.5.2 Communities of Practice, Professional Genres, and Mechanical Solidarity

Some activity theoreticians (Clot 2005; Kloetzer et al. 2015) stress the importance of professional genres to transform collective activity. A "genre" is characterized by a shared set of acting and thinking habits, techniques, symbols, and values. It

mediates singular work situations by linking them with social and cultural significations. Its members refer to the history of their profession, past accomplishments, and potential improvements. Professional genres underlie communities of practice. Lave and Wenger (1991) define communities of practice (Wenger et Snyder 2000; Wenger et al. 2002) as groups of people who share a preoccupation for something they learn to do better by interacting on a regular basis. They stress three characteristics of communities of practice:

1. The relationship between the members of the community is based on a common practice; they have a similar task to accomplish and they can discuss it together.
2. The relationship builds up from peer to peer; even if some participants have more experience than others, they are equal in the relationship.
3. The participants learn by doing and by imitating or criticizing other participants' practice.

It is not very clear how far the commonality of practice should reach. Occasionally, Wenger (1998) argues that a community of practice does not necessarily involve the same professional practice, just some common purpose to fulfill. He gives the example of the experts of a big consulting firm, in various locations all around the world, who provide the same big customer with a variety of services. Even in that case, the exchange is based on what participants share, i.e., the common customer and its key characteristics. Practice commonality leads to mutual empathy: "the term 'practice' denotes a set of socially defined ways of doing things in a specific domain: a set of *common* approaches and *shared* standards that create a basis for action, communication, problem-solving, performance and accountability" (Wenger, Mc Dermott and Snyder, p. 39). The learning process results from differences in doing the same type of task. In the vocabulary that Clot and Faïta (2000) borrow from Bakhtin (1986), participants belong to the same professional *genre*, but they practice it with different personal *styles*. However, comparability and mutual understanding are based on the similarity of practice and, beyond practice, the similarity of professional values, languages, signs of recognition, and identities. The participants are linked by the type of solidarity that links the members of a tribe, which Durkheim called "mechanical solidarity" (Durkheim 1893–1997).

7.5.3 Activity System and Communities of Process

Leontiev (1959–1981), developing Vygotsky's (1986) theory of activity, defined "actions" and "activity systems" as combinations of elementary and situated work *operations*. Operations combine into homogeneous *actions* with local goals (e.g., the beaters' action in a hunt), and actions themselves are organized, chiefly through division of labor, into *activity systems* which pursue social *motives* (e.g., providing food to the tribe). The motives of activity systems respond to social imperatives (feeding, curing, educating, etc.) *across* the division of labor, while the goals of

actions make sense *within* a given division of labor. Activity systems are similar to what managers call "business processes" (Demeestère et al. 2006), defined as sets of operations linked by important *flows* of information, sufficient and necessary to produce a given informational or material output and thus generating social value by responding to some final need.

As a result, the community of inquiry configuration that is most coherent with the concept of the activity system is the community of process: actors from different professions combining their operations to pursue a common motive and produce value, in the sense of Dewey's process of valuation. This configuration links the local action of a specialized team with the final motives of the socially organized activity. For example, the activity system of "heart attack treatment" is the set of coordinated operations required to take care of patient suffering heart attacks, save their lives, and improve their condition, all motives being "valuated" by society. It involves cardiologists, anesthetists, nurses, and technicians, within a specific organizational setting, rather than the professional community of cardiologists.

In communities of process, participants bring distinct visions of a conjoint collective activity, derived from their diverse professional cultures and functional positions. While the community of practice is characterized by the commonality of practice, the community of process is instead characterized by the *non-commonality of practice*. It is a *community of sense of distinct practices*. Members' activities are radically distinct, but they draw their sense, value, and imperative to cooperate from the shared motive. As it involves multiple "genres," the learning inquiry is heterological, as opposed to monological inquiries based on a common "genre." Each actor's aspirations to organizational change must be confronted with other actors' constraints and aspirations. Pluralistic, sometimes contradictory, dialogues expose actors to other ways of thinking and may lead them to decenter their own mental schemes. The heterological dimension of the inquiry can thus prove either a source of misunderstanding or an essential source of learning and innovation (Tsoukas 2009). Due to the heterogeneity of practices and the permanent tension between different genres, a constant effort is required to reassert the commonality of motive and maintain a collective frame of reference.

In communities of process, participants belong to different professions but the same organizational setting. As a result, organizational issues play a more important role than professional issues. Each actor's activity takes place directly within the community, which, at the same time, is a community of work (e.g., the community of actors who daily cooperate in the purchasing process) *and* a community of inquiry about work (e.g., the community of actors involved in solving purchasing problems and improving the process). At the first level (i.e., community of work), interactions between community members are mandatory; they do not result from free, contingent choices. Actors are obliged to cooperate by the very existence of their collective activity (e.g., purchasing), whether they establish an inquiring community or not. When ten purchasers working in four different regions meet, it is obvious that they wish to reflectively analyze their professional practices, tools, and problems. When a purchaser, an accountant, and a technician interact about a precise purchasing requirement, they must interact to accomplish

elementary operations. The cross-functional process is an abstract, delocalized construction, sometimes distant from familiar practices, and professional values and languages are clearly distinct. It is not obvious that the cost controller of an automotive project contributes to developing a new car model. Reflexive effort is required to connect each local action with the final motives and thus submit it to social "valuation," beyond daily routines. This form of solidarity is not mechanical. It corresponds to what Durkheim called "organic solidarity" (Durkheim 1893– 1997): the solidarity of the members of a ship crew, who may belong to different trades, have different roles and values, and practice different religions, but must cooperate and trust each other to weather a storm.

7.6   Conclusion: The "Learning Plus Organizing" Process

In EDF's case, the learning inquiry is the organizing process itself. *Learning is organizing and organizing is learning.* EDF's leaders tried to redesign the purchasing organization, but for lack of adequate communities of inquiry, the learning process did not take place, and the organizing process temporarily failed. Later on, the division leaders made three key decisions:

1. They implemented a "3-partner team" policy: each technician was associated with one purchaser and one accountant, all designated by name, and the three actors had to meet in person twice a year; this is an elementary version of the community of process, personally involving the three main actors in the process.
2. Virtual professional communities were established at local level (i.e., for technicians, who are numerous at each site) and regional level (i.e., for purchasers and accountants), with network tools and the power to suggest modifications to the software system or organizational rules; these virtual professional communities shaped communities of practice.
3. Some key elements of the purchasing process were subjected to dialogical redesign: for example, the "master agreement designing" activity was reengineered by groups in which technicians and accountants could assess the practicability of master agreements from the technical and financial points of view.

In a few months, the most acute problems were resolved. The new organization gradually became effective – in particular, the existence of the 3-partner teams enabled technicians to find contacts for the frequent micro-inquiries needed to accomplish their new tasks.

The EDF case shows the importance of establishing communities of inquiry (i.e., communities of practice and communities of process) with the right membership, appropriate timing (i.e., early enough to influence the key organizing decisions), relevant instruments (i.e., training modules, information systems, periodic meetings), and powers. The relationship between communities of practice and communities of process is important: the interplay between the two types of communities

makes learning and organizing possible. Any transformation of professional practices – discussed in a community of practice – may raise performance problems for other professionals involved in the same process. It must, therefore, be analyzed and discussed within a community of process. The evolution of professional practices can thus fuel the inquiries of communities of process. Reciprocally, the modifications of a process agreed in a community of process can disturb the requirements and values of a profession. Thus, they must be analyzed and discussed in communities of practice. The articulation between the two types of inquiry – redesigning professional practices and redesigning the cross-functional process and its organizational framework – is the very process through which actors redesign activity and organization and at the same time develop new skills. Learning and organizing, thus, take place in the ongoing iteration between communities of practice and communities of process, mechanical and organic solidarity, common and conjoint activity, profession, and organization. Through this iteration, actors compare and combine points of view and take a broader view of their professional craft and the existing organization. Learning and organizing, thus, appear as two facets of the same ongoing dialogical inquiry *within* and *between* communities of inquiry. Through such complementary inquiries, collective actors can take on the task of redesigning organized activity, a task that is beyond the reach of individuals.

But the formation of adequate communities and the felicitous outcome of their inquiries require specific organizational conditions, such as empowerment, managers' openness to field suggestions, free expression, slack time, legitimate valuation procedures, and instrumental flexibility. Concerned actors, leaders in particular, must be open to exploring and inquiring, beyond routines and taken-for-granted norms. As a result of its mediated and triadic nature, collective activity cannot be studied only in its "dyadic" or "directly performing" dimension (*A transforms B*), but must also be considered in its mediated dimension (*A means C by transforming B*). This means giving due consideration not only to "what people actually do" but also to "what people actually mean by doing what they do." This is also a methodological issue for researchers (Lorino et al. 2011), since meaning is not easily accessible and observable. It is neither "what people do" nor "what they tell colleagues or researchers what they mean when they act." Meanings and habits are partly invisible, impossible to verbalize, and in some cases even unconscious. Understanding what activity means and conveys, beyond what it is formally supposed to mean, is important to understand the learning dynamics, with three mediating dimensions: firstly, the links of day-to-day ordinary operations with "professional genres"; secondly, the links of day-to-day ordinary operations with inquiries which continuously and often invisibly transform habits and keep collective activity feasible; and, thirdly, the links of day-to-day ordinary operations with the processual and narrative thread that gives activity its global social sense and allows its valuation. In EDF's case, actors' activities were at first reduced to their observable performativity, with no consideration for their more complex and partly invisible meaning and inquiring. The organizing and learning dynamics requires us to go "through the looking-glass" (Carroll 1871–2003).

References

Austin, J. L. (1962). *How to do things with words: The William James lectures delivered at Harvard University in 1955* (J. O. Urmson, Ed.). Oxford: Clarendon Press.

Bakhtin, M. (1981). *The dialogic imagination: Four essays* (M. Holquist, Ed.). Austin: University of Texas Press.

Bakhtin, M. M. (1986). *Speech genres and other late essays* (trans: McGee, Emerson and Holquist (Eds.)), Austin: University of Texas Press.

Billett, S. (1996). Situated learning: Bridging sociocultural and cognitive theorising. *Learning and Instruction, 6*(3), 263–280.

Billett, S. (1998). Constructing vocational knowledge: Situations and other social sources. *Journal of Education and Work, 11*(3), 255–273.

Billett, S. (2001). Knowing in practice: Re-conceptualising vocational expertise. *Learning and Instruction, 11*, 431–452.

Brown, J. S., & Duguid, P. (1991). Organizational learning and communities-of-practice: Toward a unified view of working, learning, and innovation. *Organization Science, 2*(1), 40–57.

Carroll, L. (1871–2003). *Through the looking-glass, and what Alice found there*. London: Penguin Classics.

Clot, Y. (2005). Le développement du collectif: entre l'individu et l'organisation du travail. In R. Teulier & P. Lorino (Eds.), *Entre la connaissance et l'organisation, l'activité collective* (pp. 187–199). Paris: Editions La Découverte.

Clot, Y. (2008). *Travail et Pouvoir d'Agir*. Paris: Presses Universitaires de France.

Clot, Y., & Faïta, D. (2000). Genres et styles en analyse du travail. Concepts et méthodes. *Travailler, 4*, 7–42.

Cohen, M. (2007). Reading dewey: Reflections on the study of routines. *Organization Studies, 28* (5), 773–786.

de Saussure, F. (1983). *Course in general linguistics*. Bally & Sechehaye (Eds.), R. Harris (trans.). La Salle: Open Court.

Demeestère, R., Genestet, V., & Lorino, P. (2006). *Réconcilier la stratégie et l'opérationnel. L'approche "processus-compétences"*. Paris: Editions de l'ANACT.

Dewey, J. (1902). *The child and the curriculum*. Chicago: University of Chicago Press.

Dewey, J. (1915). The logic of judgments of practise (Part I). *The Journal of Philosophy, Psychology and Scientific Methods, 12*(19), 505–523.

Dewey, J. (1916/2005). *Democracy and education*, Stilwell (KS): Digireads (First published in 1916 by the Macmillan Company), New York.

Dewey, J. (1922/1957). Human nature and conduct. In J. A. Boydston (Ed.), *Middle works*. Carbondale/Edwardsville: Southern Illinois University Press.

Dewey, J. (1938/1980). *Logic: The theory of inquiry*. New York: Holt, reprinted 1980 New York: Irvington Publishers.

Dewey, J., & Bentley, A. (2008). *Knowing and the known*, in Dewey, J. *The Later Works, 1925–1953, Volume 16: 1949–1952*, edited by J. A. Boydston. Carbondale: Southern Illinois University Press: 1–294

Durkheim, E. (1893/1997). *De la division du travail social*. Paris: PUF. Translated (1997) *The division of labor in society*. New York: Free Press.

Eco, U. (1985). *Lector in Fabula*. Paris: Grasset & Fasquelle.

Eco, U. (1988). *Le Signe*. Brussels: Editions Labor.

Eco, U. (1992). Interpretation and overinterpretation (S. Collini, Ed.). Cambridge: Cambridge University Press.

Feldman, M., & Pentland, B. (2003). Reconceptualizing organizational routines as a source of flexibility and change. *Administrative Science Quarterly, 48*, 94–118.

Follett, M. P. (1924/1951). *Creative experience*. New York: Longmans-Green (1924), Peter Smith (1951). Downloadable at http://www.pqm-online.com/assets/files/lib/follett.pdf

Follett, M. P. (1924/1995). Relating: The circular response. In P. Graham (Ed.), *Mary Parker Follett: Prophet of management* (pp. 35–63). Washington, DC: Beard Books.

Follett, M. P. (1925/2003). The giving of orders. In H. C. Metcalf & L. Urwick (Eds.), *Dynamic administration: The collected papers of Mary Parker Follett* (pp. 50–70). New York: Routledge.

Garfinkel, H. (1967). *Studies in ethnomethodology*. Englewood Cliffs: Prentice-Hall.

Joas, H. (1996). *The creativity of action*. London: Polity Press.

Kloetzer, L., Clot, Y., & Quillerou-Grivot, E. (2015). Stimulating dialogue at work: The activity clinic approach to learning and development. In L. Filliettaz & S. Billett (Eds.), *Francophone perspectives of learning through work: Conceptions, traditions and practices*. Dordrecht: Springer.

Kozulin, A. (1986). Vygotsky in Context, preface to Vygotsky, L. 1986. *Thought and language*. Cambridge, MA: The MIT Press.

Lave, J. (1988). *Cognition in practice*. Cambridge: Cambridge University Press.

Lave, J., & Wenger, E. (1991). *Situated learning. Legitimate peripheral participation*. Cambridge: Cambridge University Press.

Leontiev A. N. (1959–1981). *Problems of the development of the mind*. Moscow: Progress Publishers (1st publication).

Lorino, P. (2001). A pragmatic analysis of the role of management systems in organizational learning. In R. Sanchez (Ed.), *Knowledge management and organizational competence*. Oxford: Oxford University Press.

Lorino, P. (2005). Target costing and organizational learning in new product development: The theory of activity applied to management tools. In R. Sanchez & A. Heene (Eds.), *Research in competence-based management, vol. 2. A focused issue on managing knowledge assets and organizational learning* (pp. 251–287). Amsterdam/Oxford: Elsevier.

Lorino, Ph. (2014, forthcoming). Charles Sanders Peirce. In J. Helin, T. Hernes, D. Hjorth, & R. Holt (Eds.), *The Oxford handbook of process philosophy and organization studies*. Oxford: Oxford University Press.

Lorino, P., & Tricard, B. (2012). The Bakhtinian theory of chronotope (time-space frame) applied to the organizing process. In M. Schult, S. Maguire, A. Langley, & H. Tsoukas (Eds.), *Perspectives on process organization studies Vol. 2: Constructing identity in and around organizations*. Oxford: Oxford University Press.

Lorino, P., Tricard, B., & Clot, Y. (2011). Research methods for non-representational approaches to organizational complexity: The dialogical mediated inquiry. *Organization Studies, 32*(6), 769–801.

Mead, G. H. (1934–2006). *Mind, self and society from the standpoint of a social behaviourist*. Chicago: University of Chicago.

Muniesa, F. (2012). A flank movement in the understanding of valuation. In L. Adkins & C. Lury (Eds.), *Measure and value* (pp. 24–38). Malden: Wiley-Blackwell.

Peirce, C.S. (1931–1958). *The collected papers of Charles Sanders Peirce*. Eds. C. Hartshorne, P. Weiss (Vols. 1–6) and A. Burks (Vols. 7–8). Cambridge, MA: Harvard University Press.

Peirce, C. S. (1979). In K. L. Ketner & J. E. Cook (Eds.), *Charles Sanders Peirce: Contributions to the nation. Part three: 1901–1908*. Lubbock: Texas Tech Press.

Peirce, C. S. (1992). In N. Houser & C. Kloesel (Eds.), *The essential Peirce* (Vol. 1). Bloomington: Indiana University Press.

Peirce, C. S. (1998). *The essential Peirce* (Vol. 2). The Peirce Edition Project (Eds.). Bloomington: Indiana University Press.

Schatzki, T. R. (2002). *The site of the social. A philosophical account of the constitution of social life and change*. University Park: The Pennsylvania State University Press.

Schatzki, T. R. (2005). Peripheral vision: The sites of organizations. *Organization Studies, 26*(3), 465–484.

Shields, P. (2003). The community of inquiry: Classical pragmatism and public administration. *Administration & Society, 35*(5), 510–538.

Simon, H. A. (1947). *Administrative behavior: A study of decision-making processes in administrative organization*. New York: Macmillan.

Simon, H. A. (1957). *Administrative behavior: A study of decision-making processes in administrative organization*. New York: Macmillan.

Smith, A. (1776/2003). *The wealth of nations*. New York: Bantam Classics.

Star, S. L. (1998). Working together: Symbolic interactionism, activity theory, and information systems. In Y. Engeström & D. Middleton (Eds.), *Cognition and communication at work*. Cambridge: Cambridge University Press.

Suchman, L. (1987). *Plans and situated actions: The problem of human-machine communication*. Cambridge: Cambridge University Press.

Taylor, F. W. (1972/1911). *The principles of scientific management*. Westport: Greenwood Press Publishers.

Todorov, T. (1984). *Mikhail Bakhtin: The dialogical principle* (Theory & history of literature). Minneapolis: University of Minnesota Press.

Tsoukas, H. (2009). A dialogical approach to the creation of new knowledge in organizations. *Organization Science, 20*(6).

Vygotsky, L. S. (1986). *Thought and language*. Cambridge: The MIT Press.

Wenger, E. (1998). *Communities of practice. Learning, meaning and identity*. Cambridge: Cambridge University Press.

Wenger, E., & Snyder, W. (2000). Communities of practice: The organizational frontier. *Harvard Business Review*, Jan–Feb, *78*(1), 139–145.

Wenger, E., McDermott, R., & Snyder, W. (2002). *Cultivating communities of practice: A guide to managing knowledge*. Cambridge: Harvard Business School Press.

Wertsch, J. (2007). Mediation. In H. Daniels, M. Cole, & J. Wertsch (Eds.), *The Cambridge companion to Vygotsky* (pp. 178–192). Cambridge: Cambridge University Press.

Chapter 8
Learning as Dialogue: An "On-the-Go" Approach to Dealing with Organizational Tensions

Frédérik Matte and François Cooren

Tensions are omnipresent in organizational settings and arise as soon as contradictions emerge regarding what should *matter* or *count* in a given situation (Cooren et al. 2013). Ashcraft (2006) points out that tensions constitute an intractable aspect of organizational life. That is, they are unavoidable and can never be completely resolved. Members, therefore, have to learn how to deal with tensions, knowing that their actions will hopefully allow them to *get by* in their daily activities (Oliver and Montgomery 2000; Volberda 1996). Any tension or contradiction can, thus, be viewed as either something to be resolved individually or as a constitutive aspect that people have to learn to deal with collaboratively (Lewis et al. 2010). In this chapter, we explore the latter perspective by showing how dealing with a specific tension on a daily basis can be reflected in what we call an "on-the-go" approach toward learning (and collaborating): one that is built upon dialogues and that fosters a process of co-construction.

Mobilizing what we call a ventriloquial perspective on interaction (Cooren 2010, 2012), this paper identifies and analyzes communicative practices that enable the humanitarian organization Médecins Sans Frontières/Doctors Without Borders (also referred to as "MSF") to learn how to deal with specific tensions that seem ubiquitous in members' discussions. These tensions arise from the need to deploy an emergency-oriented approach while adopting a more long-term perspective during the implementation of missions around the world (Fox 2004). Our aim is to empirically show how an experienced and an inexperienced member of MSF both deal with and learn from such a tension in their daily activities.

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Organizational learning is, therefore, envisaged as a communicative achievement. Through their conversations, organizational members, especially inexperienced ones, learn how to evaluate what should *matter* or *count* in a given situation. That is, they learn to read what a given situation is supposed to *dictate* or *require* (Dewey 1916, p. 324; Misak 2013). Such a reading is cultivated by keeping it updated, contextualized, and attuned. More specifically, we argue that organizational learning is subtly occurring through everyday interactions, implying an evaluation mechanism where the situation itself contributes as a third party. Therefore, these interactions represent an insightful point of entry to analyze the performative and collaborative nature of such a phenomenon.

We first address the literature on both organizational tension (OT) and organizational learning (OL) by focusing on their communicative aspects. By doing so, we show that the OT literature does not empirically demonstrate how communicatively addressing organizational tensions can create a learning environment for both experienced representatives and newcomers. Furthermore, our research contributes to the OL literature, which we argue does not fully analyze, at a micro level, the communicative acts that keep an organization "in tension" (Antonacopoulou and Chiva 2007), that is to say, the many ways for it to adapt, change, and learn.

To do so, we articulate a view of tensions as features that are inherent in processes of organizing and learning with an outlook that features the communicative and embodied dimensions of such tensions, grounded in recent research on the communicative constitution of organizations (CCO; see Brummans et al. 2014). More precisely, we outline a ventriloquial approach to organizational communication (Cooren 2010, 2012). According to this approach, human interlocutors constantly position themselves (or are positioned) as being constrained or animated by different principles, values, interests, ideologies, norms, facts, or experiences, which thus orient their conducts. It is these figures, which animate the discussion, that are presented as contradicting each other, requiring specific courses of action over others (Cooren et al. 2013). Tensions are, therefore, both experienced and constructed, as well as abstract and concrete. Finally, we reflect on the implication of such a posture toward learning and organizing.

8.1   Tensions, Organizational Learning, Reflecting, and Dialoguing

The literature on organizational tensions (OT) addresses topics related to management by examining the long-term versus short-term contradicting imperatives prominent in a technology-based firm (Groen et al. 2008) or by highlighting security issues that arise from competing requirements of a nuclear power plant (Kettunen et al. 2007). The discursive facets are also examined by underscoring the contradictions emerging from a planned organizational change (Whittle et al. 2008) and through the translating process accomplished by a socio-material object (whiteboards) that facilitates mediation (and dialogue) in clinical settings (Riley et al. 2007).

Organizational culture and identity have also been the focus of attention of some researchers by showing the emergence of tensions related to the process of a cultural integration during a corporate acquisition (Pepper and Larson 2006). More broadly, the literature shows that tensions can be felt, lived, and embodied at different levels (individual/personal, interpersonal, and organizational/group) and appear to represent a tangible aspect of the socio-material reality of organizations (Jian 2007). As pointed out by Smith and Lewis (2011), this literature tends, however, to present several epistemological disparities. In particular, one of the challenges is to come up with a theoretical and analytical perspective that would take into account two aspects of tensions that remain disconnected in the literature; they are either abstractedly defined as *inherent in* any organizational systems or concretely understood as socially constructed and emerging from the practice of human actors. In this regard, Oswick et al. (2004) suggest that most publications in the literature remain relatively abstract by adopting a formal prism of analysis, which limits the opportunity to explore the embodied nature of these tensions through interactions.

What this literature prompts is an encouragement to show how actors concretely learn to live with or get by with these tensions, which appear to constitute an intractable aspect of organizational life. According to Trethewey and Ashcraft (2004), researchers in organizational communication "could learn much from examining the micro-practice members employ as they maneuver irrationality" (p. 175). Therefore, our chapter aims to contribute to this literature by showing how these tensions animate the work of organizational members and explaining the mechanisms by which these tensions are cultivated in order to foster a learning environment.

If we now turn to the organizational learning (OL) literature (Cunliffe and Sadler-Smith 2012), we notice that the notion of learning in organization or within the process of organizing has been far from consensual (Fox 2009). For instance, Bisel et al. (2012) argue that some "scholars recognized that organizations do not learn, per se. Rather, individuals learn (or fail to learn) and communicate (or fail to communicate) this knowledge with one another" (p. 138). Although the literature on OL recognizes this problem of scale (Kim 1993) and criticizes it openly (Gherardi et al. 1998), it remains that adopting such an individualistic vision tends to reduce to a matter of knowledge transfer the fundamental question surrounding the linkage between individual and collective/organizational learning. In contrast to this functionalist approach to organizational learning, several authors opted for a more constructivist one (Elkjaer 2004) by primarily focusing on actors' situated practices (Gherardi and Nicolini 2002). This posture is mostly based on the pragmatist approach put forward by the philosopher John Dewey (1896/1972). For instance, Elkjaer (2004) mobilizes Dewey's concept of "inquiry" (or reflective thinking), to argue that a learning process "begins when an uncertain situation is met and humans work to resolve this situation and apply thinking as an instrument in such a pursuit" (p. 420).

Elkjaer (2004), however, suggests what she calls a "third avenue" to organizational learning that encapsulates the acquisition (Senge 1990) and participation

(Nicolini et al. 2003) approaches, both of which dominate the OL field. Elkjaer (2004) defines this third way as "the development of knowledge and experience by inquiry (or reflexive thinking) in social world held together by commitment" (p. 419). Kolb (1984), for instance, was one of the first to acknowledge the centrality of reflection in any learning process and proposed to envisage learning as something that "follows a rhythm of reflecting on ideas and experiences to find meaning and of expressing that meaning in thought, speech and action" (p. 312).

Following from this, Clegg et al. (2005) propose to consider learning and organizing as a "becoming" process. Through that lens, the authors define (organizational) "learning and organizing are seen as mutually constitutive and unstable, yet pragmatic, constructs that might enable a dynamic appreciation of organizational life" (p. 150). Adopting this "becoming" orientation (Tsoukas and Chia 2002) toward learning and organizing, some scholars, therefore, propose to envisage dialogue as an ongoing process where both individuals and organizations are able to cocreate learning (Cunliffe 2002; Raelin 2001).

In keeping with this "dialogue as learning" approach, a body of literature proposes to highlight the supervisor-subordinate relationship, which "is a microcosm of the organizational universe (. . .) and their interactions are an observable manifestation of organization-in-action" (Bisel et al. 2012, p. 129). Nonetheless, Bisel et al. (2012) also highlight a possible "mum" effect in such a typified relationship, meaning that the person in the subordinate position might not say what is really ought to be said because of the face-threatening actions this would involve and some reluctance for the possible negative feedback (Rosen and Tesser 1972) this might produce. This pattern, in many cases, echoes what Goffman (1959) called facework, that is, a view on interaction stipulating that most people will often act and behave to make sure that no one loses face during a conversation. Therefore, human beings tend to privilege a diplomatic approach toward dialogue to keep agreement and oneness at glance. For example, if a supervisor asks if a new report is relevant, the subordinate will most certainly respond positively to the request if ever this person thinks the other way – that the report is actually useless. Of course, the subordinate could say what she really thinks, but the consequence of such a reply might be disastrous for the relationship (Mazutis and Slawinski 2008). In that regard, most professional relationships proscribe provoking, bringing about, challenging, disputing, impugning, and contesting what others are saying, especially in an organizational context where opposing voices are sometimes being shut up (Boje 1995). That kind of relationship, according to Bisel et al. (2012), is supposed to lead to a "non-learning" organizational pattern. To further explore this avenue (and possibly counter this "non-learning" bias described as a source of organizational ignorance (Harvey et al. 2001), these authors suggest that "researchers begin by employing field experiments and field observations" (p. 140).

This is the methodological path we would like to fully embrace here. An on-the-go approach to learning allows participants to engage in a learning process while not necessarily positioning themselves as teaching anything. As we hope our analyses will show, participants are able to achieve this form of self-effacement by showing each other that the situation they observe sort of speaks for itself,

requiring or demanding that specific actions be taken. In other words, teaching/learning how to deal with organizational tensions is something that participants keep doing, but not necessarily in an explicit and overt way. To identify and analyze how this teaching/learning is actually taking place, we propose to mobilize a ventriloquial approach, as proposed by Cooren (2010, 2012).

8.2 Communication as Ventriloquism

According to this perspective, any act of communication can be analyzed as an act of ventriloquism, that is, an act that consists of making various figures speak or express themselves in a discussion, whether these figures come to be situations, facts, principles, rules, values, or even technologies. Instead of having only two or more people talking to each other, this activity of positioning, which is achieved by the participants themselves, allows the latter to introduce other agents that are presented as literally and figuratively participating in the interaction. Classical examples of ventriloquism can be found in situations where clerks would invoke a policy to turn down a request for something. For instance, by saying, "I'm sorry but our policy forbids us from releasing this kind of document," clerks position themselves as speaking in the name of the policy, which is supposed, according to them, to prevent him from releasing a specific document we are requesting. This means that it is not only the clerk but also the policy itself that precludes us from accessing this document. One way to see what is happening in this scene consists of noticing that clerks ventriloquize the policy, that is, that they make it say that it forbids them from releasing this document.

Furthermore, if the clerk ventriloquizes the policy, we could as well note that the policy, to some extent, ventriloquizes the clerk. Why can we say that? Because clerks are supposed to know that their function requires that they respect the administrative policy. The existence of this policy leads them to say what they are saying. That is, they are supposed to be animated or moved by the necessity to abide by this policy. Ventriloquism and animation, thus, function in both directions: The ventriloquist is also ventriloquized and the dummy is not always the one we expect (Goldblatt 2006)! This process means that any interaction can be analyzed according to its polyphonic nature. Whether in institutional or mundane contexts, people constantly ventriloquize figures that lend weight to what they are saying. In other words, ventriloquizing figures consists of making them say something that the ventriloquist also says, which means that several authors are now saying the same thing, lending weight to the ventriloquist's position. This is why ventriloquism has a lot to do with authority, since ventriloquizing figures consists of multiplying the sources of authorship (Cooren 2010).

Notions of ventriloquism and ventriloquation have already been proposed by followers and translators of Bakhtin's (1994) work, especially in referring to the polyphonic or heteroglot aspect of discourse (Holquist 1981). Yet, it has, to our knowledge, rarely been exploited to analyze how interactions unfold, especially in learning situations (but see Samuelson 2009, for an exception). Furthermore, the

connection with the question of authority, which is, of course, a key question when learning takes place, has also not been fully acknowledged (but see Taylor and Van Every 2011).

We believe that this approach is productive to analyze how teaching and learning arises through interaction. In other words, this approach can show us how learning and teaching occurs through the invocation of various figures that lend weight to what someone is saying, a form of ventriloquism that contributes to the decentering of this kind process. Individuals who are teaching something to someone indeed need to demonstrate that what they are talking about is not "made up" so to speak (even if it is, to some extent), but that their contributions consist of expressing some principles, truths, or facts that their interlocutors need to know. As we will show, this act of decentering not only increases the authority of ventriloquists but also allows them not to look like someone who is teaching someone else something. In other words, by letting other figures speak, a form of self-effacement takes place, which might facilitate the learning process.

8.3   An Ethnographic Perspective

Taken from a 9-year ethnographic study of MSF, our case study shows that dealing with a particular tension requires experienced volunteers within the organization to play the role of the novice. Armed with our mini video camera (McDonald 2005), we followed (and discreetly filmed) two MSF logisticians in their routine activities where they are engaged in an informal conversation. This dialogic scene embodies and exemplifies what seems to be an ongoing tension between two approaches regarding MSF operations. On the one hand, and taking into account that MSF is positioning itself as an emergency organization, its natural posture would aim for a quick response strategy targeting the medical needs of populations in distress. MSF is drastically inclined to respond to emergency situations. Yet, many of these situations and contexts seem to require a more nuanced position, therefore allowing to envisage the implementation of missions within a broader perspective and a longer-term approach.

As we will empirically show, this particular tension tends to repeatedly emerge while talking about an ongoing building site (pit, burner, drain, etc.) designed to collect waste materials from the MSF hospital based in the city of Bunia in RDC Congo. In the scene we will analyze, the newcomer – who is in charge of the site on a daily basis – is taking the experienced logistician (and his hierarchical supervisor) for an overview tour of the project. As we will see, the newcomer and the experienced representative appear to be both engaged in a learning experience as they are trying to figure out what seems to be the most suitable approach vis-à-vis the project.

Hence, and through this learning and adapting process, we will analyze how the experienced MSF volunteer is "talking through" this posture in tension by formulating questions (Sofo et al. 2010), by producing reassuring words, by being critic, and by sharing knowledge (Gherardi 2001) while reflecting on the job done. This

"walking thought" event then obliges the newcomer to reflect back, justify, and explicate his recent moves and decisions in order to make sense of what the situation seems to require according to MSF's raison d'être. Accordingly, two scenes will be analyzed, one showing that a learning process does not explicitly unfold as such during a mundane dialogue, while the other illustrates how different ways to envisage a budget spending nonetheless create an organizational learning environment.

8.3.1 Learning "On-the-Go"

The first dialogic scene analyzed here illustrates how a mundane conversation that occurred during a guided visit of an MSF construction site allows two logisticians to deal with the organizational tension aforementioned above. More so, it shows how the experienced member is able to read what is at stake and what the situation, according to him, requires, meaning that he is able to voice pieces of the puzzle that ought to be addressed according to the MSF organizational principles, values, and norms of action.

153	Luc	And the posts over there, did you concrete them or not?
154		
155	Fred	No, there are not made with concrete. Uh.
156		
157	Luc	Because you see there it- it won't last, three like that. At some point
158		fttt ((imitating the noise of a post falling down)) it will still collapse
159		for the- [for the
160		
161	Fred	[Yeap
162		
163		(0.5)
164		
165	Luc	For the- (0.5) Oh yes, but for the health centers- ((answering to
166		himself)) But you don't do the same thing for the health centers, you
167		do a xxx=
168		
169	Fred	= But they are concreted for the health centers. There (here), it has
170		not been done and it is too late
171		
172	Luc	Uh
173		
174	Fred	This had been planned normally
175		
176	Luc	Is this true?
177		

178	Fred	Budgeted yeah yeah (inaudible)
179		
180	Luc	But why didn't you do it then?
181		
182	Fred	Uh because the- this has not been entrusted, you see when I arrived
183		it was- it was almost completely planted
184		
185	Luc	Hum hum

In the beginning of the excerpt, Luc's question amounts to positioning Fred and others as accountable for what was done or not ("And the posts over there, did **you** concrete them or not?" (line 153)). Fred's response consists of informing Luc about the state of the post themselves right now ("No, there are not made with concrete" (line 155)). Although Fred does answer Luc's query, his response leaves open the question as to who should be held accountable for the absence of concrete. Luc then reacts to Fred's response by justifying why he is asking this question (lines 157–159).

We can note the work done by Luc to make the situation he is talking about very tangible: He talks about "the posts over there," some posts that Luc is looking at right now and that the latter implicitly invites Fred to see ("Because you see there"), imitating even the sound they will make when they will fall at some point ("fttt"). It is a situation that Luc implicitly claims to be readable, a situation that would, according to him, normally dictate or require the installation of concrete for the posts. Although we are potentially in a situation of learning (i.e., to the extent that Fred could be learning at this point that concretes should have been installed in this specific case), we also see that this learning takes place through the reading of a situation that both Fred and Luc are able to observe. It is not an abstract form of learning, but a real one, which consists of letting the situation speak for itself. Why can we say that the situation speaks for itself? This is because at no point do we see Luc saying to Fred, "You should have concreted these posts." What he does, however, is telling his interlocutor what will happen to these posts that have not been concreted, without drawing any specific conclusion.

By describing the situation, we thus see how Luc is *ventriloquizing* it, that is, how he makes it speak (for itself). A form of learning can thus potentially take place through the reading of this situation, a situation that is readable/decipherable to people such as Luc who are experienced and can, therefore, predict what might happen in the long term. Fred is, therefore, invited to draw his own conclusions, that is, that the posts should have been concreted, something that he seems to acknowledge by saying "Yeah," which marks an alignment with the way Luc reads the situation. Luc then starts talking about the health centers of which Fred is also supposed to be in charge. But, he then interrupts himself, realizing that the situation is, according to him, different in their cases ("For the- (0.5) Oh yes, but for the health centers- But you don't do the same thing for the health centers, you do a xxx"

(lines 165–167)). We can thus infer that Luc was about to invoke the health centers as constituting a similar situation, which would have then led him to generalize his teaching: It is not only these posts that should have been concreted but also the ones of the health centers. Fred, however, contradicts Luc by pointing out that the health centers' posts are actually concreted (line 169), contrasting the health centers' situation with the present one ("There (here), it has not been done and it is too late" (line 170)). We, thus observe how Fred informs Luc about something the latter apparently does not know, a move that positions Fred as knowledgeable about his context of intervention.

While we saw that Luc made the situation speak in terms of what should have been done, we see Fred reacting by making it speak in terms of what the situation is. In other words, this situation is supposed to disclose, express, or reveal itself through Fred's reaction, marking another form of ventriloquism. Furthermore, and in coherence with his former positioning, Fred does not stage himself in this account, marking a form of dissociation on his part from how this situation is supposed to reveal, express, or disclose itself to Luc. At no point do we indeed see Fred acknowledging a form of direct responsibility for what happened.

After Luc acknowledges what Fred just told him (line 172), the latter goes on by saying, "This had been planned normally" (line 174), a piece of information that appears to surprise Luc ("Is this true?" (line 176)), which leads Fred to confirm that it was "budgeted, yeah yeah" (line 178). Through Fred's interventions, certain aspects of the situation thus continue to be presented as revealing, expressing, or disclosing themselves to Luc, a disclosing that Luc's reaction appears to question, but that Fred quickly confirms. While the initial situation, as read by Luc, could have pointed to or indicated a lack of knowledge on the part of Fred and his team (the fact that they *did not know* that posts had to be concreted), Fred's precision allows him to convey that they not only knew that they had to do it, but that they had even planned and budgeted it. The situation, as now revealed by Fred, is thus supposed to show or demonstrate that he and his team are competent and knowledgeable. They knew what should have been done, also a piece of information that allows Fred to temporally reinforce his credibility.

If their competency is implicitly reaffirmed by Fred, it remains that something could now require some explanation, i.e., why something that had been planned and budgeted was not carried out. This is precisely what Luc directly asks him (line 180). Fred then responds, "Uh because the- this has not been entrusted, you see when I arrived it was- it was almost completely planted" (lines 182–183). All the markers of dissociation that had been identified earlier in Fred's interventions now find their explanation: Fred was apparently not in charge of this construction site when the lack of entrustment took place. The situation, as described by Fred, therefore, shows that he cannot be held completely accountable for this mishap, positioning the situation itself as a more suitable accountable actor.

As shown in this analysis, ventriloquizing the situation is what allows Luc and Fred to do a series of things without explicitly saying that they are doing it. We saw,

for instance, how Luc was able to tell Fred what they should have done, even if at no point we see him explicitly doing this. How does he do that? By telling his interlocutor what the situation *is*, i.e., what will happen, knowing that the posts were not concreted. Similarly, we also see how Fred reacts by informing Luc about what happened before the posts were planted, a situation that is supposed to show that the logistic team knew what had to be done and that Fred should not be accountable, two things that he never explicitly says. Both interlocutors, thus, dwell on past and future (in)actions to make their case about what the situation requires according to MSF's standards. This requirement is based upon an organizational tension that cannot be taken for granted and that needs to be talked (and walked) through, i.e., learned and actualized "on-the-go," highlighting the unstable nature of any organizational learning toward a situated tension.

To make a situation say or show something, thus, allows both interlocutors to more safely convey positions about what should have been done and who should be held accountable. These two topics can indeed be risky in terms of facework (Goffman 1967), since they deal with questions regarding people's rights and obligations (Katambwe and Taylor 2006; Labov and Fanshel 1977). A form of teaching/learning can thus take place "on-the-go" by letting/making the situation speak for itself. Certainly, it is Fred and Luc who also make it speak, but making something – whatever it is – speak still means that this thing does say something, creating an effect of decentering in the activity of teaching/learning (Caronia and Cooren 2013).

In other words, it is also the situation, as depicted, read, or revealed by Luc and Fred, that is teaching/telling them something they did not know. To the tangible nature of this learning process – to the extent that people appear to sometimes learn from what they actually see or observe while reflecting on it – its depersonalized aspect can be added, that is, a depersonalization or self-effacement that allows interlocutors not to enter into the messy business of what people do not know or who should be held responsible for a mistake/inaccurate reading that was probably done.

The "on-the-go" aspect of this learning process thus points to the absence of interruption that this form of ventriloquism allows. Throughout this episode, Luc is inspecting what was done and Fred is either taking Luc's remarks into consideration or correcting them if needed. At no point do we see them interrupting this exercise by, for instance, explicitly teaching/telling the other what should have been done or rebuking accusations of incompetency. If these activities of teaching/telling and rebuking are actually done, they are, as we saw, folded in the inspection exercise itself, which consists of ventriloquizing the situation. Moreover, by voicing his concern about the lack of concretization of the posts, Luc is pointing out an underlying central tension at MSF: Do we build infrastructures that might outlast MSF's intervention (a more long-term approach) or do we simply go with an emergency mindset that does not take into account that aspect? By reading the situation as he does, Luc is able to refer to what should have been done (i.e., planting the posts with concrete) but also recalibrate the tension at stake and also reorient the newcomer's perspective. As for Fred, he is sort of obliged to stray the

burden of this allegedly mishandling by stating that the work started before his arrival on the project.

This conversation, therefore, allows both members to (re)create the situation of a learning dialogue, which implicitly addresses the tension at stake. Firstly, we can presuppose that there is a particular know-how that has to be shared, a know-how put forward by the experienced logistician, the latter arguing for a better way to plant the posts. For that to emerge in the conversation, Luc has to ask questions to Fred, leading the latter to justify the work done and implicitly acknowledging (and integrating?) the way it could have been done according to the MSF standards, in that case voiced through Luc's discourse. Secondly, without Fred's insights – he is the one who knows the story behind the post – Luc could not have been able to share his knowledge about such a building strategy.

Furthermore, we see that the "learning curve" that is shaped through this mundane dialogue represents a two-way process. On the one hand, Luc, by formulating questions, is able to learn more about the evolution of the project because Fred knows most of its nitty-gritty. Therefore, it is Fred who is positioned as the informant. On the other hand, Luc embodies an authoritative figure who has the legitimacy to endorse (or not) and to criticize what has been done in the name of MSF's standards. Accordingly, both logisticians are enrolled in a learning process that permits the cocreation of a renewed state of affairs vis-à-vis this tension at stake. In other words, it appears that Luc and Fred have been able to learn "on-the-go" as they walked through the construction site, that is to say, that they were able to create a situated knowledge about this tension.

Let us move forward by looking at another excerpt taken from this conversation unfolding along this walking tour of the construction site. In this next excerpt, Luc and Fred address the question of the budget, a question that, as we will see, also relates to the emergency vs. more long-term approach tension.

8.3.2 Grounded in Learning

Like many NGOs, MSF is supposed to be preoccupied with its expenses. Budget does matter because the money spent mainly comes from individual donors to whom the organization is accountable. Accordingly, if the money given by these donors is alleged to be "not well spent," the tacit delegation agreement (from the donors to the humanitarian organization) would not be considered valid anymore. Therefore, there is a recursive accountability scheme at work (donors to MSF/patients to donors), representing a central preoccupation for all MSF representatives. Despite and beyond these financial and ethical considerations, this next scene that we analyze shows Luc, the experienced logistician, trying to convince Fred, the newcomer, that MSF has a more nuanced posture regarding what should be done with expenses into the field.

Concretely, the same organizational tension between an emergency perspective and a more long-term approach is once again raised further along the walk. This

time, it is addressed through budget spending. On the one hand, Fred is envisaging spending according to an emergency perspective and, thus, wishes to cut costs at its maximum, potentially leaving the door open to a less well-built site. On the other hand, Luc is favoring a more nuanced approach by arguing that a fully spent budget is a well-spent budget, no matter what, allowing for a presumably better building of infrastructures, which would, therefore, last longer. In this excerpt, we thus see Luc countering the argument put forward by Fred by ventriloquizing/talking in the name of MSF.

As the excerpt begins, Fred and Luc are talking about an MSF director who is very vigilant about how the budget is spent in missions. While Luc (the experienced member) seems rather critical vis-à-vis this director's form of micromanagement, Fred (the newcomer) defends the latter by saying that he is right to make sure that all the money spent be justified. As an illustration, Fred takes the example of money that the director apparently allowed him to save on the cost of painting.

186	Fred	Yes, I put 25 dollars for one gallon, we paid [uh 103=
187		
188	Luc	[Ah yeah (.) but it's not- it's not like that we should do with money. I
189		see the money that is there ((supinating his two hands as to mate-
190		rialize the amount of money he is talking about)). If the money is
191		available, we::: can=
192		
193		
194	Fred	=Yeah but he ((speaking of the MSF director)) is telling me, "If we
195		don't spend this money it means that we can use it on a another
196		project where we [xxxx
197		
198	Luc	[Yes yes but he's completely wrong ((shaking his head))
199		
200		
201	Fred	Ah this I don't [know
202		
203	Luc	[But no, money is also needed we need this money for materials.
204		You, the painting, well=
205		
206	Fred	=Yes no it's=
207		
208	Luc	= There are different prices from::: one to twenty=
209		
210	Fred	=Yeah
211		
212	Luc	No, no, I can- A well-spent budget is a budget that is spent up to
213		ninety, nine- hundred percent, it's a budget, at least it's:::: it's
214		perfect you know=
215		

216	Fred	=Hmmm=
217		
218	Luc	=If we need it, it's there, we need to use it, we cannot say, "Well,
219		this money, if we don't spend it, it could be used for another
220		project." This, it's not at all:::: Anyway not at MSF. MSF, on the
221		contrary. If- if you spend 70 or 60 % of the budget, they are not
222		happy because we say: "this, [there-
223		
224	Fred	[But it's not possible=
225		
226	Luc	=The money, it's available to us ((showing two lines on top of each
227		other with his forearms as to display a certain quantity of money))
228		and we do not spend it while it could have been spent=
229		
230	Fred	=Yeah but=
231		
232	Luc	=There I [agree ((putting his right finger on his mouth as to show
233		that he is making a point))
234		
235	Fred	[But it depends on the activity. If you spent 60 % of your budget and
236		you did 60 % of your activities, they are not happy
237		
238	Luc	No yeah=
239		
240	Fred	=If you did all your planned activities and you spent 65 % :::: I
241		think that they applaud you doubly-
242		
243	Luc	Yeah but it means that it was not well evaluated. It's a pity because
244		this money that finally you put into you budget, instead you
245		overvalued you budget=
246		
247	Fred	=Yeah

In the beginning of the scene, Fred mentions that he paid $103.00 per gallon of paint instead of the $25.00 he had initially budgeted, implying that he paid too much. Promptly, Luc replies in stating, "Ah yeah (.) but it's not – it's not like that we should do with the money" (lines 188–189). With this type of categorical statement, Luc thus ventriloquizes a sort of general rule that is supposed to express itself through his turn of talk. It is he, the experienced worker, who says that this is not the proper way to deal with the money budgeted. He might also, and maybe especially, see this rule is implicitly voiced through this turn of talk, lending weight to his claim.

As to contrast with this general statement, Luc immediately personalizes and concretizes it by telling Fred what he usually does with the money he is in charge of. As he points out, "I see the money that is there. If the money is available, we:::

can=" (lines 189–192). In other words, Luc stages himself in a hypothetical situation in which he assesses how much money is available (we even see him supinating his two hands as to make the situation more tangible), that is, an assessment that allows him to gloss the rule that remained implicit until now: "if the money is available, we can spend it." As we see, Luc's reaction consists of leaving Fred out of the situation he is staging. At no point do we indeed see him explicitly telling his interlocutor what to do. What he does, however, is presenting a general rule to which he, Luc, positions himself as subjected or submitted. It is a kind of subjection or submission that concerns anyone who finds himself or herself in this kind of place (note how he uses the "we" as he is about to say "we:: can spend it" (line 192)). In terms of ventriloquism, it is also this rule – if the money is available, we can spend it – and not only Luc that dictates Fred what to do in this kind of situation. While the radicalism of Luc's disagreement could be, at first sight, surprising, note that it mainly targets the absent director and not Fred himself. This discussion indeed started as Fred was telling Luc what this director told him to do about the way to spend the money. This radicalness could, therefore, be attributed to the question of knowing who really represents MSF's views regarding these budget matters. Is it the director or Luc's view, given that they both represent figures of authority while embodying two opposite ways to deal with money that was budgeted? Luc's strong reaction could, thus, be explained by the fact that his own authority is implicitly threatened in this kind of situation. This opposition of authority seems to be clearly understood by Fred when he responds by reproducing what the director apparently told him (lines 194–196). To the rule that Luc ventriloquized, Fred thus responds by ventriloquizing the director, a director that, in his turn, ventriloquizes an opposite rule. Again, note how this form of ventriloquism allows Fred not to position himself as the only source of contradiction: It is a rule, as voiced by the director, which appears to contradict another rule, which was voiced by Luc. If Fred contradicts what Luc is saying, it is under the guise of other agents: the director and the rule this director reminded him.

Again, Luc's strong reaction – "Yes yes but he's completely wrong" (lines 198–199)) – confirms what seems at stake in this situation, that is, his own authority and credibility. As someone who is supposed to tell Fred, the newcomer, what to do and what not to do regarding the budget, Luc has to engage with an alternative source of authority to which Fred seems not only subjected but also somehow attached. This attachment can indeed be felt when Fred responds by saying "Ah this I don't know" (line 201), as to implicitly question what Luc is claiming. We then see Luc reacting by a series of statements (lines 203–204, 208), which leads him to redefine another version of the previous rule: "A well-spent budget is a budget that is spent up to ninety, nine- hundred percent" (lines 212–213). This is, for him, the perfect budget (lines 213–214). Luc then presents to Fred what this rule not only allows but also requires them to do: "If we need it, it's there, we need to use it" (line 218). It is also, according to him, a rule that forbids them to say certain things: "we cannot say, 'Well, this money, if we don't spend it, it could be used for another project'" (lines 218–219). If it is Luc who appears to be telling/teaching Fred what should and should not be done, we see again how he is doing this by ventriloquizing a rule that

demands and forbids that specific actions take place regarding the way budgeted money should be spent. This rule, again, is his source of authority and what is also authoring what he is saying at this point. To this source of authority, Luc adds MSF itself as he points out, "Anyway not at MSF, MSF, on the contrary, if- if you spend 70 % or 60 % of the budget, they are not happy because we say, 'this, there-" (lines 221–222).

Fred is for once staged in the situation Luc depicts ("if *you* spend 70 % or 60 %"), but note how it is MSF that is now identified as the source of criticism, a source to whom Luc identifies ("because *we* say"). Many voices can, thus, be heard in this turn of talk: MSF's voice and the program directors' voice (they) but also the members' voice (we). This polyphony, staged by Luc, is supposed to tell Fred how he should proceed with the budget, lending weight to this injunction. Luc, thus, both dissociate from and associate with these voices, an oscillation typical of ventriloquism, which allows him to reinforce his own authority *and* the logic of action he is putting forward.

Thus, by ventriloquizing another recognized authority at MSF – the headquarter directors – and by keeping it at distance, he allows himself to enhance his individual credibility/authority while still speaking in the name of the organization. This way, Luc seems to appropriate the official voice of the headquarters, reinjecting the latter into the field. By doing this, Luc is able to show Fred that at MSF, the "real deal" is mostly local (and grounded in action). In other words, the learning experience at MSF comes from the field, "on-the-go" and grounded, where reality is more complex than he might have thought at first hand. More so, learning the MSF way certainly does not come from a distanced (and managerial) authority. Accordingly, Fred is learning what *should* have been done in this particular situation (and mission) but also in any other missions at MSF, regardless of what the HQ suggests. Therefore, this reality check done by Luc underscores a generalization at work that is entangled in any learning process, putting forward the assumption that it is practice that fosters knowledge acquisition (Gherardi and Nicolini 2002).

More broadly, we see that Fred has been confronted with what should be appropriate for the situation (and for MSF in general): Spending less might have been to him the way it was supposed to be done at MSF. But now, into the field, he might foresee it with a different lens: MSF is also an organization that invests more locally, translating a logic of action that promotes a more long-term approach toward infrastructures. But Luc needed to justify his position throughout this situated dialogue. A dialogue that was thus grounded with a tangible preoccupation (the painting price) but where an underlying knowledge was also looming and that allowed an appropriation of an organizational tension at stake.

While the previous episode illustrates how Luc, the experienced member, ventriloquizes the situation, this one shows us how he ventriloquizes MSF and what he presents as one of its rules. In the first excerpt, it was the situation itself that was said to dictate what had to be done regarding the concrete posts. This form of decentering, as we saw, allowed Luc to teach Fred "on-the-go," without appearing to be too directive in this situation. In contrast, the second excerpt shows a more radical aspect of the experienced worker, a radicalness that, however, seems

proportional to the threat that the absent director constitutes regarding Luc's authority. Even in this second case, we see that Luc's critiques are not targeting his interlocutor, but the director to whom Fred presumably reports. Furthermore, if questions of rights and obligations are explicitly addressed, it is not only Fred who is positioned as subjected to them but also Luc himself, as well as all the MSF members, as if Luc wanted to diffuse the face threat that his teaching could constitute. Finally, and as in any kind of teaching/learning situation, it is not only Luc who is positioned as the source of knowledge but also other figures of authority that Luc represents and embodies, in this case MSF itself. This polyphony, thus, constitutes another form of diffusion or diversion, rendering the act of teaching less personal and problematical.

8.4   Conclusions

What have we learned from this empirical demonstration based upon a somewhat common event at MSF? To begin with, we can assert that by focusing on interactions, in the swirl of organizing, learning, and communicating, we were able to unravel how organizations deal with tensions and by proxy foster a learning environment. More specifically, we focused on how actors dealt with a tension that required experienced volunteers to play the role of the journeyman. In our case, it evolved around a conflicting alignment ubiquitous at MSF that encourages both an emergency perspective and longer-term vision. This chapter, thus, contributes to the OT and OL literatures by showing how these tensions *animate* the work of MSF actors and explaining the mechanisms by which a specific tension is cultivated to emulate a dialogue *as* learning logic. As a result, we empirically illustrated how an emergency organization such as MSF is engaged in a learning and becoming process (Clegg et al. 2005), since such a tension has to be communicatively reaffirmed on a daily basis in order to keep up with the flow of events and, more so, with these specific antagonistic norms of practice (emergency vs. longer term).

To manage (and learn from) these tensions, the two logisticians mobilized many figures, which translated preoccupations. In the first scene analyzed, Luc, the more experienced logistician, directly assessed what seems to be a problem regarding the posts. In order to do that, he invoked his own experience as a logistician at MSF to put forward the credibility (and authority) he needed in order to lend weight to his recommendation. More so and while simultaneously enacting the situation along with Fred, Luc managed to distance himself from the problem at stake by solely focusing on what was required in *those* circumstances. Accordingly, we saw how Luc distanced himself from what was needed by pinpointing "on-the-go" what appears to be an inaccurate reading of the situation. Here, learning takes place through an oblique and transient mechanism: Actors look for opportunities to share knowledge, (re)create enhancing moments, and foster a loose-coupling environment. This learning process is always on the watermark of the conversation, as neither Luc nor Fred had to directly tell the other what to do or what was (not) done.

In other words, the "blaming game" did not seem to be on, allowing both to build on the temporarily objectified critics/interrogations put at test. Just like revolving doors, no time out was necessary for the conversation to unfold fully, enabling the interlocutors to stage the appropriate figures that needed to be voiced as well as enhancing a constructive dialogue to counter a possible "non-learning" bias as suggested by Bisel et al. (2012).

As the two scenes analyzed in this chapter showed us, speaking on behalf of principles, experiences, organizational values, or even cultures (i.e., what is cultivated) seems to give a chance to address topics that appear to be in tension and learn from them. In other words, when interlocutors are involved in a learning process, letting situations speak for themselves appear to be productive (and non-face threatening). They can then focus on the more appropriate ways to read the situation in itself. This reading is, of course, always negotiable and demands justification for it to be accepted. So what a situation requires must in the end make sense for actors as they are (re)enacting their own environment "one interaction at the time."

References

Antonacopoulou, E., & Chiva, R. (2007). The social complexity of organizational learning: The dynamics of learning and organizing. *Management Learning, 38*(3), 277–295.

Ashcraft, K. L. (2006). Feminist-bureaucratic control and other adversarial allies: Extending organized dissonance to the practice of "new" forms. *Communication Monographs, 73*(1), 55–86.

Bakhtin, M. (1994). Social heteroglossia. In E. Arnold (Ed.), *The Bakhtin reader* (pp. 73–79). London/New York: The Free Press.

Bisel, R. S., Messersmith, A. S., & Kelley, K. M. (2012). Supervisor-subordinate communication hierarchical mum effect meets organizational learning. *Journal of Business Communication, 49*(2), 128–147.

Boje, D. M. (1995). Stories of the storytelling organization: A postmodern analysis of Disney as "Tamara-Land". *Academy of Management Journal, 38*(4), 997–1035.

Brummans, B. H. J. M., Cooren, F., Robichaud, D., & Taylor, J. R. (2014). Approaches in research on the communicative constitution of organizations. In L. L. Putnam & D. K. Mumby (Eds.), *Sage Handbook of organizational communication*. Thousand Oaks: Sage.

Caronia, L., & Cooren, F. (2013). Decentering our analytical position: The dialogicity of things. *Discourse & Communication*, 8(1), 41–61.

Clegg, S. R., Kornberger, M., & Rhodes, C. (2005). Learning/becoming/organizing. *Organization, 12*(2), 147–167.

Cooren, F. (2010). *Figures of communication and dialogue: Passion, ventriloquism and Incarnation*. Amsterdam: John Benjamins.

Cooren, F. (2012). Communication theory at the center: Ventriloquism and the communicative constitution of reality. *Journal of Communication, 62*(1), 1–20.

Cooren, F., Matte, F., Benoit-Barné, C., & Brummans, B. H. (2013). Communication as ventriloquism: A grounded-in-action approach to the study of organizational tensions. *Communication Monographs* (ahead-of-print), 1–23.

Cunliffe, A. L. (2002). Reflexive dialogical practice in management learning. *Management Learning, 33*(1), 35–61.

Cunliffe, A., & Sadler-Smith, E. (2012). Dispelling a management learning myth. *Management Learning, 43*(1), 3–4.

Dewey, J. (1916/1944). *Democracy and education: An introduction to the philosophy of educa-tion*. New York: The Free Press.

Elkjaer, B. (2004). Organizational learning the 'third way'. *Management Learning, 35*(4), 419–434.

Fox, R. C. (2004). Observations and reflections of a perpetual fieldworker. *The Annals of the American Academy of Political and Social Science, 595*(1), 309–326.

Fox, S. (2009). 'This interpreted world': Two turns to the social in management learning. *Management Learning, 40*(4), 371–378.

Gherardi, S. (2001). From organizational learning to practice-based knowing. *Human Relations, 54*(1), 131–139.

Gherardi, S., & Nicolini, D. (2002). Learning the trade: A culture of safety in practice. *Organi-zation, 9*(2), 191–223.

Gherardi, S., Nicolini, D., & Odella, F. (1998). Toward a social understanding of how people learn in organizations the notion of situated curriculum. *Management Learning, 29*(3), 273–297.

Goffman, E. (1959). *The presentation of self in everyday life*. Garden City: Doubleday.

Goffman, E. (1967). *Interaction ritual: Essays on face-to-face behavior*. Chicago: Aldine.

Goldblatt, D. (2006). *Art and ventriloquism: Critical voices in art, theory and culture*. London: Routledge.

Groen, A. J., Wakkee, I. A. M., & De Weerd-Nederhof, P. C. (2008). Managing tensions in a high-tech start-up: An innovation journey in social system perspective. *International Small Business Journal, 26*(1), 57–81.

Harvey, M. G., Novicevic, M. M., Buckley, M., & Ferris, G. R. (2001). A historic perspective on organizational ignorance. *Journal of Managerial Psychology, 16*(6), 449–468.

Holquist, M. (1981). The politics of representation. In S. J. Greenblatt (Ed.), *Allegory and representation: Selected papers from the English Institute* (pp. 1979–1980). Baltimore: Johns Hopkins University Press.

Jian, G. (2007). "Omega is a four-letter word": Toward a tension-centered model of resistance to information and communication technologies. *Communication Monographs, 74*(4), 517–540.

Katambwe, J., & Taylor, J. R. (2006). Modes of organizational integration. In *Communication as organizing: Empirical and theoretical explorations in the dynamic of text and conversation* (pp. 55–77).

Kettunen, J., Reiman, T., & Wahlström, B. (2007). Safety management challenges and tensions in the European nuclear power industry. *Scandinavian Journal of Management, 23*(4), 424–444.

Kim, D. H. (1993). *A framework and methodology for linking individual and organizational learning: Applications in TQM and product development*. Cambridge, MA: Massachusetts Institute of Technology.

Kolb, D. A. (1984). *Experiential learning: Experience as the source of learning and development* (Vol. 1). Englewood Cliffs: Prentice-Hall.

Labov, W., & Fanshel, D. (1977). *Therapeutic discourse: Psychotherapy as conversation*. New York: Academic.

Lewis, L., Isbell, M. G., & Koschmann, M. (2010). Collaborative tensions: Practitioners' experi-ences of interorganizational relationships. *Communication Monographs, 77*(4), 460–479.

Mazutis, D., & Slawinski, N. (2008). Leading organizational learning through authentic dialogue. *Management Learning, 39*(4), 437–456.

McDonald, S. (2005). Studying action in context: A qualitative shadowing method for organiza-tional research. *Qualitative Research, 5*, 455–473.

Misak, C. (2013). *The American pragmatists*. Oxford: Oxford University Press.

Nicolini, D., Gherardi, S., & Yanow, D. (2003). *Knowing in organizations: A practice-based approach*. Armonk: ME Sharpe.

Oliver, A., & Montgomery, K. (2000). Creating a hybrid organizational form from parental blueprints: The emergence and evolution of knowledge firms. *Human Relations, 53*, 33.

Oswick, C., Putnam, L., & Keenoy, T. (2004). Tropes, discourse and organizing. In D. Grant, C. Hardy, C. Oswick & L. Putnam (Eds.), *The Sage Handbook of organizational discourse* (pp. 105–127). Thousand Oaks: Sage.

Pepper, G. L., & Larson, G. S. (2006). Cultural identity tensions in a post-acquisition organization. *Journal of Applied Communication Research, 34*(1), 49–71.

Raelin, J. A. (2001). Public reflection as the basis of learning. *Management Learning, 32*(1), 11–30.

Riley, R., Forsyth, R., Manias, E., & Iedema, R. (2007). Whiteboards: Mediating professional tensions in clinical practice. *Communication and Medicine, 4*(2), 165–175.

Rosen, S., & Tesser, A. (1972). Fear of negative evaluation and the reluctance to transmit bad news. *Journal of Communication, 22*(2), 124–141.

Samuelson, B. L. (2009). Ventriloquation in discussion of student writing: Examples from a high school english class. *Research in the Teaching of English, 44*(1), 52–88.

Senge, P. M. (1990). The art and practice of the learning organization. In M. L. Ray & A. Rinzler (Eds.), *The new paradigm in business: Emerging strategies for leadership and organizational change* (pp. 126–138). New York: J.P. Tarcher/Perigee.

Smith, W. K., & Lewis, M. W. (2011). Toward a theory of paradox: A dynamic equilibrium model of organizing. *Academy of Management Review, 36*(2), 381–403.

Sofo, F., Yeo, R. K., & Villafañe, J. (2010). Optimizing the learning in action learning: Reflective questions, levels of learning, and coaching. *Advances in Developing Human Resources, 12*(2), 205–224.

Taylor, J. R., & Van Every, E. J. (2011). *The situated organization : Case studies in the pragmatics of communication research*. New York: Routledge.

Trethewey, A., & Ashcraft, K. L. (2004). Special issue introduction. *Journal of Applied Communication Research, 32*(2), 81–88.

Tsoukas, H., & Chia, R. (2002). On organizational becoming: Rethinking organizational change. *Organization Science, 13*(5), 567–582.

Volberda, H. W. (1996). Toward the flexible form: How to remain vital in hypercompetitive environments. *Organization Science, 7*(4), 359–374.

Whittle, A., Mueller, F., & Mangan, A. (2008). In search of subtlety: Discursive devices and rhetorical competence. *Management Communication Quarterly, 22*(1), 99–122.

Chapter 9
Discussion: Francophone Approaches to Learning Through Practice

Geoffrey Gowlland

9.1 Introduction

In this chapter, I propose a reflection on the six contributions to the section on 'francophone approaches to conceptualising the links between learning and practice'. The six chapters propose to address the relationship between learning and practice in contexts of work. As will become apparent to the reader, there is an impressive diversity of views, models, and approaches in these six contributions, and each refers to a diversity of traditions in the philosophical and social sciences traditions on practice. It is worth noting from the start that French traditions to practice are present, but the authors also draw from traditions that will be more familiar to an Anglo-Saxon readership, including the pragmatic philosophy of Dewey, the Vygotskian tradition and activity theory, phenomenology, and actor-network theory. In this discussion chapter, I will propose my own reading of the contributions and draw parallels and highlight differing viewpoints between chapters, to draw out some elements of these 'francophone approaches' to practice. The task is not an easy one, since when reading these contributions and during discussions at occasion of the workshop organised in Geneva in February 2014, I was struck by the range of influences that underpinned these contributions and of insights that the authors offered. Amid this diversity, there were two notions around which the contributions seemed to coalesce, and that will serve as threads to guide me in this discussion chapter: these notions were 'intentions' and 'tensions'. Taken together, perhaps through a play of words such as 'in-tensions', I would suggest that these act as points of focus around which the authors construct understandings of 'practice'. Indeed, several chapters identify tensions as sources of learning in the workplace. The dimension of intentionality meanwhile comes up in other contri-

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butions and points to the necessity to understand the actions of individuals with reference to their motivations, goals, and ideas about themselves. The two dimensions of tensions and intentions come together in some instances, for instance, in description of cases in which the plural and competing intentions of actors gives rise to tensions within a work or learning environment, and the negotiation or resolution of these tensions results in learning and/or development.[1]

To make sense of these six chapters, I have grouped them under three major themes in the theory of practice. The first theme is 'community': how does one conceptualise learning and work communities, what are their dynamics, and how do scholars intervene to introduce changes within them? The second is the 'environment', both physical and social: how do we conceptualise the way actors interact with the environment, with tools, technology, and other people, and how does the physical environment mediate interactions in the social environment? The third is 'morality and ethics': how do individuals act according to what is expected of them or appropriate to a given situation, how are differences between the statuses and expertise of individuals acknowledged, and how are tensions tackled and defused?

I will discuss the contributions by Gilles Brougère and Kloetzer et al. under the first topic, Blandine Bril and Germain Poizat under the second, and Philippe Lorino and Frédérik Matte and François Cooren under the third. I however do not imply that these authors address exclusively one aspect of workplace learning, and I will cross-reference other chapters under each topic.

9.2   Community

Although obviously, the 'collective' dimension runs through all the six chapters in some way, the two chapters that address the question of community more directly are the chapters by Kloetzer et al. (2015) and Brougère (2015). Identifying the parallels and contrasts between the two chapters, and the two cases that are provided by their authors, can bring us to reflect on the definition of a community and its dynamics.

Brougère (2015) provides us with a detailed, ethnographic study of day-care cooperative centres in which parents take on shared responsibilities in all aspects of work. What is immediately striking in reading about the cooperative day-care centres is the extent to which rules and appropriate practices are loosely defined. In contrast to most workplaces, there are no clearly defined authority figures, very few of the rules are explicit, and each decision and innovation is negotiated as part of the daily practices of the community. The second striking aspect of this organisation of the community is how efficient the system appears to be despite this relative lack of structure.

The case study enables Brougère to reflect on learning in an informal context in which participants do not think of their practices as involving learning. Brougère

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[1] I will not attempt to identify the difference between development and learning in this paper, though this question was raised during the workshop and addressed in other papers.

uses to good effect the model of 'community of practice' (COP) to think about this loose but efficient system of organisation and the kind of learning that arises within it. The COP model was first formulated by Jean Lave and Etienne Wenger (1991) to reflect on the dynamics of a community in which individuals share a common practice and in which 'newcomers' are gradually integrated and become full participants in such a community to eventually become 'old-timers'. The model was later developed by Wenger (1998; Wenger et al. 2002), who expands on the idea of COP to include those more loosely defined 'communities' in which individuals come together through shared interests and work together to achieve a common goal.

Other scholars have used detailed ethnographic cases to argue for the limited application of the COP model, in particular to the modern workplace (e.g. Fuller et al. 2005). I see Brougère's chapter as rather exploring the flexibility of the COP model, through a case study of a particularly informal, flexible, and diverse (including culturally diverse) context. The day-care centres that the author discusses are a particular kind of COP in which, more than other such communities, it is not always easy to distinguish between newcomers and old-timers nor to identify exactly what expertise might consist in, given the complex and ever-changing roles within the centres. The example that is most striking to me is the case of the child of immigrant parents who is used to eating with his hands at home. The parents in the day-care centre have to make choices as to whether not only that specific child but also other children at the centre are allowed to forfeit knife and fork at lunch. The example is interesting to me since the immigrant parents, whom Brougère notes are often relatively marginalised in the centres, are bringing to the community a new challenge, precipitating new practices and the formulation and replacement of new rules. The classic distinction between 'newcomers' and 'old-timers' seems to break down in this and other similar examples.

The case studies of Kloetzer et al. (2015) are strikingly different. Kloetzer, Clot, and Quillerou-Grivot bring us to think about communities that are not working well but are in crisis: they are breaking apart or were never operational in the first place. The scholars apply the models and scholarship on learning and development to intervene in these situations of crisis, through what they term the 'activity clinic'. The diagram they provide is useful in giving us a visual of a community that is working well and in balance. The authors ask us what happens when a crisis creates unbalance in such a community, and how do we as scholars and researchers intervene to bring back the community of work to a 'healthy' and working state? Their approach, influenced by the activity theory of Leontiev and others, is to identify and make visible the tensions in the work community. In contrast to the case described by Brougère, in which tensions or problems are solved collectively through daily practice, in the cases described by Kloetzer et al., the daily practices of the work community are not sufficient to bring about resolution of deep-seated tensions. There is a need for intervention to bring actors to take a step back and reach another level of thinking and analysis to address the issues. The way of conceptualising development recalls the work of Engeström (1987; Engeström and Sannino 2010) and his concept of expansive learning, though the authors refer

primarily to the French ergonomics tradition. The activity clinic does not pretend to bring a single solution to a problem but, by revealing tensions and bringing individuals to confront each other by viewing video footage of work practices, opens up a space for confrontation, dialogue, and self-reflexivity, which all have potential for development. This process can only be carried out collectively, and the method of cross self-confrontation, whereby workers comment on the recorded work practices of each other and thereby also become conscious of their own practices, is designed to engage the community and enable reflection at a level above daily practices. In the use of video recordings, tensions are made into objects that can be manipulated and submitted to the gaze and analysis of others. During the workshop in Geneva, I asked Laure Kloetzer whether these recordings helped create different narratives for the workplace, but her answer was that precisely, a narrative is a single interpretation, whilst the activity clinic aims to capture the multivocality and differing points of view and ways of thinking and working that are part of the workplace. Through this methodology, controversy within the workplace can be appropriated and transformed into a tool for development.

9.3   Environment

After a discussion on the collective, I now 'zoom in' to the level of the individual to think about the implications of the theories and cases presented in the chapters by Blandine Bril and Germain Poizat on the interactions between individuals and the environments in which they work and learn.

In Bril (2015), we have an all important reminder that having a clear understanding and model of actions on the material environment through tool use is needed to steer clear of untenable positions in our theories of learning in practice. Bril brings us to reflect on some of the key implications of ecological psychology and the work of James Gibson and Nicholai Bernstein, for understanding activity and learning. The crucial insight in Bril's chapter is that one cannot leave out the intentions of actors when we try to understand and analyse their actions. Bril says she is reversing the tenet of cognitivism, countering the idea that humans start an activity with representations and motor schemas 'in the head' that can be unambiguously 'translated' into actions (Ingold 2000). Rather, one must understand activity in terms of the intentions of individuals and the selection of strategies that can enable individuals to proceed towards goals. Citing Bernstein, Bril highlights that learning consists in a repetition of not mechanical movements but the process of arriving at a solution. This is what she terms a 'functional' approach to activity, in contrast to a computational model that does not include the goals and intentions of persons. Borrowing the concept of affordances from Gibson enables Bril to formulate her model to include intentions, bodies, and environment in a coherent whole. Of particular interest in that model is the way it enables one to address differences between individuals, in terms, for instance, of age, abilities, physical dispositions, and levels of expertise. This might be a particularly

interesting point to carry over to social theories of learning and the failure of many of them to include what Stephen Billett calls the 'brute facts' of individual abilities and disabilities (Billett 2009). After the construction of a careful model of the engagement of individuals in an activity, Bril shifts to the point of view of the collective. Through the notion of 'sociality' or 'education of attention', Bril reminds us that learning rarely takes place in isolation but rather through the participation of social others who point out relevant features of an environment and in so doing create new affordances for the learner.

The contribution by Poizat (2015) presents us with a contrasting, but in many ways complementary, position to Bril. Poizat (2015) is also concerned with the relationship between an individual and the environment and echoes Bril when he argues that we cannot understand individual and environment as operating distinctively from each other. Poizat's reflection however stems from different scholarly traditions, and he is critical of the phenomenological and ecological psychology approaches discussed by Bril. The chapter is concerned with technology and makes the point that vocational learning virtually always operates in environments where technology is present. For Poizat, technological objects are not passive tools but are beings that evolve and become increasingly 'concrete', understood here as 'organic': elements of a technological object become increasingly interdependent with time. In this sense, technological objects become increasingly individual, a process that finds parallels with the increasing individualisation of persons (an idea developed in the co-authored chapter by Poizat and Durand in the second part of this volume). Poizat's issue with phenomenology and ecological psychology is that these approaches tend to consider the material environment, including tools and technologies, as the context in which humans carry out their activities, whilst Poizat's approach imagines technologies, environments, and persons, not as given but constantly self-generated and mutually constituted. This is an important point to counter the same kind of computational positions that Bril also critiques. Poizat's critique can also be addressed not only to the cognitive sciences but to biology and, in particular, the dominant model of the 'selfish gene'. In a similar critique to this dominant biological model, the anthropologists Ingold and Pálsson (2013) suggest that, instead, we should talk of human evolution as 'biosocial becomings', to identify a process that constitutes persons and bodies that is at the same time biological and social. Transposed to a discussion on learning, the point to retain in the chapter by Poizat is that persons are constantly in learning, or in other words, there is no end point to learning. This idea is echoed in other chapters, notably that of Kloetzer et al. (2015), who discuss the inevitable tensions that occur in workplaces as sources of development, and the arguments of Lorino (2015) that workplace learning is not separate from the constant negotiation of a worker's place within an enterprise. It is interesting that in these three examples, learning is conceptualised as originating in some kind of disturbance, specifically in the environment for Poizat, with reference to the biological concept of autopoiesis. In Poizat's highly theoretical discussion, persons are in a state that is never resolved, never static. As in these other chapters, there is no neutral state in which a person 'knows', but rather learning is a constant process of knowing.

9.4   Morality and Ethics

From an initial discussion on concepts of community, I went on to consider the environment through the chapters by Bril and Poizat. The two authors agree that a proper understanding of learning includes a conceptualisation of the individual-environment dyad. I return now to a consideration of the social dimension of learning more directly, through a reflection on the contributions by Philippe Lorino and Frédérik Matte and François Cooren. What brings these two chapters together is a concern for the moral and ethical dimensions of workplace learning. The socio-linguist Nick Enfield (2011, p. 303) reminds us that humans are not rational but moral animals. Enfield's point here is that we humans are always operating in contexts in which we not only attribute meanings to things and other people, but we are also constantly aware that other social peers are interpreting our own actions in moral and ethical terms. Extended to our concern about workplace learning, this principle suggests that learning takes place in a way that learners and mentors are constantly aware of their moral positioning with regard to the other and opt for certain ethical behaviours as a result.

Lorino (2015) addresses these issues through a careful case study of a failed attempt at innovation in an organisation. The management of the French corporation EDF introduced a new system of sales in which workers were called to fill in roles that went beyond their initial expertise as technicians, salesmen, or accountants. Technicians, for instance, were taught and expected to take charge of simple tasks of accounting. The model of EDF rested on the assumption that workers would act in a 'rational' way and could, for instance, easily learn new basic skills. The fundamental mistake, as Lorino shows us, was failing to take into account that workers are motivated and engaged in learning according to the roles they understand they are playing in an organisation. For the technicians, learning accounting skills did not fit their 'professional genre' (in Lorino's terms), which is to solve practical problems. The notion of professional genre explains the actions of workers not simply in terms of drives, wants, or directives but as developing in dialogue with their own image of what is expected of their role. Ideas about this role are built through interactions with others, within the enterprise, and, for instance, technicians in this case felt strongly that they were different kinds of persons than accountants. Thus, the ultimate failure of this new system EDF tried to implement was to assume that workers were only rational, and not moral or ethical, persons. For Lorino, people engage in activities with a sense of what is expected of them, their own goals, and an awareness of the intentions and goals of others. This includes an understanding not simply of the goals of colleagues but the broader goals of other departments or the organisation as a whole.

One might venture that this approach by Lorino is an expansion of the model that Bril develops around the significance of intentions in human activity. For Bril, we cannot reduce an activity to a sequence of operations, and we must rather understand activity as being generated from intentions and goals. In Lorino's chapter, there is a change of focus from the individual (Bril) to the collective. This

introduces an added level of complexity, since Lorino's model needs to account for the articulation of the goals and intentions of different individuals in a collective and the way each individual models the goals and intentions of other persons to inform their own actions. The concept of 'community of inquiry' accounts for this complexity, in a way that the model of community of practice of Lave and Wenger discussed above might not. In Lorino's model, narratives play a key role in enabling the articulation of the activities of communities of practice (workers sharing similar activities) and communities of process (workers with different activities who collaborate with each other with a shared goal).

In the chapter Matte and Cooren (2015), we continue with the topic of morals and ethics and the foundational notion that in activity and workplace learning, persons are constantly aware of the goals and intentions of others and model their behaviour accordingly. Learning is conceptualised here as a negotiation in one's social environment, which includes understanding the ethical positioning of other people. Similarly to Poizat's point that we should not think of learning as the extraction of meaning from an already existing environment, Matte and Cooren reflect on the way meanings in workplace environments are created as part of negotiations between actors. Matte and Cooren refer to Goffman's concept of 'facework', which identifies the steps taken by individuals to prevent an interlocutor from losing face. Through an analysis of the interactions between workers in an organisation, Medecins Sans Frontieres (MSF), the chapter shows us how personal and work ethics takes precedence over intentions of teaching or learning. In the case study of interactions between a 'newcomer' to a workplace and an 'old-timer' who is giving him a tour of the grounds, the authors show us how forms of learning take place in conversations, but this learning is disguised by the actors as something that is not learning. Actors refer to hearsay and the words of higher authorities, which enables them to carry out a conversation without appearing to formulate outright critiques nor appear to take a stand on contested issues. In this way, any potential tensions are downplayed through the work of saving face of the interlocutor. Facework here is dependent on the interlocutors' awareness of each other's status, as expert, newcomer, or co-worker. In this chapter, as in other chapters in this section, tensions are conceptualised as lying at the heart of certain forms of learning. For Kloetzer et al. (2015), tensions are a source of development. Matte and Cooren also suggest that tensions can play a key role in learning, but in contrast to the methods of the activity clinic of Kloetzer et al. which serves to *reveal* tensions, the interlocutors in Matte and Cooren's case study are at pains to conceal or downplay these tensions. Yet as the authors note, forms of learning do appear to take place even if not recognised as such by the interlocutors.

As for Lorino, Matte and Cooren show us how we act in ways that are consistent with images we want to give to others. For Lorino, these images are professional roles; Matte and Cooren focus on respective status. Taking turns in the conversation, the interlocutors, for instance, defer to the authority of the interlocutor, claim certain forms of legitimacy in speaking about aspects of their work, or deflect attempts to contest this legitimacy. In this chapter, we get a sense of how learning is a by-product of interactions and the negotiation of tensions. By highlighting subtle

and fleeting moments in which interlocutors diplomatically affirm their knowledge or contest the knowledge of others, Matte and Cooren expand on our understanding of the many ways in which learning can take place in contexts of work.

Matte and Cooren, in a similar way to Poizat, imagine the contexts of learning not as given, pre-existing in the environment, but actively constituted by actors. This is strikingly illustrated by the fact that the two actors are moving in the environment; they are 'on the go'. What is seen by the actors as they move through space is not an objective reality but one that is actively constructed by their exchanges. They cast a 'professional vision' (Goodwin 1994) on the world around them, seeing the world according to their capacities to discern relevant details, for instance, in the structure of a building that sparks a conversation on the policies and practices of MSF.

A last note about facework, the authors show the subtleties of the actors' interactions and pains taken to avoid the interlocutor to lose face. This is to be understood with reference to the status of the two actors, as employees of the same organisation, and despite differences of status, they are also interacting as co-workers. Facework is certainly not a necessary feature of work-based learning, and I am reminded of several cases in the anthropological literature on apprenticeship (Marchand 2001; Herzfeld 2004; Simpson 2006) in which verbal and physical abuse, mockery, and shaming – in other words everything but facework – are part and parcel of interactions between mentors and trainees.

9.5   Conclusion

This small sample of essays gives us only a glimpse of the diversity of francophone approaches to the theory of practice. Identifying three general themes in the chapters – community, environment, and morals/ethics – was my way to make sense of this diversity and think about connections between the approaches, but in no way is meant to confine each chapter to a single perspective.

The chapters give us a variety of models to work with. During the workshop, an interesting conversation focussed on the ways in which different contributors used models in different ways. This point was first raised by Simone Volet, and Gilles Brougère reflected on his own use of models: for him, the model of community of practice serves as a heuristic to formulate initial thoughts about a case study but does not constrain the analysis of that study. In an ethnographic spirit, Brougère is interested in revealing the subtleties of interactions in a community of practice rather than testing whether a given case fits the model. We get a sense from Lorino's chapter that he is doing the opposite: starting with the detailed analysis of a case study, he derives a model of the community of enquiry that can usefully be applied to other cases of workplace learning. Bril strikes me as taking yet another approach to the use of models in that she appears, in her paper, to 'think through' a model of learning, defining what are the essential elements and parameters involved to build a model that is universally valid. In yet another approach to the use of the model by

Kloetzer, Clot, and Quillerou-Grivot, a model of development in the workplace emerges as a result of a method, the activity clinic, that is applied to concrete cases. In this approach, there is a close relationship between theory and method since, as the authors note, the work should adapt to workers rather than the other way around.

In the diversity of approaches of the different authors, there is a diversity of ways in which learning is conceptualised and defined. A commonality, however, is that learning is defined as fluid, open ended, and goal and intention directed and a positive outcome of the daily tensions and disruptions of working life. Learning maps onto participation, in other words the dynamics of a community, whether it is working well (Brougère) or not (Kloetzer, Clot, & Quillerou-Grivot), maps onto the material environment in which it is situated, as people interact with tools (Bril) and technologies (Poizat), and maps onto morality and ethics, as persons situate themselves within roles (Lorino) and statuses (Matte and Cooren) as part of complex forms of sociality which brings persons to transform themselves or in other words to learn, together.

References

Billett, S. (2009). Conceptualizing learning experiences: Contributions and mediations of the social, personal, and brute. *Mind, Culture, and Activity, 16*(1), 32.

Bril, B. (2015). Learning to use tools: A functional approach to action. In L. Filliettaz & S. Billett (Eds.), *Francophone perspectives of learning through work: Conceptions, traditions and practices*. Dordrecht: Springer.

Brougère, G. (2015). Learning by participating: A theoretical configuration applied to French cooperative day care centres. In L. Filliettaz & S. Billett (Eds.), *Francophone perspectives of learning through work: Conceptions, traditions and practices*. Dordrecht: Springer.

Enfield, N. J. (2011). 12 sources of asymmetry in human interaction: Enchrony, status, knowledge and agency. *The Morality of Knowledge in Conversation, 29*, 285.

Engeström, Y. (1987). *Learning by expanding*. Helsinki: Orienta-Konsultit Oy.

Engeström, Y., & Sannino, A. (2010). Studies of expansive learning: Foundations, findings and future challenges. *Educational Research Review, 5*(1), 1–24.

Fuller, A. H., Hodkinson, P., & Unwin, L. (2005). Learning as peripheral participation in communities of practice: A reassessment of key concepts in workplace learning. *British Educational Research Journal, 31*(1), 49–68.

Goodwin, C. (1994). Professional vision. *American Anthropologist, 96*(3), 606–633.

Herzfeld, M. (2004). *The body impolitic: Artisans and artifice in the global hierarchy of value*. Chicago: University of Chicago Press.

Ingold, T. (2000). *The perception of the environment: Essays on livelihood, dwelling and skill*. London: Routledge.

Ingold, T., & Pálsson, G. (2013). *Biosocial becomings: Integrating social and biological anthropology*. Cambridge: Cambridge University Press.

Kloetzer, L., Clot, Y., & Quillerou-Grivot, E. (2015). Stimulating dialogue at work: The activity clinic approach to learning and development. In L. Filliettaz & S. Billett (Eds.), *Francophone perspectives of learning through work: Conceptions, traditions and practices*. Dordrecht: Springer.

Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. Cambridge: Cambridge University Press.

Lorino, P. (2015). Learning as transforming collective activity through dialogical inquiries. In L. Filliettaz & S. Billett (Eds.), *Francophone perspectives of learning through work: Conceptions, traditions and practices*. Dordrecht: Springer.

Marchand, T. (2001). *Minaret building and apprenticeship in Yemen*. Richmond: Curzon.

Matte, F., & Cooren, F. (2015). Learning as dialogue: An 'on-the-go' approach to dealing with organizational tensions. In L. Filliettaz & S. Billett (Eds.), *Francophone perspectives of learning through work: Conceptions, traditions and practices*. Dordrecht: Springer.

Poizat, G. (2015). Learning through interaction with technological objects: From the individuality of the technical object to human individuation. In L. Filliettaz & S. Billett (Eds.), *Francophone perspectives of learning through work: Conceptions, traditions and practices*. Dordrecht: Springer.

Simpson, E. (2006). Apprenticeship in Western India. *The Journal of the Royal Anthropological Institute, 12*(1), 151–171.

Wenger, E. (1998). *Communities of practice: Learning, meaning, and identity*. Cambridge: Cambridge University Press.

Wenger, E., McDermott, R. A., & Snyder, W. (2002). *Cultivating communities of practice: A guide to managing knowledge*. Boston: Harvard Business School Press.

Part II
Conceputalising the Links Between Training and Work

Chapter 10
Vocational Didactics: Work, Learning, and Conceptualization

Patrick Mayen

The object of this chapter is to present vocational didactics and to develop on one of its principal characteristics, namely, conceptualization in action. Vocational didactics is the translation for "didactique professionnelle." But, a better translation would mix "professional didactics" and "vocational didactics." Vocational didactics is situated within the field of practices in vocational education for young people and adults. It is geared toward both research and action, striving to help address the tasks, problems, and issues specific to vocational education and its further development. It is not a discipline but a process defined by a perspective on matters of vocational education and specific principles, concepts, and methods. According to one deliberately simplified sense of the word, it is a technology defined as the organized mobilization of knowledge to solve pragmatic problems (Leplat 2008). The goal of vocational didactics is, therefore, to generate knowledge and methodological tools for use by actors in vocational education whose roles are to design and implement educational programs, pathways, situations, and procedures. Vocational didactics can also be mobilized when intervening in work settings in order to act upon and optimize their learning potential. In this sense, it is consistent with the intentions of what is referred to in the Anglophone world as "workplace learning" in that it takes an interest in work situations and their potential for learning and development (Mayen 1999, 2008, 2011). It also, however, addresses professional learning within and through training, which is also analogous to vocational education broadly cast.

Vocational didactics commences by examining the use of work situations for training by attempting to answer two questions: How can educational pathways be designed in such a way as to integrate work and training situations? And how can training pathways and situations be designed based on and in reference to work

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situations? It also looks at vocational education and asks: what potential can a training pathway develop for action within a work situation? This last question raises the issue of the gap between vocational education and actual work and the observation that vocational training is more or less able to meet the learning needs of workers or future workers. Finally, vocational didactics studies learning within work situations. As we will see in the two cases presented later in this chapter, the learning potential of certain work situations is limited, particularly in terms of engaging and supporting conceptualization processes and constructing forms of action and reasoning situated on conceptual registers and not only procedural ones.

Vocational didactics emerged to address the issue of training for industrial workers faced with evolving work conditions and the need to develop diagnostic and adjustment skills. In his first writings on professional didactics, Pierre Pastré (1992) analyzed the work of injection machine operators and adjusters in molding companies. He showed that in terms of work activities, the tasks associated with defect diagnosis and adjustment were performed at very different cognitive levels. Some workers functioned at an analytical and cognitive level, while others worked at a procedural level only. Pastré proposed, based on work analysis, to design a simulator by which to train the operators and adjusters, requiring them to perform diagnostics and also to perceive and interpret the effects of their actions. Pastré's research in the industrial sector was followed by studies in agricultural domains, for instance, regarding tasks associated with vine pruning or the growing of field crops (Caens-Martin 1999). A recent book (Mayen and Lainé 2014) devoted to this area of study examined a series of occupations in which work is performed on living organisms (e.g., landscape and natural area maintenance and protection, landscaping, fishing, forestry, organic farming, etc.). The intent was to understand, first, how sustainable development perspectives modify work and, second, what learning is needed to think and act effectively in such a context. Mayen has also examined vocational didactics in the service sector, such as automobile after-sale service, services to individuals, and career guidance. Other publications have examined vocational didactics in management or supervision, public policy consulting/evaluation, emergency management (Samurçay and Rogalski 1991) education, and training (Rogalski 1995). Professional didactics has also been mobilized in another area, namely, tutoring in the workplace or in adult training internships, considered as belonging to the realm of work and in reference to work situations. From a training standpoint, professional didactics has thus explored the issues of learning within and through work and also examined ways of designing training based on work activities and situations. Research on simulation and the use of simulations are an especially effective illustration in this regard, e.g., in alternation-based training, which offers a way to conceive of learning holistically over the course of both work and training. Other studies have been undertaken with a view to developing evaluation tools, namely, designing evaluation frameworks, assessing and validating experience-based learning, and carrying out assessment in work situations for certification purposes, which are all associated with this movement. Vocational didactics research, then, clearly touches upon all domains of work and has expanded to encompass many questions pertaining to vocational education.

The first part of this chapter will present vocational didactics, along with its intentions, principles, and concepts, giving an important place to the question of conceptualization. The second part will set forth two cases of work analysis and training design under a vocational didactics approach. Both cases aim to show how such a conceptualization can be approached.

10.1 Vocational Didactics: Work Analysis and Conceptualization

Consistent with many current accounts of workplace learning, vocational didactics proposes that work can be a space for learning and development. Using the notion of development assumes that work, in many cases, requires something more than applying procedures and repetitively performing programmed and standardized actions. Work also requires competent professionals, i.e., people who are capable of the capacities needed to adjust or invent ways of doing things to solve problems and complex situations. As a result, work requires that individuals both learn a job and, under certain conditions, learn and develop the ability to act in ways that include being able to adapt what they know, can and value to circumstances that are different than those in which they initially learned them.

10.1.1 Work: A Space for Thinking, Acting, and Learning

The first essential idea in this respect is that a work situation is, at least potentially, a problematic situation, in the sense suggested by John Dewey (1938): work situations are often situations that lead to require higher orders of thinking and acting. This is what we have referred to as a potential situation for learning and development (Mayen 1999). Paid work has specific features that make it possible to create an environment in which and with which learning and development are possible. This is one of the assumptions of vocational didactics, namely, that one can learn and develop in and through work. The main "educational" or didactic characteristic of work is that it requires conscious and engaged thought. To borrow an expression from Pastré, the interesting element in know-how, from a vocational didactics standpoint, is that the "how" involves "knowing." Workers think consciously and intentionally about and during their actions. They are led to think in this way for the simple reason that tasks, events, and problems arise for which the usual forms of action and routines may prove to be insufficient. Workers can also be led to think simply because an action's orientation requires the conscious, voluntary, and systematic activity of diagnosis and looking for clues in order to determine the status or development of a situation, construct action scenarios, anticipate consequences, make decisions, and then control and adjust and, finally, assess a chosen action. To paraphrase Dewey

(1938), work requires individuals to investigate and construct problems in order to find solutions and, hence, reestablish the continuity of action.

To be able to do so, workers must construct and appropriate certain forms of knowledge and reasoning to be able to use them instrumentally. The idea that the knowledge, concepts, laws, and propositions that are considered to be true about objects, phenomena, and situations constitute instruments is not very widely shared. Yet, Gérard Vergnaud (2008) reminds us that thinking is an action. Moreover, in keeping with Vygotski (Vygotski 1985; Friedrich 2012), intentional goal-directed thinking is an "instrument-based" action: it is knowledge (including the concepts, laws, and rules that govern phenomena, modes of reasoning, and signs) that shapes the existence, forms, and exercise of practical thought.

As a final point, in the realm of work, knowledge is incorporated into situations, tasks, instruments, and documents. It is an integrated part of technical systems and how they function and are used. Knowledge circulates between workers and their partners and is exchanged in conversations and in coordination- and cooperation-related interactions. As we have seen in previous research on the process of learning to milk dairy cows (Bazile and Mayen 2002), the concept of a germ, even if it does not have exactly the same meaning for all actors in a given setting, circulates and is exchanged among farmers, technicians, suppliers, clients, veterinarians, and so on. This concept makes it possible to think about and collectively numerous work-related events, to make decisions, and to adjust actions. This is why learning is constructed in action within a situation, in and through experience with a professional environment that is, first and foremost, a cultural world created by humans.

10.1.2 How Vocational Didactics Addresses Difficulties Within Vocational Education

Vocational didactics has emerged to address the tasks, problems, and issues of vocational training in light of a number of observations of failures or, at the least, difficulties.

10.1.2.1 Work Is Not the Application of Knowledge, Techniques, or Procedures

The first observation has to do with a disassociation between vocational programs and actual work requirements. This is the case even if these programs target current or future workers' capacities for action in work situations. Programs are often designed based on either scientific and technological knowledge or prescribed procedures or protocols, neglecting what ergonomists call "real work." From a professional didactics standpoint, action is not the application of knowledge, techniques, or procedures. Knowledge and techniques, considered as available

cultural resources, need to undergo appropriation processes that Gérard Vergnaud (1990) has described as "pragmatic elaboration processes." This means they need to be re-elaborated to meet the characteristics and requirements of situations, on the one hand, and to adjust to the other knowledge and techniques mobilized in these situations, on the other. Finally, some more or less explicit knowledge and techniques also exist that are not accessible in and through the disciplines but can be learned and transmitted in and through action, as well as via exposure to professional settings and their members.

10.1.2.2 Work Is Poorly Understood

The second observation is that actual work is often poorly understood in its two dimensions. The first has to do with the concrete and complex conditions and subsequent requirements of work situations. The actual activities of human beings in these situations are poorly understood, as are, among other things, the forms of knowledge and reasoning that organize their action.

The result is that the diversity and variability of situations that a professional might encounter are often underestimated. Competence for a category of situations can therefore be defined as the capacity to face situational variations while maintaining a sufficient level of effectiveness to achieve production goals but also to face these variations while preserving individual physical and psychological health. An example is the diversity and variability of situations confronted by home care workers for the elderly, a case that will be elaborated upon in the second part of this text. The diversity in this last case concerns the conditions offered by each individual's accommodations that can be more or less conducive to the work at hand; for example, a bathroom can be more or less well equipped or capable of accommodating both an individual and a care worker. This diversity also concerns the extent of the individual's dependence and their health characteristics, capacities, and needs. For the same individual living under the same accommodations, variability also arises through developments in their state of health, state of mind, and state of fatigue, during the same session. What is expected of a competent professional is precisely to be able to provide quality service in spite of the diversity and variability of their work conditions. Even the "simplest" and most procedural tasks involve variations that arise with each new occurrence of the task. Workers are always led to modify and adjust their actions, if only because they must also confront variations in their own physical or psychological state.

At the same time, actions can exhibit a kind of invariability in that the phenomenon on and with which workers must act and the conditions under which they must act have some constant characteristics and show behavior consistent with certain laws. One of the objectives of work analysis in professional didactics is to identify the "invariant" structural characteristics of each category of work situation that can be found within the diversity and variation of particular situations that workers might encounter. This implies having diversified and adjustable modes of action but also and especially being able to either choose and adjust ways of doing things

depending on situational variations or, to a certain extent, be able to invent novel ways of doing things. All of this requires the ability to reason on the register of conceptualizing action. This conceptualizing is the sense in which the notion of competence is conceived in vocational didactics. A more competent professional is a professional who is able to handle greater situational diversity and variability and who can conduct diagnoses to identify the state of development of situations and phenomena and, based on these diagnoses, choose, adjust, and even create new courses of action. A professional's diagnoses correspond to a form of investigation within and into the work situation, leading to the ability to make a pragmatic judgment on the problem and the situation and, hence, to determine subsequent actions. More competent workers, therefore, reason through their actions using a system of concepts and propositions that they hold to be true and use to interpret clues collected in a situation. A professional does not stay at the mere level of applying rules based on recognized clues. Diagnostic and reasoning abilities are not applied only during action but also after and outside the action; they are, therefore, also means for reflecting on action and for understanding relationships between the conditions for action, the action itself, and the action's effects. In other words, these abilities constitute the foundation for the reflective activity.

10.1.3 Methods and Concepts Originating from Ergonomics and Developmental Psychology

Vocational didactics attempts to respond to these observations by developing on the work of a few Francophone ergonomists and psychologists interested in training (Leplat 2000, 2002; Weill-Fassina 2008; De Montmollin 1986) and based on a theoretical framework developed by Gérard Vergnaud, in turn inspired by the developmental psychology of Jean Piaget (1964, 1979).

10.1.3.1 Ergonomic and Didactic Work Analysis

From ergonomics, vocational didactics primarily retains the following two points. The first point is the distinction between *task* and *activity*. A task is made up of conditions with which a professional is called to act. In this regard, ergonomists emphasize the irreducible difference between prescribed work and actual work. Actual work, produced by human individual activity, is never identical to prescribed work. It cannot be boiled down to the application of procedures. There is always intelligent activity (and actor), not in the sense that this intelligence always yields efficient practices, but in the sense that each action contains operations of information gathering on the situation and its development, of interpreting this information based on individually organized knowledge, and of constructing and adjusting the action playing out within the situation.

The second point retained from ergonomic intervention is the need to analyze the work involved prior to designing and proposing ways to transform work or vocational training. The notion that one needs to be familiar with the work to be able to design vocational education is not always accepted, especially when work is considered in its dual dimension—a task, understood as a set of conditions under which a professional is or will be called to act, and an activity, understood as a global, bodily, intellectual, and emotional endeavor within and bearing on the particular environment that is the work situation. It is important to place work analysis in an educational context. The traditional definition of vocational didactics (Pastré 1992, 2011) is "analyzing work for training," which shows that the perspective of training comes first. One might say, in other words, that to conceive the contents and methods of training, one must analyze the work involved.

Work analysis is above all an analysis of work situations defined as the environment with which and on which workers are called to act and reason and with which environment they must be familiar. Work situational analysis comprises both ergonomic and didactic dimensions. Work analysis consists in shedding light on the characteristics of a category of situation, namely, its complexity, and what it deals with, its variations. It also involves underlining its different components and their interactions, namely, goals, since any work situation is directed at an outcome; objects, since actions deal with certain aspects of the world; conditions, including the organization of work and physical, spatial, and temporal conditions; instrument systems; partners; etc. In other words, work analysis examines everything with which one must act and that needs to be taken into account for understanding the action involved. From an educational perspective, each component of a class of situation potentially constitutes what workers will be called to discover, know, and understand and with what they must learn to act. The focus is, therefore, on what might be referred to as the "work content" and "training content." This analysis of the situation as a given environment is also needed to be able to design training situations, whether inspired by work situations, simulated, or reconstituted events.

The other aim of work analysis is to analyze activity, that is, to analyze the activity of workers who have varying degrees of experience and recognized competence. The concern here is to underscore the modes of action, ways of reasoning, and types and forms of knowledge that are implemented during action within a situation. Activity analysis is also "didactic" in the sense that it is concerned not only with knowing (future) workers' modes of action, reasoning, and knowledge but also identifying variations in action and in reasoning depending on variations in the complexity of situations. It further strives to identify different registers of action and reasoning depending on the professional and the extent of their experience or the efficiency of their actions. In this regard, it is essential to identify errors, difficulties, obstacles, biases in reasoning, incomprehension, risk-taking, and incidents. As these are not just potential objects of training, they are what make training more difficult to put in place and conduct out successfully. In both situation analysis and activity analysis, special importance is given to the dimension of conceptualization.

10.1.3.2   Psychological and Didactic Work Analysis

An "Action Intelligence"

In a way, to speak of competence is to speak of intelligence in the broadest sense, the operative intelligence of knowing "how" rather than knowing "that." Competence, indeed, supposes action, which could be described as modifying an environment in order to adapt to it. It could be said to imply at least three things:

1. Individuals are capable of selecting, from a global environment, the elements that provide the information needed to set a course of action.
2. Having defined a course of action, individuals are able to implement a sequence of movements or activities enabling the realization of the objective one has set.
3. What individuals have learned from past successes or failures is taken into account when defining new endeavors.

It is obvious that these three aspects of the issue are all related to development; but the last is the one most closely connected with it (Connolly and Bruner 1973).

Conceptualization in Action

One of the characteristics of the position of professional didactics has been expressed by Vergnaud (1996):

> In the beginning is not the verb, much less the theory. In the beginning there is the action, or better yet, a being's adaptive activity within an environment. Thought actually begins with action: more precisely and more thoroughly, it begins through action, information gathering on the environment, control of the action's effects, and a possible review of the way one's conduct is organized. None of this would be possible without representation, that is, the forming into thought of objects, properties, relationships, transformations, circumstances, conditions, and functional relationships between these objects and between these objects and the action in question. In short, nothing would be possible without conceptualization. (p. 275)

Conceptualization in action is central to the field of vocational didactics and defines a position toward work and training. It also defines aims for professional learning and development and organizes the field's theoretical and methodological frameworks. To begin with, conceptualization in action defines a position toward work and training. In the professional world, as well as the world of vocational education for young people and adults, the distinction between designing and executing work that is a product of organizational considerations continues to exist, as does the distinction between manual work and intellectual work. According to these dissociative conceptions, tasks defined as execution tasks are thought to be "executable" without reasoning or knowledge. The application of procedures aimed at clearly defined goals is thought to be sufficient. Execution tasks are most often "manual." In other words, according to common sense, these are tasks that are not intellectual and only require an individual to follow and repeat action rules. "The emergence of

a dichotomy between manual and intellectual work is not spontaneous. On the contrary, one could say that the 20th century was characterized by deliberate efforts to separate doing from thinking" (Crawford 2009).

The position of vocational didactics, based on works of ergonomics, the sociology of work, and developmental psychology, consists in positing that all action is organized. It is organized at the level of representations; all actions are composed of operations of reasoning, information gathering on the environment, and subsequent interpretation. Accordingly, competencies are nothing other than intelligence in action and for action, as the earlier cited quotes of Bruner emphasize:

> Activity is organized, especially when it is successful and successfully reproduced: this is referred to as competencies. The main feature of this organization of activity is that it provides a link between invariance and adaptation to circumstances. In other words, activity organization is a flexible rather than stereotypical organization: competence does not consist in reproducing the same operational means, but rather adjusting to the situation. However, if there was no invariance, the activity could not be reproduced consistently and effectively. (Pastré 2008, p. 56)

Here, didactics borrows from developmental psychology, namely, from Jean Piaget and Gérard Vergnaud. The invariance that Pastré (2008) discusses is conceptual in nature. From Piaget, Pastré borrows the concept of an *operational invariant* to designate situational properties that are able to guide action. The notion of an operational invariant designates the construction, in thought, of the most influential properties of the situation, those that need to be taken into account, those on which it is necessary to reason and to act, and those that must be monitored, kept in balance, or transformed. Importantly, the phenomena, relationships, and transformations relating to objects, and their mutual interactions and those entertained by the individual working with them, are not immediate givens, for the simple reason that they cannot be perceived and grasped. From a Piagetian perspective, they must be constructed.

The epistemology of Piaget is constructivist. It is a theory that attempts to explain relationships between the subject and objects in the development of knowledge. Conceptualization and the construction of operational invariants both involve an essential aspect: knowledge is not perceived, in that it is not "given" to the senses or at first glance, but rather it is constructed. Vocational didactics also borrows another aspect from Piaget: conceptualization is closely tied to action. It is through action with objects in an outcome-oriented situation that objects are ascribed properties, as Dewey (1938) has also noted. For Vergnaud (2008), it is because individuals can imagine the properties of objects and situations that they can act upon them, but working with objects and situations also enables the construction of the most meaningful and operational properties for relevant and effective action.

Analysis of Work Conditions as Potential Learning Conditions. . . or Not. . .

Work analysis is also an analysis of work conditions. This is, firstly, because it strives to identify what workers are confronted with, since training must plan for the

discovery and appropriation of work situation components, and, second, because actions and competencies are fundamentally distributed between what comprises individual action and what constitutes the situation. Indeed, the professional environment can be said to shape both the mind and the action (to paraphrase Jerome Bruner). In a didactics approach, what is of interest is how work conditions constitute or fail to constitute conditions which, on one hand, help and promote or inhibit and constrict the expression of personal capacities, including to achieve goals set by the work involved, and, on the other, how they constitute or fail to constitute potential for learning or at least for maintaining workers' capacities and knowledge. Indeed, educational orientations vary depending on whether one is preparing workers to work with a facilitating environment or not. Likewise, it is not the same thing to prepare workers and to design training pathways using work situations with and without enabling environments.

Work condition analysis is likewise useful for thinking about what must be put in place in professional situations, both during training and after training, and whether involving technical, organizational, or management-related modifications. It is useless to attempt to develop certain capacities if the tools are not well suited for the job or if the way work is organized does not allow subjects to express, exercise, and reinforce their learning. This concern for engagement is analogous to what some have called "educational accompaniment" measures. Moreover, work conditions can be acted upon to allow workers to attempt new tasks, to try them out, and to exercise and develop new ways of doing things and reasoning, by temporarily decreasing time constraints and productivity requirements, on one hand, and by authorizing the right to gather together, analyze individual action, etc., on the other. Yet, this process of engagement and access cannot be anticipated by vocational programs without taking into account the actual work conditions.

10.2 Two Cases of Vocational Didactics Analysis

This section examines two cases that are apt to demonstrate the main characteristics of a vocational didactics approach as discussed above and will attempt to show the place of conceptualization in both work analysis and training design.

10.2.1 Installing Sidewalk Curbs

Installing sidewalk curbs is a common task for public works enterprises and involves the installation of blocks of granite in the shape of cuboids between the sidewalk proper and a paved thoroughfare, usually a roadway. The curb not only separates the sidewalk from the pavement but also helps form a drainage channel for water evacuation.

The task is done by manual laborers. Related job descriptions often define sidewalk curbing in three stages: setting down, installation, and adjustment. Setting down refers to bringing the curb to the ditch dug into the pavement and lowering it onto a prepared concrete bed. Installation means placing the curb using stakes that have been put in place beforehand and set up the project site. The stakes are often placed by a supervisor and follow a certain direction, with a cord determining a specific slope. The supervisor also generally installs the first curb on the site, which becomes a reference for the ensuing work. Aside from the stakes, the available tools are a crowbar, a level, and a mallet. The study we conducted was aimed at identifying what non-qualified young adults were able to learn in a work situation, to identify possibilities for recognizing and validating their learning, and, finally, if action in a work situation did not enable sufficient learning, to design training sequences enabling these young people to build competencies and obtain a recognized form of qualification. Observation of eight young adults, over the course of a few days in the company of experienced workers, led to the following results. Our observation and analysis were performed by a professional didactics researcher and by a trainer and a former professional specializing in this field.

The task involved here is "misleading" insofar as any sufficiently determined individual can successfully set down and install a curb, not necessarily "in just any which way," but without needing to follow a systematic method. Such individuals can proceed by trial and error, approximation, and successive adjustments based on the reference provided by the previous curb. This is what both young and more experienced workers do. Observation revealed that the chief difference resides in the ease with which workers can smoothly link together operations, but the nature and order of operations are not distinguished; the younger and older workers do the same things. On the worksite, the younger workers speak very little with their more experienced colleagues but participate silently. The available tools are rarely or never used. Attention is exclusively focused on the curb being installed, as well as the previous one. The young people (and the older workers, to a lesser extent) are led to redo actions they have already completed, for example, lifting up a curb when it is sideways or one of its edges has ground into the concrete bed. They repair the alignment by working vertically and use their bare hands to lift and move the curb, letting it fall directly in the concrete or grasping and lowering it by the rough edges. This causes various postures that are likely to lead to musculoskeletal problems. It is possible to advance two observations from what has been described above.

First observation: the trainer finds out that the work setting and situational action lead to what he judges to be insufficient learning that is "hazardous" to the health of the young (as well as older) workers. Although the curbs can always be set down roughly consistent with the previously determined layout, the trainer considers that the time needed to lay down each curb is much too long. Most significantly, the absence of systematic action leads to a multiplication of operations and a systematic use of physical effort to correct, adjust, and redo actions using laborious or hazardous postures.

Second observation: when the trainer completes the task himself on site, there are many differences. He installs the curb much more quickly, not by working

hastily, but by avoiding the need to redo operations. The trainer's attention shifts from the curb that is being installed to the cord and the previous curbs. He uses the level very frequently, "straddles" the curb with his feet inside the ditch, and uses the crowbar throughout different operations while keeping his back straight. Moreover, he never uses his hands directly to adjust the curb.

The clarifying interviews we held with this trainer in the situation, as well as during subsequent video observation of his actions and the younger and older laborers' actions, shed light on the way he reasons and acts. A shift can be observed from a register of motor coordination (Pastré 1992) in which action is organized by the events that arise in action and by perceptions and information gathering on concrete action-related conditions to a conceptual register. The professional trainer begins by pointing out the importance of a fundamental law in public works: in all sites for public works, roads, channels, curbs, and gutters, there is a slope defined by a high point and a low point. The slope materializes in this case through the ditch that is prepared in advance, and by the cord, and can be controlled using a level. Installing and adjusting a curb imply that it is set down, installed, and adjusted based on the slope defined by a portion of the pavement. Two other dimensions are also at play: first, the alignment that refers to the direction and successive adjustment of curbs consistent with a predefined continuous line and, second, the "verticality," or the vertical dimension of curbs. The trainer's action consists in acting on these dimensions right from the moment the curb is set down, that is, by taking care to lay down the curb as close as possible to the last one, parallel to the concrete bed in order to avoid crushing it and breaking the slope, and as vertically as possible. One might say that he "presets" the curb. Each of his actions is, therefore, organized based on the anticipated outcome and the current state of the curb with respect to these three dimensions. The trainer follows an order of actions. He also keeps certain dimensions constant, for example, using his knees to keep the curb vertical while working on the slope. To work on the alignment or vertical aspect, he uses the crowbar as a lever, with the mallet acting on the slope.

The training program developed together with the trainer plays out as follows: the trainer personally intervenes on the worksite and guides the completion of the task by the young workers. He talks about, describes, and comments on what he does, explaining his thought in action. The trainer suggests a method in which, among other rules, he defines an order of actions and a specific use of tools to complete each operation, namely, action related but also information gathering related, so as to monitor each dimension of the curb's installation, as well as to adjust and control it. The trainer intervenes, corrects, and forbids the use of hands, and he makes the workers use tools. Overall, the trainer organizes group training sequences by creating a simulation with concrete blocks on sand to reveal the properties of working with this three-dimensional solid on loose ground that is easier to work with from a didactic standpoint than a 30–80 kg curb. Finally, in a classroom with a chalkboard and chalk, he asks young workers to sketch the worksite (e.g., stakes, cords, ditches, and curbs) and to show how a curb "reacts" based on the actions performed on it. Contrary to expectations, young adults show strong interest in these situations.

In a few days, the young workers are seen to gain speed, avoid dangerous gestures, and go from a solely approximate approach to working accurately on the curb's dimensions. Their attention shifts toward the cord and stakes. They have become aware of the system that guides action on the worksite and they talk about the setup, cord, level, slope, alignment, and vertical placement. Slope, alignment, and perpendicular placement correspond to what Piaget has termed *operational invariants*, which are properties of objects or more precisely situational objects, in the way they interact with action and can be conceptualized by an individual.

On the worksite, these invariants not only constitute the properties of this cultural object that is a curb, with its physical and mechanical properties, but are incorporated into the site's setup and execution system, including the stakes, the cord, the ditch, the ground that is acted on consistent with the alignment and slope, and the level. For the young workers, the formative intervention has expanded their system of representation and reasoning to encompass this system. A broader part of the situation now falls under the young workers' active environment, a part that was not taken into account previously. New properties have been assigned to the previously existing objects and instruments (i.e., curb, cord, etc.) and to tools (i.e., leverage properties of the crowbar, properties of the level, etc.). The action has been transformed, for it is no longer only a procedural method that acts as a "method with no method" but rather one founded and organized by pragmatic conceptualizations. Words have appeared and have been appropriated and used to describe the situation, its objects, its events, and its actions. The body has also been reintegrated as an integral part of the situation and situational analysis and as a component to be protected by action. It should be noted that half of the young laborers were quickly offered positions as supervisors because of their ability to set up worksites and to oversee the conformity of alignments and slopes.

On the observed worksite, the young workers learned situationally what the potential of the particular circumstance (Mayen 1999, 2011) allowed them to learn, namely, ways of thinking and acting that fall under what we have called a register of motor coordination. This register is not very economical from a health perspective or in terms of work quality and efficiency. The learning potential of action situations accompanied by more experienced workers, but who have not been trained and who learned on the job, is limited. This circumstance is also because of what we have referred to as the misleading character of the task of installing a curb. Contrary to other types of tasks, it is possible to complete this action successfully to a point, regardless of the modes of reasoning and action. In other words, the action's effects do not allow sufficient links to be made between the action and its repercussions, which is an essential condition for learning through action. The more experienced workers' inability to intervene in this process substantially limits the learning potential of the situation.

The trainer, together with the researcher, provides assistance by establishing didactic situations that associate situations in their context with situations that are more or less decontextualized or abstract. The most fundamental properties of action are the ones that are dealt with, since the idea is to foster a basic and practical "manipulation" of action-related properties. Abstraction can be observed in the

sense that certain material conditions that are attended to (curb weight and jamming, narrowness of the ditch, etc.) are set aside; yet the same operations of reasoning must be exercised by the learners.

10.2.2 Home Care

The need for elderly home care has generated job growth and the need for training in this sector. From a family or social activity, home care has become a regulated and organized service activity. This evolution has been concurrent with the requirement of professional qualification. The study presented here is directly related to this issue. It sought to examine and understand the evolution of this work and the situations with which workers are confronted. The goal was to understand the workers' actions and their underlying knowledge and to assess the quality of service provided to the elderly. The approach undertaken initially involved identifying developments in recent legislation and regulation and analyzing studies devoted to elderly needs. The first observation has to do with an evolution in political and regulatory orientations. Home care for the elderly, and the development of services that contribute to maintaining their autonomy and home life, has both a humanistic and economic aim (i.e., elderly prefer to live at home, and this is less expensive for the community). In this context home care is defined by two objectives: firstly, to help people with specific everyday tasks (i.e., cleaning, shopping, cooking, eating, personal hygiene, etc.) and to be present to monitor patient health and to compensate for their frequent isolation and, secondly, originating from gerontology, namely, to promote individual activity through the care provider's presence, discussions, or help to go out and to do physical or intellectual exercise. Home care is there not only a matter of helping individuals to do what they can no longer do but also assisting them in maintaining their physical and intellectual capacities, as well as their morale, in the best possible condition.

This description of home care is not, in our study, a contextual element, but rather a characterization of the work expected by public authorities. This characterization, in which the goals and work objects have to do with the individuals' capacity to maintain a sufficient level of autonomy to live at home, literally defines what structures the work. In the course of the study, two gerontologists confirmed this orientation. They point out the particular orientation of this nursing work. That is, the worker is not supposed to do things for someone else, but to help someone do things and to encourage him to do what he still can, since this also enables patients to maintain their physical and intellectual capacities.

As in the previous case, in which the slope structures public worksites, these work dimensions—defined by the "object" of work and by the scientific and pragmatic field of elderly care but also by social orientations—constitute an important step for didactic work analysis. What is the object of these workers' intervention? What do they act upon? What do they transform or maintain through

their action? These three questions also apply to what professional didactics calls situation analysis and activity analysis.

Our work analysis on 14 home care workers identified the following elements. Job descriptions and reference documents define the work involved based on concrete tasks that workers need to perform, namely, cleaning, preparing meals, giving eating assistance, helping with getting up in the morning, bathroom assistance, help with simple administrative tasks, and health monitoring. A few other objectives are also mentioned, including speaking with these individuals and suggesting activities (e.g., taking walks, playing games, and doing exercises for intellectual stimulation).

The work analysis shows, firstly, that most home care workers carry out maintenance and cleaning tasks irrespective of what their patients could do. They take charge of these tasks. The workers are accordingly observed to take charge of personal hygiene and eating assistance. During cleaning, meal preparation, and housekeeping, the elderly are often spectators and in all cases not encouraged to engage in these tasks. Verbal exchanges are brief, functional, and made up of primarily directive statements. They have to do with actions of coordination as they are carried out (i.e., having a meal, getting up in the morning, movements, personal hygiene, etc.). They are also unbalancing. That is, home care workers take the initiative in interactions and decide when to end them. They further initiate and change the subjects of conversation, ignoring or rejecting their patients' conversational initiatives. Non-conversational exchanges are often stereotyped and circular, focusing on the weather, news about the elderly person's children, television programs, and the like. Workers say that it is not easy to "make conversation."

However, a small minority is found to adopt an entirely different strategy. First, an unexpected sharing of the work of cleaning, maintenance, and meal preparation was observed. The principle cited by the workers is similar to the one stated by gerontologists but enriched by an experiential knowledge of the elderly: "Personally I let them do things or I encourage them to do these things with me, even the cleaning. They do what they can or what they want to do, or what they prefer because some have their pet activities." The three workers concerned explained that this "gives them exercise" and add that elderly people enjoy it. A greater number of functional conversations were also observed as they deal with task completion. Also noted is a greater conversational cooperation during bathroom assistance or meals, owing to the fact that the workers explicitly ask these individuals to help with their own personal hygiene, trips, and other movements. Functional exchanges are an occasion for pleasantries and, sometimes, even playful satisfaction with their awkwardness or conversely their success and capacities. Statements are not only directive but also assertive since workers verbalize what they are doing and what is going on so as to guide the elderly individuals' actions. These elderly individuals are more active and speak more. Actions are not stereotyped, but performed in different ways depending on each patient. Finally, the work ultimately gets done quickly and the workers say they appreciate their work with these individuals.

What is important here is to note the convergence between the forms of action implemented by "ordinary" workers and the expected goals. This means that new

forms of action can be learned and constructed by an identical population. In addition, generally speaking, it can be noted that substantial work needs to be done with most of the population. It might be posited that the registers of thought and action are completely different between the two categories of workers observed. Most significantly, however, several didactic orientations emerge. The first is that material- and care-related tasks can be opportunities for achieving overarching goals is consistent with the work of maintaining physical and intellectual capacities as well as morale. In this sense, these tasks, which are often thought of as technical or material and which are often not very highly valued, can also become technical and relational tasks and play a part in individual health. We will limit ourselves here to outlining only the resulting courses of action for training in this sector. To take action consistent with the direction of this occupation's anticipated developments, it is necessary to understand the issues and aims involved. Training, therefore, integrates sequences for discovering, understanding, and reflecting on these matters, as well as imagining their consequences for everyday work. The professional milieu and relationships with management only rarely provide the means to do this. Yet, the shift from a conception of work as help for an elderly individual considered to be unable to a conception of work as action upon and according to the capacities of individuals—and as a shared and distributed action (one no longer works for individuals, but with them)—constitutes a break in thinking. Training also strives to construct ways to reason and take action in this direction. The idea is to begin by proposing to develop workers' capacity to identify (i.e., diagnose) the capacities of the individuals for and with whom they perform tasks in order to more closely align with their capacities and wishes or needs. This capacity for adjustment is worked on in training based on filmed sequences of work, as well as the use of concrete situations. Each category of task is revisited based on what we consider to be operational invariants for action: diagnosing the state of physical and intellectual capacities and, to complete or provide assistance with each task, identifying the emotional states that can be prompted or encouraged or, conversely, modified. The intent is to construct modes of action with a view to stimulating and accompanying each patient's activity.

As in the previous case, the practical situations, simulations, or observation and analysis of filmed professional sequences are used for diagnostic operations, manipulation, and pragmatic development in relation with the operational invariants to be constructed. The concept is to first learn to interpret and research information which, over the course of action with an elderly individual, will permit workers to adopt actions to the particular elderly persons' state to assist them only where necessary and to let them act as soon as they are able and willing to do so. Information gathering bears on both proprioceptive perceptions (e.g., "she is leaning more lightly on my arm today," "I am encouraging her to walk alone or try to do her grooming") as well as conversation sequences involving exchanges on what the individual is feeling and what they sense they are capable of doing or not, etc. Choices and courses of action are only presented and selected as possible and effective ways of doing things, among others. Their validity and relevance only

come from the work goals and their effects on the fundamental aspects of the work, namely, the individual's capacities and state of morale.

In both cases, the dimensions on which action is focused are abstract, which need to be constructed in thought so that a worker can act with and on them. These dimensions restructure and order work operations. It could be concluded that the goals of each operation or each action are reordered by hierarchically superior goals. The result is that operations cannot remain unchanged. The variability of action is much greater, in the case of the elderly, since the variety of situations is greater. That which "holds together and organizes" action remains however profoundly invariant. Observation of home care workers in training shows manifestations of development, in the sense that they imagine, discover, and appropriate new ways of doing things based on a reorganization of the situation's structural goals and objects. Also observed is a change in the way they speak to people and more specifically to the elderly.

10.3 Conclusion

In this chapter, we have introduced the issue of pragmatic conceptualization, which can be defined as conceptualization in and for action. A theory of conceptualization, as developed by Vergnaud based on the work of Piaget, may provide avenues for solving certain problems posed by binary oppositions that are still common in the world of training and education or employment and work for that matter. A recent book by Crawford (2009) shows that the oppositions between theory and practice, manual and intellectual workers, and thought and action continue to live on in many societies. Yet, regardless of its nature, work involves an "action intelligence." This intelligence can be constructed and exercised at different levels of conceptualization, a fact which may enable differentiation between more or less competent workers. Conceptualization is a condition for constructing capacities for action to address the variability and diversity of a class of situations. It is also a condition for mobilizing, adjusting, or inventing modes of action depending on developments, variations, and unforeseen events that arise in the course of action. This cannot be done through modes of thought organized at more procedural levels. The concepts at play, those that more specifically organize action for a class of professional situations, can, as we have seen in the two cases presented here, stem from either the scientific or technological knowledge of a professional field or from occupational knowledge that is currently being developed, as in the case of pragmatic concepts in the context of home care services for the elderly. These concepts are pragmatic because they are used as instruments of thought that organize action while lending it invariance and enabling it to adapt to the variations inherent to any work. They are also pragmatic as they are given targets, through work-related objectives, and they are re-elaborated in order to connect with specific goals, conditions for action, and a series of information gathering and action-related operations.

Finally, pragmatic conceptualization processes can be implemented under certain conditions that do not always come together in work situations. These are cases in which vocational training can play a role, not by teaching scientific and technological concepts that workers would have to figure out for themselves, but by constructing training based on work situations so as to provide the conditions for a pragmatic elaboration of thought and action.

References

Bazile, J., & Mayen, P. (2002). Le développement des concepts scientifiques à partir des conceptualisations dans l'action, proposition de didactique professionnelle. *Aster, 34*, 75–96.

Caens-Martin, S. (1999). Une approche de la structure conceptuelle d'une activité agricole : la taille de la vigne. *Education Permanente, 139*, 99–114.

Connolly, K. J., & Bruner, J. (Eds.). (1973). *The growth of competence*. London, New York: Academic.

Crawford, M. B. (2009). *Shop classe as soul craft. An inquiry into the value of work*. New York: Penguin Press.

De Montmollin, M. (1986). *L'intelligence de la tâche*. Berne: Peter Lang.

Dewey, J. (1938). *The theory of enquiry*. New York: Henry Holt and Company.

Friedrich, J. (2012). *Lev Vygotski : médiation, apprentissage et développement. Une lecture philosophique et épistémologique*. Geneva: University of Geneva, Carnets des sciences de l'éducation.

Leplat, J. (2000). *L'analyse psychologique de l'activité en ergonomie. Aperçus sur son évolution, ses concepts et ses méthodes*. Toulouse: Octarès.

Leplat, J. (2002). *Psychologie de la formation. Jalons et perspectives*. Toulouse: Octarès.

Leplat, J. (2008). Formation et didactique professionnelle: un chemin psychologique dans l'histoire. *Travail et Apprentissages, 1*, 34–50.

Mayen, P. (1999). Des situations potentielles de développement. *Education Permanente, 139*, 87–107.

Mayen, P. (2008). Dix développements sur la didactique professionnelle et le développement. In Y. Lenoir & P. Pastré (Eds.), *Didactique professionnelle et didactiques discipliniaires en débat* (pp. 109–125). Toulouse: Octarès

Mayen, P. (2011). Les situations professionnelles, un point de vue de didactique professionnelle. *Phronesis, 1*, 59–67.

Mayen, P., & Lainé, A. (Eds.). (2014). *Apprendre à travailler avec le vivant*. Dijon: Editions Raison et Passions.

Pastré, P. (1992). *Essai pour introduire le concept de didactique professionnelle*. PhD dissertation, Université Paris 5.

Pastré, P. (2008). Activité et apprentissage. In Y. Lenoir & P. Pastré (Eds.), *Didactique professionnelle et didactiques disciplinaires en débat* (pp. 53–79). Toulouse: Octarès.

Piaget, J. (1964). *Six études de psychologie*. Paris: Presses Universitaires de France.

Piaget, J. (1979). *L'épistémologie génétique*. Paris: Presses Universitaires de France.

Rogalski, J. (1995). From real situations to training situations: Conservation of functionalities. In J.-M. Hoc, C. Cacciabue, & E. Hollnagel (Eds.), *Expertise and technology: Cognition and human computer cooperation* (pp. 123–137). Hillsdale: LEA.

Samurçay, J., & Rogalski, J. (1991). A method for tactical reasoning (MTR) in emergency management: Analysis of individual acquisition and collective implementation. In J. Rasmussen, B. Brehmer, & J. Leplat (Eds.), *Distributed decision making: Cognitive models for cooperation work* (pp. 291–301). Chichester: Wiley.

Vergnaud, G. (1990). La théorie des champs conceptuels. *Recherches en Didactique des Mathé matiques, 10*(2–3), 133–170.

Vergnaud, G. (1996). Au fond de l'action, la conceptualisation. In J.-M. Barbier (Ed.), *Savoirs thé oriques et savoirs d'action* (pp. 275–292). Paris: Presses Universitaires de France.

Vergnaud, G. (2008). De la didactique des disciplines à la didactique professionnelle, il n'y a qu'un pas. *Travail et Apprentissages, 1*, 51–57.

Vygotski, L. S. (1985). La méthode instrumentale en psychologie. In B. Schneuwly & J.-P. Bronkart (Eds.), *Vygotski aujourd'hui* (pp. 39–47). Neuchâtel: Delachaux et Niestlé.

Weill-Fassina, A. (2008). Ergonomie et formation: chassés croisés. *Travail et Apprentissages, 1*, 34–50.

Chapter 11
An Activity-Centred Approach to Work Analysis and the Design of Vocational Training Situations

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This chapter presents an activity-based framework for research with two objectives: (i) to understand the social practices of work and training and (ii) to design innovative vocational training methods based on this approach. We first explain the rationale for our framework and the broadening of perspective that it offers. We then present the working hypotheses and various procedures for designing training aids.

Understanding the nature of work is never as simple as it seems. This is because the work that is actually done is never exactly what was supposed to be done: there is always a gap between what was prescribed and what was in fact accomplished (Daniellou 2005; De Keyser 1991; De Montmollin 1991; Guérin et al. 2007; Leplat and Hoc 1983; Ombredane and Faverge 1955). This gap does not occur because actors are trying to avoid doing what was prescribed, but rather because they are very much trying to do what was prescribed. This always requires interpretation, deviation and invention, all of which are essential to 'getting the job done' but none of which is usually spelled out in the instructions, procedures, specifications or job descriptions in the profession or organisation that has specified the job. This gap is, thus, natural and probably impossible to fill. Far from reflecting an unthinking or unprofessional attitude towards work, it reveals much about the actor's knowledge, personal commitment and creativity. The importance given to this difference between prescribed and accomplished work is a fundamental characteristic of what has come to be known as 'French ergonomics' and explains why French-speaking ergonomists conduct fieldwork inquiries and focus on the workplace with the express aim of describing the articulation – always enigmatic – between the prescribed work and the real or accomplished work (e.g. de Keyser 1992).

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Observing actors in the field is fundamental, although not sufficient, to this type of investigation. In most cases, actors are invited to contribute to the study of their own work by supplying information that only they can give to the researcher. This information concerns (i) the nonobservable aspects of work such as decision-making, evaluations and judgements, thinking and analyses while in action, emotions, intentions, mobilised knowledge, postural adjustments etc., (ii) the complex aspects of work that can only be known and understood through training or the ad hoc explanations that the actors give to the researcher, (iii) the components of expert practice that the actors may not even be aware of because they have become routine and automatic and (iv) all that is 'taken for granted' and serves to ensure the efficiency of social interaction. The invisibility of certain work components that are not often identified in everyday interactions and practice occurs because they are not (or no longer) consciously experienced and because the actors have the impression that they are trivial, low-level automatisms and uninteresting for researchers.

This invisibility or transparency, which is a condition for effective practical accomplishment, is also an obstacle to obtaining greater knowledge and understanding of work practices for both the researcher and the actors. Therefore, a certain distance from the work is needed in order to study it, and work analysis requires that the researcher adopt a singular attitude of 'transparency breaking'. That is, breaking with the habitual modes of engaging with others and with work situations. This, in turn, requires that the actors display two modes of work engagement. The first is routine, as they merely act normally, allowing themselves to be observed and filmed and responding to the researcher's questions. Yet, they must also break with the routine of everyday work and what 'goes without saying' during ordinary interactions and practice, to inform the researcher about this routine.

In traditional French-speaking ergonomics, research is thus based on the articulation of (i) work prescription and (ii) the real work. Work prescription encompasses the set of explicit and implicit instructions in the job specifications and various standards in the job category, as well as the constraints linked both to organising production and to management, which contributes to specifying the work objectives and sub-objectives and the social and material conditions for their accomplishment (Leplat and Hoc 1983). Real work is, of course, what the actors actually do when they work. This second point, the focus in this chapter, assumes the definition of a research object that is sufficiently precise to allow for rigorous study and yet broad enough to acceptably represent the work practice and an actor's engagement in the practice. Research in French-speaking ergonomics is typified above all by the study of real work or work as it is actually performed in workplace environments. This work is analysed as a type of human activity, which is conceptualised as a holistic theoretical object that can account for the individual and collective meaning and organisation of vocational practices and their transformations (Amalberti et al. 1991; Daniellou 2005).

In Part 1 of this chapter, we present the research approach to work and vocational training developed in our research unit. It centres on the analysis of human activity and falls within the framework of course-of-action theory, which is based on the

postulate of enaction and two principal hypotheses concerning (i) human experience and (ii) the self-construction of activity and actors through typification and individuation. We provide simplified excerpts to illustrate our theoretical premises, all taken from a research corpus on work and training in a variety of work settings. Although the excerpts are all taken from ongoing or completed studies, in this chapter, they serve only to illustrate concepts and are not considered as empirical results.

In Part 2, we describe the technological aspect of our research and present the notion of spaces for encouraged actions (SEAs) as an instrument for training interventions in connection with the hypotheses and theoretical elements mentioned above. Last, we describe the principal modes of work analysis as applied to training perspectives.

11.1 Research Approach to Work and Transformations in Human Activity

11.1.1 An Approach Centred on Human Activity

In our research programme, *activity* is defined as what a given actor does as a living, cultural and reflexive unit engaged in a social practice (in this case, work). A here-and-now activity refers to a time point or state in the history of dynamic exchanges between this living unit and its environment. These exchanges permanently fluctuate in two directions: the unit's absorption of environmental elements and the unit's production of elements that are projected into the environment. The characteristic of a living unit is that it is not manufactured by another living system. Instead, it constructs itself in the course of constant exchanges with its environment. It is not dispersed in these exchanges, nor does it lose its character of wholeness – instead, it self-constructs. Maturana (1988) described this living unit as autopoietic, and in our research, the unit of analysis is therefore the unit-environment coupling.

Activity is, thus, taken to be the set of ongoing interactions of a living unit and its environment, and it is further assumed that these interactions produce the very structure of this unit and its environment and are in no way the mere response of a predetermined unit reacting to stimuli or adapting to constraints from a world that is itself predetermined. During these interactions, the unit and its environment are in a relationship of co-definition. They define each other. But, this co-definition is asymmetric in that only the living unit specifies what in the environment is meaningful for it (and not the reverse). This coupling has the following two characteristics: (i) it is totally dependent on the structure of the living unit, which specifies its scope for action, and (ii) it specifies this structure, moment by moment, including the nature of the elements that constitute it, their relationships and its borders. For this reason, it is called structural coupling (Varela 1989): it expresses – and results from – the history of the simultaneous transformations of the unit and

environment, in which what the living unit is receptive to is completely determined by its structure, not its environment. The unit is self-referential: its activity (i.e. the activity that produces it) is regulated only by its structure.

Work activity is a specification of human coupling with the environment, that is, a self-referential unit with human characteristics (Theureau 2004). This type of activity shows substantial mediations compared with the structural coupling of less-complex living units. The presence of symbolic (notably language) and instrumental (notably technical) dimensions suggests that this coupling has two salient properties. Firstly, (i) it is the constant updating of a history that assumes three types of memory: biological, cultural and personal (Stiegler 1998). Secondly, it has a massive productive component defined by the set of finalised transformations that it produces in the physical, cultural and social environment. These arise, for instance, when building a technical object, caring for a person, composing a symphony, managing a team and so on. This productive property is so powerful in humans that it eclipses the fact that activity is also constructive (and produces the unit that produces it) in many theories. This constructive aspect is such that activity is not just a flow that maintains its organisation, much like a river maintains the stable form of an eddy in running water: human activity modifies itself little by little simply through acting. It is the reason why we speak of a course of activity rather than a flow of activity.

11.1.2 Course-of-Action Theory

Although human activity is conceived as a dynamic whole, our research reduces the complexity of the actor-environment coupling. It addresses the *course of action* (Theureau 2004, 2006, 2009), which is defined as 'the activity of a particular actor, engaged in a particular physical and social environment and belonging to a particular culture: an activity that is meaningful for the actor; that is to say, that can be shown, recounted, mimicked and commented on by the actor at any moment of its unfolding to an observer-interlocutor in favourable conditions' (Theureau and Jeffroy 1994, p. 19).

The course of action is a chaining of elementary actions that may take various forms. These include (i) 'practical actions' that change the state of the environment, (ii) 'communicative actions' that change the state of other actors or (iii) 'symbolic actions' that comprise the emotions that change the affective state of actors, interpretations that change their cognitive state and focuses of attention that change the information on the situation (Theureau 2006). These elementary actions can be complex units, such as when an actor is emotionally touched by a situation and moves an object while thinking about the recent event and explaining this act to another actor... (See excerpt 1).

Every elementary element composing a course of activity results from the relationship between (i) an intentionality consisting of a set of concerns – sometimes prominent and sometimes in the background – and possibly contradictory;

Table 11.1 A typical episode illustrating the chaining of elementary action units in a radiographer's course of activity

	Radiographer's elementary actions
Ux	. . .
U1	Greets the patient
U2	Checks the patient's identity
U3	Walking with the patient over to the machine, asks him if he is in a lot of pain
U4	Asks the patient to rate the intensity of the pain and to indicate the painful side
U5	Remarking that he himself has had this type of pain, asks the patient if he is breathing normally
U6	Tells the patient that he has already had a broken rib and that he sympathises with him
U7	Points out that the exam will be brief
U8	Asks the patient to tell him if the position he is placed in is very painful
U9	Insists that even if the position is painful, he must not move so that they can get a good image and the right diagnosis
U10	Asks the patient to stand upright on a black carpet in front of the X-ray machine
U11	Instructs the patient to place his chin on the chin rest
U12	Adjusts the height of the chin rest
U13	Asks the patient to 'thrust his chest out' while placing his right arm behind his head
U14	Helps in positioning the right arm
U15	Says he knows that it hurts but that it can't be helped
U_n	. . .

(ii) an inherited repertory from a history of structural coupling whose components are habits or knowledge; (iii) a very-short-term projection of unfolding actions and events, signalling an immediate and vaguely determined expectation; (iv) anchorage in perceived or remembered elements that 'make a sign' here and now for the actor; and (v) a tendency to generalise the unfolding activity to future circumstances on the assumption that it will serve as an exemplary example or standard.

In an ongoing study on the work of hospital radiographers, episodes similar to the sequence described below are frequently observed. This sequence consists of meeting/positioning a patient in a conventional radiography room to take a chest X-ray following the patient's fall. The radiographer performs the elementary actions presented in Table 11.1.

In this sequence, each of these units is related to the preceding one by a relationship of dependency and/or to all of them taken as a whole. They are linked with elements of meaning that are signs for the radiographer in the environment and in his own repertory, such as the paper with the physician's prescription for a chest X-ray, the way the patient responded to his greeting, the grimace on the patient's face when he made an uncontrolled chest movement, his assessment of the patient's postural compensation to ease the pain, the sudden memory of another patient waiting in another examination room, a signal produced by the machine and so on. In this episode, the course of activity is smooth and continuous, but in other

cases, the judgements anchored in elements making signs (such as those listed above) are the sources of reorientations or bifurcations in the course of activity.

11.1.3   The Postulate of Enaction

Course-of-action theory is based on a one main supposition: *enaction* (Stewart et al. 2007; Varela 1989; Varela et al. 1991). This supposition is presented here in four points:

1. Human engagement in the environment is always pragmatic and active, meaning that it is brought about by action and it brings about action. This theory focuses on humans as actors. From this perspective, contemplation is an action, and 'nonaction' is inconceivable just as is pure passivity, which would be synonymous with death.
2. Human engagement in the world is embodied, meaning that all human actions – even those that appear to be purely mental – are specified by functional properties linked to their corporeity (Gallagher 2005; Varela et al. 1991): actors specify an environment every instant by their engagement, based on the pertinence to their corporeity.
3. Actors make a proper world emerge from their activity, in their activity and by their activity: by walking, they enact a *world* that is *walked* and *walkable* and simultaneously a *micro-self* that is *walking* and *walker*; by running, they enact a *world* that is *run* and *runnable* and a *micro-self* that is *running* and *runner*; and so on (Varela 1996).
4. Human activity is conceptualised as a permanent dynamic whole, expressing global functioning in which cognition and action are indistinct from one another (Varela 1996). This assumption contradicts theories of cognitive dualism that define cognition as the computation of symbols and knowledge as an immaterial entity foreign to action and stored in autonomous memories isolated from the physical bodies of actors.

11.1.4   The Course of Action, Pre-reflexive Consciousness and Experience

Human activity is doubly lived, in the sense that it is the activity of a living being, and it constitutes an experience for the actor. The concept of experience refers to the idea that human activity is proper to beings who feel a permanent self-presence in their engagement with the environment. This experience is similar to what Sartre (1960) described as reflexive and pre-reflexive consciousness, meaning the components of actors activity that are explicit to them (as an example, in Table 11.2, the radiographer experiences himself asking a patient to make an effort that is painful)

Table 11.2 Self-confrontation offers access to several dimensions of the actor's experience and complements the researcher's observations

Radiographer's elementary actions	Radiographer's expressed experience
U1: Greets the patient	'. . . There. . . normal politeness. . . I try to establish good contact right away. . . like always, it's a bit strained and timid at first. . .'
U2: Checks the patient identity	'. . . I make sure there has been no mix-up in patients. . .'
U3: Walking with the patient over to the machine, asks him if he is in a lot of pain	'. . . I start the protocol by going over to position him. . . I see that he's bent over and grimacing. . . I know that it's painful in the chest area especially if there's a fracture. . . I see how he handles pain. . . not well or by toughing it out . . .'
U4: Asks the patient to rate the intensity of the pain and to indicate the painful side	'. . . he tells me it's 'horrible'. . . well. . . from experience I know that it's not really that horrible. . . it's not that serious unless there's a perforation. . . I use the classic pain scale. . . he rates it a 6. . . he can stand it and I take advantage and ask him which side hurts and where exactly. . . to verify on the paper from the physician. . .'
U5: Remarking that he himself has had this type of pain, asks the patient if he is breathing normally	'. . . I want to reassure him and show him that I sympathise. . . well. . . and also so he knows that I know what the pain is. . . and that it is not as serious as all that. . . I find out if there is any problem with his breathing. . . which his doctor has surely already asked him about. . .'
U6: Tells the patient that he has already had a broken rib and that he sympathises with him	'. . . I realise I'm being a hard on him. . . I tell him I've had the same thing and that I really am taking his pain seriously. . .'
U7: Points out that the exam will be brief	'. . . to reassure him and get him prepared for the exam I tell him that it will be fast. . . so that he'll get into the right position. . . It's often pretty painful and they accept it better when they know it won't last long. . .'
Ux	Etc.

or that are implicit, but able to become explicit by a simple shift in focus, with no change in the actor's course of activity (e.g. while talking with the patient, the radiographer suddenly experiences himself speaking with an authoritarian tone of voice).

The actor can sometimes express experience while in the midst of activity. This can occur during or just after the activity. The experience occurring simultaneously with activity is of twofold interest for our research: (i) it is interesting in itself to gain insight into the actor's experience and any ensuing transformations (i.e. Durand et al. 2013) and (ii) insight into experience complements the external observation of the actor's action, as the expression of this concomitant experience provides a first-person perspective (Varela and Shear 1999). Consistent with the

postulate of enaction, this means taking into account the 'actor's point of view' on human activity, while respecting the asymmetry of the actor-environment coupling.

During a self-confrontation interview, the actors confront the recorded traces of their activity (generally videos) and are asked (i) to put themselves back into the dynamic situation in order to re-enact the recorded and observed situation and relive the same experience or something very close to it and (ii) to express, with the researcher's help, their experience of carrying out the actions being visualised, by way of verbal descriptions and comments, physical mimicking or demonstrating (Theureau 2010). Using this method, the researcher can build a corpus that documents both his or her observations and the concomitant expression of the actors' experience. Table 11.2 maps the radiographer's action units with his verbalisations from the self-confrontation interview.

The units of the course of activity described in this table emerge from the radiographer's relatively stable engagement throughout the episode:

– The radiographer's primary intentions were to take the chest X-rays prescribed by the physician, establish a reassuring contact with the patient, ensure his cooperation, tell him what exactly was going to happen, give him clear and precise instructions, provide X-ray images as clear and informative as possible, protect the patient and himself from radiation and not fall behind in the department schedule for the day.
– The radiographer adjusted some of his habits and knowledge regarding the following: operating the X-ray machine, the physician's prescribed protocol, the pain and disability caused by broken ribs, the anxiety of patients in pain, the frequent recalcitrance of patients under the influence of pain and anxiety, the day's overscheduling, the positioning the patient to achieve clear and well-targeted X-ray images, the fact that the positioning in this case was going to put pressure on the thoracic ribs and muscles and cause an increase in pain, the fact that patients show different degrees of courage and willingness to deal with the pain caused by this exam and the possibility that interactions with a patient can sometimes be difficult because of pain.
– The radiographer expected the exam to unfold in the usual way, as this type of X-ray is frequent and not usually a problem. These expectations can be described as 'somewhat questionable evidence' that in the very near future he will be in charge of this episode of conducting an exam, the patient will be cooperative, the X-ray machine will determine the sequence of behaviours that he will initiate and support etc.

This structure specifies the overall engagement of the radiographer in the situation. This engagement is singular (e.g. different from that of the patient or the researcher who observed the episode) and, although the structure remains much the same for the entire sequence, it might have varied, according to the circumstances.

11.1.5   The Hypothesis of Self-Construction by Typification and Individuation

From our theoretical perspective, 'here-and-now' action is emergent. That is; action is the realisation of one possible among many because of the actors' engagement in the situation in accordance with their own culture and intentionality. Accomplished action is a specification/selection of an action configuration (the actualised possible) against a background of possibilities that remain open and unrealised. And from the results of each action, repetition and the search for regularity and invariance, the actualised actions are potentially generalised, even to the point of becoming a reference for the actors or a part of their own culture – from which the future opening of possibles will proceed. Activity is, thus, not only an accomplishment in the 'here and now'. But it is being inscribed in time; activity is also marked by transformation in such a way that it becomes increasingly more effective, efficient, smooth and adjusted to circumstances. It self-constructs (Maturana and Varela 1980, 1987; Mingers 1995; Zeleny 1981) because of its recursive property such that the repetition of action *a* modifies this action as a function of its result or effect so that it becomes an action *b* (Maturana 1988).

Our hypothesis is that this transformation of activity occurs through *typification* or the allocation of a standard value – as a kind of 'exemplary example' – to certain configurations of the actor-environment coupling (Rosch 1978; Theureau 2006). These types concern all the constituents of human activity: emotional, cognitive, intentional, corporal and so on. All are typified alone (an emotion type, an item of knowledge, an intention type etc.) or as configurations or actions. These typifications are individual-social constructs in the sense that they are shared to diverse degrees by the members of a work collectivity and are the source for collective activity (Schütz 1962). As an example, Table 11.3 shows how components of a radiographer's professional culture can be transformed, towards the end of an exam.

This episode illustrates a possible modification in the type of relationship a radiographer in mid-career has with his patients towards a new type expressible as 'cooperation during the exam, especially if it's been painful, should not be rewarded by interpretations of the X-rays or diagnosis even if the cooperation has been good'.

Many authors have noted that human activity is the articulation of its productive and constructive components (Durand 2013a, b; Filliettaz et al. 2015). These constructive transformations manifest not only as learning but also as successive reorganisations that we conceptualise as *individuation*. Particularly developed by Simondon (2005, 2008), this concept takes into account the notion that actors construct themselves over the course of transformations in the actor-environment coupling, becoming increasingly individuated, that is, more integrated and differentiated (one might say in this case that the actor becomes 'more of a radiographer'). From this perspective, individuals are not always already constructed. Instead, they emerge, just as a phase does, from the process of individuation in such a way that they are as much the source of activity as its product. For example,

Table 11.3 Some events or actions enhance or otherwise modify the radiographer's repertory

Patient-radiographer interactions	Radiographer's self-confrontation
Patient: '. . . can I see the X-rays. . .' Radiographer: '. . . showing the pictures . . . if you want . . . of course . . . you can see there that (indicating a point on the picture) . . .' Patient: '. . . that it's broken. . .' Radiographer: 'Sir. . . it's the radiologist who is the specialist. . .' Patient: '. . . but there you showed me. . .' Radiographer: '. . . I'm not the doctor . . . he's the one who will make the diagnosis . . .' Patient: '. . . you don't believe that this is a broken rib – the white spot that makes an angle . . .' Radiographer: '. . . yes, it's possible . . .' Patient: '. . . but you don't want to say it . . .' Radiographer: '. . . yes . . . it's definitely a fracture . . . but you have to see the doctor . . .'	'. . . we are often asked to make an interpretation at the end . . . especially if we've made good contact with the patient . . . here I am . . . since he seemed to have a lot of pain during the exam . . . he managed to get me to give him an answer and . . . most importantly . . . it's obvious that it's broken . . . but still . . . I let myself be too influenced . . . yesterday, the same thing happened. . . it was a little different but the same . . . a patient in pain who got to me. . . and she was in a lot of pain during the exam . . . I have to know how to say no to these patients in pain. . . not that their pain is an excuse . . . I'm glad they are willing to twist into position to make sure I get beautiful images . . . I need to be more careful in the future . . . I don't owe them anything, um . . . even . . . especially if they're in pain I'm going to give no answer at all or an evasive one . . .'

we observed the first professional experiences of a manager in a small enterprise and noted that the successive phases in this individual/actor's activity displayed a transformative potential that was manifested as increasingly more integrated and specific states in relation to her work (Durand 2013b).

Individuation does not result from a shape given from the exterior to the unit that receives it, but instead it proceeds from the self-transformation of a unit that is supersaturated with potential energy and that takes on its shape through the dynamics of morphogenesis. This global transformation receives no instruction from the exterior. It results from processes of equilibration and internal contagion, this latter because of the contiguity of one unit subsystem with another, from local microevents that disturbed the system in an earlier state. For example, novice radiographers may be focused on achieving perfect images, until they face problematic situations with patients. For instance, patients suffering from injuries may not be able to hold body positions that permit the taking of such high-quality images. By facing these contingencies, novice radiographers could then learn to accept the fact that some body positions are not always possible to obtain. Moreover, they come to learn that under certain conditions, actual work includes dilemmas such as ones raised by the balance between image quality and patient comfort. Gradually, these contradictions and dilemmas can become accepted as inherent to professional action. They can also be shared and discussed together with other professionals. An 'individual increasingly more individuated' emerges in such a way that each region of the unit momentarily serves as a principle and model for the next region, and the transformations stretch from neighbouring region to neighbouring region (which does not mean continuously, nor without critical

episodes). The overall effect is that an unresolved incompatibility of the unit at one phase of its individuation becomes the organising dimension for its development.

11.2   A Technological Approach Centred on Activity for the Design of Training Aids

11.2.1   Spaces for Encouraged Actions

Trainers must be able to design environments that help transform trainees' activity of learning/development. They, thereby, seek to provoke transformations that enhance trainees' activity, that is, transformations that are positively oriented and that open to higher states of equilibrium, effectiveness, efficiency and integration. According to the hypothesis of enaction, this objective may seem paradoxical: how, in fact, can one claim to help transform the activity of another, when this activity is supposedly self-constructed?

We suggest that trainers' interventions can be characterised as the design of *spaces for encouraged actions* (SEAs), spaces that, it is hoped, will be propitious for transformation (Durand 2008). The concept of SEAs is derived from the concept of fields of promoted action, as proposed by Reed in cultural anthropology (Bril 2015; Reed 1993; Reed and Bril 1996) and revisited by Recopé (2001). These SEAs are 'spaces for action' that result from the arrangement of the environment in such a way that (i) the trainees' usual or habitual activity is no longer fully adequate, (ii) they, therefore, perceive that shifts or reorientations are needed and (iii) the long-lasting transformations likely to be found in the environment can be initiated. SEAs influence trainees' activity according to a dynamic that we characterise as a dialectic of encouragement/discouragement: some actions are encouraged (protected, rewarded, valorised, preferred and touted as gratifying), and others are discouraged.

All training is normative: in one way or another, it expresses what should and should not be done. And these norms are established within more or less narrow/ broad boundaries for a set of possibilities (i.e. encouraged actions) and a set of impossibilities (i.e. discouraged actions). If we accept the hypothesis that activity has two components (i.e. productive and constructive), we might logically conclude that ergonomists/designers are more focused on the productive component than the constructive component. Yet businesses are increasingly aware of operating within a knowledge economy where actors' acquisitions and expertise are also considered to be work products, and these companies are therefore showing increasingly greater interest in training situations that expand and extend the range of their workforce capacities (Falzon 2013). Similarly, although training situations give priority to the constructive component of activity, these situations do not exclusively concern learning.

Trainers, thus, need to design environments in which trainees' activity is disturbed to the point that transformation is called for and then guide this transformation in the direction they (and the trainees) deem most appropriate. But trainees always have something to do in the training situation that is different from learning: they must do something to learn. And the question for the training environment designers is particularly complex: what other than their work can be proposed to trainees that will nevertheless help them to learn their work? This question concerns the productive component of activity that is encouraged and its relationship with the targeted work, as well as the constructive component and its articulation with the productive component. We suggest that SEA designers need to focus on both the object of learning, that is, what there is to be learned, and the processes or dynamics of transforming the trainees' activity, that is, how they learn and develop in these situations.

Designing SEAs means inventing arrangements that have many properties: euphemising or accentuating the effects of errors, simplifying or complexifying, augmenting or simulating reality, focusing on a single work component or taking a global approach, serious or playful approaches, trainees' mimetic or reflexive involvement etc. SEAs deal with both what will be transformed in the trainees' activity and how the transformation will occur. They can be designed to meet learning and/or development needs.

From vocational educators' perspective, work analysis fits four main types of training situation design: (i) work didactics, (ii) the ergonomics of training, (iii) the pedagogy of career trajectories and iv) personal and interpersonal development.

11.2.2 Work Didactics

From the perspective of work didactics, analysing the activity of experienced workers is a way to document what must be learned to perform a specific job (Durand 2011, 2013a). The results of the analysis are used to model the real work by identifying its generic or invariant components considered as individual and/or collective types (Rosch 1978; Schütz 1962).

These analyses, which provide models for work positions and jobs, are used to document the design of training contents that remain very close to the actual work in mind. An example here would be competency frameworks based on specifications or the formal analysis of the prescribed work. These training contents are expected to speed up the acquisition of expertise and reduce the gap between the activities of beginners and old timers. They help to complete, reorient or even contest work models currently used in training, but not based on a detailed analysis of the real activity of experienced actors.

For example, the analysis of a radiographer's activity as described in Part 1 led to a model of this activity for conventional radiology departments that was valid in other sectors of radiology, such as MRI, CT scanning and radiotherapy. Models typify an activity that has been observed many times and is often associated with a

sentiment of typicality, as expressed by the actors themselves. In this case, it can be considered as an archetypal structure of the radiographer's work, although further research is needed to confirm this. We characterised the model as a triad: (i) positioning the patient, (ii) producing a reliable X-ray image that can be interpreted for diagnosis and (iii) ensuring/improving the patient's physical condition.

Positioning the patient makes it possible to radiate the body part that the physician wants visualised at the correct angle and with the optimal dose. This means projecting onto flat-surface body parts that are never geometrically shaped. Protocols are available and are today often integrated into the automated functions of contemporary image scanners. They, nevertheless, need adjusting to accommodate certain patients' morphology, handicaps that interfere with positioning, pain caused by the trauma being investigated etc. This requires not only good knowledge of anatomy/physiology but also practical reasoning to establish a relationship between the living being and geometry, this capacity being specifically required in every sector of radiology, whether diagnostic or therapeutic.

Producing a reliable image of diagnostic quality means that the image is accurate and without zones of ambiguity so that the physician can make an interpretation. The images must be of the greatest quality, despite the many constraints, as they serve to document the physician's decisions. The radiation doses are often preset, but adjustments are often required.

Ensuring/improving the patient's physical condition refers to the inherent risks of radiation and the need to minimise patient exposure. In therapeutic radiology, this means (i) targeting optimal dosages to pathological cells and sparing healthy surrounding tissue and, more generally, (ii) respect for and the rehabilitation of the patient as an autonomous person.

The range of radiographers' professional activity falls within this triadic structure: the three components are simultaneously implicated in their work, both alone and in relationship with the other two. Their concomitance may give rise to contradictions that call for an activity of compromise in the case of an insoluble dilemma (Jorge and Scheller 2014). For example, radiographers may have to compromise between patient comfort and following the protocol, image quality and the duration and intensity of the radiation exposure, providing information to patients and confining their remarks strictly to their field of competence, adhering to the department schedule and attentive care to patients and so on.

Although presented quite succinctly here, a model of activity of this sort can be used to guide the conception of vocational training. It indicates what is central or critical as opposed to what is peripheral or accessory, and it helps to identify the constitutive invariants of a professional culture of action. It also shows that an exclusive focus on exhaustively proceduralising radiographers' actions is limiting and that responsible professional flexibility is indispensable for this work. More broadly, it confirms the pivotal role of this profession in the dynamics of in-hospital patient care.

11.2.3 Ergonomics of Training

From an ergonomics of training perspective, the analysis of an actor's activity of providing or receiving training within a formal programme documents the steps to improving the programme and the situations exploited (Durand 2008, 2013a). This ergonomic procedure has successive phases: activity analysis of the actors at work (in this case, the work of trainers and trainees), identification of points for discussion or improvement in the training scheme documenting the work of co-conceiving (bringing together trainers and researchers) training schemes that are hoped to be more effective than the existing ones, then an activity analysis of the new situation and so on. As applied to the analysis of the work of training, this iterative process improves training programmes (i) in detail, (ii) at the broader scale of overall programme design and, even more generally, (iii) in terms of design principles for educational situations.

We investigated the activity of nurse-anaesthetists enrolled in a simulation programme (Durand et al. 2013; Horcik and Durand 2011; Horcik et al. 2014). The training sequences took place in real operating rooms, but the trainees had to anaesthetise and then wake up programmable manikins during a simulated operation. The trainers had carefully designed the sequences to be as realistic as possible: one might say that they had chosen emblematic scenarios of putting patients to sleep and waking them. In these episodes, we analysed trainees' activity and observed a particular experience that we termed mimetic. This is based on an earlier concept of playful feinting, referring to a framework for inauthentic experience where the simulator and the scenario mimic real situations, the manikin stands in for the patient, the monitor displays the 'patient's' vital signs etc. With the addition of instructions from the trainers, this set of elements provokes the trainees to an activity that we are referring to as mimetic and that has simultaneous twofold intentionality: learning and working. The interpretations made by the nurses in the simulation situation fluctuated from one moment to the next. At certain moments, the vital signs on the monitor were absent referents and the actions could be characterised by the exclusive search for information on the patient's status and the anaesthesia procedure ('there I'm doing what I always do... it's the way I work every day... I start checking the monitors up there... everything is as it should be... the communication is good and everything fits...'); at other moments, the meaningful elements were linked to the training situation per se, as when the nurse exaggeratedly and laconically mimed aspirating the trachea while making a comment to the trainers ('OK there... I've aspirated everything...'). This was again commented on in the self-confrontation interview ('I told them "it's good, you've heard it... I did it... I aspirated everything..."'). The setting for playful feigning is continuously modified in action: the trainees constantly try to determine whether the difficulties they encounter are accidental or planned by the trainers, they feign having recourse to a medication, they check on absent vital signs, they exaggerate the speed of performing a medical act or caricaturise performing an action and so on. Mimetic immersion, which is often used as an argument in favour of simulation

training, is rare in this episode. The trainees never forget that they are in simulation, and although sometimes engaged in activity that strongly resembles the real work, they nevertheless always have the experience of participating in a simulation.

Several directions for modifying this simulation training programme were suggested by the findings. Among these are the following: (i) assume that learning occurs during the debriefing but also during the simulation itself, (ii) do not attempt to achieve total realism in the simulation but take into account the trainees' capacities for both mimetic immersion and twofold intentionality, (iii) use ad hoc exercises in the beginning of the session to encourage mimetic activity to bring out this type of engagement in the simulation episode and (iv) as trainers, use the methods that offer access to the real activity of actors (i.e. self-confrontation) for the debriefing procedure in order to prompt a work of re-elaboration closely tied to the lived experience.

The adjustments to the training programmes after analysing the trainees' activity were collectively discussed in design workshops. This opened on to new training schemes in which activity analysis was used to evaluate the pertinence of the modifications to the original programme, the design of entirely new ones and so on. To some extent, these findings can be generalised to other types of training, not just simulation. We thus proposed the hypothesis of a playful and mimetic dimension to all training and searched for the relationship between work activity and training activity, mediated according to this hypothesis (Durand et al. 2013).

11.2.4 Pedagogy of Career Trajectories

From the perspective of the pedagogy of career trajectories, activity analysis of novices during their first work experiences can identify typical professional situations. That is, work sequences or episodes that are not observed in experienced professionals, but that are critical experiences for beginners. These typical beginners' experiences are interpreted as nodes encountered in the process of professional development. Also, rather than leave beginners to face these issues alone, training programmes are designed to guide them on their trajectory of progressive control of these nodes. This perspective also reflects the research showing that novices derive minimal benefits from training designs that present the activity of professional experts as the model to follow (Ria 2009, 2012).

As an example, the analysis of the activity of novice teachers revealed a constant that was not seen in the experienced teachers and had never been mentioned in the literature: the start of lessons was a powerful source of difficulty for them, to the point where this phase was long and delicate to navigate, although it is very brief and almost unnoticed by experienced teachers. This phase was both an obstacle and a resource for professional development because these moments were salient and decisive for their work, determining to some extent their effectiveness. Yet, because these moments of starting the lesson pose no problem for experienced teachers, they

are rarely dealt with in training. An ad hoc environment called Néopass@ction[1] was, therefore, constructed to complement teacher education by accompanying novices along their professional trajectories (Durand 2014; Ria 2009, 2010, 2012; Ria and Leblanc 2011). This site proposes a variety of resources, notably excerpts from the research corpus of video clips showing novices in difficulty at the beginning of lessons (the site covers other topics of interest to novice teachers), self-confrontation sequences with these teachers and other materials from studies of novice teachers.

The training environment of Néopass@ction is based on two hypotheses that support extending the principles for designing environments to fields other than teacher education, such as training programmes for nurses or radiographers. The first is that progress in teaching does not mean reducing the gap between novice practices and an expert model, but rather it means developing novice practices to the point of creating the dynamics for overcoming critical problems and for assisted self-construction (described as individuation in Sect. 11.1.5). The second hypothesis is that this implies an activity of mimetic study for the novices in this type of environment, with training episodes featuring other novices dealing with situations that are very similar to those that they confront in the real work. Thus, the preservice teachers do not see themselves on Néopass@ction, but they do watch other novices with activity quite similar to their own (and who mimic it, one might say), partly because of the typicality of teaching support situations (i.e. the start of lessons) and partly because of the engagement in mimetism offered by this training scheme (Durand 2014).

11.2.5 Individual and Interindividual Development

From an individual and interindividual development perspective, actors' participation in research on social practices provides opportunities for transforming their activity. They derive developmental benefits by allowing themselves to be observed during their practice, by making the practice more accessible and understandable to the researcher and by using the various methodological tools at their disposal to express their experience, private selves or subjectivity. The evaluation of the effects of participating in this type of research reveals recurrent signs of personal development, as exemplified by Leroux (2010), a contemporary music composer who participated in 3 years of research on the activity of artistic creation (Donin and Theureau 2007). This study investigated the activity of creation as a phenomenon irreducible to procedures. About his participation in this research, the composer Leroux categorised the effects as follows: 'what I knew without having put a name to it', 'what I discovered', 'what I want to learn more about', 'what I can assert', 'what I used immediately in the creation of my next composition' and 'what may

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[1] http://neo.ens-lyon.fr/neo

have unconsciously influenced my composing work'. These effects, impossible to detail here, deal with the knowledge and understanding of his past activity, recent activity and activity underway as he worked on the composition under study. All these effects were future oriented in the sense that they had a direct influence on the composition of the next work. The composer, thus, described a better understanding of himself, specifically in terms of (i) insight into the implicit elements of his composing activity (the consequences of his aversion to symmetry); (ii) understanding about what an *idea* really is in the beginning of a composition (his initial uncertainty serves artistic construction because it works at the horizon of possibilities, then becomes more certain and objective); (iii) the rapturous feeling of solving compositional problems; (iv) understanding that writing part of a partition occurs at two levels, implying two stories at once (carrying out the initial plans for the work and confronting unexpected changes or events); (v) his tendency to initially try to circumvent problems; (vi) the function of *strategically rereading* his work, during which the initial project takes shape as he listens deep within himself; (vii) the serene acceptance of being unable to plan everything out in advance and of 'living the music experience' by working with a balance between *out-of-time* preparation and *in-time* listening within himself; (viii) returning to the reservoir of ideas stored in the research corpus; (ix) accepting one or two remarks from the researchers that helped him to find solutions more quickly; and (x) the interest of keeping a composing diary and the occasional deviation of the research towards a sort of training in composition.

11.3 Conclusion

In this chapter, we propose the analysis of actors' activity as they engage in work or training situations as a means of gaining insight into little known or overlooked elements of these practices. Our theoretical perspective is based on the enaction paradigm, with activity analysis taking into account 'the actor's point of view' by restituting the meaning that actors attribute to their practices and by demonstrating the processes by which their activity is self-constructed. Activity analysis can help trainers to design training environments that accurately target the real work and take into account the specificities of trainee activity in both training and work situations. This analysis is not limited to here-and-now activity, but also its transformations over time, which can be conceptualised as follows: (i) typifications of certain occurrences or episodes of activity that serve as exemplary examples or, in other words, prototypes that prefigure the future activity and (ii) individuation, by which an activity becomes more or less an integrated, balanced and stable whole. For the design of training environments, activity analysis differentiates those actions to be encouraged from those to be discouraged, thereby equipping trainers to orient and guide their transformation. Spaces of encouraged actions are equally concerned with training contents and the processes by which trainees are transformed. From this perspective, the training contents are defined using the

methods and concepts of a scientific analysis of activity and are not based only on the 'insider' knowledge of trainers who have done the job or are currently doing it. The support for transformation also requires a solid understanding of both novice and experienced actors' activity in work and/or training situations. This aid to the design of training environments is a significant contribution of work analysis to the practices of trainers and to the implementation of education programmes that are rigorously linked to work situations and transformational processes in trainees. For this reason, the analysis of work is increasingly included in programmes to train trainers and is a field of research that is showing growth in French-speaking research in education.

References

Amalberti, J.-R., de Montmollin, M., & Theureau, J. (Eds.). (1991). *Modèles et méthodes en analyse du travail*. Bruxelles: Mardaga.

Bril, B. (2015). Learning to use tools: A functional approach to action. In L. Filliettaz & S. Billett (Eds.), *Francophone perspectives of learning through work: Conceptions, traditions and practices*. Dordrecht: Springer.

Daniellou, F. (2005). The French-speaking ergonomists' approach to work activity: Cross influences of field intervention and conceptual models. *Theoretical Issues in Ergonomics Science, 6* (5), 409–427.

de Keyser, V. (1991). Work analysis in French language ergonomics: Origins and current research trends. *Ergonomics, 34*(6), 653–669.

de Keyser, V. (1992). Why field studies. In M. Helander & M. Nagamachi (Eds.), *Design for manufacturability: A systems approach to concurrent engineering and ergonomics* (pp. 305–316). London: Taylor & Francis.

de Montmollin, M. (1991). Analysis and models of operators' activities in complex natural life environments. In J. Rasmussen, H. B. Andersen, & N. O. Bernsen (Eds.), *Human-computer interaction* (pp. 95–112). London: Erlbaum.

Donin, N., & Theureau, J. (2007). Theoretical and methodological issues related to long term creative cognition: The case of musical composition. *Cognition, Technology & Work, 9*(4), 233–251.

Durand, M. (2008). Un programme de recherche technologique en formation des adultes. *Education & Didactique, 2*(2), 69–93.

Durand, M. (2011). Self-constructed activity, work analysis, and occupational training: An approach to learning objects for adults. In P. Jarvis & M. Watts (Eds.), *The Routledge international handbook on learning* (pp. 37–45). London: Routledge.

Durand, M. (2013a). Human activity, social practice and lifelong education: An introduction. *International Journal of Lifelong Education, 32*(1), 1–13.

Durand, M. (2013b). Construction of dispositions and development of human activity: A theoretical framework illustrated by the case of a novice manager. *International Journal of Lifelong Education, 32*(1), 39–55.

Durand, M. (2014). Quelques avancées pratiques et conceptuelles liées à la conception et l'usage de la plateforme Néopass@action en formation des enseignants. *Recherche et Formation*, 75, 23–35.

Durand, M., Goudeaux, A., Horcik, Z., Salini, D., Danielian, J., & Frobert, L. (2013). Expérience, mimèsis et apprentissage. In L. Albarello, J.-M. Barbier, E. Bourgeois, & M. Durand (Eds.), *Expérience, activité, apprentissage* (pp. 39–64). Paris: Presses universitaires de France.

Falzon, P. (Ed.). (2013). *Ergonomie constructive*. Paris: Presses universitaires de France.

Filliettaz, L., Billett, S., Bourgeois, E., Durand, M., & Poizat, G. (2015). Conceptualising and connecting Francophone perspectives on learning through and for work. In L. Filliettaz & S. Billett (Eds.), *Francophone perspectives of learning through work: Conceptions, traditions and practices*. Dordrecht: Springer.

Gallagher, S. (2005). *How the body shapes the mind*. New York: Oxford University Press.

Guérin, F., Laville, A., Daniellou, F., Duraffourg, J., & Kerguelen, A. (2007). *Understanding and transforming work. The practice of ergonomics*. Lyon: Anact Network Edition.

Horcik, Z., & Durand, M. (2011). L'ergonomie de la formation par simulation. *@ctivité(s), 2*, 173–188.

Horcik, Z., Poizat, G., Savoldelli, G., & Durand, M. (2014). The mimetic experience of nurse anesthetists training on a simulator. *Simulation in Healthcare, 9*(2), 94–101.

Jorge, J., & Scheller, L. (2014). Radiographers' communicative activity: A case study. *Journal of Clinical Radiography and Radiotherapy, 8*(2), 10–18.

Leplat, J., & Hoc, J.-M. (1983). Tâche et activité dans l'analyse psychologique des situations. *Cahiers de Psychologie Cognitive, 3*(1), 49–63.

Leroux, P. (2010). Questions de faire. La génétique musicale in vivo vue du côté du créateur. *Genesis, 31*, 55–63.

Maturana, H. R. (1988). Reality. The search for objectivity or the quest for a compelling argument. *Irish Journal of Psychology, 9*(1), 25–82.

Maturana, H. R., & Varela, F. J. (1980). *Autopoiesis and cognition. The realization of the living*. Dordrecht: Reidel.

Maturana, H. R., & Varela, F. J. (1987). *The tree of knowledge: The biological root of human understanding*. London: Shambala.

Mingers, J. (1995). *Self-producing systems. Implications and applications of autopoiesis*. New York: Plenum.

Ombredane, A., & Faverge, J.-M. (1955). *L'analyse du travail*. Paris: Presses universitaires de France.

Recopé, M. (2001). *L'apprentissage*. Paris: Editions EPS.

Reed, E. (1993). The intention to use a specific affordance: A conceptual framework for psychology and context. In R. H. Wosniack & K. W. Fisher (Eds.), *Development in context: Acting and thinking in specific environments* (pp. 45–76). Hillsdale: Erlbaum.

Reed, E., & Bril, B. (1996). The primacy of action in development. A commentary of N. Bernstein. In M. Latash & M. Turvey (Eds.), *Dexterity and its development* (pp. 431–451). Hillsdale: Erlbaum.

Ria, L. (2009). De l'analyse de l'activité des enseignants débutants en milieu difficile à la conception de dispositifs de formation. In M. Durand & L. Filliettaz (Eds.), *Travail et formation des adultes* (pp. 217–243). Paris: Presses universitaires de France.

Ria, L. (Ed.). (2010). *Plateforme de formation en ligne Néopass@ction de l'Institut Français de l'Education de l'ENS de Lyon*. http://neo.ens-lyon.fr

Ria, L. (2012). Collaboration entre praticiens et chercheurs sur la plateforme Néopass@ction: l'activité débutante comme objet d'étude et de transformation. *Travail et Apprentissages, 9*, 106–119.

Ria, L., & Leblanc, S. (2011). Conception de la plateforme de formation Néopass@ction à partir d'un observatoire de l'activité des enseignants débutants. *@ctivité(s), 2*, 150–172.

Rosch, E. (1978). Principles of categorization. In E. Rosch & B. B. Llyod (Eds.), *Cognition and categorization* (pp. 27–48). Hillsdale: Erlbaum.

Sartre, J.-P. (1960). *La critique de la raison dialectique*. Paris: Gallimard.

Schütz, A. (1962). *The problem of social reality*. La Haye: Martinus Nijhoff.

Simondon, G. (2005). *L'individuation à la lumière des notions de forme et d'information*. Grenoble: Millon.

Simondon, G. (2008). *Imagination et invention*. Paris: La Transparence.

Stewart, J., Gapenne, O., & Di Paolo, E. (Eds.). (2007). *Enaction: Towards a new paradigm for cognitive science*. Cambridge, MA: MIT Press.

Stiegler, B. (1998). *La technique et le temps. 1- La faute d'Epiméthée*. Paris: Galilée.

Theureau, J. (2004). *Le cours d'action. Méthode élémentaire*. Toulouse: Octarès.

Theureau, J. (2006). *Le cours d'action. Méthode développée*. Toulouse: Octarès.

Theureau, J. (2009). *Le cours d'action. Méthode réfléchie*. Toulouse: Octarès.

Theureau, J. (2010). Les entretiens d'autoconfrontation et de remise en situation par les traces matérielles et le programme de recherche « cours d'action ». *Revue d'Anthropologie des Connaissances, 4*(2), 287–322.

Theureau, J., & Jeffroy, F. (1994). *Ergonomie des situations informatisées*. Toulouse: Octarès.

Varela, F. J. (1989). *Autonomie et connaissance*. Paris: Seuil.

Varela, F. J. (1996). *Quel savoir pour l'éthique*. Paris: Seuil.

Varela, F. J., & Shear, J. (1999). First-person methodologies: What, why, how? *Journal of Consciousness Studies, 6*(2–3), 1–14.

Varela, F. J., Thompson, E., & Rosch, E. (1991). *The embodied mind: Cognitive science and human experience*. Cambridge, MA: MIT Press.

Zeleny, M. (1981). *Autopoiesis, a theory of living organizations*. New York: North Holland.

Chapter 12
Activity Analysis and Workplace Training: An Ergonomic Perspective

Sylvie Ouellet and Nicole Vézina

12.1 Activity Analysis and Workplace Training

The provision of workforce training in companies often involves experienced employees training new recruits. These worker-instructors, often recognised by their peers for their know-how, find themselves in a situation where they are required to pass on skills relating to performing the particular activity (i.e. movements, sensorimotor perception, planning), characteristics of the material to be worked on, tools used and various working conditions. These skills, built up by memorising experiences, on the one hand, require particular mental aptitudes (Chevallier and Chiva 1991) to integrate them and organise them to meet individuals' needs in the context (e.g. technical, organisational, social conditions, etc.) and, on the other hand, call for perceptual-motor abilities needed for identifying and processing information required for the performance of the task. These abilities, developed over time, enable experienced workers to anticipate, correct and adjust and to decide on the best movements to perform at each step of the task. They may also enable them to protect their health, particularly by preventing musculoskeletal disorders (MSDs) (Authier 1996; Chassaing 2006; Chatigny 2001; Denis et al. 2007). Yet, for good reason, workers may find it difficult to verbalise their working methods (Daniellou and Garrigou 1995; Reber 1989; Teiger 1996) as these processes have become proceduralised and not requiring access to conscious memory. One can, therefore, only speculate to what extent worker-instructors are able to verbalise their ways of working and provide pointers that characterise their expertise when they are called upon to give training, especially when those skills have become "second nature". The pooling of the know-how of a group of experienced workers and the putting into words of the knowledge that they draw on is an

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essential step towards providing an understanding of the reasoning that underlies movements. This is the case because of the importance for learning these tasks requires accounting for the mechanisms that enable movements to be performed (Bellier 2002; Desmurget 2006).

Studies have also shown the contribution of ergonomic analysis in meeting workforce training requirements. For example, Vézina et al. (1999) on knife sharpening and Denis et al. (2007) on handling among garbage collectors have shown how, in the context of developing training material, ergonomic analysis allows the know-how acquired by experienced workers to be put into words. This know-how derives particularly from strategies developed to meet the demands of production while protecting oneself. In manual work, tasks compel operators to cope with a number of requirements simultaneously, particularly speed and accuracy, which call for particular motor skills (Bouisset 2002). Workers' perceptual-motor skills allow them to meet requirements by continually adjusting their movements to suit the situation (Chassaing 2006). The task for those seeking to promote the learning of these skills is how to determine to what extent it is possible to refine ergonomic analysis of working activity to put into words this type of knowledge that is "recorded in the body and the movement" [free translation] (Adell 2011, p. 132) of workers. This knowledge, developed in practice, is mobilised in know-how that is expressed as knowing how to "observe", "feel by touch", "listen", "smell" and "taste", all of which imply the existence of perceptual-motor reference points (Ouellet and Vézina 2008).

To address this question, we have chosen to present the broad outlines of a process developed during an ergonomics research-intervention project (Ouellet 2009). As well as seeking to meet research objectives, namely, to advance knowledge on the links between how training is organised, learning conditions and the training content given on preventing musculoskeletal disorders (MSDs), this project also sought to satisfy the request of a company that wished to obtain training content for repetitive manual tasks, in particular for the deboning of pieces of meat, and to receive guidance on the design of their training. In the following sections, we first present the approach taken in the study and the contribution of various disciplines to the understanding of movements. Then, we discuss the findings of the study conducted in the company. Then, the final sections serve as the basis for a discussion of the importance of putting into words elements of "embedded knowledge" (i.e. knowledge stored in the body) to make them accessible during training. It proposes the need to describe and understand all components of the work activity to produce training content representative of the actual work and make it credible to workers.

12.2 Activity at Work as the Focus of Occupational Training

Workplace training is not restricted to mere demonstrations of working movements and giving instructions. It must ultimately enable learners to carry out their work in ways that meets both organisational objectives and their own objectives,

particularly that of safeguarding their health. In ergonomics, the distinction between task and activity is fundamental, orienting the point of view taken on work. While a task is defined by an organisation, with its procedures, instructions and expected results in terms of quantity and quality of work, an activity means the manner in which a person does his work (St-Vincent et al. 2011). Work activities are always performed, in part or whole, by individuals, with their own particular characteristics. They will, in their own ways, interpret the task set, in terms of operations to be carried out, instructions and procedures to be followed and quantity and quality of work to be maintained (St-Vincent et al. 2011). In carrying out activities, individuals take into account the various elements that make up their working framework. These include conditions and means available in the context, whether material (e.g. layout and spaces, machines, tools and furniture) or organisational (e.g. schedules, teamwork, temporal organisation, etc.), together with the social environment (e.g. social structures, hierarchical links, mutual help between colleagues, the expectations of others, etc.). To achieve this outcome, individuals note the characteristics of the situation and make a representation of them that will guide their action – which gives rise to the concept of regulation of working activity (Guérin et al. 2006). Here, we draw a connection with the "orientation" operations in guiding activity described by Savoyant (1995), who pointed out that these operations may be "implicit" in the performance of the work, frequently making them difficult to clarify (verbalise). As Bril (2012) points out, learning a work activity partly depends on learning relevant information that can be gathered in the setting.

It follows that an individual cannot be characterised as someone who merely executes a task, regardless of the trade. Rather, the individual is a person able to take initiatives and resolve problems to respond adequately to production contingencies (Lacomblez 2001). Performing the work activity necessarily involves a cognitive process in which connections are made between "why", "if", "when" and "how" conditions – connections invisible to the observer. These connections stem from know-how built up through experience of a wide variety of situations. For example, every attempt, every work cycle performed, gives individuals opportunities to judge the results and to discover new reference points, new solutions that will enrich their knowledge. In a work environment, a role of the work-instructor is to make these "invisible" points of knowledge visible (Billett 2002) that is so necessary to the development of occupational skills, accessible to new employees.

12.3 Manual Work: Operations of Underrated Complexity

How often do we hear a company manager say, "We'll put you next to this worker, do as he does", or a worker say, "Watch me and then try to do what I do". Instructions of this kind are heard when the work is manual and repetitive because it is often seen as straightforward and mainly composed of a series of movements to be imitated. However, Bouisset (2002), a movement physiologist, pointed out that

tasks that are to some extent piecemeal and performed under time constraints, as on assembly lines, involve a number of requirements, particularly speed, precision and dexterity, and a number of associated basic actions. Working quickly, while complying with the other requirements of the task, thus defines the sensorimotor skills most frequently in play. In ergonomics, a number of studies of repetitive manual tasks have shown the complex nature of these tasks (Falardeau and Vézina 2004; Gaudart 1996; Richard 2002; Teiger et al. 1974; Vézina et al. 2003).

"Skill" is a term commonly used to characterise manual work. This notion is difficult to pin down and has been the subject of study and reflection by many actors and scientists from a variety of fields such as ergonomics, work psychology, psychophysiology, anthropology, physiology, philosophy and ethnology (Bril and Roux 2002; Chassaing 2006; Gandolfo et al. 2006; Latash and Turvey 1996; Leplat 2013; Leroi-Gourhan 1964; Séris 1994; Vezeau 2004; Vézina et al. 1999). A number of these authors stress the thought-out nature of movements. In the field of ergonomics, Bourgeois et al. (2006) report that movements are thought out, chosen and adapted, so that they lose their efficiency as soon as the situation forces them into a standardised format. For these authors, the notion of skill takes into account not only the characteristics of motion (e.g. amplitude, force, speed, acceleration, etc.) but also psychological characteristics (e.g. will, intent, emotion, etc.) and social characteristics (e.g. grip, "knack", etc.). A skilled movement is a compromise between the objectives, task, means of work and the individual characteristics of the person carrying it out. In Leplat's view (2013), the notion of skilled movement cannot be dissociated from those of action and activity. Instead, a movement has a context and in a work situation must be analysed with reference to the latter two notions, because each sheds light on the others.

12.4   Movement and Perception

Earlier, we pointed out that workers adapt their movements. Experienced workers' perceptual-motor abilities enable them to continually adjust their movements to execute the best movement in the situation. Bril and Roux (2002) state that expertise lies not in the sequence of operations carried out to achieve an overall goal, but rather in the basic movements and how they are strung together. In these authors' view, these aspects are crucial elements of expertise, that is, characterised by flexibility, adaptation, anticipation, minimum outlay of energy and the perception and use of information. On this point, Chassaing (2006) noted in her studies of workers operating an automobile assembly line or working on the formwork for highway bridges that there is a difference in the level of information sought to guide a movement, depending on a worker's seniority in an activity. Operators with less seniority evoke fewer working methods related to sensory, auditory and proprioceptive components. Recourse to sensory resources appears to develop with seniority and knowledge of the task.

In everyday language, the term perception refers to sensory detection of information about the environment and its components, to becoming aware of the reality that surrounds us (Bonnet and Lestienne 2003). For Berthoz (1997, p. 15) "perception is a simulated action". Perception is not limited to the interpretation of sensory signals: "[. . .]: it is constrained by action, it is an internal simulation of action, it is judgment and decision making, it is anticipation of the consequences of action" [free translation] (p. 15). Berthoz suggests that perception is not so much a function of the intensity of the stimulus as of the matching of the stimulus with a hypothesis produced by the brain. He stresses the fact that the multisensory nature of perception includes the presence of signals that come not from the senses but also from the intention of the movement. The active nature of perception is demonstrated by this profound influence of the intentional character of the movement. "In other words, we must completely reverse the direction in which we study the senses. We should start from the goal that the body is seeking to achieve, and understand how the brain will query the sense organs by regulating sensitivity, combining messages, and pre-specifying estimated values, based on an internal simulation of the expected consequences of the action" [free translation] (Berthoz 1997, p. 287).

Ultimately, the characteristics of a movement and the mechanisms that condition its efficiency will have consequences not only for the way it can be learned or appropriated but also for what must be conveyed to learners to help them choose relevant movements. On this point, Bellier (2002, p. 48) states that an "Analysis of content to be transmitted must go much further than the mechanics of the physical, concrete or abstract movement. From the outset, it must incorporate an understanding of the underlying method, of 'how to go about it'" [free translation]. Desmurget (2006), working in the field of motor control, states that learning must focus not on the formal attributes of a movement carried out by an expert but also on the acquisition of mechanisms enabling this movement to be carried out. In this regard, we would, however, stress that if it is desired to prevent MSDs in manual trades, it is important not to neglect certain attributes of movements that could contribute to the risk of injury and, in particular, the biomechanical component of movements.

12.5   A Multistep Process: Study of the Deboning Activity

Here, a case study is presented of the application of ergonomic approach to the task of boning meat in a meat processing plant. Let us state at the outset that the ergonomic approach used in this study is based on the work activity analysis-centred approach (Daniellou and Rabardel 2005; Guérin et al. 2006; St-Vincent et al. 2011) in which all components (i.e. physical, cognitive and social) are considered, but with particular emphasis on very detailed analysis of the movements of workers deboning pieces of meat. The design of the research project sought to incorporate several concepts and models taken from different fields: ergonomics (Bourgeois et al. 2006; Chatigny 2001; Guérin et al. 2006; St-Vincent et al. 2011; Vézina 2001) in order to describe the work activity and

neurophysiology to understand movement-control and motor-learning mechanisms (Berthoz 1997; Schmidt and Lee 2005). The findings of neurophysiology led us to look for connections between the objectives the workers were seeking to attain with their action and the sensorimotor information mobilised to attain these objectives.

12.5.1 A Reformulated Request

The study was conducted in a company with over 300 production employees. About 20 of these employees, all male, perform the defatting and deboning of the meat. Workers process pieces of meat through sequences on a mobile production line. As mentioned earlier, the company was seeking to obtain training content for the deboning task and to be guided in the design of their training. The company's initial idea of the training content was to identify a single correct method and the correct movements to convey to the workers to prevent injuries and especially musculoskeletal disorders (MSDs). The project could not go ahead until this part of the request was reformulated in a manner acceptable to all parties. To achieve this goal, we met with actors in the company to help us understand the issues and take stock of knowledge of the learning process, particularly the learning of movements. Three main points emerged: (1) a movement is not entirely transmissible (Bril and Roux 2002) because part of it is a movement of the body, and to learn to produce this movement, all the sensations involved must be felt before it can be appropriated (Schmidt 1999); (2) the movement is thus constructed by the learner and is no longer that of the trainer; and (3) the constructed movement, therefore, depends on each learners' abilities and characteristics. In these conditions, seeking to teach one correct method of working to learners is illusory (Bellemare 1996). We, therefore, drew attention to an anticipated variability in the working methods of experienced workers and importance of demonstrating different working methods so that every learner could appropriate the method that best suits them without neglecting the need to make sure that the biomechanical dimension of the movements chosen by the learner will not increase the risks of MSDs. Accordingly, we suggested that the various working methods and the movements that involve the greatest risk be described and that consensus reached with a group of experienced workers on what could be shown to learners.

Consequently, the request concerning training content was reformulated, allowing for the fact that content would be developed based on the knowledge of a group of experienced workers, incorporating elements from several working methods and setting out the advantages and disadvantages of each of these elements for workers' health, product quality and learning difficulty. To ensure that MSD prevention was built into the project, the objective was also to incorporate into the training content all elements of the work performed (i.e. work organisation elements, rules and procedures, stages of the task, names of parts and products, various points regarding working methods, tricks of the trade and prevention principles). From our point of view, the prevention objective should form part of any development of training content, particularly in manual trades or occupations involving health and safety risks.

12.5.2 Bringing Expertise to Light to Help Develop Training Content

Once the company's request had been reformulated, we began with a preliminary step: the selection of six experienced workers recognised by their peers for their know-how and their ability to respond to the demands of production. Among these workers were the two deboning trainers. Naturally, selecting a group of experienced workers to serve as a reference for the design of training content raises a number of questions. First, who should choose these workers? How could we make sure that choices were not made on the basis of "special relationships" between various players in the company? How were we to make sure that choice on the basis of the criterion "recognised by their peers" would not be biased by the level of the other workers or by interpersonal relations? In addition, is recognition from one's peers due to speed of execution of work, to quality, to the cutting power of knives and to not injuring oneself? To eliminate bias in selection, we undertook observations at the workstations to document workers' profiles. The criteria on which we based our choices were the various working methods, the differences in the choice of knife shapes, the various personal characteristics and the possibility of an aptitude for training. Discussions were subsequently held with the supervisor to present our choices and to try to understand some of his proposals. Our active involvement in the selection of participants helped bring out the issues behind the choices made by actors in the company and, thus, to influence these choices, where necessary, consonant with the project's objectives. Once the selection was made, individual interviews were conducted with each participant for the purposes of understanding their work and finding out about their experiences, the difficulties they encountered and any unease they experienced.

After this preliminary step, our objective was to highlight the know-how of these experienced workers and put their knowledge into words. First, observations at the workstations were conducted to find out more about the way work was organised, the steps of the task and the factors that could influence their work methods. This step served to prepare for systematic data collection, which led to analysis of movements. For this step, as alluded to earlier, we started from the premise that a movement carries a meaning and an intention and that it is thought out, deliberately chosen and adapted to the conditions; these aspects may be said to constitute the strategies, reference points and tricks of the trade that have been developed for the purposes of protecting oneself and meeting production requirements. We, therefore, wanted to document the cognitive components of movements and not merely the biomechanical components.

The next step was to produce a detailed analysis and description of work methods and of movements made at every stage of the task based on video clips recorded at the workstations. Some of the variables considered in the analysis were about the temporal organisation of the task and the sequence of steps, while others were aimed at describing working gestures such as the manner of handling the piece of meat, the manner of holding the knife, the direction of movements, etc. This step,

therefore, served to describe the observable part of occupational skills, that is, actions and movements.

At this point in the project, it was necessary to use a methodology that would enable a validation of our observations and gather data on the non-observable part of movements. This led to the holding of a 2-h individual "self-confrontation" meeting (Guérin et al. 2006) with each worker (Vermersch 2008). These meetings resulted in the identification of determining factors of the methods and above all brought to light the reasoning underlying movements. Among the questions asked in these meetings were those aimed at identifying reference points the worker-instructors used to undertake their work. For example, we asked the following questions: (1) When you free the bone, what tells you that your knife is in the correct place (e.g. feeling the bone, seeing the bone, anticipating the shape of the bone, etc.)? (2) Are there pointers that tell you whether the blade of your knife is correctly pushed into the meat to free the bone (e.g. not deep enough, deep enough or too deep)? (3) If so, what are your reference points (e.g. visual, tactile, others)? (4) What do you look at when freeing the bone? These questions were based on knowledge in the field of neurophysiology. To assist in verbalisation, video clips of the work activity were used during the individual self-confrontation interviews.

Furthermore, to prevent elements of content transmitted to learners from contributing to an increased risk of developing muscular skeletal disorders (MSDs), it was necessary to reach a consensus with the experienced workers about what could or could not be shown to learners. Hence, group meetings were organised to foster the sharing of workers' points of view about working methods. During these meetings, the results of our analyses were presented to the group, and one of the discussions focused on operating methods, reference points used in carrying out the task and the diversity of work methods. To add substance to the discussions, we arranged for the meeting to include a 60-min trial in the production room during which workers could demonstrate their methods, try out the methods of others and express their point of view on these methods. The aim was not to highlight a single method, but to draw out the reasoning behind the movements and certain principles of the biomechanics of movements, in order to then present the various methods, pointing out their advantages and disadvantages. For example, the deboning task involves performing movements in which the position of the knife and the shape of the blade affect the postures required of the arm. An experienced worker in the group performed a movement using a knife position that caused major flexion and abduction of the shoulder, postures which are considered to be conducive to the development of MSDs (Loppinet and Aptel 1997). All the experienced workers agreed that it is important to monitor movements of this type in learners, and this was taken into consideration in developing the training content. These meetings made it possible to systematically draw out the various elements of work methods with their advantages and disadvantages for health, product quality and learning. The goal here was not to construct training content that would serve as a tool to prescribe work methods, but rather to construct a reference tool enhanced with know-how "extracted from the memory" of a number of workers, in view of the fact that every person develops their own manner of coordinating their movements. The

trainer must act as a guide in the learning process (Billett 2002). This tool can serve as a memory aid and provide worker-instructors with a greater range of possibilities in their interactions with learners for the purpose of better meeting their needs and facilitating their learning. These were premises from which the spirit in which the training content was developed (Ouellet 2009). In the next sections, we present the results of our analysis of the work activity.

12.6 Analysing Activity to Understand the Reasons for Particular Actions

Analysis of the work activity revealed substantial variability in operating modes both between individuals and in the same individual. This variability showed itself in a number of aspects of the cutting work, namely, (1) cycle time, (2) order in which steps were executed, (3) number and length of knife cuts, (4) positioning and moving of the piece of meat, (5) types of knife used, (6) ways of holding the knife, (7) manner of performing each step, etc. To understand the reasoning behind the choices made by the meat boners and bring out the knowledge underlying this reasoning, workers were questioned about the factors that determined their working methods. Figure 12.1 shows the factors that were identified and were consequently taken into consideration in the diagnosis of the situation. For example, some boners explained that when a piece of meat approaches their workspace, they first determine whether it is a left or right piece of meat. In the deboning activity, every second counts, and being able to distinguish a right from a left piece of meat when it arrives at the workstation is vital if time is not to be lost. This anticipation enables boners to prepare to carry out the task by determining how they will set about it and by anticipating difficulties that they habitually have with either of the pieces, if any, thereby giving themselves a margin for manoeuvre.

The boners also estimate the time the deboning operation takes as based on: the quality of work already performed upstream (e.g. length of the hock, quality of defatting, position of the piece on the conveyor belt) and whether or not they need to sharpen their knife before beginning the cycle. If the boners believe that they will need a little more time on account of any of these factors, they may attempt to begin their cycle earlier on the conveyor. Yet, to do this, they must first consider the position of their upstream colleagues to avoid injuring themselves with their knives. If their colleagues are behind in their own cycle, bringing them closer, the boners cannot begin earlier in the cycle. Two compromises will, then, be possible: either to accelerate the pace (i.e. faster movements) or to encroach upon the downstream workspace at the end of the cycle. This example demonstrates that even in a highly repetitive task, a number of elements are considered together by the boners to construct their representation of the situation and guide their choice of actions (Ouellet and Vézina 2008).
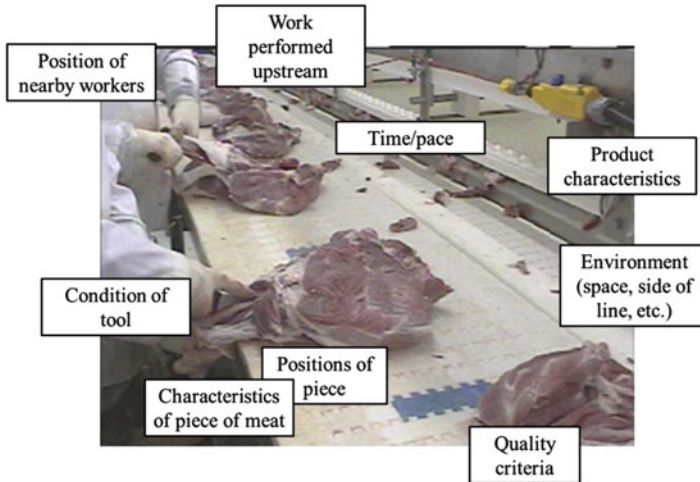
Fig. 12.1 Factors that determine working methods in deboning

12.7 Working with the Senses: The Body's Unconscious Knowledge

Deboning pieces of meat requires precise movements performed in a raw material that contains elements that are not initially visible and are uncovered only as the movements and tasks progress. The aim is to remove the bone from the piece leaving as little meat as possible adhering to it, considering that the bone has a nonsymmetrical shape and that there are variations from one animal to another. Success depends on workers' motor skills and their ability to assess the elements of the situation, for example, the characteristics of the piece of meat as it arrives and, sometimes, to "see" the invisible elements in order to succeed in inserting the knife at the correct spot in the piece of meat. This ability calls on knowledge of the characteristics of the raw material, knowledge that enables workers to construct perceptual-motor reference points. In the course of the individual self-confrontation meetings and group meetings, we wished to find out what workers did to make their movements more efficient. Discussions focused mainly on the five objectives of good-quality deboning which every learner must succeed in attaining. These objectives, set out in Fig. 12.2, focus on the manner of placing the knife, the exact spot in which to insert it and the ability to work around a major obstacle formed by the joint connecting two bones, failing which the worker risks damaging the blade of his knife.

The interviews were aimed at identifying how these boners went about achieving these objectives. As Table 12.1 shows, they reported using sight and touch, and some stress that they had a mental representation of the bone's shape and dimensions that enabled them to anticipate obstacles and position their knife appropriately. The "feeling of leaning on the bone" was frequently expressed as a way of

Hold knife at
correct angle

Move the knife to
mark out a piece called
the "inside"

Anticipate
obstacles
associated with
the bone

Insert the blade into the
meat to the correct
depth

Slide the knife through
the correct places in
the other parts of the
piece
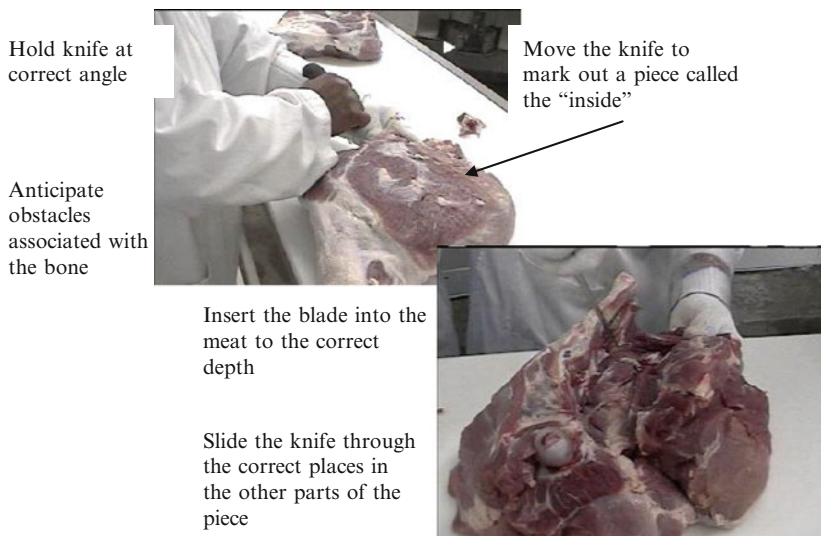
Fig. 12.2 Five objectives for boners when deboning the piece of meat

knowing whether the knife was travelling in the right path to remove as much meat
as possible, at the right angle, and anticipating obstacles. One of the workers, with
25 years of experience, stated that he could debone without looking and could
immediately tell the result of his work by touch. On this point, another boner stated
that it is important not to hold the knife too tightly in order to get this tactile
sensation from the bone. However, in order not to hold the knife too tightly, the
knife must cut well, which is not necessarily the case for learners who do not easily
master the sharpening of knives. This is a determining factor in the learning of
efficient movements and the possible appearance of the musculoskeletal disorders
that interest ergonomists (Savescu et al. 2013; Vézina et al. 1999). Among the
factors identified during the discussions as determining the cutting quality of the
knife was the daily preventive maintenance of the tools and equipment used to hone
and sharpen knives.

  We would like to draw attention to a fact that this example nicely illustrates the
contribution made by the practical trial in the production room during the group
meeting. During the gathering in the production room, workers frequently repeated
that an important point for the success of deboning was to use the correct part of the
knife blade, namely, the "point" of the blade. But as we listened to the workers, two
questions arose from the dialogue. One was what the workers meant when speaking
of the blade "point" and the other as to whether the point really was the part always
used. The last question was difficult to observe from the video clips. During trials in
the production room, we were able to highlight the fact that workers had a different
representation of what the blade "point" meant and that in certain steps, a larger
portion of the blade was used. For some, the "point" was merely a small section at
the extremity of the blade, while for others it represented about one third of the

Table 12.1 Points of information workers look for while carrying out the task and links with skills (number of workers out of six who mentioned the point) (Ouellet and Vézina 2008)

Objectives	Points looked for		
	Visual	Tactile	Mental representation
Mark out the "inside" piece with the knife	Location of the "ball of the femur" in order to start beside it (1)	Leaning on the bone (1)	Shape of the bone in the meat (1)
	Location of the line of fat (white line) in order to follow it (4)		
Slide the knife through the correct places in other parts of the piece	Location of the bone (3)	Leaning on the bone (4)	
		Difference in texture between meat and cartilage (1)	
		Change in the shape of the bone (2)	
Insert the blade into the piece of meat to the correct depth	Result after cutting (1)		Bone diameter and thickness (2)
	Thickness of the bone (1)		
	Hand/meat distance (dagger grip) or finger/meat distance (other grips) (1)		
Anticipate obstacles associated with the bone		Change in shape of the bone, which widens as it approaches the joint (1)	Distance travelled by the knife in relation to mental representation of the length of non-visible bone (1)
Hold the knife at the correct angle	Shape of the bone (1)	Leaning on the bone (2)	Shape of the bone (2)

length of the blade. Yet all informants affirmed that the secret to deboning was to work with the "point" of the blade. The practical trials, therefore, allowed us to highlight the representation that each worker had of the notion of the "point" of the knife. This was used to make them realise that ultimately in action, this is not always the part of the blade used even if it is the main part involved and, finally, to understand the reasoning behind the choice of blade length to use for different steps.

These data highlight the importance of knowing the characteristics of the raw material and of the tool used and of having perceptual-motor reference points to assist in performing the task in accordance with requirements. Knowledge of the characteristics of the piece of meat and bones was deemed essential by the boners. This finding raises the question of learning difficulties that novices may encounter in work of this type, which involves perceptual-motor requirements. How can this

perceptual-motor ability of experienced workers be developed without having to go through years of painful, laborious practice? In deboning, inserting the knife at the correct place reduces the effort required. Not hitting the joint that connects the two bones prevents damage to the knife blade, and this, therefore, means less cutting effort. Added to which, a knife that does not cut well combined with the stress felt by a beginner can lead to a tight grip on the knife handle. Consequently, it seems essential to encourage the greatest possible number of points of embedded knowledge to be brought to light and made accessible to learners, even if putting them all into words is impossible. Telling novices that the bone widens as it approaches the joint does not mean that they will succeed in detecting this change of shape of the bone by touch. But this pointer will at least tell them that there is a change in shape and that this change can be detected by touch. They will, therefore, be encouraged to try to develop their sense of touch to perform this task.

12.8   Conclusion: Training Content, for Whom and Why?

Experienced workers are usually those given the mandate to train new workers, without necessarily having been prepared to do so (Cooper et al. 2010). Asking workers to give training under these conditions takes for granted that they will be able to verbalise their knowledge spontaneously in a work situation. But, as noted, manual work involves mobilising multiple points of embedded knowledge that are difficult to articulate in a verbal form. In another phase of the same study, Ouellet and Vézina (2009) demonstrated that among the points of knowledge least often passed on to learners during training are the reference points that experienced workers use and the reasons why actions are taken. Yet, these are the points that characterise the expertise of experienced workers and are those that novices need to learn. Training content built on an analysis of operations and consequently of the know-how of a group of workers will give the worker-instructors a reference tool enriched with knowledge "retrieved from the memory" of a number of workers. It must be remembered that the objective of this research-intervention project was not to prescribe working methods, but to obtain consensus on the advantages and disadvantages of each of the methods described, taking into consideration product quality and possible effects on workers' health. The company was presented with a copiously illustrated training manual in both paper (i.e. ring binder) and digital formats to facilitate updating when necessary. Among other topics, the manual sets out the steps of the task, the health prevention principles associated with each method, the reference points used and tricks of the trade. Some of these tricks deal with ways of manipulating the piece of meat during deboning and ways of holding the knife. To foster the construction of a mental representation of the bone, workers agreed during the group meeting that it is important to put greater emphasis on the physical characteristics of the raw material and the shape of the bone in particular. In this respect, it was suggested that bones from the piece of meat be exhibited on

the table used for learning deboning, so that learners could examine them and visualise their characteristics when needed.

Furthermore, where learning work tasks are concerned, it is essential to take into account the safety aspects of movements shown to novices, especially when the tasks involve health and safety risks for workers. For new employees, learning to produce is important, but safeguarding their health is no less so. Ergonomic analysis of the working operations of experienced workers has not only made it possible to put into words knowledge developed in practice but has also led to the identification of factors that can lead to the development of MSDs. For example, earlier we pointed out that the cutting capacity of the knife can affect the tightness of a worker's grip on the knife handle. Cutting quality has a major impact on a boner's work. During individual and group meetings, boners stressed the fact that the knife's cutting capacity plays a major role in the effort expended in cutting, the time required to make a cut and the quality of the finished product. As this factor is crucial for the work of experienced workers, it is equally important for new employees. Measures have been taken in conjunction with the company to improve equipment and training for knife sharpening and honing. Developing training content with the participation of the workers concerned also presents an opportunity to question the conditions under which learning is conducted and to identify solutions.

If we summarise the ergonomic perspective using a participatory approach to workplace training, the following five points emerge as key: (1) describing the working activity in sufficient detail to increase our understanding of the know-how involved and bring out practical points of knowledge that can be put into words in training content, (2) comparing the operational modes described to preserve differences between individuals and enrich training by encouraging learners to develop their own working method, (3) introducing the notion that safeguarding one's health is an inherent part of performing a production operation, (4) understanding the effect of working conditions on learning and (5) proposing steps to improve learning conditions.

One of the important contributions of the meetings held during the course of the study was to foster the involvement of workers in the development of training content, making it representative of the actual work, in the eyes of all workers and of the company, and hence credible to learners who are trained. Workers also reported that the meetings held during the study led them to consider critically their own way of working. Some left the meetings saying that they wished to verify what it was that they did in certain circumstances.

Is such an approach, prioritising analysis of working activity and movements in order to describe workers' know-how, necessary and useful solely in the case of manual work? From our point of view, regardless of the trade or profession, it will always be necessary to describe and understand all components of the work activity if the aim is, on the one hand, to produce training content representative of the actual work and, on the other hand, to foster the development of know-how through training. Who does not use mental points of reference in their work?

References

Adell, N. (2011). *Anthropologie des savoirs*. Paris: Armand Colin.

Authier, M. (1996). *Analyse ergonomique des stratégies de manutentionnaires experts et novices*. PhD dissertation, Université du Québec à Montréal.

Bellemare, M. (1996). La bonne méthode de travail. . . et si elle n'existait pas ? *Travail et Santé, 12* (4), 5–10.

Bellier, S. (2002). *Ingénierie en formation d'adultes. Repères et principes d'action*. Paris: Édition Liaisons.

Berthoz, A. (1997). *Le sens du mouvement*. Paris: Éditions Odile Jacob.

Billett, S. (2002). Toward a workplace pedagogy: Guidance, participation, and engagement. *Adult Education Quarterly, 53*(1), 27–43.

Bonnet, C., & Lestienne, F. (2003). *Percevoir et produire le mouvement*. Paris: Armand Colin.

Bouisset, S. (2002). *Biomécanique et physiologie du mouvement*. Paris: Masson.

Bourgeois, F., Kemarchand, C., Hubault, F., Brun, C., Polin, A., & Faucheux, J. M. (2006). *Troubles musculo-squelettiques et travail – Quand la santé interroge l'organisation*. Lyon: ANACT.

Bril, B. (2012). Apprendre des gestes techniques. In E. Bourgeois & M. Durand (Eds.), *Apprendre au travail* (pp. 141–151). Paris: Presses universitaires de France.

Bril, B., & Roux, V. (2002). *Le geste technique. Réflexions méthodologiques et anthropologiques*. Ramonville Saint-Agne: Éditions Erès.

Chassaing, K. (2006). *Élaboration, structuration et réalisation des gestuelles de travail: les gestes dans l'assemblage automobile et dans le coffrage des ponts d'autoroute*. PhD dissertation, Conservatoire National des Arts et Métiers.

Chatigny, C. (2001). Les ressources de l'environnement: au cœur de la construction des savoirs professionnels en situation de travail et de la protection de la santé. *Perspectives interdisciplinaires sur le travail et la santé, 3*(2), 1–17.

Chevallier, D., & Chiva, I. (1991). L'introuvable objet de la transmission. In D. Chevallier (Ed.), *Savoir-faire et pouvoir transmettre* (pp. 1–11). Paris: Éditions de la Maison des sciences de l'homme.

Cooper, L., Orrell, J., & Bowden, M. (2010). *Work integrated learning. A guide to effective practice*. London: Routledge.

Daniellou, F., & Garrigou, A. (1995). L'ergonome, l'activité et la parole des travailleurs. In J. Boutet (Ed.), *Paroles au travail* (pp. 73–92). Paris: L'Harmattan.

Daniellou, F., & Rabardel, P. (2005). Activity-oriented approaches to ergonomics: Some traditions and communities. *Theoretical Issues in Ergonomics, 6*(5), 353–357.

Denis, D., St-Vincent, M., Gonella, M., Couturier, F., & Trudeau, R. (2007). *Analyse des stratégies de manutention chez des éboueurs au Québec. Pistes de réflexions pour une formation* (Report R-527). Montreal: IRSST.

Desmurget, M. (2006). *Imitation et apprentissages moteurs: des neurones miroirs à la pédagogie du geste*. Paris: Solal.

Falardeau, A., & Vézina, N. (2004). Apport de différentes sources de données à la description comparée des contraintes et à l'amélioration d'un groupe de postes occupés en rotation. *Perspectives interdisciplinaires sur le travail et la santé, 6*(1), 1–22.

Gandolfo, G., Legrand, D., Taland, F., Mourand, P., & Grammont, F. (2006). L'intelligence du geste. *Biologie Géologie, 1*, 131–162.

Gaudart, C. (1996). *Transformations de l'activité avec l'âge dans des tâches de montage automobile sur chaîne*. PhD dissertation, École Pratique des Hautes Études.

Guérin, F., Laville, A., Daniellou, F., Duraffourg, J., & Kerguelen, A. (2006). *Comprendre le travail pour le transformer. La pratique de l'ergonomie*. Lyon: ANACT.

Lacomblez, M. (2001). Analyse du travail et élaboration des programmes de formation professionnelle. *Relations industrielles/Industrial Relations, 56*(3), 543–578.

Latash, M. L., & Turvey, M. T. (1996). *Dexterity and its development. With on dexterity and its development by Nicholai, A. Bernstein.*. Mahwah: Lawrence Erlbaum Associates Inc.

Leplat, J. (2013). Les gestes dans l'activité en situation de travail. *Perspectives interdisciplinaires sur le travail et la santé, 15*(1), 1–19.

Leroi-Gourhan, A. (1964). *Le geste et la parole. Tome I. Technique et langage*. Paris: Éditions Albin Michel.

Loppinet, M., & Aptel, M. (1997). *Les TMS dans la filière viande. Revue de la littérature* (Notes scientifiques et Techniques No. 162). Nancy: INRS.

Ouellet, S. (2009). *Acquisition d'habiletés motrices à la découpe de viande et prévention des troubles musculo-squelettiques: apport de l'analyse ergonomique à la conception de formation*. PhD Dissertation, Université du Québec à Montréal. Retrieved from http://www.archipel.uqam.ca/2474/

Ouellet, S., & Vézina, N. (2008). Professional know-how and MSD prevention: Conceptual and methodological reflection leading to their identification and the start of their construction. *Perspectives interdisciplinaires sur le travail et la santé, 10*(2), 1–32.

Ouellet, S., & Vézina, N. (2009). Professional knowledge and MSD prevention: portrait of their transmission during training and the intervention perspective. *Perspectives interdisciplinaires sur le travail et la santé, 11*(2), 1–34.

Reber, A. S. (1989). Implicit learning and tacit knowledge. *Journal of Experimental Psychology: General, 118*, 219–235.

Richard, P. (2002). Analyse ergonomique et mesures biomécaniques dans un abattoir de porcs. *Perspectives interdisciplinaires sur le travail et la santé, 4*(1), 1–11.

Savescu, A., Vézina, N., & Brunet, R. (2013). *Combining quantitative and qualitative assessments of knife cutting capacity: A major MSD prevention issue in meat cutting*. Paper presented at the meeting of the 8th international scientific conference on prevention of work-related musculoskeletal disorders PREMUS, Seoul, North Korea.

Savoyant, A. (1995). Guidage de l'activité et développement des compétences dans une entreprise d'insertion. *Éducation permanente, 123*, 91–99.

Schmidt, R. A. (1999). *Apprentissage moteur et performance*. Paris: Vigot.

Schmidt, R. A., & Lee, T. D. (2005). *Motor control and learning. A behavioral emphasis*. Champaign: Human Kinetics.

Séris, J.-P. (1994). *La technique*. Paris: Presses universitaires de France.

St-Vincent, M., Vézina, N., Bellemare, M., Denis, D., Ledoux, É., & Imbeau, D. (2011). *L'intervention en ergonomie*. Quebec: Éditions Multimondes.

Teiger, C. (1996). L'approche ergonomique: de travail humain à l'activité des hommes et des femmes au travail. In S. Cukierman, M. de Nanteuil, & M. Parlier (Eds.), *Apprentissages formels et informels dans les organisations* (pp. 109–125). Lyon: Éditions ANACT.

Teiger, C., Laville, A., & Duraffourg, J. (1974). Nature du travail des O.S.: une recherche dans l'industrie électronique. *L'orientation scolaire et professionnelle, 1*, 7–18.

Vermersch, P. (2008). *L'entretien d'explicitation*. Paris: ESF Editeur.

Vezeau, S. (2004). *Apports des utilisateurs et méthodes d'investigation de l'activité dans un processus de design d'outils manuels: de la parole au geste du plâtrier*. PhD dissertation, École pratique des hautes études.

Vézina, N. (2001). *La pratique de l'ergonomie face aux TMS: ouverture à l'interdisciplinarité*. Paper presented at the meeting of the SELF-ACE 2001 conference – Les transformations du travail, enjeux pour l'ergonomie, Montreal, Quebec, Canada. Retrieved from http://www.ergonomie-self.org/documents/36eme-Montreal-2001/PDF-FR/v1-05a-vezina.pdf

Vézina, N., Prévost, J., Lajoie, A., & Beauchamp, Y. (1999). Élaboration d'une formation à l'affilage des couteaux: le travail d'un collectif, travailleurs et ergonomes. *Perspectives interdisciplinaires sur le travail et la santé, 1*(1), 1–17.

Vézina, N., St-Vincent, M., Dufour, B., St-Jacques, Y., & Cloutier, E. (2003). *La pratique de la rotation des postes dans une usine d'assemblage automobile: une étude exploratoire* (Report R-343). Montreal: IRSST.

Chapter 13
University-Corporate Partnerships for Designing Workplace Curriculum: Alternance Training Course in Tertiary Education

Laurent Veillard

Since the end of the 1980s, *alternance training* courses,[1] consisting in combining learning phases in an educational institution with those in the workplace, have developed quite well in France, especially in tertiary education. An important pedagogical question about this type of course is how best to organise the workplace learning phases to guarantee effective learning opportunities consistent with the aims of the training. Part of the answer to the question may well reside in developing pedagogical partnerships between educational institutions and their professional partners to organise workplace learning and understand how to structure such partnerships.

In this chapter, this issue is addressed within the specificities of the French educational context. In a first part, some historical events and political choices are outlined that led to an initial vocational training system, both at secondary and tertiary levels, which emphasised teaching situations in educational institutions. This school centric approach can explain why the workplace learning culture is so weak in France when compared to other nearby countries such as Germany, Switzerland or Austria. In a second part, several research projects, including francophone studies are discussed that inform the issue of pedagogical collaboration between scholars (or academic) and workplace. In the third part, two case studies used in a master course (i.e. production management) are presented to illustrate different aspects of such pedagogical collaborations between a tertiary institution and two of its industry partners that aimed to organise effective workplace learning. The fourth and final part comprises a discussion based on both the findings of the two case studies and other studies, on how to improve this type of pedagogical collaboration.

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[1] Alternance training in France can be compared to other forms of work-integrated learning that developed in several countries like apprenticeship, cooperative education, sandwich courses, etc.

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13.1   A Short History of Alternance Training in France

Historically, France has built a school-based initial vocational education and training (VET) system to prepare young people for working life. In this VET system, workplace learning has for a long time only had a limited role (Prost 1981). The French revolution led to the brutal removal of craft and merchant guilds, and this decision has had some important and enduring consequences for the apprenticeship training systems (Charlot and Figeat 1988). Despite the public authorities trying several times during the twentieth century to modernise and boost this mode of occupational training, apprenticeship remains of marginal importance in the French VET system in terms of the number of people trained through this mode, and most of these are restricted to a small number of craft occupations (e.g. building, catering, ironworks, joinery, etc.) and also the industrial trades. During the first part of the twentieth century, representatives of the biggest companies, the state and the trade unions agreed that the best way to prepare young people for occupations (especially for industrial jobs) was to place them in vocational schools (Pelpel and Troger 1993). The motivations were quite diverse and include learning the best known techniques, protecting children from employer abuse, giving a correct moral and religious education, lack of time of employers to deal with young people and financial interest to avoid training expanses. But these motivations were all compatible with the idea that the public state had to take care of young people's vocational training through some separate and preserved spaces from the workplace. The positivist ideas coming from the philosophy of the Enlightenment were dominant amongst the political and intellectual French elites at this time and probably had a strong impact on this decision (Greinert 2004). These elites were convinced that reason and science should be the organising principles of society, especially the national industrial apparatus which needed to modernise to compete effectively with other countries (especially England) on economic terms. Traditional craft practices were eliminated because they were considered as obsolete and irrational and replaced by new techniques arising from scientific discoveries. It was agreed that the best way to reach this goal was to prepare the successive generations of workers in vocational public schools, controlled by the central state. In these schools, students were taught the up-to-date scientific and technical knowledge and skills, and there was consensus that they had a big role to play in developing industrial innovations and to make them more reliable.

The state started by creating some graduate schools of engineers[2] and then progressively built a national VET system at the secondary level during the

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[2] The first 'Grandes Ecoles d'Ingénieurs' were created in the military domain in the sixteenth century. Then some civil schools were opened during the eighteenth century. These institutions were formed separately from the universities which remained very traditional in terms of academic knowledge. For the state, this was a way to circumventing the corporatist resistances of academics to develop more vocational courses.

twentieth century to train qualified workers. Some undergraduate and graduate vocational training courses were also created much later (from the 1960s) in universities as the tertiary level became more and more accessible to all the French population. In the 1970s, the main characteristics of this VET system were still the following: mainly public schools; the state as the single operator delivered diplomas; national joint committees comprised representatives of employers, state and trade unions were given the role to build, trade by trade, the vocational curriculum for each diploma. This comprised three main types of teaching situations, (i) general and technical courses in classrooms, (ii) practical training in school workshops and (iii) some very short training periods in workplaces, and supervised by teachers, either with a theoretical background (i.e. general and technical courses) or with a professional experience (i.e. practical courses in the workshops). At tertiary level, the pedagogical organisation was generally quite similar, except that the theoretical component was emphasised more.

Such a training system, mainly based on teaching situations at school (or at university), was not seen to be a problem while the economic growth was strong and the French economy enjoyed full employment. However, from the middle part of the 1970s, the first economic crises led to a significant increase in youth unemployment. The lower-qualified young people were first impacted by these changes, and then, progressively, all level of diplomas, including tertiary education (even though in lower proportion obviously), began to be affected, despite being in a situation where more and more young people were reaching this educational level. More and more employers complained that these qualified young people were unable to perform work task independently after they left school. The employers stated that they had to take time to prepare them to become effective workers. The existing VET system was perceived to be very remote from the realities and requirements of workplaces and unlikely to be generating graduates who could quickly adapt to working life. From this time, public and private stakeholders gradually became aware that it was not possible to learn all the necessary competences required to employment in vocational schools or in an academic milieu. This growing awareness of the limitations of school-based VET system led successive governments to develop what is called 'formation en alternance' (called 'alternance training' in this chapter) in francophone countries. That is the provision of vocational courses in which students have alternating training periods in vocational schools and workplaces. Alternance training is a generic naming, which refers to a pedagogical principle, which can take various forms. For instance, in the apprenticeship system, people are salaried in a same company during all the training courses; in some other cases, people keep the social status of students and have several internships during their vocational training course.

In the 1970s, the French state's actions were initially directed to those people who failed in general schooling and left the educational system without any diploma. Some specific induction courses (from six to twelve months), combining long workplace learning phases with some much shorter teaching periods in a training centre, were implemented to give these young people a new chance to secure a minimal qualification and prepare them to move into work life. This type of

course was supposed to be more adapted to those students experiencing academic failure as it was mainly based on workplace learning. Moreover, it could provide an educational programme for the best of these students, a motivation to return to school. Afterward, and as unemployment grew and included an increasing percentage of young people, including some who were much more qualified, employers and public authorities gradually considered that alternance training was a pedagogical organisation that could be applied to all training courses, including those at tertiary level. It was a policy solution to both vocationalise students and give them a high level of theoretical and general knowledge and was requested more and more by employers. It was also a way to move schools or universities closer to the places and circumstances where graduates would find employment, thereby permitting the educational institutions to better understand the changing requirements of workplaces (e.g. greater flexibility, capacity to adapt to new situations, relational and managerial skills, managing new technologies, etc.). Because of these demands and requests from employers, from the end of the 1970s, and particularly since the late 1980s, successive left or right governments have taken various measures to develop different types of courses, so that the pedagogical landscape is currently complex and not particularly coherent (Le Douaron et al. 2012; Merle and Théry 2012). The two most effective measures consisted of the following:

- On the one hand, extending the legal possibility (a vocational education act in 1987) to use apprenticeship at all levels of the educational system, including tertiary education, and encouraging employers to use this type of training course. In this case, the young people are employees of a company and alternate school and workplace learning periods according to prescribed arrangements.[3] This type of course is called *alternance under salaried status*.
- On the other hand, increasing the number and the length of the internships or placement periods within existing school or university training courses. This second type of course is called *alternance under school status*.

Despite apprenticeship developing well as a mode of occupational preparation from the beginning of the 1990s to the present, especially at tertiary level, the young people who elect to engage in this mode of occupational preparation are still in the minority. The vast majority of students continue to use the school (or university)-based pathway for at least two reasons. The first is economic. Apprenticeship is a much more costly system than the school system. The local authorities (regions) who first requested schools and universities to develop apprenticeship training courses and provided funding for that option have become less enthusiastic in recent years because they have less funds to expend on this option. There is also a French cultural specificity: apprenticeship has now a better reputation than in the past, but most of the students and their family still prefer the academic way,

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[3] Alternation can be organised on a weekly rhythm (3 of 4 days in the workplace and 1 or 2 days in the vocational school or at the university) or on a monthly base (15 days/15 days or 1 month/1 month).

especially at secondary level, so as to maximise students' chances of continuing their studies at the tertiary level. However, overall, students at both secondary and tertiary levels now spend much more time learning in workplaces than in the past. The number of trainees (*alternance under school status*) has increased greatly in recent years: they were 800,000 in 2006 and 1.2 million by 2012 (Conseil économique et social, 2012). Moreover, these placement periods are, on average, increasingly longer.

13.2 Different Forms of Alternance Training

Even when companies or administrations welcome many more young people for apprenticeships, internships or placement periods than in the past, it seems the training and learning culture in French workplaces remain low compared to countries where there has been a dual VET system for a long time (e.g. Germany, Austria, Switzerland, Denmark). The French institutional environment is weak in supporting this kind of a system (Geay 1998; Vanderpotte 1992). Thus, in apprenticeships (*alternance under salary status*), the law specifies that workplace tutors must engage in a compulsory training day to support that role in assisting these apprentices. However, should the company not release their staff for this training, there are no consequences arising from nonparticipation. Moreover, despite that being some financial incentives to participate in these activities, many tutors do not participate to this compulsory training day because they are not encouraged to do so by their employers. For the workplace tutors of trainees (*alternance under school status*), there are generally no training opportunities. In most companies, to be a tutor usually does not lead to financial rewards or career progression, thereby protecting the view that this work is not important. In many alternance training courses, the apprentices or trainees are also accompanied by a school or academic tutor, that is, a teacher or a trainer who is in charge of assisting students make connections between the experiences in the school and workplace settings. There is, however, rarely any training opportunity for these school tutors. In addition, reference models of competencies are not very useful for these workplace trainers because they often remain vague in terms of both skills to develop and situations in which to enact them in workplaces to achieve these kinds of learning objectives. This is particularly true for the undergraduate and graduate courses taken by middle managers, managers, engineers, etc., where these reference models hardly communicate concrete advice that is helpful in terms of the objectives of the training course. At secondary level (CAP, Baccalaureat Professionnel), they are a little more specific.

In such an unfavourable institutional context, it is difficult to provide effective learning experiences. Indeed, many research surveys show important variations for apprentices or trainees, in some cases with significant problems. This is particularly true in secondary education (Aldeghi and Cohen-Scali 2007; Labrusse 2001; Monfrin et al 2002) but also arises for courses in higher education (Domingo

2002; Giret and Issehane 2012). The most common problems are repetition of the same low-skilled tasks, workplace activities which are not well aligned to the objectives of the training course, unpaid work experience or a large number of unpaid overtime and weak supervision from workplace trainers and/or the school tutors. The resulting negative learning experiences are highly demotivating for apprentices and trainees and can lead to attrition and drop out (Cart and Toutin Trelcat 2010).

One possible way of improvement is a closer collaboration between training institutions and their professional partners to optimise the apprentice's or trainee's workplace learning pathway (Clenet and Gérard 1994). In this view, it is interesting to consider this learning pathway as a workplace curriculum. The concept of curriculum is generally restricted to educational institutions for characterising a learning plan which integrates the knowledge contents, the pedagogical methods, and the teaching and evaluating tools. But some researchers suggested to use it to analyse the successive apprentices' or trainees' activities and situations in the workplace (Billett 2006; Lave 1990). Using the concept of curriculum in this way presents two potential bases for improving these experiences.

First, the novices' workplace learning trajectories are not considered as informal or unpredictable, but structured by historical, cultural and situational factors, like the social and technical organisation of the workplace and those of the communities of practices inside. Several researches, in various vocational training fields, show that workplace learning goes through a progressive participation to the collective and instrumented activities of some community of practitioners. Novices firstly usually occupy a peripheral role and then evolve towards a more central function within this community. This evolutionary process connects closely the acquisition of knowledge with the learners' identity development (Delbos and Jorion 1984; Kunégel 2011; Lave and Wenger 1991; Lioger 1988; Pharo 1985).

Second, while respecting this principle of learning by progressive participation and considering the specific constraints of every organisation, it is possible to intervene partially and in particular ways according to the company's requirements, on nature, progress and frame of the learners' activities; to redress some unwanted effects of on-the-job learning (e.g. some current practices considered as dangerous or based on misconceptions); and to enrich the learners' activities or facilitate their learning processes by adding some affordances (e.g. possibilities of observation and participation) in the work environment or giving more explanations and assist novices. Thus, there is a place for an acknowledgement of workplace pedagogical practices being different from those that exist in the educational institutions (Billett 2001; Filliettaz 2009; Kunégel 2011; Mayen 1999).

The assumption is that these practices can be organised through close collaboration between the tutors of both institutions (i.e. workplace and school tutors), and this collaboration can improve the efficacy of the workplace curriculum. On one side, the workplace tutors bring their knowledge and field experience of the productive organisation, and, on the other side, teachers who play the role of school tutors give their pedagogical sensibility and knowledge about the aim and the

contents of the teaching course. However, the collaboration is not really possible if there is an unfavourable pedagogical framework.

Since the first francophone research works on alternance training in the 1970s, researchers have become interested in the degree to which the pedagogical collaborations are possible (Antoine et al. 1988; Bourgeon 1979; Malglaive 1994; Meirieu 1992). They suggested different theoretical models to classify the training courses according to these criteria. Thus, Bourgeon introduced at the end of the 1970s a classification that is still used now. The classification distinguishes three forms of alternance:

– *Juxtapositive*. In this case, there is not pedagogical collaboration. The school has no influence on learners' workplace curriculum, and the company is totally free to allocate them tasks and to manage learners as suits workplace needs.
– *Associative*. The training and productive institutions agree on a division of the training labour and meet regularly to coordinate their respective actions. In this case, some learning aims and some assessment criteria are negotiated for the workplace periods, but schools do not act on the local organisation of the workplace curriculum, and learners' assessment is the sole responsibility of the company.[4]
– *Copulative*. In this last case, the partnership is stronger. There is not only a distribution of the learning objectives but also a joint construction of the workplace curriculum and more generally of the global learning curriculum. The two partners try to connect the teaching activities at school with the learning activities undertaken in the workplace.

The possibility of a more integrated learning curriculum in VET courses has been explored by researchers in other countries (Deitmer and Heinemann 2009; Griffiths and Guile 2003; Guile and Griffiths 2001). The concept of 'alternance copulative' seems to be close to the connective pedagogy suggested by Guile and Griffiths (2001). In both cases, the training institution is not only restricted to giving some courses or to organising some reflexive thinking about the workplace experiences but has an active role in the constitution of the workplace curriculum through close collaboration with companies. The aim is to increase the local learning possibilities and to design a curriculum that gives the opportunity to transfer and adapt what has been learned at school in the workplace. However, this type of local pedagogical collaboration is not easy to establish because actors of both institutions have often very different logics of action and representation. The main reason is organisational: they belong to some institutions which have very different objectives and constraints[5] (i.e. production of goods or services versus

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[4] Dual training courses in Germany, Austria or Switzerland can be considered as some associative forms of alternance training. As a matter of fact, some authors in these countries suggest to go further than a clear division of the training labour between schools and companies, to solve transfer and knowledge integration difficulties for apprentices (Deitmer and Heinemann 2009).

[5] Some francophone researchers consider that a more integrated form of alternance training is not really possible. For them, the real interest of this type of pedagogic organisation is to confront the

training, economic constraints versus obligation to respect the training plan, pragmatic and specific versus general and theoretical knowledge, student/teacher versus novice/expert roles, etc.) (Clenet 2012). These differences can explain why most of the training courses stay at the level of a 'juxtapositive' or 'associative' form of alternance training, even if, in rare cases, some try to get closer to a more integrated form.

13.3 Pedagogical Collaboration Between Workplace and Academic Tutors to Design Workplace Learning Curricula

To illustrate how a pedagogical collaboration can concretely develop between educational and workplaces and what kinds of constraints arise in this case, I refer to a qualitative study done some years ago (1996/2000) in a master course in an industrial area (Veillard 2000, 2009).

13.3.1 Context of the Study

This master course, and the graduate school of engineers which hosts it, was created by both academics and employers at the beginning of the 1990s, following the new legal possibility to create apprenticeship training programs at the tertiary level. The educational aim is to prepare production engineers, that is, field experts with extensive technical, economic, organisational and managerial knowledge and skills who can supervise and improve industrial manufacturing systems. For this reason (i.e. to train field experts and not specialists in a narrow scientific technical area, as was often the case until this time in most graduate schools of engineering in France), this masters degree recruits only students with previous undergraduate technical studies,[6] who also have workplace experience due to then have taken one or more internships or a previous alternance training course. Across the duration of their course (3 years), these individuals are nominated as apprentices, i.e. salaried by a company.

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learners to tensions and contradictions between different types of social practices, roles and learning forms. In their mind, the trainers have to concentrate on a meta-reflexive support of the learners to help them to identify these tensions and contradictions in order to use them as personal and vocational development opportunities (Charlot 1995; Kaddouri 2012; Lerbet-Séréni and Violet 1999).

[6] Comparatively, in the traditional 'Grandes écoles d'ingénieurs' in France, students are only recruited on the basis of their academic merit. Before entering these graduate schools (the most famous are 'Polytechnique', 'X-Mines', 'Ecole des Mines', 'Supelec', etc.), students must follow a preparatory cycle ('Classes préparatoires') mainly based on scientific and mathematics courses.

If we use Bourgeon's (1979) classification, this master degree course can be considered as a copulative form of alternance training or connective in the Guile and Griffiths (2001) classification. From the reading of the curriculum documents, this programme appears to be a rare case of strong pedagogical collaboration between a training institution and some private companies. This tertiary institution shows a clear intention to act strongly upon its professional partners to optimise the apprentices' learning situations in workplaces. For that, people in charge of the training course have designed a precise workplace learning curriculum and formalised it in some documents to be used by companies. During the 3 years of the master course, these apprentice engineers alternate between teaching periods at school and on-the-job learning experiences in the same company. Both periods of alternance have a duration of about 1 month. During their learning pathways in the workplace, the apprentices are accompanied by two experimented tutors: (1) a company tutor (CT), who is a professional expert of the firm (i.e. engineer or manager), and (2) a school tutor (ST), who can either have a teacher or an engineer background, but in all cases is familiar with the field of production management and the industrial world. The CT coaches the apprentice daily. The ST is in charge of helping the CT to build a workplace curriculum that is consistent with the territory education institution's criteria. These coaches also assist apprentices to develop some reflexive thinking about their work experience as novice engineers and act to make some connections between this experience and the academic teachings. Overall, three phases have been identified to frame the learning pathway in these workplaces.

1. The integration phase. Apprentices commence with a 1-month period in which they work as production operators. The pedagogical aim is to understand the concrete working conditions in an industrial workshop. The ST asks apprentices to write a discovery report and to present it to some other apprentices. During the two next periods in the company, apprentices have to make two additional written studies: one on the general organisation of the company and another on its manufacturing system. The school provides some guidelines to orientate the apprentice's work.
2. The project definition phase. The three next periods in the workplace are dedicated to a critical analysis of all or part of the firm's manufacturing system. The apprentices must analyse the strengths and weaknesses of this system according to different criteria (i.e. profitability, technical and organisational optimisation, human safety, quality of goods, etc.) and then design a project to improve it on a specific bases. Some guidelines are provided by the school to help the apprentices to develop an improvement project that must integrate not only technical but also economic, organisational and managerial dimensions. At the completion of this second phase, each apprentice's project is assessed by a panel comprising both teachers and experimented engineers.
3. The project management phase. During the next 2 years, apprentices manage their projects under the supervision of the company tutor. In addition, regular reporting is required about their activities and learning in the workplace to the

ST through some oral and written presentations. Finally, at the end of the training course, apprentices must write and present to an assessment board (similar to the one at the end of the phase 2) a professional thesis with a critical analysis of the project.

During the 3 years of the master program, each apprentice is assessed four times by the CT, according to different criteria addressing their tangible realisations, behaviour and competences. The ST is in charge of managing the evaluation sessions which take place in the company. The ST must ensure that the learning situations in the workplace are consistent with the assessment criteria defined by the school. Marks awarded to the apprentice have an important impact on allocation of the final diploma.

To extend the analysis beyond the pedagogical frame designed by the school, some case studies in two different companies that have apprentice engineers were undertaken. The research questions were the following:

(i) In what ways was the pedagogical frame designed by the school considered effective by both the company and the school tutors and how they established in each workplace?

(ii) What were the possible obstacles and constraints to overcome to identify and implement the workplace curriculum?

(iii) How did the workplace curriculum in each company already lead to the school learning goals?

13.3.2   Theoretical and Methodological Approach

On a theoretical plan, we used the concept of workplace curriculum proposed by Billett (2006). This author distinguishes three versions of this curriculum: the intended, enacted and experienced versions. We adapted these versions to both our research field and research questions. The *official curriculum* corresponds to the pedagogical frame designed by the school to organise the apprentices' workplace learning (see below). The *local curriculum* is what the firm supervisor, helped by the ST, set up in each workplace. This local version refers to the successive tasks assigned to apprentices by their tutors and to the different interventions of these tutors to help or assess them. Finally, the *real curriculum* corresponds to the apprentices' successive concrete actions and situations. We were particularly interested in the causes of the differences between these three versions of the workplace curriculum. Like other researchers focusing on alternance training courses (Boudjaoui 2011), we consider that francophone work psychology and cognitive ergonomics give some interesting theoretical elements to analyse these discrepancies between what is prescribed to the actors and what they really do. This is because prescriptions are always interpreted according to their own knowledge, beliefs and motivations (Leplat and Hoc 1983). In addition, these actors always have to take into account some local constraints and hazards and to make some

compromises between what is required and decide what is possible at a given time. In our case studies, this type of discrepancies occurred a priori twice, that is, firstly, when the tutors had to set up a specific workplace curriculum from the school prescriptions (i.e. differences between the official and the local curricula) and then, secondly, when the apprentices interpreted these local prescriptions to act in real working conditions, facing specific constraints and opportunities (discrepancies between local and real curricula).

The case studies were undertaken in two companies of a similar size, but significantly different in terms of age, technical and social characteristics. The profiles, roles and positions of both the apprentices and the tutors were also quite different. The characteristics for each case are synthesised in Table 13.1. An ethnographic methodology was deployed that combined field notes (i.e. observations of the apprentices' actions and situations in the workplace), audio-recordings (i.e. apprentices' situated interactions with the other actors), document analyses (i.e. produced or used by the apprentices during their work) and interviews with the apprentices and their tutors. These different data aimed first at retracing the 3-year apprentices' workplace *real curriculum* in the form of narratives. On the basis of the most frequent types of realised actions and encountered situations, we drew some conclusions on the type of professional expertise developed by each apprentice. We used the company and school tutors' interviews to rebuild the *local curriculum* in each case and to analyse how they collaborated to make their pedagogical choices. The *official curriculum* was described (see above) from several school documents and some discussion with the training staff. Our methodology did not lead to a precise description of the tutoring practices, as some other researchers provided in some recent francophone studies (Filliettaz et al. 2010; Kunégel 2011). Instead, the data allowed us to analyse some pedagogical strategies and collaborations and their learning effects over a longer time scale.

13.3.3   The Local Curriculum Development Process

From the same official curriculum document, the local curricula developed in the two contexts were quite different from each other. In the first case, the local curriculum was close to the official one. As it was planned by the school, the first apprentice (Sebastian) started by working several weeks in different manufacturing workshops within the company as an industrial operator. In parallel, he undertook the written tasks requested by the school. Then, during the next phase, he had several discussions with his company and school tutors to define a three-step industrial project that addressed some real needs of the company (i.e. improving the paper cleanliness) and also the school criteria. The aims for this project were first to analyse the causes of the non-cleanliness problems of the manufactured paper, then to find some new technical and managerial solutions to solve these problems and finally to implement some of them in the production teams to reduce these problems. The company tutor asked Sebastian to start the first step of the

Table 13.1 Main features of the two case studies

Apprentice	Sebastian 22 years old. Undergraduate in paper-mill techniques	Jean 21 years old. Undergraduate in mechanical engineering
Company	Company A 　Manufacturing of specific top-of-the-range papers (drawing, luxury wrapping paper, etc.) 　650 people spread over 4 production sites based in the same region of France. A majority of the staff works in production. Relatively high average seniority 　Large industrial set-up, organised according to a continuous production process; production teams work in shifts (3 or 5 shift system), made up almost entirely of men	Company B 　Manufacturing of reagents (small bottles, vials or test stripes) for medical analysis laboratories 　3,000 employees spread over 4 sites (A, B, C, D) located in the same region of France. High percentage of engineers, executives and technicians. Weak average seniority 　Small-size workshops, organised according to a discontinuous manufacturing process; production teams work in two shifts (large majority of women)
Apprentice's assignment and department	Integration into the production department covering 3 production sites and different technical support services (organisation and methods department, maintenance, R&D laboratory, etc.) 　Project: improvement of cleanness of the manufactured paper (setting up technical control procedures and apparatus, testing chemical additives, awareness of production staff)	Integration into a local service of the engineering department (on site B), responsible for setting up new technical equipment and improving the production organisation on the different sites 　Project: setting up 3 new technical product packaging installations and improvement of the production organisation of a workshop
Company tutor (CT)	Graduate of a papermaking school (Grande Ecole d'ingénieur). Responsible for production department	Two successive mentors (1st year/last 2 years). The second is a graduate of CESI (master course) and is a methods engineer and the local head of the design office on the B site
School tutor (ST)	Graduate of a general engineer high school. Many years as a senior executive in the steel industry	'Agrégation' (highest teaching diploma) in mechanics. Previously teacher (mechanical engineering) in a traditional engineer high school (master course). Very good knowledge of the industry

project by learning how to analyse the causes of the non-cleanliness problems of the paper from a technician of the R&D department who was doing this type of task for a long time and had significant expertise associated with it. During the next steps, Sebastian had to propose and implement some possible solutions to solve the identified issues by contacting different internal (i.e. methods, R&D, and maintenance departments, production supervisors and operators) and external actors (i.e. supplying companies that proposed some technical answers to these types of

problems). During the two last years of the curriculum, the CT encouraged the apprentice several times to engage more in the managerial tasks and regularly helped him to do the reflexive written activities prescribed by the school (i.e. explaining what has been done and learnt in the workplace), especially to write the final thesis.

The closeness of the *official* and *local curricula* was mainly due to the CT's interest for the official curriculum to be enacted. His company had never hosted an apprentice before. It was used to accepting young people for some training periods, but these had been either apprentices at a lower level (i.e. secondary training courses) or trainees (4–6 months) from undergraduate or graduate courses in technical departments (R&D, methods, engineering, maintenance, etc.). Consequently, there was no established learning pathway for Sebastian. The official curriculum proposed by the school allowed the company fill this gap. Moreover, the CT was convinced about the great importance for a young engineer to learn how to manage some production or project teams. He did not himself receive any training in the field of management or leadership during his graduate studies and lamented the lack of this skill and knowledge early in his career. This personal insight explains why he was so concerned with this pedagogical issue and so receptive to the arguments made by the school. More particularly, he explained the great importance to start as an operator to experiment and to understand concretely what are the working conditions in a manufacturing workshop. This type of experience is essential for managing people afterwards. For the same reason, he was also very receptive to add managerial dimensions to the technical project of the apprentice.

> – CT: his first challenge was to know the company and I think there is always an interest to learn it from the ground [. . .] I wanted him to experience the operational side, the operators' view, because when you move toward the other side of the gate, when you are in a manager position [. . .] you face some situations, you must know how to deal with them and it's better to have experienced these things before and understand how an operator behaves. (Interview with the CT, Company A)

The school tutor (ST) had a similar experience during his school-to-work transition. He was initially trained as a generalist engineer, with a lot of scientific and technical knowledge in a very academic way and had very few field experience through which to develop his managerial skills. He mentioned lacking these types of skills later when he had to take some important managerial responsibilities in big companies. These similar experiences probably make the pedagogical collaboration easier for the two men. They quickly agreed to implement a local curriculum close to the official one, with a great focus on management learning. In addition, the ST was the head of the alternance training course for several years, and he was, therefore, richly engaged in the design of the official curriculum. During the interview, he repeated several times the importance for companies to apply this official version to guarantee good learning conditions in the workplace, especially to help the young apprentices to become some good managers. Perhaps one can see here an industrial way of considering the training and learning processes, very
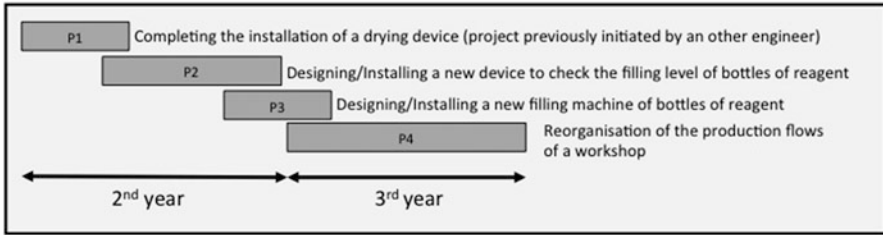
Fig. 13.1 The different projects of Jean's local curriculum during the second and third years

similar to the quality management culture widely spread amongst engineers (same industrial processes to guarantee the same results).

In the second case (Company B, manufacturing of chemical reagents), the local curriculum enacted was far removed from the official one on several aspects. The apprentice (Jean) did not do any operator work. As soon as he joined the organisation, the CT asked him to immediately contribute to some engineering projects aiming at installing new packaging devices in the manufacturing workshop. The apprentice's job consisted first in designing and installing some small technical parts of these packaging devices. He had a lot of autonomy for that task. In addition, this tutor refused to give him some time for doing the school written studies. The apprentice had to undertake these tasks outside his working hours. Thereafter, this CT was weakly available to discuss with the ST and the apprentice about the project to design. His plan was to delegate him some other technical design tasks, and he was reluctant to give him a bigger project with some managerial responsibilities. Finally, 10 months after the beginning of the training course, this CT transferred to another department without the project being defined, despite several attempts by the apprentice and the ST to speak about this project with him. Another engineer of the department was interested to replace him as a tutor and was much more cooperative than his predecessor with the school. Some discussions between the three actors (CT, ST and apprentice) quickly led to a local curriculum combining four projects. The way these projects were planned resulted in an increasing complexity of the apprentice's activity over time (see Fig. 13.1).

During the next 2 years, the second CT interacted much more with Jean than his predecessor. These interactions were to give him some help or provide advice, but without much help on the reflexive activities requested by the school.

In this second case, several gaps between the official and the local curricula came from a strong reluctance of the first CT towards the pedagogical frame prescribed by the school. Unlike the CT in the first case, this one considered that the official curriculum was difficult to organise into a learning pathway for the apprentice. Jean was seen as being recruited as an apprentice to strengthen the engineering team, and, on that basis, the department needed him as soon as possible to contribute on technical projects. There was no time for a period as an operator, or some other non-value-added activities like written studies or reflexive thinking. He was very reluctant to discuss with the ST to define a project meeting the school

criteria, especially the managerial and decisional dimensions. Moreover, he considered that it was not an option to give such responsibilities to an apprentice or a trainee in the company because of administrative rules that prohibited this possibility. The second CT of the apprentice was not so opposed to the official curriculum and much more open to a compromise between the company's needs and a learning pathway allowing Jean to progressively acquire both technical and managerial skills. Unlike his predecessor, he considered that it was easy to bypass the administrative rule prohibiting managerial responsibilities for apprentices or trainees. He only had to be the official manager of the apprentice's projects and to remain in charge of validating the main decisions, while allowing Jean to manage autonomously the different activities. This second CT did previously an alternance training course and had probably already experienced before this type of compromise between productive and learning logics.

> – CT: The three first projects were a little bit more addressed to us (Company), and the last, the long-term project during the last year, was more for him (apprentice) [. . .]. I remember Jean said to me :'We should define what will be done during the last year, that's important for the school.' I said to him :'there will always be some technical projects. But I understand your concern: if we are back to the same type of small technical projects, that will not change for you, you will not learn anything». (Interview with the CT, Company B)

The school tutor was also very concerned with the possibility to find a compromise, even if that was not able to respect all the official curriculum aspects. Together, they rapidly agreed to define a local curriculum composing of some successive projects and not only a big one as it was planned by the school.

13.3.4   The Apprentices' Real Curricula

The first case study seemed to be an exemplary partnership between the school and the company. Both the school and the company tutor were in agreement to apply the official curriculum as closely as possible. In contrast, the second case showed a much more difficult collaboration, with some tensions, discrepancies and finally a compromise between the two parts. Now, let us have a look on the real curricula, that is, the successive situations experimented by these two apprentices in their workplaces.

The first part of Sebastian's learning trajectory unfolded as planned. During the interview, he said that he learned a lot from his several weeks experience as an operator, especially about the production processes and practices. The written studies undertaken for the school were also very efficient in providing a broader view of the organisation, both of the production department and the company more broadly. Similarly, he learnt a lot about the analytic methods of the non-cleanliness problems of the paper and the possible causes of these problems by working with the experienced technician in the R&D department. But from the middle of the training course, a gap started to increase between the local and real curricula when Sebastian had to suggest and implement some possible actions to improve the paper

cleanliness. From this time, he had difficulty to play the role of a manager-engineer, able to create a project team, interact with several types of actors to gain their assistance and to engage with the production team to convince them to change their practices. Despite the CT often pushing him to engage more in this type of managerial actions and sometimes reducing the difficulty of his workload by giving some more restricted tasks, the apprentice rarely dared to do such managerial work. Most of the time, he limited himself to technical actions. Because of the apprentice's difficulty in completing to this part of the local curriculum, the real version did not really integrate the managerial activities that were planned by the two tutors.

One possible interpretation of this difficulty can be found in the apprentice's identity building process. The local curriculum led him to play three successive and very distinct roles. In the beginning, he was in a peripheral position within the workshop teams. The experienced workers gave him some orders and taught him how to do some basic tasks (cleaning, handling, technical help to the workers, etc.). Several excerpts in one of the interviews with him (done in the middle of the training course) show that after this first working phase in the workshops, he became very familiar with these workers and shared a common culture with them. Sebastian appreciated the time spent within this working-class culture, including some festive events outside the work schedule.

> Sebastian : Last time in the workshop 2, we did a big party with all the workers that I know now. That is why they consider me more as a workshop member than a future engineer. We were joking together. (First interview with Sebastian, Company A)

This first position was not a problem when he moved to the R&D department and started to do some analyses of the causes of the non-cleanliness problems of the paper. The relationship of trust established with the workers was a clear advantage to gain some important information about the manufacturing events. But a few months later, when he had to move towards a management role and develop some authority relationships with the same workers, he had great difficulty in arguing against their reluctance to change working practices to improve the paper cleanliness. He frequently appeared to hesitate between their arguments and those of the company tutor. Objectively, it was very difficult for him to find the different appropriate resources (i.e. technical tools or methods, linguistic resources, behavioural models, etc.) for this part of the project. His environment was not adapted to a progressive participation to a community of practitioners (i.e. of managers in this case). The company tutor, who is also the manager of the production department, interacted a little bit more frequently with him during this last part of the workplace curriculum, but mainly in an interpersonal way. Sebastian was rarely invited to participate in the managers' or engineers' meetings. He had to create some new resources and to develop new practices for his project in a complex technical and human environment on his own due first to the specificities of the manufacturing process (continuous process) and second to some controversial social relationships after several industrial restructuring initiatives. This project was probably a far too large challenge for a novice, especially for someone who had created friendly relationships with the work teams.

In Jean's case, the local curriculum was seemingly more chaotic, but led to a much more progressive learning pathway, both on the level of the technical complexity and the identity building process. Jean stayed in the same (engineering) department from the beginning to the end of his workplace curriculum. He started his apprenticeship by contributing to limited parts of some technical projects, albeit in a very autonomous way. Then, he progressively came to manage more and more crucial aspects of this type of project until he was in charge of a global one, aiming at restructuring the production flows of a complete workshop. The technical and human organisation of his department and more generally of the complete company was very supportive of his development as it offered some easy-access and very adapted resources of the type of tasks he had to complete. The actors from the other departments (i.e. production teams or people from different technical departments) were particularly accessible to answer his requests for information and technical issues, as was the maintenance department.

> – Jean : I knew everyone quickly.
> – Researcher : Why? Because of what you had to do?
> – Jean : Yeah, because I was always here and there. If I needed some plan, I went to the maintenance department and I asked them: 'Where are the plans?' [...] In case I had few things to do, like drilling a hole, I went the maintenance department and asked the : 'Where is the electric drill?' Thus, in all what I did, all the steps, I needed some technical equipment and I went to see them. (Interview with Jean, Company B)

Jean could also refer to written shared procedures within the department formalising the steps of his projects. In addition, he could always actively participate in the daily activities of the department and frequently interacted with experienced engineers. Numerous conditions were thus combined for a progressive participation to this group of practitioners and for a strong proximity between the local and real curricula.

Finally, the expertise resulting from the real curriculum in case A is very different from the one in case B. Sebastian mainly developed very specialised knowledge and skills in the narrow field of paper cleanliness (i.e. main causes of non-cleanliness problems and some possible solutions to solve them), whereas Jean built a larger expertise in industrial project management (i.e. technical, economic and managerial knowledge and skills) as it was expected by the school. This seems to be a paradoxical finding as the official curriculum was much more applied in the first case than in the second.

13.4   How to Foster the Pedagogical Collaboration Between the School and the Workplace?

The two case studies are helpful for understanding the difficulties of the pedagogical partnership between the schools and companies. They also suggest some paths to foster this type of local collaboration and make these partnerships more efficient. A first point is about the interest for the schools in building a pedagogical frame to

organise workplace learning. Our findings show that such an official curriculum cannot be mechanistically applied to all companies. It depends a lot on the company tutor's attitude towards this official frame. The two case studies highlight at least three possible attitudes: (i) acceptance (CT in case 1), (ii) refusal (1st CT in case 2) and (iii) adaptation to the local specificities of the company (2nd CT in case 2). Some evidence from the interviews suggests that these different attitudes mainly come from tutors' beliefs that were the product of their own training background or their workplace activities under specific constraints.

For instance, the first CT in company B clearly favoured a *labour logic* to address the important human resources needs of the engineering department. That is, the apprentice was recruited to strengthen the team that was short of staff. This does not mean that the CP refused the idea of workplace learning, but in his view, learning should arise from a progressive participation to the department's activities. He considered all the school requirements that were supposed to enrich workplace learning were a waste of time and inefficient. This belief was not just directed to the productive plan but also in training logic, because this department had already developed an efficient local curriculum to integrate novices. Following this idea, a juxtapositive conception of alternance training was favoured, where the two training spaces and periods (school and workplace) remained clearly separated. It also appeared counterproductive to change such established routines and separate learning logics.

In the first case study, the positive attitude of the CT towards the official curriculum came from a quite different constraint. He did not have a suitable workplace curriculum for this type of apprentice, because through this scheme the company welcomed an apprentice-engineer for the first time. Aside from filling this pedagogical vacuum, this official curriculum was greatly appreciated because the CT was sharing some common beliefs with the school concerning the great importance to learn management and the types of tasks to develop these types of skills. The underlying hypothesis of this belief can be summed up as the following: giving an industrial project to manage to an apprentice is the best way to guarantee the diversity of the apprentice's activities (i.e. diagnosis, finding some innovative functional and technical solutions, team management, budget management, etc.) and the richness of his workplace learning. In addition, project management appears to be a typical engineer activity and is, therefore, a strong identity marker to distinguish these apprentices from others in companies. Yet, the logical sequence of activities in an industrial project can be sometimes largely inappropriate in terms of a workplace learning logic as it can require rich expertise at an early stage of novices' work activities. That was the case for Sebastian who was asked to set up an organisation for his project in a complex technical and human environment, with few appropriate affordances in his immediate working area (especially some practice models).

More generally, applying a unified pedagogical frame to all the companies raises a risk of not considering the specificities of each organisation. There is uncertainty about the learning effects that can be very remote from the aims of a training course. This was the case for Sebastian who learnt a lot on a technical plan (he can be

considered as a vertical expert of a narrow technical domain), but was not prepared to become an industrial manager, with some broader and transferable competencies as was expected. These findings here can be linked to other francophone research that show how educational institutions attempt to control the various practices and learning situations in alternance training courses (especially within the workplace) by applying curricular standards similar to those in general education (Beauvais et al. 2007). This logic of standardisation reflects not only the big influence of the traditional school model but also perhaps the strength of the industrial vision. Both are often based on the idea that the same results required the same 'production' processes. This view is far from one essential characteristic of workplace learning, i.e. a progressive participation to specific communities of practitioners, which requires to understand how the work processes and the production structures have been historically and specifically organised.

Between these two possibilities (i.e. applying an official standardised curriculum versus refusing it in favour of situated on-the-job learning), the pedagogical collaboration between the second CT of Jean and his ST shows that a middle way is possible, that is, if the tutors are able to mediate the institutional constraints and develop a local curriculum by taking into account both the training aims and the local characteristics of the workplace. In other words, different local curricula can be developed in distinct ways across workplaces to realise the same type of learning aim (in this case, developing a large production management expertise). The official curriculum should no longer be considered as a model to respect or to apply, but instead as a pedagogical resource amongst others to build a local curriculum. It is no coincidence that the second CT is more open to the discussion with the school than the first one. This engineer has been trained a few years ago in an alternance training course and experienced what seemed to be a connective curriculum. His successive workplace learning situations were selected to develop an increasing complexity and level of responsibility while at the same time respecting the workplace constraints and the learning goals of the training course. Similarly, the ST in this second case study was not a standard teacher. He had a considerable experience of alternance training course and was very familiar with the industrial world.

One of the greatest difficulties in developing this type of local collaborative practices is the lack of training and specific tools for tutors. We saw from these two case studies that these workplace trainers had different and more or less clear ideas about how to go about their role. They also differed in their capacities to analyse the potentialities and constraints of a given workplace in terms of its potential as a learning environment and, subsequently, to develop and implement a learning curriculum consistent with the goals of a training course. Their own previous training and workplace learning experiences (or teaching experience for some school tutors) played a crucial role in their practices, but ran the risk of being ill-adapted to the specificities of workplace learning. Experience as a teacher and a school tutor in some other alternance training courses confirms these research findings. There is, therefore, an urgent need to develop some specific training programs towards these workplace trainers which should be based both on existing (and numerous) researches in workplace or work-integrated learning and on

experienced tutors. Some operational pedagogical tools should also be developed, to assist them in their work role. Several concepts like *workplace curriculum*, *progressive peripheral participation to communities of practitioners*, *affordances* and *constraints, and connective pedagogy* can be used to direct and focus their collaborative work.

An interesting way to develop more connective approaches consists of building some more explicit links between the apprentices' workplace activities and the teaching part of the course and thereby offering additional learning opportunities. The cases described above did not explore this possibility, but in a later research, we designed and experimented a pedagogical tool to foster knowledge transfer and integration from the teaching courses to workplace activities (Veillard and Kouamé Kouassi 2012). This was done in an undergraduate course in the field of statistics and data management. The teaching staff of this alternance training course had identified big difficulties for the apprentices to use some concepts and methods in advanced statistics or in computer sciences during their workplace experiences. This was, despite a substantial amount of teaching hours in these domains, directed to achieving these outcomes. Our study showed that the pedagogical organisation of the training course was not designed (as most of the existing ones) to foster the knowledge transfer from the school to the workplace. We proposed to the managers of this training course to collaboratively design[7] (collective work of researchers and teachers) a new pedagogical tool, allowing the tutors and the apprentice to better know (i) all the typical vocational tasks that an apprentice can do in the workplace and (ii) the possible connections between these typical tasks and the disciplinary contents taught at university.

This new tool was tested by several 'trios' (CT, ST and apprentice), in different workplaces. Our qualitative findings show that this new pedagogical tool was well received by both the tutors and the apprentices and can potentially have a significant effect on the workplace curriculum building process. It brought these individuals new ideas in terms of potential tasks and resources for the workplace curriculum and led to interesting discussions between them on how to adapt the disciplinary contents to make some new resources for these tasks. These results also show how some new pedagogical tools, designed as boundary-objects, could foster the local collaboration between educative and professional institutions. But again, it is important to insist on the necessity to develop specific training programs for the tutors in so far as our study revealed that some of them have difficulties to use this new tool.

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[7] Basically, the collaborative design process has consisted in the main three steps: (1) building a typology of tasks from an analysis of several apprenticeship booklets and the expertise of several experienced school tutors, (2) defining what could be the a priori conceptual and methodological resources for each of these types of tasks, (3) specifying the disciplinary courses where these concepts and methods have been (or will be) studied. This study is based on new sociocultural perspectives on transfer of learning, from researchers like Tuomi-Gröhn et al. (2003) or Beach (2003). We tried to design the new tool as a boundary object which can be used in some collective boundary-crossing activities between the two tutors and the apprentice.

References

Aldeghi, I., & Cohen-Scali, V. (2007). L'apprentissage: une image et des conditions de travail à améliorer. *Consommation et Modes de Vie, 199*, 1–4.

Antoine, F., Grootaers, D., & Tilman, F. (1988). *De l'école à l'entreprise. Manuel de la formation en alternance*. Bruxelles: Vie Ouvrière.

Beach, K. (2003). Consequential transitions: a developmental view of knowledge propagation through social organizations. In T. Tuomi-Grohn & Y. Engeström (Eds.), *Between school and work: new perspectives on transfer and boundary-crossing* (pp. 39–62). Amsterdam: Pergamon.

Beauvais, M., Boudjaoui, M., Clénet, J., & Demol, J.-N. (2007). Accompagner la qualité de l'alternance éducative. Pragmatique, épistémologie et éthique de la conception. In F. Merhan, C. Ronveaux, & S. Vanhulle (Eds.), *Alternances en formation* (pp. 47–66). De Boeck: Bruxelles.

Billett, S. (2001). *Learning in the Workplace: Strategies for Effective Practice*. Crows Nest: Allen & Unwin Academic.

Billett, S. (2006). Constituting the workplace curriculum. *Journal of Curriculum Studies, 38*(1), 31–48.

Boudjaoui, M. (2011). Enseignement supérieur et dynamiques professionnalisantes: étude comparée de deux dispositifs. *Les Sciences de L'éducation Pour L'ère Nouvelle, 44*(2), 49–68.

Bourgeon, G. (1979). *Socio-pédagogie de l'alternance*. Paris: UNMFREO.

Cart, B., & Toutin Trelcat, M.-H. (2010). Contrat d'apprentissage, les raisons de la rupture. *Bref, 272*, 1–4.

Charlot, B. (1995). L'alternance, une forme de métissage culturel. *Education, 5*, 24–26.

Charlot, B., & Figeat, M. (1988). *Histoire de la formation des ouvriers, 1789-1984*. Paris: Minerve.

Clenet, J. (2012). L'alternance éducative: tensions et développements. *Education Permanente, 193*, 41–52.

Clenet, J., & Gérard, C. (1994). *Partenariat et alternance en éducation: des pratiques à construire*. Paris: L'Harmattan.

Deitmer, L., & Heinemann, L. (2009). Evaluation approaches for workplace learning partnerships in VET: investigating the learning dimension. In M.-L. Senström & P. Tynjälä (Eds.), *Towards integration of work and learning. Strategies for connectivity and transformation* (pp. 137–151). Dordrecht: Springer.

Delbos, G., & Jorion, P. (1984). *La transmission des savoirs*. Paris: Editions de la maison des sciences de l'homme.

Domingo, P. P. (2002). Logiques d'usage des stages sous statut scolaire. *Formation Emploi, 79*, 67–82.

Filliettaz, L. (2009). Les formes de didactisation des instruments de travail en formation professionnelle initiale: une approche comparatiste. *Bulletin Suisse de Linguistique Appliquée, 3*(1), 26–56.

Filliettaz, L., Saint-Georges, I., & Duc, B. (2010). Skiing, Cheese Fondue and Swiss Watches: Analogical Discourse in Vocational Training Interactions. *Vocations and Learning, 3*(2), 117–140.

Geay, A. (1998). *L'école de l'alternance*. Paris: L'Harmattan.

Giret, J.-F., & Issehane, S. (2012). L'effet de la qualité des stages sur l'insertion professionnelle. Le cas des diplômés de l'enseignement supérieur. *Formation Emploi, 117*, 29–47.

Greinert, W.-D. (2004). European vocational training systems. Some thoughts on the theoretical context of their historical development. *European Journal of Vocational Training, 32*, 18–31.

Griffiths, T., & Guile, D. (2003). A connective model of learning: The implications for work process knowledge. *European Educational Research Journal, 2*(1), 56–73.

Guile, D., & Griffiths, T. (2001). Learning Through Work Experience. *Journal of Education and Work, 14*(1), 113–131.

Kaddouri, M. (2012). Ecarts épistémiques et écarts identitaires de l'alternance. *Education Permanente, 193*, 203–218.

Kunégel, P. (2011). *Les maîtres d'apprentissage. Analyses des pratiques tutorales en situation de travail*. Paris: L'Harmattan.

Labrusse, B. (2001). Horaire de travail d'apprentis, plan d'activité de 17 médecins du travail du Vaucluse. *Archive Des Maladies Professionnelles, 3–4*(6), 308–310.

Lave, J. (1990). The culture of acquisition and the practice of understanding. In J. W. Stigler, R. A. Shweder, & G. Herdt (Eds.), *Cultural Psychology: The Chicago Symposia on Human Development* (pp. 259–286). Cambridge: Cambridge University Press.

Lave, J., & Wenger, E. (1991). *Situated Learning: legitimate peripheral participation*. Cambridge: Cambridge University Press.

Le Douaron, P., Maillard, D., & Fournier, C. (2012). Le développement de l'alternance, une quête impossible? *Education Permanente, 190*, 31–48.

Leplat, J., & Hoc, J. M. (1983). Tâche et activité dans l'analyse psychologique des situations. In J. Leplat (Ed.), *L'analyse du travail en psychologie ergonomique* (Vol. 1). Toulouse: Octarès.

Lerbet-Séréni, F., & Violet, D. (1999). Paradoxes de la médiation. Tradition et alternance. *Revue Française, 128*, 17–24.

Lioger, R. (1988). *Le savoir-faire des lamineurs de Syam*. Rapport au conseil du patrimoine ethnologique. Paris: Mission du patrimoine ethnologique.

Malglaive, G. (1994). Alternance et compétences. *Cahiers Pédagogiques, 320*, 26–28.

Mayen, P. (1999). Des situations potentielles de développement. *Education Permanente, 139*, 65–87.

Meirieu, P. (1992). La logique de l'apprentissage dans l'alternance. In M. de Lyon (Ed.), *Colloque: les jeunes et l'alternance école/entreprise* (pp. 29–33). Lyon: MAFPEN

Merle, V., & Théry, M. (2012). Un projet politique pour les formations en alternance. *Education Permanente, 190*, 9–29.

Monfrin, F., Acher, D., Leclerc, G., Leconte, A., Rabarison, L., Roy, C., & Sejourné, A. (2002). Une analyse des conditions de travail dans une population d'apprentis de moins de 18 ans. *Documents Pour Le Médecin Du Travail, 91*, 247–258.

Pelpel, P., & Troger, V. (1993). *Histoire de l'enseignement technique*. Paris: Hachette.

Pharo, P. (1985). *Savoirs paysans et ordre social*. Paris: C.E.R.E.Q, Collection des études, n°11.

Prost, A. (1981). *Histoire générale de l'Enseignement et de l'Éducation en France. Tome IV. L'École et la Famille dans une société en mutation (1930-1980)*. Paris: Perrin.

Tuomi-Gröhn, T., Engeström, Y., & Young, M. (2003). From transfer to boundary-crossing between School and Work as a tool for developing vocational education: an introduction. In T. Tuomi-Grohn & Y. Engeström (Eds.), *Between school and work: new perspectives on transfer and boundary crossing* (pp. 1–14). Amsterdam: Pergamon.

Vanderpotte, G. (1992). *Les fonctions tutorales dans les formations alternées: rapport au ministre du travail, de l'emploi et de la formation professionnelle*. Paris: La documentation Française.

Veillard, L. (2000). *Rôle des situations professionnelles dans la formation par alternance. Cas des élèves-ingénieurs de l'ISTP de Saint-Etienne*. PhD dissertation, Université Lumière Lyon 2.

Veillard, L. (2009). Organiser les situations de travail pour l'apprentissage: approche didactique de la formation professionnelle par alternance. In M. Durand & L. Filliettaz (Eds.), *Travail et Formation des Adultes* (pp. 125–156). Paris: Presses universitaires de France.

Veillard, L., & Kouamé Kouassi, D. (2012). Collaboration chercheurs – formateurs pour la conception d'un outil d'aide au transfert de connaissances en formation par alternance. *Travail et Apprentissage, 9*, 41–61.

Chapter 14
Learning Through Verbal Interactions in the Workplace: The Role and Place of Guidance in Vocational Education and Training

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This chapter seeks to explore some aspects of the complex relations existing between learning and work. It investigates how individuals engaging in production tasks may encounter learning opportunities in the workplace and how these opportunities may best be recognised, understood and reproduced for training purposes. These considerations have become of particular interest as increasingly aspects of professional practice are being connected to educational purposes. These connections certainly have a long tradition and history, particularly in western apprenticeship programmes, where the workplace is conceptualised as a legitimate and rich context for the development of professional competences (Fuller and Unwin 2013; Gonon 2005). These connections between learning and work have also been under particular scrutiny in the context of tertiary education, where an increasing number of vocational training programmes are engaging students with practicum experiences. These experiences, which complement formal teaching periods, occur in the circumstances of practice and are subject to complex forms of learning outcomes, which are highly dependent on individual and contextual factors (Akkerman and Bakker 2012; Billett et al. 2013; Tynjälä 2008). Hence, vocational training programmes appear as highly concerned by the conditions under which learning arises in and through professional practice itself. These concerns have certainly been extensively addressed in Anglophone research traditions, but they have also attracted a lot of attention in the Francophone research fields related to training and work.

More specifically, the chapter focuses on the role and place of guidance and mentoring in learning as it may occur in the circumstances of work. The recent literature in the field of workplace learning has stressed the importance of guidance in the process of learning in and from practice (Billett 2001a, b; Fuller and Unwin

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2003). Workers do not only learn just by conducting specific tasks individually; they learn when adequate resources are afforded to them and when more experienced workers are able to share their knowledge and skills and assist them in their practice. Hence, it is important to investigate the specific qualities of guidance at work so as to understand how novice workers engage with these resources. In this particular context, the chapter advances two main ideas. The first is to consider that a close examination of the conditions under which mentors and students engage in face-to-face interactions provides a relevant theoretical basis for exploring the relational interdependences between these actors (Billett 2001a). The second is that these interdependences may be described and analysed as "interactional participatory configurations" that provide helpful conceptual bases for describing empirically how the provision of guidance emerges, unfolds and transforms in the circumstances of professional practice.

These theoretical and methodological considerations are explored here in the occupation of early childhood education and more particularly in the provision of initial vocational education and training to early childhood educators in the context of Switzerland. In the Swiss VET system, early childhood educators are trained at tertiary level, in what is called higher vocational education. Students move back and forth during periods of being taught in vocational schools and periods of practical training in institutions caring for pre-school children. During their practicums, students are supervised by mentors, who assist them in their early days at work and make sure they meet the pedagogical objectives assigned by the curriculum. In this chapter, we will use empirical material collected in a research project[1] to understand (1) how mentors are shaping specific participation configurations for students as a way to mediate their access to professional practice and, reciprocally, (2) how students are able to align to these configurations and make use of the opportunities afforded to them and (3) how these participatory configurations are constantly being renegotiated within and during work activities.

To achieve these goals, the chapter first briefly refers to the existing literature about the role of mentoring and guidance for learning through the circumstances of work (1). The second section is designed to provide the reader with a synthetic understanding of a specific theoretical perspective, which proposes to see guidance as an "interactional accomplishment" (2). Key concepts and principles of such an interactional perspective are exposed, and the concept of "interactional participatory configuration" is defined, as a methodological resource for exploring ways guidance may be accomplished in practice. In the next section, an empirical illustration of these claims is provided: by using audio-video material collected in

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the research programme. Through that project, specific interactional patterns are identified and illustrated, by which guidance is provided to students in the context of early childhood education training practices (3). Finally, in a concluding section, the theoretical and practical implications of the presented approach are discussed (4), and more general considerations about the relations between learning and work are developed.

14.1 The Role of Guidance and Mentoring in Professional and Vocational Education

When considering the body of knowledge available in the literature, one first aspect that draws attention is the rather paradoxical position of the topic of guidance in vocational education practices and research. The paradox lies in the mismatch that exists between theoretical assumptions that have become largely dominant within sociocultural approaches to learning and the relatively low level of empirical knowledge available on naturally occurring mentoring practices in the conditions of work. On the one hand, there is a large body of research that assumes the configuring role of "the other" in learning processes. The Vygotskian framework (Vygotsky 1978) and its famous concept of the zone of proximal development or Bruner's concept of "scaffolding" (Wood et al. 1976), for instance, emphasise the idea that individuals do not learn on their own but only when interacting with more experienced partners. These claims have deeply influenced research conducted in vocational and professional education, where it is now widely assumed theoretically that workers do not learn just by engaging in work production tasks, but when adequate resources are afforded to them by co-workers. But on the other side, little empirical knowledge seems to be available to date regarding the specific conditions in which guidance is provided in the conditions of professional practice. In many workplaces, the fact that experienced workers assist newcomers in the profession is taken for granted and not necessarily seen as an activity per se, associated with specific and complex forms of actions and skills. Workers are often expected to be competent "guidance providers", but they are not necessarily trained and qualified to do so. Consequently, there is often a lack of social recognition attached to the role of mentors and insufficient understanding of the specific skills attached to such roles.

Amongst the scholars who have recently attempted to go beyond these evidences and shed light on empirical aspects of guidance and mentoring at work, Anglophone anthropologists and workplace learning theorists have certainly brought significant contributions. It is noteworthy that insights from Francophone traditions such as professional didactics (see Mayen 2015) also provide useful and complementary resources for conceptualising the role and place of guidance in vocational and professional education.

One first significant contribution to the literature on the role of guidance in vocational and professional education is that guidance should be conceptualised as related to professional practice itself and as a dynamic and transformative process. This idea has been put forward by Lave and Wenger (1991) and their concept of "legitimate peripheral participation" (LPP). The concept of LPP suggests that access to professional practice constitutes a precondition for learning. It is by engaging in professional practice progressively that newcomers access and experience the body of knowledge associated to the practice itself. And it is by transforming the conditions in which participation occurs over time that newcomers experience changes in the ways they are socially positioned within specific communities. From that perspective, guidance can be defined as the process through which newcomers navigate a community of practice and are progressively invited to become full members rather than peripheral participants.

Closely aligned to Lave and Wenger's conceptions, Kunégel (2011) also attempted to account for the practical and dynamic nature of guidance in the workplace. In his PHD study, conducted within the framework of Francophone professional didactics (Pastré 2011; Pastré et al. 2006), Kunégel observed and described in detail how mentors provide guidance to apprentices in the context of small-size car mechanics workshops in France. The research findings inform the description of a set of basic actions through which guidance may be exerted and expressed in context (e.g. instructions, prescriptions, demonstrations, evaluations, etc.). They also illustrate the dynamic and transformative nature of these actions as they evolve over time. Kunégel's work, for instance, establishes a model capturing the sorts of relations between apprentices and mentors at various stages of the apprenticeship pathway. Six successive steps are distinguished, including a phase of "familiarisation", a phase of "instruction" and a phase of "attribution of work production tasks". At each step, the relation between mentors and apprentices is expected to take a different shape and displays specific properties. The main interest of this model is to show that there seems to be a strong alignment between the level of competences apprentices are expected to have acquired and the sorts of verbal and nonverbal interactions existing between apprentices and their supervisors. The other interesting contribution of this model is that it proposes to see these interpersonal configurations as evolving in time and not as given or static realities.

Another particularly interesting contribution to reflections on guidance can be found in Billett's work dedicated to workplace learning. Billett conceptualises the ingredients to learning in the workplace as "relational dependencies" (Billett 2001a, b). In line with sociocultural approaches, learning is conceptualised as related to "participatory practices" by which workers gain access to specific actions in workplace contexts. But, as pointed by Billett (2001a), "it is inadequate to believe that learning simply by just doing it will suffice" (p. 7). Both social and personal factors may either support or on the contrary hinder learning opportunities. Social factors are designated as "affordances". Affordances include, for instance, the sorts of guidance provided to novice workers, the type of expertise available or not and more globally the range of resources workplace contexts are able to make available

to learners. Personal factors are referred to as "engagement". Engagement is related to the specific ways individual workers elect to make use of the resources afforded to them in the workplace. These individual factors include, for instance, personal values, prior experiences and personal epistemologies. Affordances and engagement are seen as key determinants of learning in the workplace and as shaped by a relation of interdependence. From that standpoint, the provision of guidance plays a significant role in workplace learning, but not a sufficient one. It is significant in the sense that it constitutes a key resource for learning, but not sufficient in the sense that workers have to engage with these resources to make progress and learn.

14.2 Guidance as an Interactional Accomplishment

As mentioned above, strong and convincing conceptualisations exist in the Anglophone literature that have proposed to see guidance as a *practice*, related to *participation* in social action and as a *dynamic* and *reciprocal* process involving both individual and contextual ingredients. However, there is a need for understanding in more detail how participation and the relational dependencies that relate to it unfold in everyday situations and how they may be enacted in specific workplace contexts. However, contributions also emanate from Francophone conceptions.

In earlier work dedicated to apprenticeship in the Swiss dual VET system (Filliettaz 2010a), we have proposed to approach the provision of guidance as an *interactional accomplishment*, namely, as a social, cognitive and semiotic process that is mediated through the ongoing performance of verbal and nonverbal interactions between learners and mentors. Over the last couple of years, we have attempted to bring numerous illustrations on how such verbal and nonverbal interactions unfold in the context of guided learning at work (Filliettaz 2010b, c, 2011a, b, 2013).

In what follows, we introduce a range of complementary theoretical and methodological ingredients that are closely aligned to a sociocultural perspective on guidance and that may contribute to our understanding on the role of guidance in vocational and professional education. First, we make explicit how practice can be conceptualised as interaction. Second, we specify such an interactional perspective by defining the notion of "interactional participatory configuration" and its conceptual ingredients.

14.2.1 Conceptualising Practice as Interaction

Conceptualising guidance as an interactional accomplishment consists in considering that the provision of learning resources to novice workers cannot be regarded as an abstract process that takes place independently from naturally occurring

practices. It is by providing or receiving instructions, by sharing views or solving problems and by displaying interpretations or evaluations of other conducts that experienced workers assist newcomers in their work. In other words, it is in and through ordinary everyday interactions between participants that guidance may be accomplished and provided. Adopting such a perspective refers to a body of literature that builds on the work of anthropologists, sociologists, sociolinguists and discourse analysts, who have adopted the concept of interaction as a central category for understanding social practice. In what follows, we specify some of the key ingredients of an interactional perspective, by referring to the concepts of *situatedness*, *indexicality*, *coordination in action*, *sequential organisation*, *linguistic mediation* and *multimodality*.

14.2.1.1 Situatedness and Indexicality

The first idea that lies at the core of an interactional perspective is that social practices take shape in visible actions, such as they are accomplished by individuals in specific contexts when they participate to situated interactions (Heath et al. 2010; Suchman 1987). Situated interactions are said to be *indexical* with these contexts in the sense that they entertain multiple and complex relations with the social and material conditions in which they are accomplished. On the one hand, visible actions are often seen as being shaped by these contexts in the sense that historic, cultural and material arrangements exert a form of influence on the ways actions are performed. But, on the other hand, visible actions are also shaping these contexts in the sense that participants may use their behaviours as resources to make visible how they interpret specific contextual arrangements. In observing the concreted actions amongst members and describing how these members communicate and interact, interaction analysis examines what members produce together, what they hold each other accountable for and how they make sense of actions of others. In doing so, they identify patterns of practice that make visible what members need to know, produce and interpret to participate in socially appropriate ways. Such ideas have been formulated by Harold Garfinkel and his founding contribution to ethnomethodology. These ideas are currently widely applied and further developed in fields such as workplace studies or ethnomethodological studies of work, in both Anglophone and Francophone traditions (Mondada 2006).

14.2.1.2 Coordination and Sequential Organisation

A second central idea is that interactions go beyond the sphere of influence of single and isolated individuals but are collectively accomplished in the form of joint actions (Clark 1996). This requires a dense and finely tuned coordination process in which participants have to adjust their contributions and align to each other to produce a common ground for their actions. These dimensions of social interactions have   been   thoroughly   investigated   by   conversation   analysis   and

ethnomethodologists, through the concept of *sequential organisation* (Sacks 1992; Schegloff 2007). By exploring the organisation of sequences in interaction, conversation analysts understand that social actions jointly accomplished by a plurality of participants do not unfold in an arbitrary way but reflect a specific social order. To align to this social order and to make it visible, participants engage in fine-grained coordination procedures in which they take turns, use adequate places for leaving the floor to co-participants and orient to the successive steps by which action is accomplished. From there, conversation analysts consider the sequential organisation of talk-in-interaction as the dynamic process through which participants make their actions publically accountable and shape interpretations about what they perceive as relevant in the context. The machinery of turn-taking in interaction becomes a resource for interpreting how participants orient to each other and accomplish a joint understanding of their actions.

14.2.1.3 Language Use as Meditational Means

A third idea that is widely spread across interactional analysts is that situated interactions are mediated processes, in which language use plays a significant role. It is by producing and interpreting linguistic forms that participants' interactions accomplish the fine-grained cooperation process related to their joint actions. These ideas have been shared and developed in a wide range of traditions, including, for instance, interactional sociolinguistics (Gumperz 1982), the ethnography of speaking (Hymes 1984) or mediated discourse analysis (Scollon 2001). These traditions view language not only as a way of conveying information from speakers to recipients, but as a historically and culturally shaped medium through which individuals take actions, achieve cooperation, align identities and participate in social events. Francophone research in discourse analysis (Bronckart 1997; Filliettaz and Roulet 2002) has also contributed to these traditions by conceptualising the complex relations that link social actions with language. These relations are associated with two distinct and interdependent functions that are frequently associated with language use in regard to social actions. On the one hand, language use endorses "representational" functions and can be regarded as a means for describing and referring to past, present and future actions. On the other hand, language use also assumes "pragmatic" functions in the sense that it materialises specific actions – speech acts – that have a transformative effect on the contexts in which they are performed.

14.2.1.4 Multimodality

The sequential organisation of interaction and its contribution to the joint accomplishment of situated actions does not exclusively rely on talk and linguistic units. On the contrary, it also involves a wide range of other semiotic systems participants may use as resources for coordinating their participation. To refer to this multitude

of semiotic resources combined in interaction, the concept of *multimodality* has recently emerged as a solid reference point within interaction analysis. Multimodal discourse and interaction analysts originate from a variety of subdomains of linguistics such as conversation analysis (Goodwin 2000), mediated discourse analysis (Levine and Scollon 2004; Norris 2004) or social semiotics (Kress and Van Leeuwen 1996). These various disciplines have developed distinct approaches to discourse and interaction, but they also share a shift away from a logocentric view of interaction. The concept of multimodality relates to the plurality of semiotic modes combined in human behaviour (gestures, gazes, body movements, spatial displays, images, objects, voices, texts, etc.) and to the local arrangements through which they are used as tools for accomplishing social actions. For multimodal discourse and interaction analyses, participants are constantly engaged in complex meaning-making processes in which they have to produce a joint understanding of their actions. It is by using and combining a plurality of modes that they produce and interpret meaning in context and that they elect (or not) to orient to specific resources. These choices are not arbitrary. Instead, they are to some extent, shaped by the specific potentialities of these resources themselves and the conditions in which they are used. Moreover, participants also express forms of agencies through the specific ways they make use of semiotic tools in interaction.

14.2.2 Conceptualising Interactional Participatory Configurations

Elaborating on this earlier work and on an interactional perspective of social practice, it is proposed here that the relational dependencies and workplace participatory practices associated with the provision of guidance can best be described through the emergence of "interactional participatory configurations". Interactional participatory configurations are specific forms of local arrangements, through which participants to social encounters establish the principles that shape how they interact with each other. These rules set rights and obligations to participants and have to be recognised by them as resources for organising participation in the context of joint actions (Losa et al. 2014; Filliettaz et al. 2013, 2014; Durand et al. forthcoming). From there, interactional participatory configurations are based on a plurality of components. They result from (1) the specific nature of activities accomplished in context and the purposes attached to these activities, (2) the situated identities endorsed by participants when they engage in these activities (3) and finally the conditions under which participants access specific positions from which they may or may not communicate with each other. Concepts borrowed from the field of the microsociology of everyday life – *activity frames, roles and situated identities and interactional participation frameworks* – provide useful references to elaborate these ingredients.

14.2.2.1 Activity Frames

First, how participants engage in interactions is highly dependent on the sorts of activities they recognise as being accomplished in context. This aspect of participation in interaction has been particularly well investigated, analysed and discussed in Erving Goffman's work dedicated to what is called "frame analysis" (Goffman 1974). Goffman's theory stresses the idea that the meaning of ordinary perceptions and human behaviour is highly premised in light of natural and social "frames". These "frames" include culturally acquired knowledge about social and natural phenomenon and their particular meaning. Individuals constantly make use of this knowledge to answer the question "what is going on here?". They rely on these premises to interpret social reality and to adapt their own conducts to such interpretations. In other words, it is by applying "frames" to these experiences that individuals may participate adequately to the sort of activity they interpret as being accomplished in context. Building on William James' and Gregory Bateson's phenomenological thinking, Goffman (1974) considers that these framing processes are complex and dynamic. These processes are complex in the sense that, in a given situation, multiple actions may be going on at the same time and, consequently, numerous activity frames may be relevant to interpret what is going on. Another way to illustrate this complexity is to recognise that, apart from "primary frames", which may be recognised directly and without reference to another meaning system, a large number of activities observable in social life rely on "transpositions" or "transformations" of more elementary frames. This is the case, for instance, in simulations or in drama plays, where multiple levels of interpretation must be recognised, to adjust an adequate frame to the ongoing activities. Apart from being complex, framing processes are also conceptualised by Goffman (1974) as never given or fixed; they are vulnerable to change. People may misunderstand the meaning of contextual arrangements; they may also be abused or influenced to produce false interpretations; finally, they may also revise the meaning they attribute to the reality they experience in social life. From such a dynamic perspective, "frames" can be seen as the result of a process of "framing" through which participants jointly negotiate how to interpret the conditions in which social action takes place.

14.2.2.2 Roles and Situated Identities

Relatedly, the experience of social life, interactional participatory configurations are also shaped by the specific *roles* and *situated identities* attached to the sorts of activities accomplished in interaction. This particular aspect has also been scrutinised by social theorists, as a way to understand how participants to interaction position themselves according to each other and with regard to broader cultural and institutional arrangements. Following Goffman (1974) again, these processes of positioning are not perceived as determined by preexisting social roles, but endorsed by participants in interaction itself (Goffman 1961; Sacks 1992; Bucholtz and Hall 2005). It is by "doing being" a person of a certain kind (e.g. doctor, teacher, mentor, etc.) that participants endorse particular identities in social action

and that they place co-participants in a reciprocal position (e.g. patient, student, mentee). Situated roles, when they are endorsed, project specific expectations regarding what is recognised as a valuable and relevant form of engagement. It is by adopting the conducts related to these expectations – or by failing to do so – that participants endorse these specific roles and display their ability to behave according to these norms and values.

14.2.2.3 Interactional Participation Frameworks

Finally, participatory configurations as they are accomplished in and through interaction also rely on the conditions under which participants gain access to talk and broader communication processes in context. Goffman (1981) referred to these aspects of interaction as "footing". The concept of footing develops the idea according to which participants to social encounters have to position themselves according to each other and with respect to what they interpret as going on in interaction. This footing problem is made particularly complex in the sense that social encounters are not always clearly delimited portions of reality and may involve a large number of participants endorsing various and specific reciprocal positions. With regard to such a complexity, categories referring to language and talk deserve to be reconsidered. For instance, in a social encounter gathering more than two individuals, participants may not only endorse alternatively the roles of "speaker" or "hearers". They may simultaneously speak and hear, or be addressed or unaddressed recipients, identified as ratified participants or not. They may also be mere "bystanders", observing or "overhearing" what is going on. In other terms, it is proposed by Goffman (1981) that social encounters are shaped by "participation frameworks" and that these frameworks specify the positions participants may or may not endorse depending on the context of interaction and its local meaning.

From there, it appears that what we call interactional participatory configurations combine practical, social and communicational ingredients. Interactional participatory configurations emerge when participants apply activity frames to their encounters, when they endorse specific identities related to such frames and when they align to positions related to specific participation frameworks. These arrangements are neither given nor determined or fixed. They are locally accomplished in interaction and collectively established by participants themselves.

Referring again to the context of mentoring in early childhood education, specific empirical questions emerge from such a theoretical perspective: what are the typical interactional participatory configurations through which guidance occurs in the workplace? To what extent do mentors and students contribute to the establishment of such configurations? How do these configurations unfold in time? And through what specific semiotic means are they accomplished and transformed? These questions, we believe, bring relevant insights to our understanding of the "relational dependencies" associated with "participatory practices" in workplace learning (Billett 2001b).

14.3 Exploring Interactional Participatory Configurations in Early Childhood Education

To address this set of research questions in an interactional perspective, specific methodological procedures have to be conducted (Heath et al. 2010). These include access to empirical fields in which students are being trained and the production of audio-video data documenting naturally occurring work and training practices. It is assumed that audio-video data and the specific analytic potentialities it affords bring useful resources for the study of interactional participatory configurations. Video data make available for analyses how participants adopt specific conducts in context, how these conducts evolve in time and unfold in sequential order and how semiotic resources of different sorts are used and combined in this dynamic unfolding. It is precisely by capturing processes that are observable that participants share mutually acceptable frames for their encounters and negotiate the various ingredients composing the participatory configuration through which they shape interaction. Some of these ingredients are highly observable.

To fulfil these requirements, specific sorts of audio-video material have been collected, in the context of a vocational training programme addressed to early childhood educators. As indicated in the Fig. 14.1, three students were followed and observed during their first year of training, in the context of a practicum taking place in institutions caring for pre-school children aged between 0 and 4 years old.

In the ways described above, each student (A, B, C) was observed three times during a period of eight weeks, equivalent to the duration of their placement.
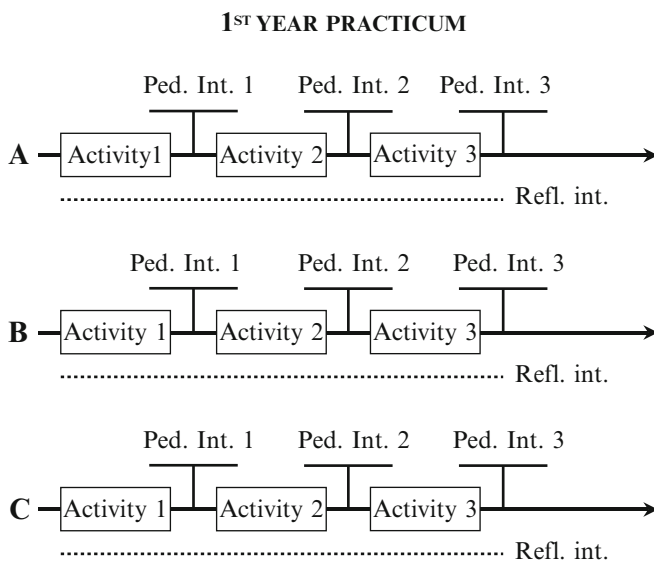
Fig. 14.1 Audio-video data available

Students were video recorded in specific contexts, in which they conducted educational activities with children. These recordings document both play activities, during which students supervise children playing feely, and more directed activities consisting, for instance, in craft, structured games or psychomotor activities. These activities were prepared and conducted by the students, in presence of and with support from their mentor.

Complementary to these video recordings, two sorts of interview data were also collected as a way to enrich our understanding of guidance provision at work. The first sort of interview data consisted in audio recordings of pedagogical meetings, held on a weekly basis between students and their mentor. These meetings are planned in the curriculum and provide space for students and mentors to reflect about their practical experience, to assess learning objectives and to plan future activities. In each site, three pedagogical interviews were recorded, between each different activity observed. The second sort of data collected comprised that gathered through reflexive interviews conducted by researchers at the end of the observation process. In each institution, students and their mentor were confronted to excerpts of video recordings of their activity and could comment on their strategies, difficulties and emotions or make explicit the rationale underlying their contributions to interactions as they were observable in the video data.

This procedure was replicated a second time, with the three same students, during another practicum taking place on the third and last year of training, briefly before the final exams. In sum, the complete data set includes approximately 22 h of video recordings of activities, 13 h of pedagogical interviews between students and mentors and 7 h reflexive interviews led by researchers.

A close examination of the video data and detailed transcripts based on these data provide a rich empirical base for examining how mentors afford guidance to students and how students engage with these resources when leading activities with children. In a recent work conducted on these data, three main "interactional participatory configurations" were identified, placing the participants in distinct and specific participation positions (Filliettaz 2014; Filliettaz et al. 2014). In the following paragraphs, we will briefly mention these distinct participatory configuration and their main characteristics. We will then use a case study to illustrate how these configurations may be enacted empirically and how they are constantly transformed and reshape as interactions unfold.

14.3.1 Emerging Forms of Interactional Participatory Configurations

When carefully analysing the data set available, it appeared that interactions occurring between mentors and students in the workplace recurrently took the shape of three distinct interactional participatory configurations. In what follows, these configurations will be defined and specified.

14.3.1.1 The Observation Configuration

One first interactional configuration through which guidance may be accomplished in the conditions of work can be referred to as *observation*. In such participatory configurations, mentors set themselves outside an educational activity conducted by the student. They observe the students from an external position and provide feedback, either during or after the activity. A complex and visible layering of activity frames usually emerges from the ways participants engage in interaction in such configurations. Mentors afford autonomous participation spaces to students and remain outside educational activities carried out with children. They display typical behaviours associated with the specific social role of a "trainer". For instance, they may keep at distance from the educational activities conducted by the student and take notes in a notebook. In doing so, they bring visibility to activities that are distinct from an educational frame but that refer to vocational training purposes. Mentors enacting an observation configuration usually endorse specific participatory positions in which they are not acting either as *speakers* nor as *addressed recipients*. They are usually witnessing what is going on and endorse the position of ratified *bystanders* according to Goffman's (1981) terminology. Students and children "know" mentors are present, but they are not primarily addressing them explicitly.

14.3.1.2 The Joint Action Configuration

A distinct form of guidance provision can be observed in participatory configurations in which mentors are not positioned as external observers but actively engage together with students in educational activities addressed to children. Such an interactional participatory configuration can be designated as *joint action*, considering that both students and mentors jointly accomplish educational activities in which training and learning opportunities may occur. Similarly to what happens in observation configurations, mentors afford active participation spaces to students and a direct access to educational activities. However, in the case of a joint action configuration, mentors also endorse the situated identity of an "educator" towards children. In other words, students are not alone in leading the activity, but they engage in a complex coordination process with mentors. This has significant implications with regard to the participation framework. In the joint action configuration, mentors are not only endorsing the position of a *ratified bystander*. They are also *speakers* and *addressed recipients*, and they are often recognised as legitimate participants by both students and children. Interestingly, training purposes are not absent from this *joint action configuration*. By playing an active role, mentors attenuate the complex and unpredictable nature of educational activities such as they are often experienced by novices in their early days at work. In doing so, they provide a form of assistance to students. But what makes the provision of guidance distinctive here is that it is accomplished from within the educational

activity frame itself. Consequently, guidance provision delivered in the form of a *joint action configuration* appears as almost invisible or transparent as it takes shape through the accomplishment of professional practice itself.

14.3.1.3 The Demonstration Configuration

Mentors and students work collaboratively in accomplishing educational activities with children in the childcare centre. Sometimes the unfolding of such activities provides opportunities to demonstrate ways of doing and bringing ostensibly to the attention of the students' specific resources for their actions. Such interactional participatory configurations are distinct from the other two previously identified and can be referred to as *demonstrations*. In the case of demonstration configurations, it is the mentors who take a form of leadership in the educational activity. Childcare students are placed in an observing position in which their direct contribution to the educational activity frame is limited. They are not primarily addressing children directly, and they are usually not addressed by them. In that sense, it is the students who endorse a ratified *bystander* position in that case. Within demonstration configurations, it can often be observed that students identify the displayed resources and reproduce them at a later stage of their practicum. Interestingly, these reproductions are often more than mere imitations. Students are also adapting the resources displayed to them by mentors to the local contingencies of the situation. These mechanisms illustrate that the sharing of repertoires is based not only on demonstration and imitation but also involves a process of appropriation and recreation.

14.3.2 The Dynamic Unfolding of Interactional Participatory Configurations

Contrary to what may be implicated by the definitions provided above, interactional participatory configurations are not static or rigid settings in which interactions unfold. They evolve constantly as interaction progresses, and they have to be conceptualised as dynamic and temporary constructions. To illustrate how interactional participatory configurations are enacted empirically and how these configurations are dynamically renegotiated by participants themselves, empirical evidence is drawn from the data.

This case study refers to one of the three students followed during the research (student A) and takes place in a day-care centre for children aged between 3 and 4 years old. The data were recorded in 2011 during a practicum at the end of the first year of training of the student. The observed activity consists in a so-called gathering, where children sit in a circle and listen to stories told by educators. At the end of the last story, the children are split in two groups. One of the groups will

participate to a painting activity conducted by the student, whereas the rest of the group will go to the playground. The sequence that will be used for the analysis is precisely the moment of transition that takes place between the end of the "gathering" and the beginning of the painting activity. The analysis will focus on the ways the student and her mentor engage in interaction at different moments of this transition between activities and the specific interactional participatory configurations that emerge from these forms of engagements.

14.3.2.1 Reshaping a Demonstration into an Observation

The first excerpt of data takes place at the end of the "gathering" activity. Children have greeted each other, and the mentor (MEN) has told a number of tales, using a blackboard and drawing significant ingredients of the story on the board. At the beginning of the excerpt transcribed below, she finishes telling the story of "The Magic Apple Tree" and starts to clean the blackboard while the student (STU) is sitting with the group and observing.

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(1) « I leave you the floor » (P-A1, 0:23:18 – 0:24:11)[2]
     1.   MEN:  [#1] so this is the end of the story of the magic apple
                tree\ ((MEN takes a sponge and starts cleaning the
                blackboard))
     2.         Guillaume please sit down for two more minutes I have
                something to tell\ ...
     3.   BEN:  don't clean the blackboard\
     4.   MEN:  you don't want me to clean it for now/
     5.   BEN:  no\
     6.   MEN:  so I will leave it like that for now\ and .. I-
     7.   BEN:  I want to hear the story of the three little pigs\
     8.   KAI:  yes another story plea:se\
     9.   MEN:  next time I will use the flannelgraf which is on the
                other side\ Daniel asked me to use the flannelgraf and I
                will do so another time\.
    10.         but now Lily ((name of the student)) will do an activity
                with some of you ((MEN and STU gaze at each other)) and
                Patrick ((name of an auxiliary member of staff)) will
                go to the playground with another group\
    11.         so Lily I leave you the floor ((MEN looks at STU and moves
                to the background))[#2]
    12.  STU:   OK so I will do a painting activity with three of you if
                you feel like\
```

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[2] Transcription conventions are listed in the Appendix, at the end of the chapter.

#1: The mentor finishes to tell the story to the group and is observed by the student
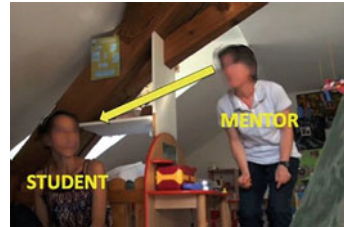
#2: The mentor looks at the student and moves to the background

Diverse participatory configurations emerge here as interaction unfolds. At the beginning of the transcribed excerpt (1), a storytelling frame is activated and participants are endorsing the typical situated identities associated with such an educational activity: the mentor acts as a *storyteller* and the children play the role of the *public*. These situated social roles are accomplished through the expected behaviours observable in this particular setting. In this instance, the mentor is producing a narrative and the children are listening to it. Specific participatory positions in interaction are associated to this storytelling frame: the mentor adopts a *speaker's* position and selects the children as *addressed recipients*. At this stage, the student is not taking leadership over the educational activity. She observes the storytelling activity conducted by the mentor and, similarly to the children, endorses the role of the *public* by listening to the story as a *recipient* or as a *ratified bystander*. The specific interactional participatory configuration that emerges in this local context takes the shape of what we have proposed to see as a *demonstration configuration*. The educational activity is indeed in the hands of the mentor, who uses the storytelling frame as a means for displaying training resources to the student. The student is placed in an observer's position and does not address children directly at this stage.

Quickly in this excerpt, a number of cues are produced that indicate participants are orienting their attention to another activity frame. In line 1, the mentor explicitly mentions that the story has just ended ("so this is the end of the story of the magic apple tree"). She also performs typical actions, such as the cleaning of the black-board, that materialise the practice of a closure and a transition. In line 2, the mentor produces a directive speech act ("Guillaume please sit down for two more minutes") and an announcement ("I have something to tell"), in which she endorses a situated role distinct from that of a storyteller. It is noteworthy that a number of children express forms of resistance to this activity change and the related situated identities attached to the storytelling frame. In particular, one of the little girls, named Bennie, asks the mentor not to clean the board (3) and asks for another story (7); another girl sitting next to her (KAI) echoes this request ("yes another story please", 8). These resistances bring the mentor to delay the closure of the storytelling frame. Some requests are ratified ("so I will leave it like that for now", 6), and some others are reshaped as promises for future actions ("next time I will use the flannelgraf which is on the other side Daniel asked me to use the flannelgraf and I

will do so another time", 9). After several attempts, the mentor then moves forward and announces that the next activity will be carried out by Lily, the student ("but now Lily will do an activity with some of you and Patrick will go to the playground with another group", 10). This activity is discursively described, but not yet specified. During this transition sequence, the student maintains her observer's position. She is referred to explicitly by the mentor, who establishes a visual contact with her, but does not engage directly with children at this stage. The conditions are progressively prepared for a change in the participatory configuration, in which the student will endorse distinct situated roles. In such a local context, the *demonstration configuration* no longer shapes how participants engage in interaction.

It is on line 11 that the mentor explicitly hands the activity to the student ("so Lily I leave you the floor"). In doing so, she selects the student as the legitimate next speaker and displaces her from the recipient and bystander position in which she was placed previously. This has important consequences in terms of situated identities. By inviting the student to take the floor, the mentor affords a participation space in which the student will be able to endorse an educational role towards children. Reciprocally, the mentor steps down from the front stage and stops to act as the leader of the gathering activity, as also indicated by her move to the back of the group (see #2). The student immediately engages with the participation space afforded by the mentor and specifies the next activity frame ("OK so I will do a painting activity with three of you if you feel like", 12). She takes the floor, addresses the children directly and selects them as ratified recipients. In doing so, she endorses the situated role of an educator and takes the lead in the gathering activity. A new and distinct participatory configuration emerges here, very close to what we have defined as the *observation configuration*: the student is placed in an active and leading position, whereas the mentor progressively participates to interaction from an external observer's position.

14.3.2.2 Reshaping an Observation into a Joint Action

The next excerpt transcribed below immediately follows.

```
(2)  « please stay seated it is Lily who asks you to come »(P-A1, 0:24:12
     – 0:24:49)
     13.  KAI:  I want/
     14.  STU:  I propose that-
     15.  KAI:  me:: me:: ((other children rise their hands and want to
                take part to the painting))
     16.  STU:  unfortunately not everybody will be able to take part
                today\ those who don't come with me will go with Patrick
                to the playground\ [#3]
     17.  KAI:  I want to stay here\
```

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18.  STU:  Audrey ((name of the mentor)) will stay here with me\ .
           and those who do not do painting today will do it
           another day\
19.  BEN:  I want to do painting ((stands up and approaches STU and
           MEN)
20.  MEN:  please stay seated\ it is Lily who asks you to come\
           ((MEN stops BEN and sends her back to her seat))[#4]
21.  STU:  I had already proposed to Elisa\
22.  KAI:  I want to do painting\ ((starts crying))
23.  STU:  so Elisa do you want to come with me/
24.  ELI:  yes ((stays seated))
25.  MEN:  so Elisa come here and stay near Lily ((MEN guides ELI
           and offers her a seat next to STU))
26.  STU:  Alice do you feel like painting/
27.  ALI:  ((ALI stands up and approaches STU))
28.  MEN:  Alice/ please sit down on the other side\
29.  STU:  and Katia\ do you want to do painting Katia/
```


#3: The student explains the painting activity while the mentor observes

#4: The mentor stops BEN and sends her back to her seat

The beginning of excerpt 2 confirms the establishment of the *observation configuration* identified previously. The student continues to endorse an active educator's role by addressing the children directly and by identifying the participants to the painting activity ("I propose that-", 14). Reciprocally, children recognise the student as the legitimate leader of this activity and select her as a ratified recipient. They align to this new activity frame by displaying willingness to take part to the painting activity (13, 15, 17). Finally, the mentor remains ostensibly in the background and does not address children directly anymore. In doing so, she endorses a visible observer's role (see #3). Two distinct activity frames emerge in such a setting: (a) an educational frame, shaped by the student in interaction with children, (b) and a training frame, in which the mentor takes the student's activity as an object of observation.

When engaging with this new activity frame and preparing for the painting activity, the student is quickly faced with a practical problem: a large number of children express interest for the painting and wish to be selected as participants. This is particularly the case for the little girl, named Kaila (KAI), who performs

various attempts to become a member of the painting group (13, 15, 17, 22). In response to these demands, the student provides various arguments for the activity frame. She states all the children will not be able to take part this time (16); the mentor will stay with the painting group (18); the children from the other group will go to the playground (16) and will be able to do the painting "another time" (18). The student then goes on by selecting three girls who will be invited to participate to the painting activity: Elisa (21), Alice (26) and Katia (29). These three girls ratify their position of selected participant to the painting activity, whereas other children express forms of resistance to become members of the other group: KAI, for instance, insists to be included in the painting group and starts crying (22); other children spontaneously stand up and want to sit next to the student (15, 19). Faced with these persistent and increasing difficulties, the mentor progressively becomes more active again within the educational activity frame. She, subsequently, asks children who spontaneously stand up to remain seated (20) and invites the selected participants to change their position in space and to sit next to the student (25, 28). She also becomes more engaged with regard to her body posture and performs touching gestures towards children (see #4). In doing so, she self-selects herself as a legitimate speaker again and addresses the children directly. She also endorses an educational role towards the group of children she was observing previously.

These observable transformations bring important changes in the ways participants shape interactional participatory configurations. Ingredients of a *joint action configuration* are noticeable, in which the mentor progressively moves away from an external observer's position but accomplishes complementary contributions to the educational activity initiated by the student. Similar and interdependent roles emerge here between the student and the mentor in the transition activity. The student lists the name of the selected participants to the painting activity, whereas the mentor is ordering the groups and placing children in space depending on the participant category to which they belong. Both the student and the mentor endorse speaker's positions and select children as addressed recipients. Training purposes are not absent from such a setting, in the sense that the mentor assists the student in a difficult situation. By placing the children in space according to their participant status, the mentor takes in charge aspects of the transition activity that are difficult to cope with and contributes to attenuate the complex and unpredictable nature of educational activities. But these training resources are not delivered from an external observer's position but from within the educational activity frame itself.

This empirical case study underlines the dynamic nature of interactional participatory configurations as they emerge in naturally occurring work and training practices. As shown in the two brief excerpts of data analysed here, the provision of guidance takes shape in specific and temporary configurations that evolve in time, as interaction progresses. In this particular case, a *demonstration configuration* is progressively reshaped into an *observation configuration*, before being transformed again into *a joint action configuration*. These configurations are neither given nor fixed. They emerge through the ways participants elect to engage in interaction and assign specific positions to their partners.

Beyond this particular situation, it is also interesting to observe how, in relation with plans and agreed activity frames between mentors and students, gaps or discrepancies may emerge when it comes to enact these plans in situated interactions. From the data and analysis, it can be observed how participation spaces afforded by mentors to students are often associated with local challenges that may result in significant changes in the ways participants see their roles and specific positions. A mentor may endorse an external observer's position for a while, before being invited again to engage in a joint action configuration. From there, referring back, to a distinction made in Francophone ergonomics (see Durand and Poizat 2015; Filliettaz et al. 2015; Mayen 2015), we see that "prescribed" participation configurations may be quite remote from the ways these participation configurations are "accomplished" in real conditions.

14.4   Doing Guidance as Interactional Competence

This chapter has attempted to make the ordinary practices of mentoring students in the workplace more visible by understanding how mentors afford learning opportunities in practice and how students engage with these resources. To do so, mentoring practices have been conceptualised not as abstract categories, but as interactional accomplishments, namely, fine-grained situated and visible conducts enacted through verbal and multimodal interactions, as demonstrated in the analyses above.

Approaching mentoring practices as situated interactions emphasises the complex framing process going on when mentors and students are "doing guidance" in the circumstances of work. More specifically, the approach adopted illuminates the complex ways educational practices involving adults and children intersect with vocational training purposes involving novices and experienced professionals. What makes these sorts of settings particularly rich and potentially profitable in terms of learning is the fact that, as we saw from the data analysis, two layers of framing are constantly shaping the ways participants engage in interaction: (1) an educational frame addressed to children and taking the form of a wide range of activities (painting, playing on a playground, being split in groups, etc.) (2) and a vocational training frame involving the student and the mentor and enacted through specific and distinct educational purposes (learning how to tell stories by using a blackboard, learning how to initiate an activity and to split children in groups, etc.). These two layers are constantly intersecting when it comes to train and learn in the circumstances of practice.

The collected data and analyses suggest that participants bring local and distinct responses to these complex framing issues. Some of the mentors observed set themselves outside the educational frame and endorse an observer position to accomplish training practices. Some others participate in these activities and position themselves as partners of a joint action collectively conducted together with students. Finally, some other mentors use these joint actions to share their repertoires of resources and make these resources ostensibly visible to students.

These ways of "doing guidance" are not only attributes of specific mentors. They can be dynamically combined, as illustrated in the case study presented here, within one same setting and evolve in time as interaction unfolds.

In sum, what we have proposed to refer to as "interactional participatory configurations" can be regarded as specific resources used by participants for navigating the contextual complexity they are faced with. It is by negotiating shared participatory positions that they reconcile the premises and expectations associated with both learning and work.

As this chapter argues, interactional competences, namely, the capacity participants have to engage in complex coordination procedures in context, play a significant role in the establishment, negotiation and constant transformation of participatory practices in vocational education. Recognising the importance of these interactional competences may serve relevant purposes for early childhood educators in general and for workers endorsing mentoring functions at work in particular. For instance, this could illuminate the high expectations in terms of *contextual adaptability* faced by both mentors and students when they experience training situations in the circumstances of work. Moreover, considering training practices through the lens of interactional competences can also help understanding why mentoring practices are sometimes so difficult to observe and why so little attention has been paid to the empirical conditions in which they unfold. From what we see in the data, this lack of visibility can be explained by the fact that mentors do not always endorse training roles by producing explicit sorts of guiding instructions. They often give to the provision of guidance the shape of professional practice itself and exert guidance through the affordance of participatory positions. If guidance is difficult to observe empirically, it is then, to some extent, because it is framed in interaction as transparent and invisible by participants themselves. From that perspective, using interaction analysis as research method or as a resource for training could bring additional visibility and social recognition to mechanisms that are central to learning through work but are yet to be fully understood.

Appendix: Transcription Conventions

CAP	accented segments
/	raising intonation
\	falling intonation
XX	uninterpretable segments
(hesitation)	uncertain sequence of transcription
:	lengthened syllable
.	pause lasting less than one second
..	pause lasting between 1 and 2 s
Underlined	overlapping talk
((comments))	comments regarding nonverbal behaviour
[#1]	reference to the numbered illustration in the transcript

References

Akkerman, S. F., & Bakker, A. (2012). Crossing boundaries between school and work during apprenticeship. *Vocations & Learning, 5*(2), 153–173.

Billett, S. (2001a). *Learning in the workplace: Strategies for effective practice*. Crows Nest: Allen and Unwin.

Billett, S. (2001b). Learning through work: Workplace affordances and individual engagement. *Journal of Workplace Learning, 13*(5), 209–214.

Billett, S., Sweet, L., & Glover, P. (2013). The curriculum and pedagogic properties of practice-based experiences: The case of midwifery students. *Vocations & Learning, 6*(2), 237–257.

Bronckart, J.-P. (1997). *Activité langagière, textes et discours*. Lausanne: Delachaux et Niestlé.

Bucholtz, M., & Hall, K. (2005). Identity and interaction: A sociocultural linguistic approach. *Discourse Studies, 7*(4–5), 585–614.

Clark, H. (1996). *Using language*. Cambridge: Cambridge University Press.

Durand, I., Trébert, D., & Filliettaz, L. (forthoming). Offre et prise de place: l'accomplissement des configurations de participation à l'interaction tutorale. In L. Filliettaz, K. Balslev & I. Vinatier (Eds.), *Pratiques professionnelles en formation: que nous apprennent les discours?*. Paris: L'Harmattan.

Durand, M., & Poizat, G. (2015). An activity-centred approach to work analysis and the design of vocational training situations. In L. Filliettaz & S. Billett (Eds.), *Francophone perspectives of learning through work: Conceptions, traditions and practices*. Dordrecht: Springer.

Filliettaz, L. (2010a). Guidance as an interactional accomplishment: Practice-based learning within the Swiss VET system. In S. Billett (Ed.), *Learning through practice: Models, traditions, orientations and approaches* (pp. 156–179). Dordrecht: Springer.

Filliettaz, L. (2010b). Dropping out of apprenticeship programmes: Evidence from the Swiss vocational education system and methodological perspectives for research. *International Journal of Training Research, 8*(2), 141–153.

Filliettaz, L. (2010c). Interaction and miscommunication in the Swiss vocational education context: Researching vocational learning from a linguistic perspective. *Journal of Applied Linguistics and Professional Practice, 7*(1), 27–50.

Filliettaz, L. (2011a). Asking questions… getting answers. A sociopragmatic approach to vocational training interactions. *Pragmatics & Society, 2*(2), 234–259.

Filliettaz, L. (2011b). Collective guidance at work: A resource for apprentices? *Journal of Vocational Education and Training, 63*(3), 485–504.

Filliettaz, L. (2013). Affording learning environments in workplace contexts: An interactional and multimodal perspective. *International Journal of Lifelong Education, 32*(1), 107–122.

Filliettaz, L. (2014). Learning through interactional participatory configurations: Contributions from video-based interaction analysis. In A. Rausch, C. Harteis, & J. Seifried (Eds.), *Discourses on professional learning: On the boundary between learning and working*. Dordrecht: Springer.

Filliettaz, L., & Roulet, E. (2002). The Geneva model of discourse analysis: An interactionist and modular approach to discourse organization. *Discourse Studies, 4*(3), 369–392.

Filliettaz, L., Losa, S., & Duc, B. (2013). Power, miscommunication and cultural diversity: Applying a discourse analysis lens to vocational training practices. In J.-J. Weber & I. de Saint-Georges (Eds.), *Multimodality and multilingualism: Current challenges for educational studies* (pp. 153–181). Rotterdam: Sense Publishers.

Filliettaz, L., Rémery, V., & Trébert, D. (2014). Relation tutorale et configurations de participation à l'interaction: le cas de la formation professionnelle des éducatrices et éducateurs de l'enfance. *Revue @ctivité, 11*(1), 22–46.

Filliettaz, L., Billett, S., Bourgeois, E., Durand, M., & Poizat, G. (2015). Conceptualising and connecting francophone perspectives on learning through and for work. In L. Filliettaz & S. Billett (Eds.), *Francophone perspectives of learning through work: Conceptions, traditions and practices*. Dordrecht: Springer.

Fuller, A., & Unwin, L. (2003). Learning as apprentices in the contemporary UK workplace: Creating and managing expansive and restrictive participation. *Journal of Education and Work, 16*(4), 407–426.

Fuller, A., & Unwin, L. (Eds.). (2013). *Contemporary apprenticeship: International perspectives on an evolving model of learning*. London: Routledge.

Goffman, E. (1961). *Encounters: Two studies in the sociology of interaction*. Indianapolis: The Bobbs-Merill Company.

Goffman, E. (1974). *Frame analysis: An essay on the organization of experience*. New York: Harper and Row.

Goffman, E. (1981). Footing. In *Forms of talk* (pp. 124–159). Philadelphia: University of Philadelphia Press.

Gonon, Ph. (2005). *Challenges in the Swiss vocational education and training system*. bwp@, 7. Retrieved December 22, 2009, from http://www.bwpat.de/7eu/gonon_ch_bwpat7.shtml

Goodwin, C. (2000). Action and embodiment within situated human interaction. *Journal of Pragmatics, 32*, 1489–1522.

Gumperz, J. (1982). *Discourse strategies*. Cambridge: Cambridge University Press.

Heath, C., Hindmarsh, J., & Luff, C. (2010). *Video in qualitative research. Analysing social interaction in everyday life*. London: Sage.

Hymes, D. (1984). *Vers la compétence de communication*. Paris: Hatier-Credif.

Kress, G., & Van Leeuwen, T. (1996). *Reading images. The grammar of visual design*. London: Routledge.

Kunégel, P. (2011). *Les maîtres d'apprentissage. Analyse des pratiques tutorales en situation de travail*. Paris: L'Harmattan.

Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. Cambridge: Cambridge University Press.

Levine, P., & Scollon, R. (Eds.). (2004). *Discourse and technology: Multimodal discourse analysis*. Washington: Georgetown University Press.

Losa, S., Duc, B., & Filliettaz, L. (2014). Success, well-being and social recognition: An interactional perspective. In A. C. Keller, R. Samuel, M. M. Bergman, & N. K. Semmer (Eds.), *Psychological, educational, and sociological perspectives on success and well-being in career development* (pp. 69–98). Dordrecht: Springer.

Mayen, P. (2015). Vocational didactics: Work, learning and conceptualization. In L. Filliettaz & S. Billett (Eds.), *Francophone perspectives of learning through work: Conceptions, traditions and practices*. Dordrecht: Springer.

Mondada, L. (2006). Interactions en situations professionnelles et institutionnelles: de l'analyse détaillée aux retombées pratiques. *Revue française de linguistique appliquée, XI*(2), 5–16.

Norris, S. (2004). *Analyzing multimodal interaction: A methodological framework*. London: Routledge.

Pastré, P. (2011). *La didactique professionnelle. Approche anthropologique du développement chez les adultes*. Paris: Presses universitaires de France.

Pastré, P., Mayen, P., & Vergnaud, G. (2006). La didactique professionnelle. *Revue Française de Pédagogie, 154*, 145–198.

Sacks, H. (1992). *Lectures on conversation*. Oxford: Blackwell.

Schegloff, E. (2007). *Sequence organization in interaction: A primer in conversation analysis*. Cambridge: Cambridge University Press.

Scollon, R. (2001). *Mediated discourse: The nexus of practice*. Londres: Routledge.

Suchman, L. A. (1987). *Plans and situated actions: The problem of human-machine communication*. Cambridge: Cambridge University Press.

Tynjälä, P. (2008). Perspectives into learning at the workplace. *Educational Research Review, 3*, 130–154.

Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Cambridge: Harvard University Press.

Wood, D., Bruner, J. S., & Ross, G. (1976). The role of tutoring in problem solving. *Journal of Child Psychology and Psychiatry, 17*, 89–100.

Chapter 15
Transmission and Individuation in the Workplace

Etienne Bourgeois, Julie Allegra, and Cecilia Mornata

15.1 Introduction

Transmission in occupations has long been associated with the idea of reproduction. At a macro level, transmission implies that a body of "best practices" and knowledge at the core of the occupation is being reproduced (i.e., passed on from one generation to the next one without undergoing significant changes). At a microlevel, it means that the individual novice strives to imitate and to incorporate the expert's knowledge as accurately as possible. By doing so, the novice gradually becomes part of the community of practice. This rather traditional scenario of transmission has long been documented worldwide. In the francophone literature on transmission in occupations, one of the most famous and influential studies in that field was conducted by Delbos and Jorion in the late 1970s and first published in 1984 (Delbos and Jorion 1984). It provides a typical illustration of this traditional mode of transmission. Their study examines the knowledge transmission processes in salt farming (" saliculture"), inshore fishing ("pêche côtière"), and shellfish harvesting ("conchyculture") in Brittany. It showed that transmission in that context operated mainly through day-to-day immersion in its practice ("frayage"), a process that is very close to that of participation in community of practice as described by Lave and Wenger (Lave and Wenger 1991; Wenger 1998). Their study also emphasizes the crucial role of learners' identification to the expert (i.e., in that context, the son to his father). It also highlights the dramatic gap between formal school-based knowledge and the knowledge actually mobilized on the job, not only in terms of content (e.g., the parameters actually taken into account to appraise the degree of salinity of the marsh water), but also in terms of learning process (i.e., observation and trials and errors *vs*. verbal transmission and rational

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calculation). This overall pattern of workplace learning and transmission is quite in keeping with the one highlighted in many ethnographical studies of this type.[1] Looking back at this study from the present, it is noteworthy that it focuses on a long-standing traditional occupation that has a relatively stable body of knowledge, practices, and social organization that have been transmitted across several generations without significant changes.

However, more recent anthropological studies in other occupational areas show a quite different picture (Burnay 2011; Burnay and Klein 2009). For example, Dolbeau's study on transmission in a blacksmith's shop in France (Dolbeau 2009, 2012) showed that the nature of this occupation (i.e., activity, technology, culture, knowledge and skill requirements, social organization) has been relatively stable for decades, if not centuries, until the rise of mechanization of agriculture following the end of WW II. This mechanization made traditional blacksmiths' work obsolete within a very short period of time (1950s–1960s). As such, it entailed a sudden break in the transmission process that had long prevailed in that occupation until then. However, a few decades later, this occupation has gradually returned, albeit in a very different form. With the popularization of horse riding as a leisure, blacksmiths are needed again, but their work has changed significantly from what it was in the past, in terms of techniques, relative valuation of ironworks and the work with horse, and social and spatial organization of the work. In other words, this occupation has been reinvented to fit radically different social, cultural, and technical conditions. Mere "reproduction" can no longer be the prevailing mode of transmission, as although some parts of the traditional occupation were still relevant, many others were not. Hence, that has to be room in this process for transformation and innovation. It is likely that this observation has become more and more relevant in a growing range of occupations, either traditional ones, which have undergone dramatic mutations in the last decades, or totally new ones that have recently emerged. We suggest that this reproduction/transformation issue can be analyzed from two perspectives:

1. From the standpoint of the history of the profession, one could describe the continuities and changes in the profession's knowledge and practices over time and interpret them in relation to cultural, economic, technological, and social factors characterizing the context during the considered period of time. Dolbeau's study, for example, clearly takes this perspective.
2. One could as well take the individual learners' perspectives. From this point of view, it is necessary to examine how novices gradually incorporate what is transmitted by experts, the extent to which, and the conditions under which while doing, so they either mimetically reproduce what has been taught or, on the contrary, find "their own way" or to put it in other words: *individuates*.

This second perspective is taken up in this chapter, which leads to the following question: *Under what conditions and through what processes does transmission in*

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[1] See, for example, Rogoff and her colleagues (Rogoff 1990, 1995; Rogoff and Lave 1984).

a given occupation allow for individuation (instead of mere reproduction)? To put it simply, *individuation* is to be understood here as the process through which novices in a given occupation gradually find their own personal way of thinking and doing things while incorporating the knowledge and practices being transmitted to them by the reference model. This view is based mainly on the French construct of "subjectivation" as elaborated by Richard and Wainrib (2006).[2] In educational contexts, individuation implies some gradual detachment of learners from the reference expert model at four levels[3]: (1) cognitive (i.e., thinking by oneself), (2) behavioral (i.e., doing one's own way, taking initiatives and endorsing them even when they are discrepant from the model's prescription), (3) affective (i.e., becoming affectively independent from the model), and (4) identity (i.e., dispensing with the model's judgment to establish one's sense of existence and value, asserting one's own identity as different from the model).

Yet, it remains unclear from the learners' point of view, whether transmission operates exclusively or mainly as a mimetic reproduction process or, on the contrary, leaves room for individuation. The question is of course vast and complex. In this chapter, we intend to examine the role of some "macro" factors (i.e., related to the nature and evolution of the profession itself and its context) and some "micro" factors (i.e., related to learners' interactions with their trainers and peers). This discussion will be based mainly on two exploratory studies we are currently conducting at the University of Geneva. Although still in progress, they already provide some significant insights on the individuation process and its factors. The first study (henceforth called the "organic farming study") focuses on the transmission process with experienced farmers who are converting to organic farming in Belgium and in France and highlights mainly "macro" factors of individuation. The second study (henceforth called the "psychology student study") deals with transmission in the context of students enrolled in a university master's degree program in developmental psychology and highlights primarily "micro" factors of individuation.

15.2 Macro-level Factors of Individuation: The Organic Farming Study

This field of investigation was chosen mainly because it stages an occupation in transition, mixing elements of break and continuity from the tradition. We were, therefore, expecting a different transmission pattern from the traditional one as documented by Delbos and Jorion. This point was already highlighted by Nizet and his colleagues (Nizet et al. 2009; Van Dam et al. 2009). They have shown that in the case of conversion to organic farming, some intergenerational transmission does

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[2] See Mahler (2000) and Caillé (2011), in particular the chapters by Bidet and Macé (2011) and Dardot (2011).

[3] Examples will be provided below.

occur. This is typically the case of conventional farmers' children who take over the family farm while shifting to organic farming. In this case, they do inherit both material properties (e.g., land, buildings, equipment, and machinery) and knowledge (e.g., some basic conventional farming practices and knowledge remain relevant to organic farming) from their parents. However, transmission in this context is only partial to the extent that much of the knowledge and practices, as well as the underpinning system of values, of organic farming departs more or less radically from the conventional agriculture. It is, therefore, worthwhile to examine the individuation process and its conditions in such a context.

15.2.1   Database and Method

The study consists of five sets of case studies, oriented to one or several of the following research issues:

- Modes of workplace learning (e.g., trials and errors, imitation, verbal transmission, and reflective thinking), with a special attention to the dominant combination patterns
- Individuation process (at the four levels mentioned above: cognition, behavior, affects, and identity)
- Engagement in learning in relation to biographical and identity trajectory

The five sets of data are the following[4]:

- Dataset #1: Four case studies of Belgian experienced organic farmers (semi-structured and critical incident interviews).[5]
- Dataset #2: Three case studies of French experienced organic farmers converting to biodynamic agriculture[6] (3-day participant observation sessions in the farm, nondirective interviews).[7]
- Dataset #3: Six case studies of adult students registered in a degree program in biodynamic farming (i.e., vocational degree for farm managers[8] BPREA) delivered in collaboration with the French Biodynamic Agriculture Movement (MABD) and giving access to run a farm business. Most of them are new to

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[4] At the time of writing this chapter, only dataset #1 was entirely collected and analyzed. The other three were not yet entirely completed. This is why, at this point, most of the observations reported here come from the first dataset. We will also mention only those observations directly related to the individuation issue.

[5] This dataset is part of a master's thesis research conducted at the University of Louvain which has just been completed by Florence Beghuin, under E. Bourgeois's supervision (Beghuin 2014).

[6] Biodynamic farming refers to a particular theory and practice of organic farming, based on Rudolf Steiner's philosophy and prescriptions (Podolinsky 1985; Steiner 2006).

[7] Study conducted in collaboration with the French Biodynamic Agriculture Movement (MABD).

[8] Brevet Professionnel Responsable d'Exploitation Agricole (BPREA).

farming at all. They were interviewed (i.e., life story and semi-structured interviews) at the end of their training, after having spent several months in the field for practical training.[9]

- Dataset #4: Six case studies of Swiss farmers (French-speaking Switzerland), with more or less long-standing experience in biodynamic agriculture (life story and semi-structured interviews).
- Dataset #5: One case study, consisting of two 2-day participant observation sessions in training sessions delivered by the French Biodynamic Agriculture Movement (MABD) and addressing experienced farmers converting to biodynamic agriculture (participant observation, informal interviews of trainers and trainees).

The respondents were interviewed mainly about the process through which they have been learning the practice and knowledge of organic farming (in some cases, biodynamic farming). The interviews focused on their life histories and their motivations for turning to organic (or biodynamic) farming. After having identified some critical learning areas, in the overall process of learning organic farming, mainly through participant observation or critical incident interviews, they were asked to describe their learning process in those areas. Some respondents were entirely new to farming and were directly trained to organic farming. However, most had already some experience in farming, which varied by degree. Among these respondents, some were in the process of conversion from conventional to organic farming (dataset #1), whereas others had already some experience in organic farming and were converting to biodynamic agriculture (datasets #2 and #5). Some others had already some experience in organic farming (datasets #1, #2, and #5) or even in biodynamic agriculture (dataset #4). So, in these ways, it was a range of learning trajectories across the informants. In the five samples, various areas of farming are represented: livestock farming (cows, sheep, and goats), mixed farming, market gardening, and wine growing.

15.2.2 A (Partly) Different Body of Knowledge and Practice

Although some continuities exist between conventional and organic farming, we are dealing here with a body of professional knowledge and practice that is primarily novel. In some respects, organic farming represents a clean break from the currently prevailing conventional agriculture in terms of knowledge, techniques, practices, social organization of work, equipment, system of values, etc. This is even truer for biodynamic agriculture. Therefore, traditional intra-family and intergenerational transmission can no longer operate as in contexts that are less dynamic such as the one studied by Delbos and Jorion. At least to some extent, novices here have to find out relevant models by themselves.

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[9] Study conducted in collaboration with the French Biodynamic Agriculture Movement (MABD).

> So, the idea is rather to <u>try to find</u> people who do it very well, who have understood, who do the best, and to discuss with those people to see how one can make progress. (Antoine, l. 130–132, we underline)

In the case of children of parents in conventional farming, the situation is even more complicated to the extent that the break in terms of professional practice (from conventional to organic farming) represents a break in their relationship with their parents. In this case, choosing to turn to organic farming is a way to assert individuality from parents' practices, which may have consequences in terms of identity. Isabelle is a novice farmer who has taken over her father's farm after his death. As she puts it:

> My objective, my thought at that time [when she took over the family farm], it was to say to myself: I am taking the farm, I do as my father does. In his time that was working, so I will do it like him. (Isabelle, l. 17–18). (...) I am glad because, on the one hand, everybody assimilates me to my father: « Hey, here is the G. [family name] daughter ». I am my father's daughter. And maybe unconsciously I wanted to break this image. I am Isabelle G. I will do differently from my father. I am no longer following his footsteps. I am glad because it's me, it's my work. It is no longer my father's genetics. It's me who jumps into the venture. (Isabelle, l. 96–104)

What makes things more difficult in that case is that most often some items are indeed transmitted from parents to children (e.g., land, equipment, basic knowledge, etc.) making the latter indebted to the former. In the case of conversion to biodynamic agriculture, the situation is even more dramatic as not only it involves a body of knowledge and practice that is even more discrepant from conventional agriculture, but this form of agriculture is often socially denigrated among farmers (i.e., it is often stereotyped as a sectarian, esoteric practice). All those elements make mere reproduction virtually impossible, hence opening the way to individuation.

15.2.3 An Open Body of Knowledge and Practice

In addition to being novel, this body of knowledge and practice is also quite open and diverse. In this area today, there is nothing such as a "one best way." We, therefore, observe a context characterized by a "multiple modeling." What is called "organic agriculture" actually consists of quite different established trends: "biodynamic agriculture" (R. Steiner), "permaculture" (B. Mollison & D. Holmgren), "conservation agriculture," "natural agriculture" (M. Fukuoka), "Michel Sencier method," etc. Moreover, many "hybrid" practices can be found in the field, combining features from these different approaches.

In the case of conversion to biodynamic agriculture, we were expecting a different picture. Much of the theoretical and philosophical foundation of this approach is codified and formalized, directly referring to Rudolf Steiner's main reference book in this area (Steiner 2006); several practices – although with some variations – appear quite standard (e.g., typically the so-called biodynamic

preparations intended to improve manuring of soil and compost). Therefore, we could expect that conversion to this approach to farming, even though representing a major break from conventional agriculture, would imply conformity to an alternative orthodoxy. However, the observed reality appears quite different. First of all, when taking a closer look, and we could see that practices and underpinning beliefs appeared far more diversified within this approach than it first seems. For example, in the training session (dataset #5), we observed two trainers supporting two opposite methods of composting. In dataset #4, some interviewees explained in details several major differences in the biodynamic approach as implemented in Western and in Eastern (German-speaking) Switzerland, following a philosophical split that occurred after Steiner's death and has lasted since then. It could, therefore, be hypothesized that novices' exposure to a wide variety of potential model of identification is conducive to processes of individuation.

Moreover, we also directly observed (dataset #5) that, in the training session, participants are often invited not to take anything for granted from what is being taught and that any suggestion has to be tried out by themselves. This was frequently confirmed by interviewees (datasets #2 and 3) and was also reported by some interviewees as a pedagogical principle asserted by Steiner himself. Participants were also taught an experimental method (based on Maria Thun's prescriptions)[10] to compare different methods of plant growing and draw their own conclusions. Again, such an explicit invitation to think for oneself is probably likely to enhance the process of individuation.

15.2.4 "Loose" vs. "Tight" Modeling

Another characteristic of the context under study possibly conducive to individuation is that it involves what we can call a "loose" modeling situation. Except for dataset #3 (consisting of students enrolled in a formal degree training program), all the respondents are judged to be typical "self-directed" learners, showing a strong engagement in both their professional choice (converting to organic farming) and hence in their learning process that engagement is directed towards achieving their professional goal. Accordingly, we also observe those respondents relying a lot on learning through trials and errors, usually combined with reflective thinking.

Although they obviously learn a lot only by personal experimentation and reflection, without specifically referring to any sort of models, they do sometimes turn to models for imitation and/or verbal transmission. However, in these cases they are either incidental models or models that they have selected and deliberately chosen to refer to: They choose the colleagues with expertise from to imitate or to ask information; or the books, journals or website they are going to consult; or else

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[10] For example (Thun 2008).

the training sessions (mostly short ones) they are going to attend, generally with a rather clear objective in mind.

> I have learnt simply by seeking information, by reading and searching on Internet, by discussing with colleagues. By attending a few training programs, but not so much. I attended once or twice training sessions delivered by the UNAB (a Belgian professional association for organic agriculture. It was really basic, yet interesting. (Antoine, l. 90–93)

> So if I summarize, three or four sources of learning. First, I learned through training sessions and group meetings, as with UNAB, etc. I think that it has certainly helped me become more confident for the future rather than having taught me really specific techniques. (…) The second source, I would say, is self-directed learning through Internet, research and readings. The third is really learning through trials and errors in the field or in the stable. By learning through experience, one tries out something, one makes progress, one gradually feels things better. And the fourth source is more recent. It is the visits paid to farmers who are a reference in the area. (Antoine, l. 148–191)

What we clearly observed in dataset #1 is that learners are strongly committed to their professional goals. They combine various sources of information in their learning process (e.g., observation, personal trials and errors, verbal information) and also are seeking interactions with peers and experts of all kinds. Also, when they imitate a model, it is usually a model that they have deliberately chosen and want to exert some form of critical, reflective thinking that make them decide what they will eventually keep from the model for their own practice or what they will ultimately reject. They never give the impression to be totally enclosed within a particular way of thinking or practicing imposed by such models. This observation can be related to another structural characteristic of the context under study. That is, these individuals are all self-employed, have to take full responsibility of their choices and consequences (including financial ones), and already have some professional and life experience behind them. This context is, of course, very different from the context of initial vocational training (as in dataset #3, implying a situation of relatively strong modeling: formal courses and supervised practical internships, with formal summative evaluation and certification, addressing mostly younger learners[11]).

15.2.5 A Loosely Defined Community of Practice

Another striking characteristic of the context under study here, which is also likely to contribute to individuation, is that it stages what we can call a "loosely defined professional community of practice." As opposed, for example, to the transmission

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[11] Although in dataset #3 students are mostly young adults, with already some life and professional experience background (although most often outside agriculture), who are mostly too in a self-directed learning process, having deliberately made the choice to shift to the vocation of organic farming, based on strong social and personal values.

context studied by Delbos and Jorion, transmission is not confined to the family circle. Even in the case of farmers' children, as they are shifting to an alternative model of agriculture to the one practiced by their parents, they have to turn (at least partly) to other models, other sources of learning, outside their family. On the other hand, it cannot be said either that they leave their family to find another, homogeneous, closed community of practice. As already pointed out, the world of "organic farming" is quite diversified, heterogeneous, loosely structured, not only in terms of knowledge and practice, but also in terms of social network. Even in the case of biodynamic agriculture, which has its own specific associations, training provision, professional federation, quality label and certification, etc., the social network for the novice entering this new world remains relatively loose. We observe novices seeking help, counseling, information, and training from different sources, not necessarily within the "biodynamic" community, while this community itself remains, to some extent, also diversified and heterogeneous. Beyond that, to a large extent, farming remains a quite individual (or family) occupation. Of course, it is easy to identify a social network gravitating around individual farmers, but it appears to be mainly an ad hoc network (e.g., peers, parents, technicians from firms selling equipment, seeds, machinery, cattle food; various trainers or supervisors from professional associations, quality control inspectors, etc.), most of the time constituted by farmers, rather than a really established, preexisting, homogeneous, self-organized community of practice.

15.2.6 A Context Largely Conducive to Individuation

In conclusion, the above observations point to several contextual factors likely to contribute to the individuation process in the case of professional transmission.

1. Organic farming is an "emerging" profession, characterized by a body of knowledge and practice that represent a significant (although not total) break from the prevailing current model (conventional farming). This situation disrupts the traditional intergenerational transmission mechanisms and to some extent prevents the learners from (entirely) relying on their "natural" traditional models.
2. This body of knowledge and practice itself is quite diverse and heterogeneous ("multiple modeling"), actually forcing the individual learners to invent, to "tinker" with their own way.
3. It is also a context of "loose" modeling, with novices behaving as "self-directed" learners, learning quite a lot of their new vocation from their own experimentation, through trials and errors coupled with rather systematic reflective thinking, and learning sometimes from imitation and verbal transmission (i.e., through direct supervision, training, reading, or the Internet). In those cases, however, they learn mainly from models to which they have deliberately chosen to turn,

and imitation is most of the time associated with personal experimentation and reflective thinking.

4. Finally, in this context no preexisting, clearly identified "community of practice" was identified but, instead, a loose and very diverse social network that individual and self-employed novices have gradually built up.

It is, therefore, not surprising at all that we can find signs of individuation at the core of the learning process reported by most of our respondents, in several respects:

1. In terms of identity and affect, for example, remember Isabelle's saying above:

   I am Isabelle G. I will do differently from my father. I am no longer following his footsteps. I am glad because it's me, it's my work. It is no longer my father's genetics. It's me who jumps into the venture. (Isabelle, dataset #1, L. 96–104).

2. At a behavioral level, individuation concerns personal professional practices, as, for example, when Antoine explains that he never duplicates exactly what he has observed from others:

   I do not stupidly copy anyone, I take what I want. I am not bound to do exactly what the others do. I do it my own way, because each farm is different. There is no single recipe that works for all … it's more complex than that. (Antoine, l. 135–140)

   … Well, you watch how the others do, and then you wonder whether it is applicable in your case or not, and if so, what lessons can be learnt from what is done there. (ibid., l. 219–221)

   … In any case, I have again much explored that by myself (ibid., l. 493–499)

   Likewise, Christian criticizes a training program for imposing one single method and explains that he took from it only what he felt to be relevant.

   I attended only 2 or 3 (training) sessions. I took only what I found relevant for me, without entering what I saw as a dictatorship, in the sense that there was only one thing to do, that is, the one they were proposing, … (Christian, l. 153–161)

3. At a cognitive level, individuation is also about learning to think by oneself. As Christian again puts it:

   Before (in conventional agriculture), one did not think. Then, afterward, one had to start thinking by oneself and look at the crop in itself. (Christian, l. 169–171).

   Tony expresses the same idea when he says:

   Then we look for ideas somewhere else, I am still open-minded. I am not enclosed in one single specific thing. (Tony, l. 208–211)

The organic farming study highlights the importance of contextual factors for the individuation process when learning a profession. This does not, of course, mean that microlevel factors did not play an equally important role. Indeed, the evidence suggests that individual dispositions (e.g., engagement and motivation, self-determination, self-confidence, independent thinking, open-mindedness, reflective and critical thinking capacity, etc.) or factors are related to interactions with expert models (like those examined below). Instead, our intention at this point is simply to show that beyond those microlevel factors, the broader transmission context itself

may be more or less conducive to individuation. In this case, emerging body of professional knowledge, loose and multiple modeling, and loosely defined community of practice were pointed out as facilitating factors. But how could individuation operate in contexts that do not have all of those features? This is what we will see in the next study. This will also give us the opportunity to highlight microlevel factors that may operate as facilitators of the individuation process, in a context that may appear at first glance as less conducive. Finally, the next study allows us to characterize the individuation process itself in more details.

15.3   Microlevel Factors of Individuation: The Psychology Students Study

The second study focuses on a transmission context that differs from the first one in several respects. It is about young students enrolled in a master's degree program in developmental psychology, combining university theoretical courses and practical internships in clinical consultation services.

Thus, we are not dealing here with what we could call an "emerging profession," as was the case with organic agriculture. Thus, although professional models are also multiple (as various psychological theoretical and clinical orientations are indeed represented in the curriculum provision: psychoanalytical, cognitive-behavioral, and systemic models), they are so to a lesser extent than in the organic farming case. Moreover, these models are far more formalized and codified than was the case in organic agriculture. Modeling is also much tighter as we are dealing here with a formal degree-bearing program, with formal evaluation (both formative and summative), formal courses, formal supervision of internships, etc. The learners in this case are young students, most of them coming directly from secondary school, with no or little professional experience background. Finally, the clinical psychology profession is far more institutionalized and socially structured; hence, the community of practice is more clearly delimited and formalized, both in terms of profession (as the students can experience it in their practical internships) and in terms of training community.

The study is part of a doctoral research project on the individuation ("subjectivation") process (Richard and Wainrib 2006; Kaës and Desvignes 2011) and the training conditions that may contribute to this process when learning to be a developmental psychologist. In this section, a more detailed account of the individuation process is advanced in that it identifies some of the dimensions that characterize this process. We will see that other dimensions could be identified from the data beyond the dependence-independence dimension mentioned so far. As a second step, two factors that appeared to play a key role in the individuation process are given special attention. These are the supervisor-student relationship and the student peer group. As with the first study, this one is currently still in progress. However, the preliminary results provide relevant insights on the questions raised in this chapter.

15.3.1   Research Method and Setting

The master's program under study is delivered by a university in Switzerland. It provides professional training in counseling and psychological assessment, including university-based theoretical courses, practical internships, and both individual and collective guidance. The internships are enacted in a university-related clinical consultation unit, which provides assessments of children, teenagers, and their families. Those internships represent the first contact with a real workplace in their area, for many of these students. Each student is supervised by at least two different trainers, one every semester, from different theoretical backgrounds.

A total of eight students were followed up for 1 year. Each was interviewed four times during the 2013–2014 academic year (once in the beginning and once in the end of the first and the second semester), using the same interview guide. In those semi-structured interviews, respondents were requested to talk about their training experience and their perceptions and thoughts on issues such as their relationships with their tutors, the relationships within the peer group and the communication climate (i.e., feelings of safety in participating in discussions, expressing assumptions and criticism in the group, etc.), the feelings related to their entry into the clinical activity and the relation with patients, and the role of the training organizational setting in their learning. In addition, all the tutors and trainers were also interviewed on the training framework and their intentions and values underlying their interventions in the training process (48 interviews in total).

The main researcher also spent about 1 day a week during the two semesters of the academic year, conducting ethnographic direct observation of different activities: clinical sessions with the patients, group discussion sessions for preparing or debriefing of these sessions, and clinical presentations, under the supervision of the trainer. The observations collected helped build a complex account of the training environment, the organizational work, and the affective climate (Arborio and Fournier 2008). They were also useful to integrate and organize into a hierarchy the narrative content of the interviews.

15.3.2   Observed Dimensions of the Individuation Process

Our initial qualitative analysis of the student cases highlighted four main dimensions of the individuation process: not only transition from dependence to autonomy (on an affective, cognitive, and identity level) as already highlighted in the organic farming study, but also transition towards a higher capacity to contain and regulate affective tensions, transition towards a more realistic idea of the profession, and transition towards increased self-agency.

15.3.2.1 Transition from Dependence to Autonomy

On the affective level, at the beginning of the training, the students are in a strong affective dependence relationship to the trainer and the group, in proportion to their feeling of helplessness:

> I like the idea of a general cohesion inside the group, I would like us to be solidary and follow the same outlines [. . .] I feel like an infant and we all are still like babies. . . we have to take the plunge. (Thérèse, l. 81 [. . .] l.102, 1st interview)

We observed that the initial need of fusion with the group and exclusivity with the trainer gradually decreases over time, with a growing concern for establishing the "right" interpersonal distance towards these "significant others."

On the cognitive level, the challenges of the training for learners are to abandon the initial mental dependence, in terms of adhesiveness, and build personal ways of thinking, for example, about the theoretical assumptions held in clinical situations. The confrontation to multiple models may create some tensions but also allows learners to build representation and become the "author" of their own ideas.

> This semester has a different dynamic with the new trainer, he has another way of thinking, another way of <u>making us think</u> [we underline], and this is what I find very interesting and improving. (Thérèse, l. 17, 3rd interview)

On the identity level, we observed how students' self-concept as a "good" professional was very much depending on the recognition and the judgment by significant others (e.g., trainers, peer groups, and patients) about themselves. This transition from conformity to some degree of self-acknowledgment of their legitimacy as a future-psychologist was confirmed in the interviews.

> At the beginning, it hasn't been easy, I thought I wasn't up to it, or I was telling inappropriate things in the group. . . as I told you at the beginning, I felt that it was difficult to really understand what the trainer was thinking . . . but it ended well, when I realized it wasn't against me (. . .). (Thérèse, l. 28, 4th Interview)

15.3.2.2 Transition Towards a Higher Capacity to Contain and Regulate Affective Tensions

Over the academic year, some significant variations in the capacity of the students to perceive and tolerate their feelings of anxiety and distress related to multiple training situations were observed, particularly regarding the understanding of what occurred in the clinical sessions. The students became more ready to make sense of their own functioning in the training situation. Being able to contain states of mind and to decrease their defensive functioning opened new possibilities for thinking in a more elaborated and symbolic way (Bion 1962, 1992).

> [During the group discussion], I was able to bring the idea that the misogynist aspect of the father in his relationship to his daughter particularly resonated in me and brought me to be over-reactive. . . That's why I spoke about some personal aspects in the training group, and I understood afterwards my stress during the clinical session. . . I was glad that I could tell it when I realized it was linked [. . .] and it would be stupid to deny it. (Thérèse, l. 113, 4th Interview)

15.3.2.3 Transition Towards a More Realistic Idea of the Profession

Through the year of training, we observed an interesting evolution of the students in their representation of the profession, in relation to their first steps in the practice. They started with a quite strong initial idealized idea of what a psychologist should be or do, based exclusively on what was learned at the university. Consequently, in the first practical experience, the students put themselves under a great pressure, and then some of them faced great disillusions by perceiving new conflicts, in many training situations. The elaboration of the conflicting areas resulted in a more realistic reconfiguration of the expectations and in valuation of a different mental functioning.

> This is something I find very difficult, when you want to convey a message to the patient, and you don't find the rights words to make you clear as you would wish, this is so frustrating! I 'm having trouble to accept it, to let go, to tell to myself: "you did what you could, now it's not your responsibility any more" this is still very difficult for me [...] but it's also reassuring to hear that I'm not the only one thinking like this and that other psychologists are also crossing this thoughts and having the same questionings, yes, it's really comforting for me! [she laughs]. (Thérèse, l. 233, 4th Interview)

15.3.2.4 Transition Towards Increased Self-Agency

At a behavioral level, it appeared that students moved from an initial quite passive attitude to a better ability to do things by themselves, assuming their own responsibilities, taking the floor, feeling more free to move in their bearing, and feeling less tired. The explanation of this in the interview confirmed the increased feeling of legitimacy and the rising room for maneuver.

> Today, I answered to the trainer's joke and for me it's a great progress ... to think that now, I can answer on the same tone! I must confess, at the beginning, I would have never [we underline] enabled myself to do so... well... I think you saw it...! But then again, I said to myself: "come on, go ahead! There is no reason why he should authorize himself to joke like this and you shouldn't! (Thérèse, l. 180, 4th Interview)

15.3.3 Factors of Individuation

Two factors of the process of individuation became the focus of the findings from the interviews. These are the relationships between the trainer and trainee and also the role of peer groups. These two factors are now discussed.

15.3.3.1 Trainer-Trainee Relationships

This relationship appeared to be an important factor of individuation for these psychology students. In reference to the work of psychoanalysts about the teacher-learner relationship (de Villers 1999; Delannoy 1997), we suggest that

the individuation process operates through a twofold identification movement that unfolds like the transference process in the psychoanalytical cure and requires a "good enough" environment.

(1) In the first step, the trainee should have the possibility to identify with the trainer (the "master" figure), and just like in Delbos and Jorion's study, the apprentice identifies with his father as he looks at him with the idea in mind that one day he (the son) would be in his (father's) place. Such identification can initially be quite symbiotic and strongly mimetic, especially when there is only one single model available. So a student, describing her trainer in the first semester, would say:

> He is so human and nice, I'm happy that he is my trainer, instead of trainer 2, because he is present, smiling, and he listens to us... I like how he works because it's also my way of working! (Thérèse, l. 45, 1st interview)

(2) From then, learners' identification with trainers can gradually be transformed into identification to the knowledge transmitted by trainers. This process, at the core of any educational relationship, can operate only under certain conditions.

On the trainers' side, it is essential not to be completely identified with the knowledge to be transmitted. Instead it is important to find the right balance between authentic engagement in the knowledge transmitted and non-identification to it (Delannoy 1997). This balance is necessary for enabling learners at a certain point to achieve a separation between the transmitter as a person and what this person transmits. For instance, learners should gradually be able to feel comfortable in questioning the transmitted knowledge, without fearing that trainers believe they are being invalidated or threatened through by such questioning. It also requires that trainers do not seek a narcissistic reward from their seduction power over students, but rather from their ability to make students find their own way through learning. In other words, trainers must not seek a narcissistic enjoyment from having the learner (and hence, learning) realized through the seduction of an idealized relationship. Likewise, the trainers should be able to accept, but also to recognize, support, and enhance learners' gradual differentiation from them, as singular individuals. This implies trainers' connection to their primary aspiration, which is supposed to be passing on knowledge and skills and enabling students to succeed. It also requires that the knowledge transmitted is not presented as a "monolithic" body, but on the contrary as including various possible points of views, if not areas of shadows, doubts, and uncertainty.

> For example, during the second semester we observed how Aude submitted to the peer group an article about language disorders that she found interesting. This article was, written by a child psychoanalyst whom had not been referred to by any of her supervisors and who was from a different theoretical background from them. Her supervisors mentioned it and added that they did not particularly appreciate that author. Nonetheless, Aude accepted their criticism, maintained her choice and confirmed during the interview that she and some of her colleagues enjoyed the article very much.

On the learners' side, this individuation process requires students to have the self-confidence to be able to detach from trainer, at some point, and not to consider the latter as a single model or identification figure. This process and the conditions

mentioned above appear very strikingly in our study with the psychology students, both from our direct observation of the supervisor-students relationship (in face-to-face or group supervision sessions) and from our individual interviews of the supervisors and the students, since they clearly express their mutual search for the "right" interpersonal distance. As in a virtuous circle, the understanding of the identification dynamics appears to consent to both the partners of the training relationship to foster their personal development (Hatchuel, 2005).

> I feel more comfortable to tell what was difficult for me with supervisor 2, maybe because the meeting with supervisor 1 was at the very beginning of my training (. . .) At the time, he told us to contradict him, but it was difficult for us because we had no ideas of what to say about the patients' problems (. . .) Plus, he was the one who was going to evaluate us (. . .) and this was difficult (. . .) Today I don't think of the evaluation so much (. . .). (Brigitte, l. 176, 3rd interview)

15.3.3.2 Role of the Peer Group

In the psychology students' individuation processes, their peer group seems to play a key role. Kaës & Desvignes (2011) showed that the group has a specific psychic life and functioning, so that members of a work or a training group, characterized by a common purpose, have unconscious alliances through identification dynamics that can be more or less supportive to individuation. According to this author, these alliances may have two functions. They can have a structuring function (as a psychological containing function) manifested by benevolent and positive exchanges that enable the process of thinking and transforming, allowing learners to rely on these alliances when building individuation. However, alliances can also have a defensive function, which may be manifested by aggressive or enigmatic exchanges and, thereby, can become an obstacle for the introjection of changes.

> In the second semester, I was frustrated in the group (. . .) particularly with my colleague P.. I had the feeling that I had to make many concessions to her, and it wasn't easy (. . .) P. didn't want to write the clinical protocols together with me, but then I had to correct hers, since they where full of grammatical mistakes (. . .) I made many efforts and I found it hard that she didn't recognize it. P., she is very . . . Well, we are very different; she doesn't let her emotion appear. . . (. . .) Maybe I am too emotional, but I had the feeling that she didn't want to share with me, and also in the group, she wouldn't speak much about how she felt. Then, during the clinical sessions, she took most of the time with the patients, leaving me very little time to speak and this was so frustrating! (. . .) We spoke about it privately because I didn't want to point at her in a group situation. . . But I experienced two very different groups. . . I went from the fusion of the first semester to a group, in the second semester, where we didn't have anything in common! (Brigitte, l. 287, 4th interview)

The group is a major source of social support, but also a source of multiple potential models. This is particularly important in the workplace, where the novice can find other potential identification figures among the "expert" colleagues, outside the supervisor, trainer, or mentor. Now, as already pointed out by Bandura (1977) and already observed in the organic farming study, the availability of multiple – if not conflicting – models equally credible and legitimate in the learners'

eyes may clearly facilitate the individuation process. In this respect, more generally, all sources of potential tensions and discrepancies between potential models provided to students (as, e.g., in block release vocational training) may have a strong constructive effect, in terms of their individuation.

In a way, when learners are confronted with multiple, discrepant models, yet equally legitimate, they have no choice but to find personal ways of constructing what the experience is, as uncomfortable and insecure it may seem. In our study with psychology students, such discrepancies may occur between the university setting (courses), the supervision setting, and the workplace setting, as well as among the supervisors themselves, and we have (self-reported) evidence of the constructive effect of such a disparity, in acceding to a more complex thought. At the end of the training, for example, the same student above says:

> My relation with trainer 2 is different then the one I had with trainer 1, who was also interesting, but in a different way... this semester was more challenging on a personal and relational level... the relationship with the patient was one of the aspects I didn't work through in the first semester, where I concentrated on learning the psychological tests... it was useful to learn how to do an assessment, and then again it was coherent to start with this aspect and then be more introspective, because that's the level trainer 2 asked us to work and think about in the second semester. (Thérèse, l. 15, 4th interview)

We also observed that the peer group helps the individual learner to withstand the frustration of not understanding immediately, which happened in the clinical session, for example, and establishes a more appropriate distance between her and the trainer's interpretations and suggestions. The capacity of taking in new knowledge is related to the trust of keeping the mind open, while understanding that it is not immediate (Salzberger-Wittenberg et al. 1983). We observed that all the learners were highly motivated. That is, their appetite and curiosity for novelty were stimulated by the new practice they were looking for and by attending this training program. Nevertheless, we observed different degrees between a more introvert and extrovert style in the approach with the new activity and in sharing their thoughts.

> I think I feel more free in the group to tell my emotions, it wasn't like this in the last semester, maybe because I felt some tensions and did not feel comfortable to speak about some difficult aspects in the group. Our new group is more welcoming and open... I like that we all are, more or less, on the same level, there is a kind of equality that I appreciate, so I tell to myself: "don't worry, if you say a damn-fool thing, nobody cares! You won't be judged!" and this helps me to share with them the feelings I have (...). (Thérèse, l. 176, 3rd interview)

15.4 Conclusion

The issue of individuation is at the core of a remarkable paradox of any educational enterprise.[12] At the outset, such an enterprise is necessarily based on a dependence relationship of learners to educators, but at the same time this relationship is meant

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[12] For an extensive discussion of this paradox, see Meirieu (2013).

to eventually lead to learners' autonomy. No education can take place if the learners' autonomy cannot eventually be achieved; otherwise, education would be only inculcation or brainwashing. However, it should be noted that such autonomy could never be built and achieved outside of/or without such a once dependence-based relationship. Likewise, in the context of vocational or professional education, novice professionals will never be able to stand out as differentiated individuals (i.e., to "individuate") if they have not first striven to master what has been produced and transmitted by others (i.e., a body of knowledge and practice historically and culturally produced by others before and outside them and transmitted through her teachers or other cultural mediators). As a famous motto says, "to break the rules, you must first master them." Or, as Sartre said, "Freedom is what you do with what's been done to you." The question of individuation points to the fact that learning is not merely a process through which individuals gradually incorporate, or assimilate, a historically and culturally body of knowledge and practices (and transforms initial schemata of knowledge and practice accordingly). This might well be the case in its earlier stages, but it is only the first part of the story. The next part is that such incorporation – under certain conditions – gradually allows for the individuation of the learner. The key question addressed in this chapter is precisely about what those conditions are. On the basis of preliminary empirical research, we have pointed out two types of factors, on the basis of some exploratory empirical work currently in progress. At the "macro" level, we have underlined the role of the nature of the professional activity to be learned. We have suggested that individuation is likely to be facilitated in the context of an "emerging" profession, whose core knowledge and practices depart from the tradition, in a context of "multiple" and "loose" modeling, as well as in a context of "loose" community of practice. At a more microlevel, we saw the important role played by the trainer-trainee relationship and the extent to which this allows for a conversion of learners' identification with trainers to personal appropriation by the former of the knowledge conveyed by the latter. We also examine various aspects of the role played by the peer group. We also highlighted four distinct dimensions of the individuation process: (1) transition from dependence to affective, cognitive, behavioral, and identity autonomy, (2) transition towards a greater capacity to contain and regulate affective tensions, (3) transition towards a more realistic representation of the profession, and (4) increased self-agency. Such an investigation of both contextual and pedagogical conditions of individuation in vocational and professional learning of course remains to be done more systematically and extensively, and the developments presented here are only a starting point in that direction.

Finally, all this discussion should not overshadow the cultural grounds of the individuation issue itself. The very idea of individuation in the context of vocational learning implies a certain vision of the relationship between the individual and the collective, and such a vision is obviously culturally bounded. In his remarkable historical account of the history of crafts, Sennett (2008) shows that the idea of an individual craftsman seeking to distinguish himself as an individual from his "community of practice" (typically, by signing his work by his name or by seeking to provide a personal interpretation of a given socially shared theme) is a novelty of

the Renaissance period. A similar argument is provided by Todorov about the Renaissance Flemish painting (Todorov 2004) and Renaissance music (Todorov et al. 2005). In the history of our Western society, the rise of "the individual" (as distinct from their reference group) is a cultural construction that gradually spread out in our society as of the Renaissance turn (Dumont 1991; Elias 1991; Flahault 2002, 2006; Todorov 2003). Interestingly enough these authors show that this individuation movement, whether in terms of phylogenesis (in our society's history) or ontogenesis (in the individual's development), could operate only to the extent that it is initially grounded in the individual's link to society.

References

Arborio, A.-M., & Fournier, P. (2008). *L'observation directe*. Paris: Armand Colin.

Bandura, A. (1977). *Social learning theory*. Upper Saddle River: Prentice-Hall.

Beghuin, F. (2014). *Les modalités d'apprentissage mobilisées par les agriculteurs lors de leur conversion vers l'agriculture biologique*. M.A. thesis, University of Louvain, Louvain-la-Neuve.

Bidet, A., & Macé, M. (2011). S'individuer, s'émanciper, risquer un style (autour de Simondon). In A. Caillé (Ed.), *Emancipation, individuation, subjectivation. Revue du MAUSS n° 38* (pp. 269–284). Paris: La Découverte MAUSS. Mauss.

Bion, W. R. (1962). *Aux sources de l'expérience*. Paris: P.U.F.

Bion, W. R. (1992). *Cogitations: New extended edition*. Stylus Publishing, LLC.

Burnay, N. (Ed.). (2011). *Transmission, mémoire et reconnaissance*. Fribourg: Presses Universitaires de Fribourg.

Burnay, N., & Klein, A. (Eds.). (2009). *Figures contemporaines de la transmission*. Namur: Presses Universitaires de Namur.

Caillé, A. (Ed.). (2011). *Emancipation, individuation, subjectivation. Revue du MAUSS n° 38*. Paris: La Découverte MAUSS.

Dardot, P. (2011). La subjectivation à l'épreuve de la partition individu-collectif. In A. Caillé (Ed.), *Emancipation, individuation, subjectivation. Revue du MAUSS n° 38* (pp. 187–210). Paris: La Découverte MAUSS.

de Villers, G. (1999). Le sujet divisé et le désir de formation. In E. Bourgeois & J. Nizet (Eds.), *Regards croisés sur l'expérience de formation* (pp. 81–107). Paris: L'Harmattan.

Delannoy, C. (1997). *La motivation. Désir de savoir, désir d'apprendre*. Paris: Hachette.

Delbos, G., & Jorion, P. (1984). *La transmission des savoirs*. Paris: Editions de la Maison des Sciences de l'Homme.

Dolbeau, M. (2009). Dualité des savoirs et pratiques de maréchalerie : entre rupture et transmission. In N. Burnay & A. Klein (Eds.), *Figures contemporaines de la transmission* (pp. 297–313). Namur: Presses Universitaires de Namur.

Dolbeau, M. (2012). *La mémoire du métier. Maréchal-ferrant : un passé retrouvé*. Paris: L'Harmattan.

Dumont, L. (1991). *Essai sur l'individualisme. Une perspective anthropologique sur l'idéologie moderne*. Paris: Seuil.

Elias, N. (1991). *La société des individus*. Paris: Fayard.

Flahault, F. (2002). *Le sentiment d'exister*. Paris: Descartes & Cie.

Flahault, F. (2006). *Be yourself !* Paris: Fayard.

Hatchuel, F. (2005). *Savoir, apprendre, transmettre*. Paris: La Découverte.

Kaës, R., & Desvignes, C. (2011). *Le travail psychique de la formation*. Paris: Dunod.

Lave, J., & Wenger, E. (1991). *Situated learning. legitimate peripheral participation*. Cambridge: Cambridge University Press.

Mahler, M. S. (2000). *The psychological birth of the human infant: Symbiosis and individuation*. New York: Basic Books.

Meirieu, P. (2013). *Frankenstein pédagogue* (13th ed.). Paris: ESF.

Nizet, J., Van Dam, D., & Dejardin, M. (2009). Les limites de la transmission familiale chez les viticulteurs bio alsaciens. In N. Burnay & A. Klein (Eds.), *Figures contemporaines de la transmission* (pp. 347–358). Namur: Presses Universitaires de Namur.

Podolinsky, A. (1985). *Biodynamic agriculture. Introductory lectures* (Vol. 1). Sydney: Gavemer Publishing.

Richard, F., & Wainrib, S. (2006). *La subjectivation*. Paris: Dunod.

Rogoff, B. (1990). *Apprenticeship in thinking: Cognitive development in social context*. New York: Oxford University Press.

Rogoff, B. (1995). Observing sociocultural activity on three planes: Participatory appropriation, guided participation and apprenticeship. In J. Wertsch, P. Del Rio, & A. Alvarez (Eds.), *Sociocultural studies of mind* (pp. 139–164). Cambridge: Cambridge University Press.

Rogoff, B., & Lave, J. (Eds.). (1984). *Everyday cognition: Its development in social context*. Cambridge, MA: Harvard University Press.

Salzberger-Wittenberg, I., Henry, G., & Osborne, E. (1983). *The emotional experience of teaching and learning*. London: Karnac.

Sennett, R. (2008). *The craftman*. New Haven: Yale University Press.

Steiner, R. (2006). *Agriculture. Fondements spirituels de la méthode bio-dynamique*. Genève: Editions Anthroposophiques Romandes.

Thun, M. (2008). *Bio-dynamie et rythmes cosmiques : Indications résultant de la recherche sur les constellations*. Colmar: MABD.

Todorov, T. (2003). *La vie commune. Essai d'anthropologie générale*. Paris: Seuil.

Todorov, T. (2004). *Eloge de l'individu. Essai sur la peinture flamande de la Renaissance*. Paris: Seuil.

Todorov, T., Legros, R., & Foccroulle, B. (Eds.). (2005). *La naissance de l'individu dans l'art*. Paris: Grasset.

Van Dam, D., Nizet, J., Dejardin, M., & Streith, M. (Eds.). (2009). *Les agriculteurs biologiques. Ruptures et innovations*. Dijon: Educagri Editions.

Wenger, E. (1998). *Communities of practice. learning, meaning and identity*. Cambridge: Cambridge University Press.

Chapter 16
On the Articulation of Training and Work: Insights from Francophone Research Traditions

Simone Volet

16.1 Introduction

The role that workplaces play as learning environments for initial and further development of vocational and professional knowledge is critical. Understanding how learning through work is most effective is imperative for the design of successful work-based learning pathways and learning opportunities for apprentices, trainees and novice workers. Such understanding is also crucial to identify work practices that are conducive to all workers' continuous learning and development, with major economic benefits for organisations.

Much of the research on workplace learning (Rainbird et al. 2004; Tynjälä 2008), learning through work (Billett 2001, 2011) and expansive learning environments (Engeström 2001; Fuller and Unwin 2004) published in English since the early 2000s has highlighted the workplace as a legitimate and significant, rich site of learning. Concepts commonly found across the Anglophone literature, such as situated learning, social practices, workplace affordances, participatory practices, individual engagement and interdependencies all stress the importance of conceptualising 'workplaces as learning spaces that are reciprocally constituted' (Billett 2004, p. 121) and learning at work as more than informal and incidental, keeping in mind that opportunities to learn through work vary across situations (Fuller et al. 2007). In this way, how participation in structured, guided and socially supported work practices can generate powerful forms of learning, and what are the ideal individual and contextual conditions for this to happen, has attracted growing research attention in recent years. Francophone perspectives on training and work,

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including ergonomics approaches, and research on professional and vocational didactics have made significant contributions to address this gap. Yet, their development and dissemination being presented mainly in French has occurred in parallel to the Anglophone research on learning through work, which has prevented earlier cross-fertilisation. This chapter examines the conceptualisation of work activity that forms the foundation of Francophone perspectives on training and work and reviews six empirical studies from these perspectives, all published in this volume.

16.2 Conceptualisation of Work Activity from Francophone Perspectives

Francophone perspectives on work activity draw from distinct, but complementary, research traditions, including French-speaking ergonomics (c.f. Daniellou 2005), work psychology (e.g. Leplat and Hoc 1983; Leplat and Cuny 1977; Leplat 1997), cognitive theory of learning through action (e.g. Piaget 1974; Vergnaud 1996) and Vygotskian developmental theory (Vygostky 1978). Research on professional didactics as conceptualised by Pastré and colleagues (e.g. Pastré 1999, 2008; Pastré et al. 2006[1]) as well as French-speaking ergonomics approaches to training and work (see Durand 2011) have made substantial theoretical contributions to the literature on learning at work through practice. The relatively recent dissemination of this theoretically solid body of work to Anglophone readerships (e.g. Durand 2013; Filliettaz 2013; Habboub and Lenoir 2011) is consolidating its international impact, with opportunities for future cross-fertilisation of ideas (a purpose of this volume).

Three fundamental assumptions about the nature of work activity and workplaces as legitimate sites of learning and training underpin Francophone research related to the articulation of training and work. The first two address the theoretical foundation of this research, and the third provides direction for the empirical work. Considering these assumptions is essential to grasp the unique contribution of this research tradition to the articulation of training and work. The first assumption is that actual work activity always involves adaptation and transformation and, therefore, cannot be reduced to the prescribed task. The second, directly related to the first, is that any work activity, even manual work, includes both a productive and a constructive component. The third, which capitalises on the other two, is that work activity and professional practices more generally afford the creation of rich learning opportunities for improved practices, thus for training through work.

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[1] Throughout this article, all translations from French are mine unless otherwise noted. Since translation always entails a shift in meaning, some original expressions are occasionally included in parenthesis to allow the reader a chance to check the intent of the French language.

This third assumption is at centre stage of all the empirical studies aimed at designing professional training situations and environments.

16.2.1   First Assumption: Actual Work Activity Cannot be Reduced to the Prescribed Task

The assumption that real work activity always involves an element of adaptation can be traced back to Ombredane and Faverge's (1955, cited in Daniellou 2005) early distinctions between the *what* (requirements) and the *how* (operations, sequences) of a task. In retracing the evolution of the distinction between 'real and prescribed work' to activity, Daniellou notes the emergence of the concept of activity as converging with the translation of Leontiev's work into French (1975), but also how the concept of activity was integrated by Leplat and Cuny (1977) into a framework of work conditions and consequences, where the worker's activity is given centre stage. Leplat and Cuny's emphasis on the worker's 'conduct' – used synonymously with 'activity' – was conceptualised by the authors as distinct from the 'requirements or conditions to which this conduct is subjected' (p. 55). The meaning of the term 'activity' in French-speaking ergonomics literature to capture the notion of 'real work' is in contrast to 'prescribed work', as discussed by Pastré et al. (2006), who also outline the points of differences with Engeström's (2001) activity theory.[2]

The proposal that how work is carried out always involves more than how work was prescribed – objectives, requirements and conditions – was elaborated in Leplat and Hoc's (1983) exploration of task and activity in the psychological analysis of situations. The authors cogently argued that 'the concept of a task (a goal to be attained under given conditions)' or prescribed task is only one element of the 'actual task, which springs quite often aside from a prescribed task' (p. 49), since during enaction the task is reconstructed and transformed by the individual trying to achieve what was prescribed. This constructivist, transformative perspective highlights the crucial role of the individual worker as a human 'actor' (Filliettaz 2013; Durand 2013), who adapts to the situation by engaging in subjective elaboration and reconstruction of the task through its enactment in the context of physical and social constraints.

The importance given to adaptation and transformation of both the task and the actor is reflected in a range of concepts found in Francophone research on the articulation of training and work, for example, 'engagement' to referring to how 'individual workers elect to make use of the resources afforded to them' (Filliettaz

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[2] One main point of difference for Pastré et al. (2006) is the focus on activity as a collective entity (Engeström's tradition) versus on individuals within the activity itself characterised as 'real work' people do in contrast to what the task requires or 'prescribed work' (French-speaking ergonomics tradition).

2013, p. 10), or 'appropriation' of the work situation components (Mayen 2015), or 'individuation' in the process of professional transmission (Bourgeois et al. 2015). This social constructivist approach to work activity, away from a perspective of work as requiring a simple application of knowledge and procedures, is consistent with Billett's proposal to 'recast[ing] transfer as a socio-personal process of adaptable learning' (Billett 2013a, p. 5).

For Mayen (2015), actual work is often poorly understood, since competent professional workers are often faced with diversity of complex conditions and subsequent variability in the requirements of work situations, which need to be balanced against 'the 'invariant' structural characteristics of each category of work situation'. In light of this, according to Mayen, designing training simply based on familiarity with the work and the prescribed task is not sufficient. It requires 'work situation analysis [that] is both ergonomic and didactic analysis' in nature, thus with a focus on the 'work content' and the 'training content' at the same time. Such analysis is at the core of professional didactics research, in that it aims to reveal everything professionals have to learn to 'act with', which in turn can be used as a basis for designing professional training situations.

16.2.2 Second Assumption: Any Work Activity Includes a Productive and a Constructive Component

The second assumption, related to the first, that any activity includes both a productive component (e.g. perform, execute) and a constructive component (e.g. understand, conceptualise, improve) (Chap. 11 by Durand & Poizat, this volume) and that these components cannot be separated is fundamental to address the articulation of work and training. Pastré et al. (2006) attribute the origin of this theoretical distinction to Samurçay and Rabardel (2004, cited in Pastré et al. 2006). The authors elaborate on this idea by proposing that while individuals are acting (e.g. performing a work task), they are transforming the real (albeit material, social or symbolic), which represents the productive side of the activity. At the same time, as they are transforming the real, individuals are transforming themselves, which captures the constructive side of the activity. They also note that although any productive activity is accompanied by constructive activity, 'not all trades ('métiers') are equal in this regard', and for some, 'the constructive side of the activity relatively quickly [leaving] traces that are more and more invisible' (p. 155). This leads the authors to conclude that not only 'there is no activity without learning' but also, and of direct relevance to training, constructive activity can continue and be extended well after the action is completed, 'especially when the person comes back on a past action through reflexive analysis to rethink ('reconfigure') in an effort to get increased meaning' (p. 155).

Pastré et al. (2006) also argue that the transformative dimension of task enactment is not only relevant to the field of ergonomics with its focus on improving

action but also of direct significance for professional didactics and the design of training through work. Drawing on Piagetian's epistemology theory, they call for a distinction between two key dimensions, namely, the theoretical dimension associated with the cognitive representation of the prescribed task and the operational dimension that captures the 'pragmatic conceptualisation' of the activity through action. For Pastré et al. (2006), all work, even manual work, has a conceptual dimension. A conceptualisation of work that considers production and construction simultaneously captures a notion of 'intelligence in action and for action' (Mayen 2015). Recognising the conceptual dimension of work is critical; otherwise, according to Pastré et al., there would be no understanding as to why the action was successful.

The notion of 'pragmatic conceptualisation' contributes to the valorisation of knowing in activity ('connaissance de l'activité') (Theureau 2010, p. 303), acknowledges the underestimated complexity of manual work (Ouellet and Vézina 2015) and is consistent with Mayen (2015) who claims that work always involves representation at some abstract level and is never just the application of knowledge or procedures. For Mayen, as well as Veillard (2015) and Durand and Poizat (2015), designing training based exclusively on prescribed or intended work is insufficient as it does not take into account the conceptualisation in action and for action displayed by experienced workers (as actors), as they navigate competently between influential operational invariants of work activities and flexible adaptation to the specific situation, including its embodied component (Mayen 2015). This micro-level navigation process is reminiscent of the process of individuation, conceptualised at a more macro-level as 'the process through which a novices in a given occupation gradually finds their own personal way of thinking and doing things while incorporating the knowledge and practices that are transmitted by the reference model' (Bourgeois et al. 2015).

At the core of Francophone perspectives on the articulation of work and training is, therefore, the need to 'engage in transparency breaking' of real work activity (Durand and Poizat 2015), with a view to identifying 'how experienced workers conceptualise their practice and how specific training programmes may be based on such conceptualisations' (Filliettaz 2013, p. 111). This need goes beyond identifying how the productive component of work activity is learnt (e.g. through observation and mimesis) and extends to examining how the constructive component of work activity can be made more visible for appropriation. This aspect is particularly challenging because experienced workers' pragmatic conceptualisation of and in action is inherently tacit and nonobservable as typically associated with routine practices. Yet, according to Mayen (2015), inviting the actors to respond to researchers' questions as they pursue their routine activities in actual real-life situations offers a window into their thinking in action while not changing the actors' course of activity. Furthermore, and based on the assumption that 'human activity is doubly lived', in the sense that it constitutes an 'experience for the actor' (Durand and Poizat 2015), there is a possibility to get insights into the constructive dimension of real work from a first person's perspective at a later stage, through, for example, placing the actors in a 'resituation' of their experience (Theureau 2010).

Although not elicited in a 'resituated' perspective, Bourgeois et al.'s (2015) semi-structured interviews combined with direct observations also provide insight into the structuring (or alternatively defensive) function of the peer group on learners' gradual individuation process.

Understanding and making visible the constructive dimension of enacted work activity is essential to design 'local contextual arrangements that are able to support robust learning opportunities in production conditions' (Filliettaz 2013, p. 120), thus for designing training through practice. This understanding then leads naturally to the third assumption, which has provided direction for much of the empirical work by Francophone research aimed at creating 'promising' professional learning situations (Poizat et al. 2013). This assumption is grounded in the well-established French ergonomics approach to understanding work activity and their derived interventions to improve practices (Daniellou 2005).

16.2.3   Third Assumption: Work Activity Affords the Creation of Rich Learning Opportunities for Improved Practice

The premise that work activity as characterised by the two assumptions discussed above can be construed and further constructed as a pedagogically rich learning site has been tested (explicitly or implicitly) in range of empirical studies from Francophone perspectives on work and training. This is evident in the common search for in-depth understanding of real work activity, aimed at understanding the nature of enabling environments for 'discovery and appropriation of work situation components' as training ground (Mayen 2015), with a view to 'supply[ing] knowledge and methods for use by actors in vocational education'.

For many Francophone researchers studying the articulation of training and work with a view to intervene to enhance professional learning, a fine-grained understanding of interactions during actual work activity in the context of a specific professional practice and real time is vital and represents the foundation upon which to create pedagogically rich work environments as training sites. Many researchers whose work is grounded in the French ergonomics tradition (e.g. Durand and Poizat 2015; Mayen 2015; Ouellet and Vézina 2015) have combined micro-level analyses of time-framed actions and interactions, with more holistic analyses of how learning, adaptation and transformation can be afforded through work-based production practices, especially when the pragmatic conceptualisation of effective practices is made visible. Although most real-life work situations are not designed with learning in mind, they nevertheless offer potential to induce improved actions through intervention (which is of direct interest to French-speaking ergonomics researchers, cf Daniellou 2005) and for the design of educational pathways that integrate work practices and training (the main focus of workplace professional and vocational education research). Influenced by the French ergonomics movement, Francophone perspectives on the articulation of work and training stress the importance of

creating professional learning situations as an integral part of work activity. These perspectives cannot be equated with the Anglophone situated cognition movement, since although they also recognise that 'knowledge is situated, being in part of the product of the activity, context and culture in which it is developed and used' (Brown et al. 1989, they are concerned by analysing both the ergonomic and the didactic aspects of work situations (Mayen 2015) with the view to subsequently design work and training situations that improve key specific aspects of the practice of a trade ('métier'). The ultimate focus on interventions captures the contractual arrangements under which Francophone researchers from an ergonomics perspective (e.g. Mayen 2015; Durand and Poizat 2015; also French clinical work psychologists, see Clot and Lhuilier 2010) are typically working. The combination of ethnographic observations and semi-structured interviews linked to authentic work activities have revealed the key role of trainer-learner relationship and multiple, equally credible and legitimate models on learners' process of individuation (Bourgeois et al. 2015), as well as the criticality of locally constructed curricula on learners' opportunities for participation and learning (Veillard 2015).

How empirical studies derived from these research traditions have examined the above assumptions is discussed next. A few overall considerations and common innovative methodological aspects are considered first.

16.3   Empirical Research from Francophone Perspectives on the Articulation of Work and Training

16.3.1   A Few Overall Considerations

Consistent with the fundamental assumption that any work activity includes some level of conceptualisation and adaptation, contextualisation plays a significant role and needs to be examined fully. This is the case regardless of whether the work appears mainly manual or operational and dependent on relatively minimal social interactions (e.g. Mayen's curb workers, Durand and Poizat's radiographers) or whether the work is inherently interactive and involves the interpretation of multiple technical and social aspects (e.g. Mayen's home care workers; Filliettaz, Durand and Trébert's early childhood educators; Ouellet and Vézina's meat workers; Veillard's engineering apprentices), which extends to interpretations in the perspective of an emerging professional community (Bourgeois et al.'s organic farmers). Considering a wide range of applied work environments for empirically grounded case studies and cross-case analysis is noteworthy. It would need to be expanded and become the subject of analysis in order to derive general principles to guide the development of educational and training pathways. This approach has been stressed by Fuller et al. (2007) as necessary to provide 'evidence of the different ways in which knowledge (of all types) is constructed, distributed and put to use within the context of a productive [workplace] system' (p. 757). Cross-

fertilisation of research on professional didactics with other bodies of literature concerned with issues related to learning through practice (e.g. Billett 2001) has already lead to integration of new concepts, such as affordances in Filliettaz's work (Filliettaz 2013; Filliettaz et al. 2015).

The influence of the French-speaking ergonomics' fine-grained, but also holistic, contextualised approach to the study of work activity is strong across all the empirical work exploring the articulation of work and training. For ergonomics researchers, work activity encompasses everything related to the 'worker's conduct' as well as the 'work conditions to which this conduct is subjected to and to which it replies' (Leplat and Cuny 1977, p. 55) that involves critical social dimensions. Consistent with the purpose of ergonomic intervention to make recommendations as to how work practices could be improved to address work-related dysfunctions, many empirical studies aim to identify how work and professional practices could be improved to maximise training through practice.

Another influence of French-speaking ergonomics research is the cross-studies emphasis on optimising the training potential of work environments, in such a way that the whole activity (which includes all participants) is more effective. This approach is consistent with the emergence of professional didactics as an extension of adult continuing education. For Pastré et al. (2006), professional didactics has developed out of the learning needs of adults, which they argue is in the context of work. For the authors, the social context of work in which adult learning takes place is essential and contrasts with the decontextualised learning taking place in schools. Although most empirical studies examining how to enhance professional learning target young people's development of appropriate work competence and practices (i.e. initial professional and vocational education) or the transformation of novices into experts (i.e. typical of professional development and retraining), the gist of the approach focusing on optimising the training affordances of the environment and individual engagement has wide applicability for a perspective of adult lifelong learning. This approach is consistent with Billett's sociocultural proposal for the development of a workplace curriculum that is grounded in a 'science of learning through practice' (2006, 2013b), rather than prescribed for subsequent implementation in practice (which would single out inexperienced trainees and apprentices).

16.3.2 Common Innovative Methodological Aspects

A few common methodological approaches of empirical studies from Francophone perspectives on work and training are noted: researchers' immersion in the research site to address an externally identified issue related to the articulation of training and work, collection and analysis of traces of actors' actual interactions in real-life work context and self-confrontation with the activity as complementary method to observation of activity.

Consistent with French ergonomics research, where the in-depth ethnographic work leading to a proposed intervention for improving specific professional

practices is undertaken as part of contract work, Francophone research exploring the articulation of work and training is typically undertaken following external requests. This means that *deep immersion into the research site* is an imperative requirement since linked to contractual nature of the work. Although few studies involve the depth of immersion adopted by Marchand (2008) in his long-term anthropological fieldwork with minaret builders, mud masons and fine-woodwork trainees, there is a noticeable effort by Francophone researchers to develop familiarity and sometimes even personal experience of the multifaceted aspects of the target activity. This is reflected in the researchers' extensive, durable presence in the work environment and their multiple forms of interactions with the different actors. Although all empirical work undertaken in real-life situations requires some degree of immersion in the research site, the need to incorporate the design of interventions as an integral part of the research places greater demand on researchers to build the necessary trust to secure vital collaboration with practitioners. Furthermore, immersion appears to privilege situations where the key interactants have to coordinate their engagement and reciprocally interpret each other's positioning and understanding to complete a specific joint activity successfully.

Consistent with work analysis as the first step towards designing training is the collection of *traces of work activity*, aimed at capturing the interactive, relational, socially situated and evolving nature of this phenomenon in its local dynamicity (Filliettaz et al. 2015). Data sources invariably involve a combination of observations and interviews (also document analysis)[3] and, whenever possible, video recordings of actual work practices (Durand and Poizat 2015; Filliettaz et al. 2015; Mayen 2015). The importance of collecting intact traces of the interactive and dynamic nature of work activities is to enable subsequent multiple layers of detailed interaction analyses. Trace data are frequently used as research tools to induce actors' engagement in 'auto-confrontation with their own activity' (or 'remise en situation', Theureau 2010, p. 288) or other self-controntation methods aimed at accessing actors' conceptualisation of their course of action. Such methods target either pre-reflexive, not transformed conceptualisation in action, for example, think aloud verbalisations, or expressed experience during or just after an activity, as illustrated in Durand and Poizat's study of a radiographer (2015), or reflexive, transformed through 'prise de conscience' conceptualisation of action (as illustrated in Mayen's research with sidewalk curbs workers in this volume), or a combination of both as advocated by Theureau (2010) and illustrated in an empirical research on real-life music composition (Donin and Theureau 2007).

Gaining access to workers' conceptualisation, perception or meaning of their course of action in specific work situations is a key concern of Francophone researchers interested in the articulation of work and training. The *self-confrontation method* articulated by Theureau (2010) is one example of original

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[3] All studies published in this volume use multiple data sources and methods of analysis.

methodological contribution to the empirical literature on training through work. It is original, in the sense that it not only differentiates conceptually and empirically between actors' reliving the experience of an activity ('resituation', carefully staged, facilitated by material traces) and their retrospective reflections and comments on that activity (also using material traces but eliciting explanation and analysis), but it stresses the complementary value of the two methods to gain insight into the enacted as well as constructed nature of work activity. The distinction between eliciting actors' experience of their cognitions and emotions in 'resituation' and prompting their retrospective reflection on the situation, as distinct tools to access mental processes during an activity, is reminiscent of an earlier theoretical case for eliciting think aloud as distinct from retrospective reports of problem-solving processes (Ericsson and Simon 1980). In the context of real-life work practices, where activities are complex and involve multiple actors and a performance agenda, 'the learners cannot do everything: avoid being overwhelmed by the dynamics of the situation and understand what is happening in order to anticipate them' (Pastré 2008, p. 21). It follows that Theureau's (2010) call for a combination of methods to gain insight into workers' course of action appears eminently suitable.

Finally, while traces of verbal and non-verbal actions and interactions during activity accompanied by actors' retrospective accounts and reflections are treated as vital to gain insight into actual work activity, they are also viewed as offering rich contextualised material for the design of interventions aimed at enhancing action (productive component), adaptation and learning (constructive component) through practice. Activity-based interventions, grounded in real-life interactional analyses, represent a highly innovative and promising new field of research on learning through work. A key feature of successful interventions is the close collaboration between researchers and professional trainers (e.g. Mayen 2015; Filliettaz et al. 2015), who are joining forces to create socio-organisational affordances of an expansive nature for individuals to engage in (Filliettaz 2012; Fuller and Unwin 2004).

16.3.3 Empirical Research on Work Activity and Professional Practice as Enabling Training Environments

Six studies presented in this volume were selected to scrutinise the empirical evidence provided by Francophone research to support their conceptualisation of the articulation of training and work. Evidence of work activity as involving more than the prescribed task is examined in the work of Durand and Poizat (2015) and Veillard (2015), and evidence of the constructive and adaptive, alongside the productive, dimension of work activity is discussed based on studies by Mayen (2015), Bourgeois et al. (2015) and Ouellet and Vézina (2015). Filliettaz et al.'s

(2015) examination of how professional learning can be enhanced through enabling interactional participatory practices is examined last.

16.3.3.1 Work Activity as Involving More Than the Prescribed Task

Durand and Poizat's *micro-level, in-depth analysis of a radiographer's course of activity*, based on the researcher's observed actions, complemented by expressed experience and reflection during a follow-up self-confrontation interview, presents a convincing case to support the view that how work carried out in real-life situations always involves more than how it was prescribed or intended (Daniellou 2005; Leplat and Hoc 1983; Durand 2013), with implications for designing training environments. The authors' fine-grained analysis of a radiographer's enaction of the prescribed, typical procedure of taking a chest X-ray of a patient reveals clear evidence of fine-tuned adaptations in the radiographer's repertoire of actions, in regard to both technical and human aspects. While some of these adaptations could be observed directly, the full spectrum of adaptation mainly emerged in the re-enactment and expressed experience. The self-confrontation interview unveiled how the course of the activity went beyond prescribed protocol and application of standard radiography procedures (typical radiographer coupling) and displayed the 'responsible professional flexibility' that is indispensable for this type of work. According to the authors, this process was driven by the radiographer's experience of what is 'central or critical as opposed to what is peripheral or accessory' when contradictions emerge, and a compromise has to be made.

Durand and Poizat's conclusion that detailed analyses of actual work activity provide models of real work that are vital for designing training contents that are close to the actual work is well supported by the findings of their study. Yet, the meaning given to the notion of contents may need to be qualified. As demonstrated in this study, what would need to be acquired in this instance is not only an in-depth understanding of the components of the typical radiographer-environment coupling but also a capacity to display responsible professional flexibility when contradictions emerge and compromising is the only choice. The authors' analysis of the experienced radiographer's actions in situation provides strong empirical evidence that an exclusive focus on exhaustively proceduralising radiographers' actions would be limited. These findings have direct implications for designing training in service professions and may question the learning value of relying on predetermined 'training packages' in vocational education and training (Stevenson 2001).

The second study is Veillard's *meso-level examination of the gap between prescribed and real work in the context of university-corporate partnerships for designing workplace curricula*. Two contrasting case studies, directly comparing the intended, enacted and experienced curriculum, demonstrated the importance, for designers of professional and vocational education pathways that include a workplace component, of paying close attention to the unique expectations and roles of all the actors involved. At a conceptual level, each party construed the workplace curriculum for the engineering apprentice from their own perspective.

As a result, the intended curriculum (i.e. designed by the school institution and tutor), the enacted curriculum (i.e. afforded through the workplace mentor, other workers and local circumstances) and the experienced curriculum (i.e. pursued and achieved by the apprentice) did not converge. For Veillard, the paradox emerging from these contrasting cases – in one instance the intended and enacted curriculum converging but not leading to expected level of expertise and in the other the intended and enacted curriculum diverging yet reaching the desired outcome – calls for an integrated approach to designing vocational training pathways. His conclusion that the two distinct professional contexts (i.e. school, workplace) should reconsider their representation of each other's interdependent role in apprentices' educational pathways and agree on some main reference points and stages for a local construction of each workplace curriculum appears conceptually and practically sound but not easy to realise. The proposal that intended (i.e. school) and enacted (i.e. workplace) curriculum should be reconciled through negotiation and flexibility around main priorities rather than better codified is consistent with the importance given to the adaptive nature of work. This approach is also consistent with Durand and Poizat's radiographer's adjusted practice, and Mayen's home carers' selection of the most suitable course of action to achieve the overarching goals that reflect contextual circumstances.

Acknowledging the adaptive nature of enacted work activity, therefore, means recognising that actual work involves more than what *could be* included in a prescribed curriculum or imparted outside practice – a normative consideration. Billett's (2006) call for the constitution of a legitimate, intended workplace curriculum, on the grounds that workplaces are vital learning environments for the appropriation of work practices, 'whose enactment is shaped by workplace factors and . . . ultimately experienced by workers as learners' (p. 31) supports this position. Gaining such recognition could be the first step in countries that lack a strong tradition of regulated and monitored workplace training of the type prevailing in Austria, Germany and Switzerland. Overall, however, and due to inevitable competing demands between production and training (Filliettaz 2010), improved training outcomes are likely to be best achieved through structured and integrated cross-fertilisation of the learning opportunities that can be afforded and consolidated across different professional environments (i.e. school, workplace). The structured reflection and integration of unprocessed experiences and knowledge developed in complementary professional learning contexts could be achieved in a shared, virtual space that connects these contexts. Researchers from the Swiss Leading House 'Technology in Vocational Education and Training' (led by scholars Dillenbourg and Gurtner) have conceptualised such a space called 'Erfahrraum'.[4] The educational value of the Erfahrraum has already been empirically tested in multiple work-based training activities (e.g. construction and discussion of portfolios, experience-based discussions, reflective writing) and using various

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[4] The term Erfahrraum is constructed from two German words, 'Raum' meaning room or space (for learning) and 'Erfahrung' meaning (reflected) experience.

technologies (e.g. mobile phones, blogs, wikis, online portfolios, tangible augmented reality simulation) (e.g. Mauroux et al. 2014; Motta et al. 2013; Schwendimann et al. 2015).

16.3.3.2 Constructive and Adaptive Dimension of Work Activity: Alongside Its Productive Dimension

Gaining insight into the conceptual and adaptive dimension of work activity is a cornerstone of Francophone research from a professional didactics perspective. For Pastré, Mayen and colleagues (Mayen 2015; Pastré 2008; Pastré et al. 2006) recognising that there is no action without conceptualisation is essential to redress the false dichotomy between manual and intellectual work. Combined with the corollary that 'there is no activity without learning' (Pastré et al. 2006, p. 155–156), this has provided a strong conceptual foundation for exploring learning through work based on fine-grained and holistic analyses of actual work activity in real-life contexts (e.g. Mayen 2015; Ouellet and Vézina 2015), as well as the process of transmission and individuation when the body of knowledge and practice to be transmitted is novel. It presents a break from conventional professional practice and requires engagement in transformation and innovation (e.g. Bourgeois et al. 2015).

Mayen's detailed description of the situational actions of experienced sidewalk curbs workers (foreman, trainer), in comparison to beginners (trainees), presents an enlightening illustration of *intelligent thinking in action* to complete a prescribed task (production component) adaptively within local constraints (constructive component) and how the learning potential of action situations can be enhanced. In the case of installing sidewalk curbs, adaptive actions involve taking into account the invariant properties of tools and material objects and the specific site conditions while also considering the required physical effort and risk of dangerous posture. This study addresses the 'misleading character of the task of installing a curb' and demonstrates how trainers can be equipped with the capacity to assist young professional trainees engage in systematic (rather than trial and error) actions – actions that are based on sufficient pragmatic conceptual understanding of their actions and the repercussions of these actions. For Mayen, this means that actions are transformed from procedural methods or 'method[s] with no method[s]' into methods 'founded and organised by pragmatic conceptualisations'. This research is important not only because it encourages rethinking an activity typically conceived as involving strictly manual work but also because it demonstrates how trainees' appropriation of effective work practices can be enhanced through unveiling the adaptive nature of the work enacted in a specific situation. This was achieved through a combination of on-site observations over an extended period, clarifying in situ interviews with a professional trainer, and subsequent video observations of the actions of the trainer and other workers with different levels of experience.

At the conceptual level, a key aspect of Mayen's study was to demonstrate the nature and function of pragmatic 'conceptualisation in and for action', specifically, how it enables the construction of capacities for action to face the variability and

diversity of types of situations. Fine-grained observations of the trainer's information-gathering, monitoring and adaptive actions, complemented by elicited access to his pragmatic representation of the activity, were critical to design a successful set of training sequences in collaboration with the trainer. A particularly innovative aspect of the training generated from this work analysis was to make explicit, probably for both trainer and trainees, the distinction between complying with the operational invariants of the task (e.g. properties of objects and tools and typical requirements of the task) and adapting to the constraints of the specific situation (e.g. how these elements interact with embodied action), all of this based on a pragmatic conceptualisation of the task in the activity.

Mayen's study stresses the value of vocational didactics analysis, that is, identifying through detailed work analysis some of the most effective actions of experienced workers and designing interventions that avoid workers learning these actions through trial and error, at personal risk and over an unnecessary period of time. Durand and Poizat's (2015) call for the design of 'spaces for encouraged action', where trainees' activity proceed through 'a dialectic of encouragement/discouragement', i.e. where the trainer defines 'a space of possibles within which the so-called encouraged actions are able to emerge', is consistent with the innovative training described in Mayen's study.

Like Mayen's study of sidewalk curbs workers, Ouellet and Vézina's (2015) study of experienced meat workers' professional gestures,[5] as they cut meat around the bones, demonstrated the adaptive aspects of what could be perceived as a work activity that typically requires minimal thinking and adaptation. Although the authors do not explicitly mention the term pragmatic conceptualisation, their effort to identify the cues that experienced workers rely on to adopt the most effective gestures (e.g. pursued objectives, visual and tactical information, mental representations) and to unveil the reasoning behind their actions reflects the same construct of conceptualisation in action. Consistent with ergonomics research' dual concern for workers' performance (achieve the prescribed task) and health (avoid hazardous postures or gestures), both studies (Mayen 2015; Ouellet and Vézina 2015) treat these two aspects as fundamental in analysing work for designing training. One aspect further developed in Ouellet and Vézina's study is the constructed nature of the most suitable professional gestures to adopt in a particular situation. Following Bril and Roux (2002) and supported by their data, the authors argue that a professional gesture cannot be simply transmitted to a novice, because it involves a movement of the body, which relies on individual perceptions and representations when enacted. From their perspective, this contributes to explain the variability in experts' gestures and in turn their proposal to train sensitivity to the cues needed to develop professional gestures, rather than the gestures themselves. This proposal has significant implications for designing training in this profession and extends to

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[5] The term *gesture* in Ouellet and Vézina's research largely overlaps with Mayen's concept of situational *action*.

many others where the adaptive nature of professional gestures and actions would need to be better understood before training through practice can be implemented.

Bourgeois et al.'s (2015) multiple case studies of organic farmers' process of individuation also explored the constructive, adaptive nature of professional work and learning. This work is quite novel because it examines the constructive aspects of knowledge and skills transmission at the macro-level of an evolving, 'reinvented' professional activity, with implications at micro-level. At the macro-level, individual appropriation was found to involve new forms of learning aimed at transformation, innovation and creation of new professional networks rather than participation in an established community of practice, one development seldom addressed in the literature. Studying the articulation of work and training in evolving professional activities is timely and imperative in light of the fast evolution in the nature of work due to new technologies and the emergence of new professional activities. At the micro-level, appropriation, according to Bourgeois et al., is located at the interface of personal dispositions and loose, multiple models that individuals can choose from, given the relativity of knowledge and skills in this emerging professional field. The authors' proposal to consider four simultaneous aspects (i.e. cognitive, behavioural, identity and affective) in the process of individuation is highly relevant in this evolving context and well supported by empirical evidence at both macro- and micro-level. Considering the affective aspect of individuation emerges as an important new development in research on professional didactics and learning through work more generally. Its importance was revealed in the challenging interpersonal dynamics in Veillard's (2015) case studies. Durand and Poizat's (2015) proposal to identify the most powerful sources of difficulties experienced by novice teachers in their professional trajectories and to create the dynamics for their overcoming of these problems through self-construction is relevant to this issue. Such an approach has potential for adaptation in other fields of professional learning.

Overall, both microanalytical and macro-level studies provide support for the importance of scrutinising actual, adaptive practices for identifying and designing pedagogically rich environments or spaces for encouraged action (Durand and Poizat 2015). At the conceptual level, Filliettaz and colleagues (Filliettaz 2012, 2013; Filliettaz et al. 2015) frame these enabling work environments as characterised by ongoing creation of social affordances for participation and appropriation of work practices. Yet, and consistent with Billett (2006)), affordances are taken up and become beneficial only if the learners have the capacity and willingness to engage in and grab the opportunities that are offered. From a professional didactics perspective, the interdependence of the socio-institutional context (providing affordances) and individual engagement is a fundamental aspect of learning through work and in turn a vital component in the design of enabling work environments as training grounds.

16.3.3.3   Enhanced Professional Learning Through Enabling Interactional Participatory Practices

Interactional participatory practices are at centre stage of Filliettaz et al.'s (2015) analysis of the role of guidance and mentoring in professional learning. Like researchers who formally framed their work in research on professional didactics (e.g. Durand and Poizat 2015; Mayen 2015), Filliettaz et al. also conduct fine-grained analyses of real-life, unfolding interactions in the course of activities as a basis to examine the articulation of learning and work – and through extension the articulation of training and work. A key assumption examined in Filliettaz et al.'s work is that mentors and students' interactions are shaped by 'relational interdependences', and consequently the emergence and nature of 'interactional participatory configurations' play a major role in professional learning, through reciprocal offer and take-up (or not) of opportunities.

Using video data of interactional participatory configurations in early childhood education, combined with complementary interview data, Filliettaz et al. provide rich, convincing empirical evidence with conceptual interpretations of how both mentors and students contribute to the establishment of distinct participatory configurations and how these are accomplished and transformed through actions, characterised by the participants' relational interdependencies. The identification of three distinct, meaningful interactional participatory configurations involving mentors and students, in the context of educational activities with children, revealed the rich opportunities afforded by activities to enable guidance through practice. Students' engagement and capacity to recycle the resources presented to them and adapt their mentors' patterns of actions in their own practice reveals evidence of productive, self-constructed appropriation of practice. This configuration also illustrates the asymmetric nature of the actor-environment coupling co-definition, which according to Durand and Poizat (2015) assigns the actor the responsibility of determining what in the environment is meaningful for the activity. Yet, in a social activity, multiple actors are involved, who represent each other's environment, and as self-regulating agents co-regulate each other's participation. The simultaneous nature of self and co-regulatory processes is fundamental to understanding human adaptation in social interactions (Volet et al. 2009). It is also a key feature of Gresalfi et al. (2012)) model of the 'dynamic relations between affordances, effectivities and intentions' (p. 252), grounded in an ecological psychology perspective. In a perspective of training through practice, the identification of productive interactional participatory configurations is needed to optimise the articulation of affordances generated in activity with the worker-learners intentionalities (Billett 2006).

One particularly interesting outcome of Filliettaz et al.'s study in early childhood education is the revelation of how various forms of mentor scaffolding were enacted when 'two layers of framing' jointly shaped engagement in alternatively the 'educational frame' addressing children and the 'vocational training frame' involving student and mentor. In this instance, the fine-grained analysis of the

mentor's enactment of scaffolding within this dual activity frame unveiled the complexity of guided practices when work (i.e. production task) and training (i.e. construction through design of suitable interactional participatory configurations) take place simultaneously. This work, therefore, makes an original contribution to the literature on scaffolding, by elaborating conceptually and demonstrating empirically the concurrent frames of action that shape participants' engagement in the scaffolding process. How multiple frames of actions co-regulate experienced and less experienced workers' engagement with each other in complex work activities will need to be examined in future research. Such insight may help to explain mentors' and worker-learners' dispositions to engage in interactional participatory practices, as well as their actual engagement in such practices.

16.4 Novel Contributions of Francophone Research Aimed at Enhancing the Articulation of Work and Training

Francophone research on the articulation of work and training makes a number of novel contributions to the overall body of literature on learning through and for practice, each supported by evidence from empirical studies presented in this volume.

The first contribution derives from the proposal that *any work activity even manual work involves a constructive dimension alongside its productive dimension*. This proposal is fundamental to framing training as being integrated with work. The constructive dimension of work activity is demonstrated through converging fine-grained evidence, across a range of occupations, of experienced workers' thinking in action and pragmatic conceptualisation of their work activity. It is further supported by documented evidence of the adaptive nature of experienced workers' practices, around the invariants imposed by the nature of the work and production constraints. In light of this integration, training and work can be brought together through creating environments that make the constructive and adaptive dimensions of successful work practices visible to all. Such environments are expected to enhance the practices of novices (e.g. Durand and Poizat 2015; Mayen 2015; Filliettaz et al. 2015) and training partners (Veillard 2015) and even create ideas for alternative practices (e.g. Ouellet and Vézina 2015; Bourgeois et al. 2015). This approach goes beyond recognition of the workplace as a legitimate site of learning, thanks to the deliberate effort to target didactic and work accomplishments at the same time and to the acknowledgement that communities of practice are in constant evolution that newcomers contribute to through their own constructions and engagements.

The second contribution, related to the first, is the proposal to capitalise on the constructive and adaptive nature of work to intervene and to *conceptualise training as integrated with work and as enacted through the design of enabling work environments* (Mayen 2015). Unique to this field of research is the focus on

professional practices that are specific to a particular aspect of a trade (or 'métier', e.g. the factors taken into account by experienced meat workers when deboning the specific actions taken by experienced sidewalk curb workers to avoid having to redo operations or the triadic structure of a radiographer's job and the need to compromise when dealing with insoluble dilemmas). This proposal can be extended to the coordination of prescribed and enacted vocational education curricula (Veillard 2015). Specifically, the idea is that designing training involves creating the conditions for making visible experienced workers' or professional practitioners' pragmatic elaboration of thought and action during work and capitalising on these elaborations to improve novices' practice. Identifying what individuals must learn to 'act with' for successful practice, including variations in action and reasoning, and creating relevant learning affordances in situation bring together the 'work content' and the 'training content'. This elaboration was illustrated in several studies presented in this volume (e.g. Durand and Poizat 2015; Filliettaz et al. 2015; Mayen 2015; Ouellet and Vézina 2015). Most importantly as stressed by Mayen, enabling environments must not only create affordances for learning the procedural aspects of professional practice but most importantly affordances that stimulate engagement in improved, sometimes reinvented (Bourgeois et al. 2015), action (conceptual aspect).

The third contribution is through the claim that *enabling environments for integrated work and training require specific participatory configurations, interpersonal processes and dialectics of encouragement* – and are not simply characterised by individual and external factors. Empirical evidence, captured in time-framed processes during actual, real-life activity, illustrates which participatory work configurations facilitate engagement, adaptation, appropriation and individuation. According to Filliettaz et al. (2015), it is important to consider the nature and evolution of experienced and novice workers' interactional participatory configurations as these play a crucial mentoring role in shaping professional practice. This was documented across microanalytical studies of actual interactions reported in this volume (e.g. Durand and Poizat 2015; Filliettaz et al. 2015; Mayen 2015). The critical role of participatory positions is also supported in Veillard's meso-level analysis of discrepancies between intended, implemented and experienced curricula, and it is consistent with Bourgeois et al.'s reported accounts of the process of individuation in emerging professions. Creating variations of work conditions to induce practice adaptation around invariants (Filliettaz et al. 2015) or disturbances in trainees' activity so that transformation is called for and supporting the dynamics of transforming the trainee's activity are proposed as alternative ways of creating spaces for encouraged action (Durand and Poizat 2015). The insights provided by analyses of interactional participatory processes provide a solid basis for rethinking how workplaces can enhance the articulation of work and training with minimal decrease in productivity (Mayen 2015). At the conceptual level, these analyses highlight the co-regulatory processes of intersecting dynamic living systems, individuals, activities and organisations (Volet, et al. 2009), where trainers and trainees not only share relational dependencies but are concurrently co-regulated by the specific production needs and other constraints of the work environment.

Other innovative contributions of research on professional didactics involve suggestions as to how professional trainers' capacity to optimise the articulation of work and training could be enhanced. One suggestion is to capitalise on the *fine-grained, discursive, interactional analyses* of the 'mechanisms by which trainers or experienced workers are 'doing guidance' and afford opportunities for participation, knowledge acquisition and identity construction' and of 'how apprentices elect to engage with the resources afforded to them' (Filliettaz 2011, p. 502) and use this *rich material to assist workplace trainers learn how to create expansive learning approaches* (Fuller and Unwin 2004). However, interest in and opportunities for the pedagogical development of workplace mentors need to be created and nurtured. Billett's (2006) call for a concept of curriculum that extends 'beyond the frames of a conceptualisation privileged by what occurs in educational institutions' (p. 45) and considers workplaces 'to be conceptualised more clearly as learning environments' (p. 31) is justified but likely to be realised only if embedded in a broad, fully integrated approach to professional and vocational education and training. This requires workplace mentors who have the commitment but also capacity to support conceptualisation processes and to create forms of action and reasoning that are located on conceptual registers and not only procedural ones (Mayen 2015). For Filliettaz (2012), this requirement implies equipping workplace mentors with the personal resources to adopt a critical approach on their training practices with a view to determine the extent to which they have actually been accomplished.

Filliettaz's (2012) attempt to foster vocational trainers' development of analytical skills for interactional analysis and to guide their subsequent use of these skills to identify expansive and restrictive interaction configurations in their respective professional context provides preliminary support for the value of these ideas. A key aspect of Filliettaz's professional development programme was to provide trainers with tools for reflecting critically on their dialectics of encouragement for the participation of trainees, in other words to build their skills for creating and improving affordances in their own work environments. The combination of theoretically driven and practice-based research advances significantly Fuller and Unwin's (2004) notion of expansive workplace environments through providing documented evidence of how affordances are actually taken up, interactively and dynamically in time-framed, real-time situations, and what are the critical features of affordances likely to improve trainees' practices. Since reflecting upon and regulating one's own cognition and actions is inherently a metacognitive activity, there may be value in considering how the latest advances in research on metacognitive regulation of cognitive activity in social contexts might open possibilities for conceptual consolidation as well as methodological developments for the analysis and representation of interactional and dynamic data (Volet and Summers 2013; Vauras et al. 2013).

A complementary direction for future research might be to explore how to prepare trainees to engage productively in their own professional learning through and from practice. Filliettaz et al.'s (2015) research with early childhood student educators illustrated how some students spontaneously seized the opportunities for improving their professional practice offered to them. However, research with

apprentices has revealed that not all trainees are able to grab learning opportunities (Filliettaz 2010). Developing trainees' self-regulatory skills to optimise their learning through practice could be helpful if implemented in action and reflected upon using a form of self-confrontation in the social context of the particular environment.

Another novel suggestion to enhancing trainees' learning through practice from a professional didactics perspective is Durand's (2014) proposal to capitalise on fine-grained analyses of novices' first work experiences – specifically those perceived by novices as challenging 'nodes' in their early professional practice, but commonly unnoticed by professional trainers and thus not addressed. Inspired by Ria's (2012) work, Durand's idea is to use the insights generated by these detailed analyses as a basis for developing a contextualised 'pedagogy of career trajectory'. At the general level, the purpose of such pedagogy is to accompany and guide novices along their professional learning journey. At the specific level of practices, proposed by Durand, this involves creating affordances to help novices develop the skills they need to overcome their specific, early difficulties and in the process facilitate self-construction and individuation. Durand's (2014) recent innovative study provides preliminary support for the potential of producing films featuring some novices confronted with the same difficulties in their initial professional practice (for self-identification) and others successful in dealing with similar situations and using this rich material to consolidate training.

In sum, research on professional and vocational didactics and the articulation of work and training more generally makes major contributions to the literature on workplace learning as well as the literature on vocational and professional education and training.

It makes a unique contribution to the *literature on workplace learning* by illustrating how fine-grained analyses of 'actual work practices' can be used productively as the basis for the design and implementation of training pathways through practice. Micro-level analyses of practices provide rich material for the creation of contextualised task and social affordances that enable individual appropriation through interactional participatory practices. Cross-studies' evidence that even manual work is not just application of procedural skills but includes pragmatic conceptualisation and adaptation in action provides solid empirical support for Billett's (2013b) conceptual case that workplaces should be recognised as legitimate sites of learning. The identification of pedagogical principles that can transform work practices into enabling environments is a major contribution to the workplace learning literature.

This research also makes a novel contribution to the *literature on vocational, professional and training research*, by highlighting the uniqueness of what can be learnt based on an in-depth understanding of actual work practices. Evidence of the constructive and adaptive nature of actual work practices offers valuable ideas for enhancing the articulation of training through work and for ensuring that prescribed, implemented and experienced vocational and professional curricula are negotiated and integrated to optimise learning. This is essential in light of institutionalised vocational and professional education's heavy reliance on

prescribed tasks and hope for transfer, despite calls for a fundamental reconceptualisation of the notion of transfer (Billett 2013a; Volet 2013).

Researching how the opportunities provided by social sources of learning (e.g. professional teachers, mentors and experienced workers) could be consolidated in practice and for practice and modelling the target competencies in their 'developmental dynamics' (Durand and Poizat 2015) should be pursued vigorously. A major strength of the Francophone research on the articulation of training and work is its conceptualisation of work activity and professional practices as enabling environments for training within the complexity of real-life, interactive and dynamic situations. Dissemination of this work in the Anglophone research community offers exciting possibilities for cross-fertilisation and mutual enrichment, conceptually, methodologically and educationally.

References

Billett, S. (2001). Learning through work: Workplace affordances and individual engagement. *Journal of Workplace Learning, 13*(5), 209–214.

Billett, S. (2004). Learning through work: Workplace participatory practices. In H. Rainbird, A. Fuller, & A. Munro (Eds.), *Workplace learning in context* (pp. 109–125). New York: Routledge.

Billett, S. (2006). Constituting the workplace curriculum. *Journal of Curriculum Studies, 38*(1), 31–48.

Billett, S. (2011). *Vocational education: Purposes, traditions and prospects*. Dordrecht: Springer.

Billett, S. (2013a). Recasting transfer as a socio-personal process of adaptable learning. *Educational Research Review, 8*, 5–13.

Billett, S. (2013b). Learning through practice: beyond informal and towards a framework for learning through practice. In *Revisiting global trends in TVET: Reflections on theory and practice* (pp. 123–162). Bonn: UNESCO-UNEVOC. 978-92-95071-57-5.

Bourgeois, E., Allegra, J., & Mornata, C. (2015). Transmission and individuation in the workplace. In L. Filliettaz & S. Billett (Eds.), *Francophone perspectives of learning through work: Conceptions, traditions and practices*. Dordrecht: Springer.

Bril, B., & Roux, V. (2002). *Le geste technique. Réflexions méthodologiques et anthropologiques*. Ramonville Saint-Agne: Editions Erès.

Brown, J. S., Collins, A., & Duguid, P. (1989). Situated cognition and the culture of learning. *Educational Researcher, 18*(1), 32–42.

Clot, Y., & Lhuilier, D. (2010). *Agir en clinique du travail*. Toulouse: Erès.

Daniellou, F. (2005). The French-speaking ergonomists' approach to work activity: Cross-influences of field intervention and conceptual models. *Theoretical Issues in Ergonomics Science, 6*(5), 409–427.

Donin, N., & Theureau, J. (2007). Theoretical and methodological issues related to long term creative cognition: The case of music composition. *Cognition, Technology & Work, 9*(4), 233–251.

Durand, M. (2011). Self-constructed activity, work analysis, and occupational training: An approach to learning objects for adults. In P. Jarvis & M. Watts (Eds.), *The Routledge international handbook on learning* (pp. 37–45). London: Routledge.

Durand, M. (2013). Human activity, social practices and lifelong education: An introduction. *International Journal of Lifelong Education, 32*(1), 1–13.

Durand, M. (2014). La plateforme néopass@ction: produit et témoin d'une approche d'anthropo-techonologie éducative. *Recherche & Formation, 75*, 23–35.

Durand, M. (2014). La plateforme néopass@ction: produit et témoin d'une approche d'anthropo-techonologie éducative. *Recherche & Formation, 75*, 23–35.

Durand, M., & Poizat, G. (2015). An activity-centred approach to work analysis and the design of vocational training situations. In L. Filliettaz & S. Billett (Eds.), *Francophone perspectives of learning through work: Conceptions, traditions and practices*. Dordrecht: Springer.

Engeström, Y. (2001). Expansive learning at work: Toward an activity theoretical reconceptualization. *Journal of Education and Work, 14*, 133–156.

Ericsson, K. A., & Simon, H. A. (1980). Verbal reports as data. *Psychological Review, 87*(3), 215–251.

Filliettaz, L. (2010). Dropping out of apprenticeship programs: Evidence from the Swiss vocational education system and methodological perspectives for research. *International Journal of Training Research, 8*, 141–153.

Filliettaz, L. (2011). Collective guidance at work: A resource for apprentices? *Journal of Vocational Education and Training, 63*(3), 485–504.

Filliettaz, L. (2012). Interactions tutorales et formation des formateurs. *Travail et Apprentissage, 9*, 62–83.

Filliettaz, L. (2013). Affording learning environments in workplace contexts: An interactional and multimodal perspective. *International Journal of Lifelong Education, 32*(1), 107–122.

Filliettaz, L., Durand, I., & Trébert, D. (2015). Learning through verbal interactions in the workplace: The role and place of guidance in vocational education and training. In L. Filliettaz & S. Billett (Eds.), *Francophone perspectives of learning through work: Conceptions, traditions and practices*. Dordrecht: Springer.

Fuller, A., & Unwin, L. (2004). Expansive learning environments. In H. Rainbird, A. Fuller, & A. Munro (Eds.), *Workplace learning in context*. London: Routledge.

Fuller, A., Unwin, L., Felstead, A., Jewson, N., & Kakavelakis, K. (2007). Creating and using knowledge: An analysis of the differentiated nature of workplace learning environments. *British Educational Research Journal, 33*(5), 743–759.

Gresalfi, M. S., Barnes, J., & Cross, D. (2012). When does an opportunity become an opportunity? Unpacking classroom practice through the lens of ecological psychology. *Educational Studies in Mathematics, 80*, 249–267.

Habboub, E. M., & Lenoir, Y. (2011). Professional didactics and teacher education: Contributions and questions raised. *Education Sciences & Society, 2*(1), 11–40.

Leontiev, A. (1975). *Activité, conscience et personnalité*. Moscow: Editions du Progrès.

Leplat, J. (1997). *Regards sur l'activité en situation de travail, contribution à la psychologie ergonomique*. Paris: Presses universitaires de France.

Leplat, J., & Cuny, X. (1977). *Introduction à la psychologie du travail*. Paris: Presses universitaires de France.

Leplat, J., & Hoc, J.-M. (1983). Tâche et activité dans l'analyse psychologique des situations. *Cahiers de Psychologie Cognitive, 3*(1), 49–63.

Marchand, T. H. J. (2008). Muscles, morals and mind: Craft apprenticeship and the formation of person. *British Journal of Educational Studies, 56*(3), 245–271.

Mauroux, L., Könings, K. D., Zufferey, J. D., & Gurtner, J.-L. (2014). Mobile and online learning journal: Effects on apprentices' reflection in vocational education and training. *Vocations and Learning, 7*, 215–239.

Mayen, P. (2015). Vocational didactics: Work, learning and conceptualisation. In L. Filliettaz & S. Billett (Eds.), *Francophone perspectives of learning through work: Conceptions, traditions and practices*. Dordrecht: Springer.

Motta, E., Boldrini, E., & Cattaneo, A. (2013). Technologies to "bridge the gap" among learning contexts in vocational training. In P. M. Pumilia-Gnarini, E. Favaron, E. Pacetti, J. Bishop, & L. Guerra (Eds.), *Handbook of research on didactic strategies and technologies for education: Incorporating advancements* (pp. 247–265). Hershey: IGI Global.

Ombredane, A., & Faverge, J. M. (1955). *L'analyse du travail, facteur d'économie humaine et de productivité*. Paris: PUF.

Ouellet, S., & Vézina, N. (2015). Activity analysis and workplace training: An ergonomic perspective. In L. Filliettaz & S. Billett (Eds.), *Francophone perspectives of learning through work*. Dordrecht: Springer.

Pastré, P. (1999). L'ingénierie didactique professionnelle. In P. Carré & P. Caspar (Eds.), *Traité des sciences et des techniques de la formation* (pp. 403–418). Paris: Dunod.

Pastré, P. (2008). Apprentissage et activité. In Y. Lenoir & P. Pastré (Eds.), *Didactique professionnelle et didactiques disciplinaires en débat* (pp. 53–79). Toulouse: Oscarès.

Pastré, P., Mayen, P., & Vergnaud, G. (2006). La didactique professionnelle. *Revue Française de Pédagogie, 154*, 145–198.

Piaget, J. (1974). *Réussir et comprendre*. Paris: Presses universitaires de France.

Poizat, G., Salini, D., & Durand, M. (2013). Approche énactive de l'activité humaine, simplexité et conception de formations professionnelles. *Education Sciences & Society, 4*, 97–112.

Rainbird, H., Fuller, A., & Munro, A. (Eds.). (2004). *Workplace learning in context*. New York: Routledge.

Ria, L. (2012). Collaboration entre praticiens et chercheurs sur la plateform Néopass@action: L'activité debutante comme objet d'étude et de transformation. *Travail et Apprentissages, 9*, 106–119.

Schwendimann, B., Cattaneo, A., Dehler, J., Gurtner, J-L., Bétrancourt, M., & Dillenbourg, P. (2015). *The "Erfahrraum": A model for exploiting educational technologies in dual vocational systems*.

Schwendimann, B. A., Cattaneo, A. A. P., Dehler Zuffrey, J., Gurtner, J.-L., Bétrancourt, M., & Dillenbourg, P. (2015). The 'Erfahrraum': A pedagogical model for designing educational technologies in dual vocational systems. *Journal of Vocational Education and Training (JVET)* (Accepted for Publication).

Stevenson, J. (2001). Vocational knowledge and its specification. *Journal of Vocational Education and Training, 53*(4), 647–662.

Theureau, J. (2010). Les entretiens d'autoconfrontation et de remise en situation par les traces matérielles et le programme de recherche "cours d'action". *Revue d'anthropologie des connaissances, 2*, 287–322.

Tynjälä, P. (2008). Perspectives into learning at the workplace. *Educational Research Review, 3*, 130–154.

Vauras, M., Kinnunen, R., Kajamies, A., & Lehtinen, E. (2013). Interpersonal regulation in instructional interaction. In S. Volet & M. Vauras (Eds.), *Interpersonal regulation of learning and motivation: Methodological advances* (pp. 125–146). London: Routledge.

Veillard, L. (2015). University-corporate partnerships for designing workplace curricula: Alternance training course in tertiary education. In L. Filliettaz & S. Billett (Eds.), *Francophone perspectives of learning through work: Conceptions, traditions and practices*. Dordrecht: Springer.

Vergnaud, G. (1996). Au fond de l'action, la conceptualisation. In J.-M. Barbier (Ed.), *Savoirs théoriques et savoirs d'action* (pp. 275–292). Paris: Presses universitaires de France.

Volet, S. (2013). Extending, broadening and rethinking research on transfer of training. *Educational Research Review, 8*(1), 90–95.

Volet, S., & Summers, M. (2013). Interpersonal regulation in collaborative learning activities: Reflections on emerging research methodologies. In S. Volet & M. Vauras (Eds.), *Interpersonal regulation of learning and motivation: Methodological advances* (pp. 204–220). London: Routledge.

Volet, S. E., Vauras, M., & Salonen, P. (2009). Self- and social regulation in learning contexts: An integrative perspective. *Educational Psychologist, 44*(4), 215–226.

Vygostky, L. S. (1978). Interaction between learning and development. In *Mind and society* (pp. 79–91). Cambridge, MA: Harvard University Press.

Chapter 17
Understanding Learning Through and for Work: Contributions from Francophone Perspectives

Stephen Billett, Ray Smith, and Charlotte Wegener

17.1 Understanding Learning Through Work: Francophone Contributions

The aim of this book is to advance Francophone conceptions of learning in and through work and their traditions and practices through engaging with and knowing more about them. This engagement and elaboration also serve to assist, understand and appraise their particular contributions to the contemporary discussions about learning through and for work and identify how they might complement or augment traditions and practices from other cultures and linguistic traditions. Additionally, beyond these specific purposes is a need for the essence of these approaches to be explicated and made available to Anglophone scientific audiences, which might not otherwise occur. It follows, therefore, that this concluding chapter seeks to identify what the contributors to this edited book can and have added to the broad project of understanding about learning in, through and for work. However, the analysis presented here is shaped not only by these contributions but also by various conversations that occurred in the development of the proposal for this book with its co-editor (Laurent Filliettaz) and with Marc Durand and Etienne Bourgeois and other colleagues at the University of Geneva; the discussions at the two meetings of contributors of this book in Geneva; as well as an understanding derived from other literature. This literature elaborates the cultural and institutional factors shaping particular forms of and processes adopted by various European vocational education systems at the time of their formation and major restructures. So, fundamentally, the analysis here is shaped by an interest to identify the particular set of contributions that Francophone tradition can make to augment the understanding about learning through work that has arisen in the Anglophone world.

In doing so, and to foreshadow the arguments made within this chapter, there is acknowledgement that there is no single unified view or perspective that can be

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characterised as the Francophone perspective. Instead, there are diverse perspectives contained here which are shaped more or less by historical, cultural, situational influences of and moments in Francophone countries. So, whilst historical and cultural factors play out, by degree, they do so in societally specific ways. So, there are particular cultural preferences and practices that set the Francophone perspectives apart from Anglophone ones, some of which are the product of French Republicanism traditions, even these are not immune from particular historical and cultural emphases, as well as interpretations and reworkings. These emphases are also being shaped by degree and at different points of time through perspectives from outside of the Francophone countries and culture. Such considerations are important because no country, culture or language has a monopoly on concepts, insights and understanding within the broad project of social science and on practices that are commonly adopted (e.g. learning through and for work). Yet, it is important that these distinct traditions and practices are made accessible and comprehensible to those outside of them. Particular cultural traditions, sentiments and practices can almost effortlessly dismantle assumptions confidently progressed by other and, allegedly, dominant cultures and discourses. For instance, the practices of Mexican birth-carers and their ways of learning those practices were not readily accommodated by or explainable through Western healthcare concepts, occupational categories or even representations of human reproductive processes, thereby opening up their fallibility and questioning their utility (Jordan 1989). Often, it is anthropologists that deliver such culturally derived chastenings (e.g. Bunn 1999; Ingold 2000; Marchand 2008), as they investigate such practices and traditions in detail and question long-held assumptions. So, what is important in elaborating these accounts is not only the distinctiveness of their contributions but also the degree by which they are either consistent with or offer critiques of what is proposed through other traditions and perspectives and thereby contributing to, augmenting or critiquing those accounts. To take another example, perspectives from historical and anthropological accounts have noted that the concept of apprenticeship from earlier and non-Western accounts position apprenticeships as being founded on the active process of learning, rather than being taught or even directly guided by a more experienced counterpart. The word 'apprenticeship' seems to derive from the word meaning 'apprehend' (Webb 1999), for the learners to take, rather than them being given or taught what needs to be learnt, which is quite contrary to how it is used contemporaneously in the Western world. Indeed, the Japanese word for apprentice is *minarai*: learning through observation and *minarai kyooiku* – to do so unobtrusively (Singleton 1989). Then, analogous to such conceptions, from the Middle East comes an account in which apprentice minaret-builders' learning is characterised as the active 'stealing' of the knowledge required to be learnt, because it is not taught or otherwise made explicit for them (Marchand 2008). The apprentices' job is not only to learn this knowledge, but also to place themselves in a position through which they can learn or apprehend that knowledge. Such accounts offer fresh conceptions of an approach to learning that has become orthodox in Western countries: apprentices and apprenticeships. So, rather than being subject to and dependent upon a more expert mentor and teacher

(i.e. tradesperson), the locus of that approach to learning an occupation is proposed as being founded on novices' interests, including knowing how to engage in that process of learning (Bunn 1999; Gowlland 2012; Webb 1999). So, accounts from the outside of dominant perspectives and countries have the potential to challenge orthodox views with implications, for instance, about how this form of occupational preparation should progress.

Yet, and on the other hand, it is easy to introduce new concepts and terms and set them apart from others and in ways that are unhelpful and can obscure what might be consonant with or analogous to other accounts. Hence, the risk is that contributions that can potentially augment what is known from other cultures, disciplines and languages can be lost through unnecessary and needless distinctions. For instance, the phenomenon that the genetic epistemologist Piaget famously described as equilibrium seems analogous to what has been identified in other theoretical traditions and outside of the Francophone world. This phenomenon seems consonant with what has variously been conceptualised as viability within individualistic (radical) constructivism by Van Lehn (1989) and von Glasersfeld (1987), typification in phenomenological sociology (Schutz 1996) and ontological security in sociological thought (Giddens 1991). So, the attempt here is to appraise the Francophone representations of learning in, through and for work in ways that permit these contributions to both extend and consolidate what is known from other traditions.

The approach adopted here is to render an overview of what emerges from these contributions, the discussions referred to above and other sources as being distinct in terms of overall emphases, particular conceptions and practices. Certainly, the patterning of the contributions in this edited monograph rehearses four particular perspectives that are advanced in this chapter. In overview of what is subsequently elaborated below, firstly, there is no single or unitary Francophone conception of learning through practice, some outlining of the diversity of what constitutes Francophone perspectives and some accounting of the origin of these distinct conceptions. The case made is that although there are cultural and linguistic traditions across the Francophone world, there are also localised historical and cultural factors that promote difference and diversity within these accounts. So, when seeking to elaborate the Francophone stance, tradition and conception of learning through practice, readers are confronted with diversity and contradictions. These diversities were, in part, a product of different historical and cultural factors that are country-specific by degree. The point here is to respect the distinctiveness of these contributions as much as having cultural rather than linguistic foundations and how institutional factors play out.

Secondly, the emphasis on a detailed analysis of situated activity and activities stands out as being a feature within Francophone accounts as represented in some of the contributions to this volume, which makes them quite distinct. Although the term 'activity' is the one which is used most frequently, its usage and the focus of its exercise are usually within a highly situated account of work, working and learning. This situatedness extends to not just an objective analysis of work-in-action in specific physical and social contexts (e.g. actions of workers), but inevitably the

situated nature of how individuals come to engage with what is being manifested in that context (e.g. how and on what bases they act). This extends to focused and place-specific interventions (Mayen 2015; Ouellet and Vézina 2015). Hence, rather than situatedness being captured through accounts accommodating social forms and norms (e.g. as in sociological or social theorising) and the material, cultural and physical elements (e.g. cultural anthropology), it also embraces how individuals' subjectivities, ways of knowing and acting are manifested situationally and personally (e.g. cultural psychology). Yet, even this situated focus is shaped by particular cultural emphases, which is manifested in the work, workers, their bodies and their engagement with tasks. Hence, specific cultural emphases appear in these accounts necessitating a focus on highly situated accounts extending to consideration of curriculum and pedagogic practices. That is, the kinds of experiences that are ordered and afforded and the situational ways that support for learning are enacted (Wegener 2014a). Therefore, having elaborated these emphases on situatedness, the attention then turns to what these accounts mean for our understanding of how processes of learning in and through work might be informed.

Thirdly, there is a pattern in Francophone conceptions and traditions of considering the personal dimensions of work and learning. Workers are viewed as active meaning-makers, which includes being critical interlocutors with what is afforded them, that is, being much more than agents passively executing work tasks and learning. Moreover, the Francophone traditions extend to bodily engagement within descriptions of and to account for the consequences of their work, which are made at the personal level, that is, the person-particular nature of bodily engagement. Perhaps privileged by Republican sentiments about the legacies (i.e. potential harm) of labour on the body, the act of learning through and for work extends to how individuals should learn to work safely and in bodily correct ways to reduce these negative consequences. Variations in how individuals engage in work tasks necessitate analyses of work and learning capturing the particular person in action in work tasks. So, rather than being viewed as an analysis of work tasks – an accounting of their activities and interactions – it requires a person-at-work approach. Hence, there is a need to conduct a particular kind of analysis that emphasise the personal bases for knowing and doing. Noteworthy here is the emphasis on intervention as a research strategy and as exemplified through the focus on ergonomics. This includes many researchers emphasizing the theory – methodology interdependence; methods are developed thought intervention and theory developed thought experience.

Fourthly, approaches to understanding and organising support for learning through work seem distinct. Following from the two previous factors, the traditions of professional didactics and ergonomics, with their particular emphasis on the situation and the body, seem quite culturally distinct. They seem more analogous to laboratory and encounter sessions from the Anglophone world than what would be used in that world to organise work-based learning experiences. In contrast to what Ouellet and Vézina (2015) and Mayen (2015) discussed here about individual analyses of work, corrective actions are the kinds of approaches adopted in the European and North American human resource development field, for instance,

where work, work performance and efficacy are often advanced as being objective and where workers' engagement and learning often are accepted as being necessarily causal (i.e. they learn what they experience or are taught). Here, considerations of work and learning appear to be more closely aligned. Moreover, there appears to be a lesser emphasis on distinctions between novices and experts, as two distinct states, there alone the various stages between these two states that seem to derive from North American views of these pathways as being linear and unproblematic (Benner 1982; Dreyfus and Dreyfus 1986).

It is these four perspectives that are elaborated and discussed in turn across the following sections.

17.2 Differences and Distinctions Within Francophone Conceptions

Through an engagement with the historical literature on educational systems and contributions within this volume and discussions with colleagues, it becomes evident that there is no unitary Francophone conception of learning through and for work. Moreover, there are also some apparent contradictions within and across them that warrant some attempt at resolution.

The conceptions of learning for and through work from France appear to be shaped by Republican traditions that sought to separate education from work, to elevate the former and be cautious and critical of the latter (Veillard 2015). For instance, in the first kinds of institutions which might be classified as vocational education in France, the focus was on using practical activities for general educational purposes. That is, students engaged in manual tasks such as caring for horses, blacksmithing and farm-related activities as vehicles for utilising their existing capacities and to improve the outcomes for them (Bennett 1938). So, rather than replicating industrial models of vocational education, work activities are designed, in part, to liberate students from such models of education and the kinds of outcomes they are intended to generate. Moreover, and fundamentally, in France educational performance has become the means by which merit is apportioned in France, with direct consequences for the status of occupations and employment. As one commentator suggested, just about everything comes second to academic performance within the French culture (Rémery and Merle 2014). As a consequence, the focus on the right to having an education and being able to succeed in and through it have become paramount in the French culture. Initial employment and securing advancement in the French public service is based upon measures of merit aligned with academic performance and test taking. In such a culture, work-related learning has been seen as being significantly posterior to that arising through engagement in educational programmes and provisions. Moreover, credentialism and the standing of the credentialing institution have become central to what young and not so young French citizens direct their energies, and this credentialism arises

from participation in educational programmes. All of these confront traditions elsewhere (i.e. the German-speaking world) that have greater limits on access to higher education and structural arrangements to preserve this outcome for a relatively limited number of individuals and give considerable emphasis on work-related learning such as in apprenticeship which is a preferred option for those unable to secure places in universities. For instance, it is only relatively in recent times that the recognition of prior learning (i.e. that learning secured outside of educational programmes) has been countenanced within France, and its introduction has required legislative arrangements to promote this approach to securing credentials (Rémery and Merle 2014). Equally, and as a result of these sentiments, the apprenticeship system in France remains relatively underdeveloped and nascent compared with English- and German-speaking countries (Troger 2002). Yet, the interest in the use of the assessment of prior learning (APL) is even more recent in Switzerland, where it has long been quite controversial, because of the emphasis on institutionally based education programmes, as with Germany. So, there seems to be a paradox in that countries that have long recognised the benefits of learning in productive conditions (i.e. the apprenticeship model) have been more reluctant to develop alternative ways to gain qualifications, based on learning through work, such as APL. So, the separation between education and work has played out in particular ways in France, albeit with efforts now to redress that situation. Yet in another Francophone country with strong influence from German traditions, there is a different manifestation of sentiments and practices associated with recognising learning through work outside of educational programmes. Yet, overcoming entrenched societal sentiments about the status of work and standing of education is difficult and subject to resistance (Cho and Apple 1998). For instance, in the French context, Veillard (2015) refers to enduring societal sentiments about the status of a university education and developing capacities associated with completing examinations. These sentiments serve to undermine educational programmes deemed to be nonacademic and include work-based experiences, because work and learning through work is seen as the antithesis of the purposes of university education. In this way, Veillard (2015) claims that whilst at one level employers complain about the lack of readiness of graduates who have had no exposure to workplace experiences, at another level local government authorities and educational institutions may be less generous with their support, including funding, for programmes emphasising work experiences, such as apprenticeships, because they are not seen as being those leading to university entrance.

In contrast, Switzerland did not have the kind of social revolution that occurred in France and the sweeping away of long-standing institutions. Hence, national sentiments associated with Republicanism are not emphasised even in Francophone cantons. Quite contrarily, it is suggested that an emphasis on self-sufficiency and self-reliance that arose from a farm-based culture emphasised practical learning and learning through work (personal communication Laurent Filliettaz). However, the Swiss apprenticeship model that is such a central mode of post-school education model arose in the 1880s after the industrial revolution and is very much related to the imperatives of industrial production (Gonon 2002). So, in contrast to France, the

most common form of post-school education in Switzerland is apprenticeship, which is available across an expanse of occupations. Moreover, in a particular and nuanced consideration of the contributions of work-based experience for Swiss apprentices has come the provision of the 'third space' for learning (Gonon 2002). That is, beyond the school and work-based elements of the apprenticeship programme is the provision for apprentices to spend time in an industry sector-specific training centre. Those centres have been established to augment the experiences in workplaces and, in particular, where the workplace is unable to provide the apprentice with a comprehensive enough range of experiences required to develop the capacities needed by trades workers. One construction here could be that a particular Francophone concern about the adequacy and comprehensiveness of workplace experiences led to this provision that is not exercised in Germany. So, beyond the dual approach of Germany (i.e. structured experiences in the workplace and vocational school) is the provision of this third space to augment apprentices' learning experiences. Of course, despite being quite canton-specific, vocational educational provisions in Switzerland are also shaped by German sentiments and practices associated with developing skilled apprentices (Gonon 2002) that are most strongly emphasised in German-speaking cantons.

Hence, unlike France, in Switzerland there is a focus on and particular set of institutional practices associated with apprenticeships that indicate their standings, perceived worth and contributions as means of securing worthwhile occupational knowledge. For instance, a common practice in Switzerland is for tradespersons to have their sons or daughters apprenticed in another company, perhaps even far away from their own, so as they bring novel contributions and expand the scope of the capacities of the family business on completing their apprenticeship elsewhere. So, in comparison with France that has sought to separate education from work, there is not only a broadly based engagement with tertiary education provisions focused on work experiences, but also specific procedures to maximise or augment those work experiences. In a different way, Quebec's traditions of technical education are shaped by being located in North America and subject to a range of institutional practices and expectations which again are in some ways distinct from those of Switzerland and France. So, there are distinct conceptions, practices and valuing of learning in and through work across Francophone countries, rather than a unitary set of tradition, concepts and practices.

However, despite the sentiments associated with separating education and work, there are some apparently contradictory emphases. For instance, as evidenced in many of the contributions to this monograph (Durand and Poizat 2015; Mayen 2015; Ouellet and Vézina 2015) and discussed below, there is a particularly strong emphasis on the nature of paid work and individuals' engagement with it. Given the sentiment to which Veillard (2015) and Rémery and Merle (2014) refer, to separate them from educational provisions, it is noteworthy that rather than referring to workplace experiences in derogatory or dismissive ways as occurs in the Anglophone discourse (e.g. informal learning, non-formal learning), which might be expected given deliberate attempts, there is a strong focus on the study of work and individuals' engagement with it within France and by Francophone researchers,

whose interventions help shape their understandings, but also practices for improvements. Also, by separating schooling and work, those learning in workplaces are not seen as being captive to terms associated with schooling, such as being students or apprentices. Instead, there appears to be less demarcation between those who are initially learning and those who are learning across working life. This sentiment is captured most strongly in ergonomic traditions and also those associated with practice pedagogies. At one level, this seems to be a significant contradiction given the kinds of separation and privileging as discussed above. Yet, it is important to bear in mind that this apparent contradiction arises from different institutional perspectives: the school-based educational perspective seems to have been favoured by educational policy makers, whereas the focus on the study of work and individual engagement originates from work organisations and researchers in vocational and professional education. What is at stake here is not only the diverse (and apparently contradictory) perspectives that emerge about the relations between learning and work but also the multiple actors that endorse these perspectives and power relations that characterise these actors and how these shape societal sentiments above what is to be more valued. However, and counter to that sentiment, perhaps, it seems this very separation permits an examination of work to occur uncluttered and without being hindered by assumptions arising from a close and negative relationship between educational provisions and work. Being treated separately from and with appropriate conceptual tools leads to detailed analyses of work and its implications for learning (if not education) as discussed below.

So, it is not helpful to refer generally to specific Francophone conceptions of learning through and for work, because these are constructed within the cultural traditions of Francophone countries. However, having made this point, there are particular emphases which are patterned across these conceptions. In particular, the sentiments that shape the discourse about learning through and for work are not reserved for particular linguistic traditions, but historical moments, institutional practices and cultural sentiments, which can be pervasive. All of these shape how learning through work is considered, supported institutionally and likely to be engaged with within nation-states. So, culture, as much as linguistic traditions, shape what is afforded workers and which, in turn, influences how they engage in and learn through and for their work. The first of these is an emphasis on work as a situated practice.

17.3 The Situatedness of Work and Learning

The situatedness of accounts of work and learning stands as being a distinct quality of the Francophone accounts provided here. When reviewing the contributions in this book, there is a strong emphasis on understanding the process of learning in and through work from a detailed and situated consideration of how workers engage in their work. So, as foreshadowed, the Francophone conception of situation goes beyond the social and physical aspects of the situation and accommodates centrally

that individuals bring to and shape the situation. Hence, much of this focuses on actions and activities that are undertaken by workers from their perspective (Durand and Poizat 2015). Distinguishing between realised action (i.e. what workers actually do) and activity that refers to unrealised possibilities in how people work (Kloetzer et al. 2015), and also with Bril's (2015) and Mayen's (2015) emphases on workers acting within a specific social context, positions action as a central consideration in their accounts. That is, the enactment of that work by an individual and in particular circumstances is proposed as the key way to understand and account for the constant changing nature of work, and the diverse ways that work can be conducted and transformed (Kloetzer et al. 2015).

Hence, work is not seen as a uniform or unitary social practice that is enacted by human actors, but one that is highly situative including how individuals come to enact it, which extends to their specific procedures and bodily posture, as in tool use (Ouellet and Vézina 2015). Ultimately, Lorino (2015) proposes that situated activity is mediated by habits (i.e. socially shared segments of social and culturally meaningful activity). Brougère (2015) similarly emphasises participation in work and considers how that participation and learning arise and its inherent situatedness. For instance, it was noted that parent volunteers can never become workers in the childcare system because regulations forbid workers to be parents of children in the centres. Hence, their experiences and learning are shaped by situational factors. This means also that workers cannot become parents in these care centres for the same reason. In this way, there are a set of situated affordances (i.e. invitational qualities) that play out in particular ways for different kinds of participants in this socially situated work setting. Whereas some aspect of the situation can be negotiated with, culturally derived regulatory practices – e.g. you do not hit children – are not negotiable at the situational level.

So, there are negotiable and non-negotiable bases to participation with Brougère (2015) noting that participation inevitably draws together concerns about processes and outcomes. That is, participatory practices constitute processes through which people come to learn and work, and in turn, what constitutes those practices is that which need to be learnt about for performance in that particular circumstance of practice. This participation and its negotiation are not abstracted; they are highly situated in particular physical and social practice. For instance, learning through and for a shared repertoire engages both processes and goals, such as the development of a repertoire of practice as both processes and outcomes (Brougère 2015). Indeed, this alignment between work and learning is so taken for granted in this perspective that throughout this chapter there is very little explicit reference to learning per se. Instead, the concern is to understand participation and participatory practices and how these are linked to the particular situated qualities of the workplace. Bril (2015) refers to ecological considerations which are exercised here and necessarily focus on engagement between the organism and the environment (albeit physical and social). She uses a framework of an ecological view of acting for learning as advanced through a consideration of three related concepts: (i) degree of freedom, (ii) affordances and (iii) constraints to action, with each of these being elaborated. Such factors require situations and situated action by

individuals acting in particular circumstances to occur and be understood (Wegener 2014a). So, it is not possible to consider work or learning without accounting for the set of personal and situative factors that shape participation.

Certainly, the engagement of individuals in their work is central to Francophone conceptions of ergonomic which, as noted, have a particular emphasis on avoiding the harmful consequences of work, for instance, and intervening to avoid this from occurring. This emphasis on understanding the enactment of work as a way of elaborating its learning places particular and salient emphases in the links between learning and the enactment of work activities as situated activities. It is commonly understood across learning theories giving social (Lave 1993; Lave et al. 1984; Rogoff 1982) and individual (Anderson 1993; Glaser 1989) emphases on meaning making that there are few key distinctions in these accounts between humans engaging in activities and their learning (Billett 1996). The particular privileging here is to understand the kinds of interactions between individuals and workplaces and their outcomes (i.e. learning and transformation of practice) (Wegener 2014a). So, understanding the particular nuances that sit behind the social suggestions that shape what is afforded to learners in terms of education and work-based learning experiences, on the one hand, and how individuals might elect to engage with them, on the other hand, informs that both learning and the transformation of practice are worthwhile task. In doing so, it emphasises this consideration of changes to work that co-occur with the changes to what individuals know, can do and value (i.e. learning).

Filliettaz et al. (2015) emphasises interactions – those between novice and more experience co-workers (i.e. apprentices and skilled trade workers) – as means to understand how both of these forms of change arise. The key basis for learning through work is premised on such interactions, referred to as interactional accomplishments that grant particular privileging to guidance by a more experienced partner. Within Francophone traditions, the means to understand such support and guidance is referred to as professional didactics (Filliettaz et al. 2015; Mayen 2015), whose explanatory reach is constrained to particular work settings and subject to those particular circumstances.

Moreover, the focus on the actual circumstances of working and learning, which is privileged in the Francophone approach, necessarily engages with micro-social processes, that is, the kinds of activities and interactions individuals engage in and, again, how these are afforded and engaged with by individuals (Brougère 2015). Indeed, what stands out in the accounts offered within his contribution is the degree by which these circumstances are given greater attention. That is, the character of these micro social processes needs to change as part of the learning process in workplaces. Hence, the relations that are at the heart of this engagement between the affordance of the social setting and individuals' engagement with them necessarily change as learners become more knowledgeable, seek their own direction and become far more selective about with whom they directly engage and for what purposes. Hence, there is a strong emphasis within the contributions of this book on these micro-social processes and from the broad theoretical orientations of what is referred to as micro-genetic development, that is, the moment-by-moment

processes of learning (i.e. micro genesis) that both shape and are shaped by individuals' ontogenetic development (i.e. the development that occurs through their personal histories) (Scribner 1985). Consequently, these broader societal sentiments shape the social milieu by influencing individuals' decision-making about what is more or less socially worthwhile, and thus directing their efforts and intentionalities accordingly. So, it is these situational emphases that necessarily include situational factors (i.e. social and physical contributions to thinking and acting) and individual bases for actual engagement that stand out in some contributions in this edited monograph and which are distinct from Anglophone accounts of working and learning. The next section discusses the quality of the emphases on the personal level and ways these are distinct and contribute to accounts of learning through and for work.

17.4   Focus on the Personal Practices

The third emphasis evident in these contributions that makes them in some ways distinct is the emphasis on personal practices. What might be described as personal facts (Billett 2009a) features greatly in this conception of engaging in and, therefore, learning through work with references to personal, interpersonal and transpersonal as well as impersonal dimensions. Hence, the personal dimension is located at the centre of the consideration of work, albeit set within historical legacies (Kloetzer et al. 2015). That emphasis seems to be exercised at a far greater level of concerns and wider consideration than in other contemporary accounts, particularly those that privilege social contributions to knowledge, knowing and learning. Here, for instance, the physical and psychological health of workers are seen as being a key concern to understand the nature of work and to avoid physical and psychological injury (Kloetzer et al. 2015; Ouellet and Vézina 2015). This concern manifests itself in a strong focus on workers and their ways of working (Kloetzer et al. 2015). It extends to a concern about actions that emphasise the compromise between what is required of workers, what they believe they should do, what has to be done and what else could be done (Smith 2005). Or, as Kloetzer et al. 2015 propose, 'human action is the result of subjective arbitration between several possible actions' (Kloetzer et al. 2015). So, Brougère's (2015) accounts of participation draw together concerns about processes and outcomes albeit with a particular focus on how individuals participate in the participatory practices that constitute processes by which people come to learn and work and, in turn, those practices are those that need to be learnt about. Yet, Kloetzer et al.'s analysis, as that provided by Ouellet and Vézina (2015), offer a level of analysis that is more fine grained and inclusive of bodily action than is found in accounts that are derived from theories and positions that often inform work-related learning and often centre on the physical and social world. Hence, these accounts of participation in work and engagement in work activities emphasise human subjectivity, intentionality, capacities and physical engagement as core considerations.

It follows then that whilst considering analogous accounts from elsewhere about working, such as in Engestrom's activity systems approach (to which Kloetzer et al. 2015 also refer), there is a dimension of personal engagement that is quite distinct from what has been advanced from his accounts. This may be a particularly helpful augmentation because whilst popular, the activity system fails to adequately acknowledge how individuals elect to engage with such social system and for what purposes and, therefore, offer an incomplete and flawed account of learning through work (Billett 2009a). So, whilst there is an emphasis on understanding the actual tasks of performing work, these are seen as being understood not as object processes of task completion per se as might arise from time and motion studies with an individual's performance but as inevitably needing to account for the person who is undertaking that task. Consequently, immediately, some distance is created from Anglophone social theories that often deny the particular contributions people bring to these tasks. So, there is a cultural nuancing when Kloetzer et al. (2015) engage with activity systems approach from Helsinki traditions that make their rendering quite distinct. For instance, Bourgeois et al. (2015) refer to the process of individuation arising through individuals' engagement in activities within work or school settings. This process is shaped very much not only by the broader social context of paid work, what it means to workers (which is in part shaped by the standing of that occupation), in a particular societal context, but also by the factors that shape their engagement and the learning that arises from it. But, in essence, the conceptual heritage going back at least as far as Baldwin (1894), taken up by Piaget and others above, emphasises the role of the person in experiencing, construing and constructing meaning from what is experienced. The kinds of mechanisms for learning that are referred here emphasise human purposeful observation, imitation and action, i.e. mimetic processes. Here the concept of individuation is central to an explanation of learning through technical objects and artefacts. It is proposed that not sufficient attention has been given to the contribution of the material world and also that which is non-objective, yet not wholly subjective (Bourgeois et al. 2015; Kloetzer et al. 2015).

Curiously, the concept of individuation here, whilst coming from strong social theorising, is reminiscent of theories which come from anthropology and cultural psychology, that is, the ways in which culturally and socially derived practices become embodied within the person, albeit through negotiation in individual or personal ways. For instance, Lorino (2015) drawing upon Peirce (1998) claims that we have knowledge of real objects in every experiential reaction (i.e. personal bases of knowing). Referring on Bakhtin (1981), Lorino holds that mediation of what is experienced is the core of learning as it enacts the social experience as experienced personally in a particular situation. Importantly, this process of mediation is shaped and enacted personally (Billett 2014). These seem to be a little like routinised specific procedures. When they are unable to explain particular experiences, they necessitate being transformed – although much of this can be adaptation and continuation as much as transformation. So, whilst grounded within social sources, concepts arising from explanation of human experiences such as subjectivity, appropriation and personal mediation become the centre of what is referred to as

individuation. These processes of experiencing are inevitably personal in kind (Billett 2009a, 2014). Whilst emphasising the act as a social being, enmeshed and engaged with social forms in the shape of technology, and other socially derived artefacts and objects, it is ultimately how individuals come to appropriate, take in and construct these contributions that demonstrate the inherent relations between the person and the social world in which they act (Poizat 2015).

So, as discussed above, many of the contributions here privilege the situational contributions of the social settings, where work actions and activities occur, as well as its suggestions, norms, forms and practices, and when those considerations extend to people, it often and, importantly, accommodates socially shaped subjectivities. For instance, the concern about ergonomics directs analysis of work (and learning) to embrace detailed accounts that include the person-dependent qualities of engagement in work activities. For instance, in the contributions by Bril (2015), Mayen (2015), Ouellet and Vézina (2015) and Filliettaz et al. (2015), the very individual nature of the execution of work is revealed as being quite intentional that emphasises the person dependence of those processes. Some of that person dependence is associated with improving individual's working habits to avoid injury or to promote greater efficacy (see Ouellet and Vézina 2015). Some of it is associated with understanding the micro-social processes that comprise everyday interactions in workplaces (see Filliettaz et al. 2015) and some that recognise the nature of these interactions will inevitably change as individuals learn (see Bourgeois et al. 2015), and part of the processes are about changing the learner's engagement from dependence to interdependence (see Veillard 2015).Yet, the analyses here are unthinkable without a consideration of the personal. Consequently, beyond a close focus on highly situated action, developing workers' capacities and the focus of the development are centred on individuals themselves and extend to a concern about the physical and psychological well-being of workers.

17.5 Approaches to Considering Learning Through Work

The approaches taken in the Francophone accounts offer similarities and differences between these and what is represented in the Anglophone literature. In particular, the differences between the kinds of orientations adopted in the human resource development movement that privilege workplace efficiency and in conceptions seem to depersonalise the processes of working and learning, and what is advanced in the Francophone literature seems contrasted. Hence, whereas that movement seeks to position learners on trajectories of preordained conceptions of competence (Benner 2004; Benner 1982), the emphasis here is on the person and how they engage in work and learning. This comprises the fourth noteworthy contribution from the Francophone literature to understand learning through and for work. For instance, across the majority of these contributions and in keeping

with a growing number of accounts, learning is seen as ordinary and every day. Brougère (2015) adopts a view about learning being continuous and ongoing, drawing upon Lave and Packer (2008, p. 19) who state that:

> ... a more complete understanding of the quotidian brings with it an alternative understanding of learning: that learning is ubiquitous in ongoing social activity. It is a mistake to think of learning as a special activity, taking place only at particular times in special places arranged for it.

There is something strongly aligned with other findings and conclusions about learning through work, which is in one way reaffirm, but also opens up areas for further inquiry and theorisation. In a series of studies seeking to understand how learning occurred through everyday workplace activities and interactions, a key finding arose repeatedly. That is, that regardless whether referring to learning through everyday work activities or where workers are assisted or guided in their learning, these processes could best be described through a duality comprising the affordances of the workplace and how work is elected to engage with what is afforded to them (Billett 2001b). Affordances refer to the invitational qualities, that is, the degree by which individuals are invited to participate in the workplace, work activities and interactions and, thereby, learn from that participation. In referring to invitational qualities, these can be positive or negative, with the invitation either being extended or being constrained in some way (Wegener 2014b). Hence, in some situations, individuals are actively encouraged to engage, their mistakes tolerated and support is provided to assist them learn and develop the capacities which extend the scope of that occupational competence and the reach of their application of that competence (Baumgartner and Siefried 2014). Yet, in other situations the invitation is constrained, frustrated or even wholly withdrawn, thereby inhibiting individuals' ability to participate and learn through that work (Filliettaz et al. 2010; Filliettaz 2010). So, on the one hand is the degree by which individuals are being invited, usually by factors associated with the social environment that constitutes the workplace or work practice, although occasionally, issues of the physical environment can also be constraining. Yet, beyond what is afforded to individuals is the degree by which workers elect to engage with and appropriate what they experience through those activities and interactions (Billett 2001a).

So, there is a need to elaborate the different kinds of affordances which support individuals' learning. It is this kind of framework which is exercised here and also attempts to be generative of a broader account of affordances. Bril's chapter (Bril 2015) positions understanding of learning being necessarily premised upon acknowledging contributions from the social, psychological and brute worlds. It references earlier work undertaken within the French tradition of anthropology (Mauss 1936) that promoted this very point. In many ways, her chapter seeks to do justice to this tradition. Amongst others, it critiques other anthropological accounts that emphasise imitation whilst failing to account for what the imitator brings to that process. In this way, the work of the anthropologist who engages in self-reporting activities may not fully account for what experiences they had previously which allows them to engage in imitation in the moment. In this way, she emphasises what

the personal epistemological qualities of learning that is increasingly capturing understandings about work and learning (Billett 2009b; Smith 2012). The simple point made here is that there is the scope or zone (the affordances of the workplace) within which imitation is possible for the individual, but beyond that is what the imitator brings to the imitative act. In this way, their scope of engagement and learning is necessarily constrained by what individuals bring to these situated practices. In this way, whilst emphasising the importance of understanding the relation between the person and the circumstances in which they act, it emphasises the person-dependent nature of that engagement and learning. Necessarily, a way of learning and engaging with the social world based on imitation is necessarily shaped by the imitative capacities of the imitator.

As elaborated in the above discussions, the degree of engagement is important as with most above Francophone accounts of learning thereby emphasise the importance of active meaning making participated in by those who are learning. That is, rather than transmission of knowledge from outside the person, individuals actively construe and construct from what they experience and so transform that experience and the range of contributions or mediations (e.g. social, material, personal, etc.) on which it was based. Consequently, what individuals know, can do and value will shape how they engage with what is afforded to them. So, there is person-dependence in these processes and that whilst interdependent they are inherently relational. Not only will affordances be projected in different ways, but how individuals come to engage with what is afforded is inherently relational, being mediated by individuals in person-particular ways (Billett 2006). What for one individual might be a highly positive invitation to participate, for another the invitation is constraining, demeaning or ill-received. Consequently, all of this means that it is not possible to understand learning through and for work in terms of an 'objective' consideration of workplaces as physical and social environments. Instead, there is also need to consider how individuals will come to engage with what is afforded to them. Hence, accounts of learning through and for work need to accommodate the duality of affordances and engagements. Amongst others, Matte and Cooren (2015) provide an example of an everyday work interaction and the way this dialogue shapes learning. In particular, dissonance between interlocutors is a means by which tensions arise and learning from each other is generated – in this instance, concerns about each other's understandings, conceptions, etc. At the heart of these discussions are issues of intersubjectivity or shared understanding.

In all, across these accounts methods of understanding work are closely centred on the perceptions and responses of workers (Kloetzer et al. 2015). Referring to earlier work, Clot (1999) refers to the professional genre – the usual ways of acting and interacting, speaking, doing and relating to people and things in a professional way that are established in a specific work environment. He also refers to this historical heritage as both a collective constraint on and collective resource for individual action. In this way, he emphasises the manifestations of the canonical knowledge of the work/occupation and its particular manifestation. The canonical knowledge is the historical heritage, it is yet manifested in the particular work situation and the negotiation of the professional genre is part of that manifestation.

In a similar way, Bril's contribution (2015) emphasises the need to reconcile the person and the circumstances in which they are acting, which extends to the kind of close support provided through guided participation.

17.6   Contributions from Francophone Perspectives

In summary, Filliettaz et al. (2015) argue that although there is great interest in and much has been written about learning through practice, a fresh view is required about what constitutes learning opportunities in work situations. In many ways, the Francophone contributions identified here do much support what is proposed in some of the more inclusive accounts of learning through work, that is, those that accommodate the necessary and interdependent contributions of both social circumstance and persons and view which the relations between these two sets of contributions as being central. Not that there is anything particularly new or fresh about that set of considerations. These have been considered over the last 100 or so years in accounts explaining human learning and development. What is noteworthy in the accounts offered here is that a particular set of cultural and institutional factors have shaped the particular emphases on the relations between work and learning. Whilst there has been a separation of considerations of work and learning within France, that may well have, ironically, led to the focus on work and work-related learning that is enacted and conceptualised on its own terms and not through an association with education (e.g. informal learning, non-formal learning). It is that association that confuses and weakens the conversation about learning through work in the Anglophone community.

In addition, the strong emphasis on situated action demands a consideration of the person in action in a particular circumstance of work that presses for a consideration of the actual practice including how worker comes to engage, learn and transform that practice. This is refreshing, if not fresh. Added here also is the strong emphasis on the personal dimension, with considerations of bodily engagement and learning, with the degree of this emphasis being fresh and refreshing. Here, for instance, the physical and psychological health of workers are seen as being a key concern to understand the nature of work and avoid physical and psychological injury – a strong focus on workers and ways of working (Kloetzer et al. 2015), which is hard to find elsewhere. Finally, what is really helpful for these authors is the broad approach to understanding learning through work that is inclusive of a range of contributions: situated, yet mediated by persons; based on what they know, can do and value; and that knowing is broadly based. Much more than declarative forms, they emphasise bodily action and knowing. In all, these accounts offer a mature and inclusive approach to understanding learning through and for work.

References

Anderson, J. R. (1993). Problem solving and learning. *American Psychologist, 48*(1), 35–44.

Bakhtin, M. M. (1981). *The dialogic imagination*. Four essays (M. Holquist, Ed.). Austin: University of Texas Press.

Baldwin, J. M. (1894). Personality-suggestion. *Psychological Review, 1*, 274–279.

Baumgartner, A., & Siefried, J. (2014). Error climate and the individual dealing with errors in the workplace. In C. Harteis, A. Rausch, & J. Seifried (Eds.), *Discourses of professional learning: On the boundary between learning and work*. Dordrecht: Springer.

Benner, P. (1982). From novice to expert. *American Journal of Nursing, 82*(3), 402–407.

Benner, P. (2004). Using the Dreyfus model of skill acquisition to describe and interpret skill acquisition and clinical judgment in nursing practice and education. *Bulletin of Science, Technology & Society, 24*(3), 188–199.

Bennett, C. A. (1938). The ancestry of vocational education. In E. A. Lee (Ed.), *Objectives and problems of vocational education* (2nd ed., pp. 1–19). New York: McGraw-Hill Book Company.

Billett, S. (1996). Situated learning: Bridging sociocultural and cognitive theorising. *Learning and Instruction, 6*(3), 263–280.

Billett, S. (2001a). Coparticipation at work: Affordance and engagement. In T. Fenwick (Ed.), *Sociocultural perspectives on learning through work* (Vol. 92). San Francisco: Jossey Bass/Wiley.

Billett, S. (2001b). Learning through work: Workplace affordances and individual engagement. *Journal of Workplace Learning, 13*(5), 209–214.

Billett, S. (2006). Relational interdependence between social and individual agency in work and working life. *Mind, Culture, and Activity, 13*(1), 53–69.

Billett, S. (2009a). Conceptualising learning experiences: Contributions and mediations of the social, personal and brute. *Mind, Culture, and Activity, 16*(1), 32–47.

Billett, S. (2009b). Personal epistemologies, work and learning. *Educational Research Review, 4*, 210–219.

Billett, S. (2014). Mediating learning at work: Personal mediations of social and brute facts. In C. Harteis, A. Rausch, & J. Seifried (Eds.), *Discourses on professional learning: On the boundary between learning and working* (pp. 75–93). Dordrecht: Springer.

Bourgeois, E., Allegra, J., & Mornata, C. (2015). Transmission and individuation in the workplace. In L. Filliettaz & S. Billett (Eds.), *Francophone perspectives of learning through work: Conceptions, traditions and practices*. Dordrecht: Springer.

Bril, B. (2015). A functional approach to action: The case of tool-use learning. In L. Filliettaz & S. Billett (Eds.), *Francophone perspectives of learning through work: Conceptions, traditions and practices*. Dordrecht: Springer.

Brougère, G. (2015). Learning by participating: A theoretical configuration applied to French cooperative day care centres. In L. Filliettaz & S. Billett (Eds.), *Francophone perspectives of learning through work: Conceptions, traditions and practices*. Dordrecht: Springer.

Bunn, S. (1999). The nomad's apprentice: Different kinds of apprenticeship among Kyrgyz nomads in central Asia. In P. Ainely & H. Rainbird (Eds.), *Apprenticeship: Towards a new paradigm of learning* (pp. 74–85). London: Kogan Page.

Cho, M. K., & Apple, M. (1998). Schooling, work and subjectivity. *British Journal of Sociology of Education, 19*(3), 269–291.

Clot, Y. (1999). *La fonction psychologique du travail*. Paris: Presses universitaires de France.

Dreyfus, H. L., & Dreyfus, S. E. (1986). *Mind over machine: The power of human intuition and expertise in the age of the computer*. Oxford: Basil Blackwell.

Durand, M., & Poizat, G. (2015). Work analysis and transformation of practices: An activity-centred approach of vocational education. In L. Filliettaz & S. Billett (Eds.), *Francophone perspectives of learning through work: Conceptions, traditions and practices*. Dordrecht: Springer.

Filliettaz, L. (2010). Interaction and miscommunication in the Swiss vocational education context: Researching vocational learning from a linguistic perspective. *Journal of Applied Linguistics and Professional Practice, 7*(1), 27–50.

Filliettaz, L., de Saint-Georges, I., & Duc, B. (2010). Skiing, cheese fondue and Swiss watches: Analogical discourse in vocational training interactions. *Vocations and Learning, 3*(2).

Filliettaz, L., Durand, I., & Trébert, D. (2015). Learning through verbal interactions in the workplace: The role and place of guidance in vocational education and training. In L. Filliettaz & S. Billett (Eds.), *Francophone perspectives of learning through work: Conceptions, traditions and practices*. Dordrecht: Springer.

Giddens, A. (1991). *Modernity and self-identity: Self and society in the late modern age*. Stanford: Stanford University Press.

Glaser, R. (1989). Expertise and learning: How do we think about instructional processes now that we have discovered knowledge structures? In D. Klahr & K. Kotovsky (Eds.), *Complex information processing: The impact of Herbert a. Simon* (pp. 289–317). Hillsdale: Erlbaum & Associates.

Gonon, P. (2002). *The dynamics of the vocational training innovation in Switzerland*. Paper presented at the Towards a history of a vocational education and training (VET) in Europe in a comparative perspective, Florence.

Gowlland, G. (2012). Learning craft skills in china: Apprenticeship and social capital in an artisan community of practice. *Anthropology and Education Quarterly, 43*(4), 358–371.

Ingold, T. (2000). *The perception of the environment: Essays on livelihood, dwelling and skill*. London: Routledge.

Jordan, B. (1989). Cosmopolitical obstetrics: Some insights from the training of traditional midwives. *Social Science and Medicine, 28*(9), 925–944.

Kloetzer, L., Clot, Y., & Quillerou-Grivot, E. (2015). Stimulating dialogue at work: The activity clinic approach to learning and development. In L. Filliettaz & S. Billett (Eds.), *Francophone perspectives of learning through work: Conceptions, traditions and practices*. Dordrecht: Springer.

Lave, J. (1993). The practice of learning. In S. Chaiklin & J. Lave (Eds.), *Understanding practice: Perspectives on activity and context* (pp. 3–32). Cambridge, UK: Cambridge University Press.

Lave, J., Murtaugh, M., & de la Roche, O. (1984). The dialectic of arithmetic in grocery shopping. In B. Rogoff & J. Lave (Eds.), *Everyday cognition: Its development in social context* (pp. 76–94). Cambridge, MA: Harvard University Press.

Lave, J., & Packer, M. (2008). Towards a social ontology of learning. In K. Nielsen, S. Brinkmann, C. Elmholdt, L. Tanggaard, P. Musaeus, & G. Kraf (Eds.), *A qualitative stance* (pp. 17–46). Aarhus Universitetsforlag.

Lorino, P. (2015). Learning as transforming collective activity through dialogical inquiries. In L. Filliettaz & S. Billett (Eds.), *Francophone perspectives of learning through work: Conceptions, traditions and practices*. Dordrecht: Springer.

Marchand, T. H. J. (2008). Muscles, morals and mind: Craft apprenticeship and the formation of person. *British Journal of Education Studies, 56*(3), 245–271.

Matte, F., & Cooren, F. (2015). Learning as dialogue: An 'on-the-go' approach to dealing with organizational tensions. In L. Filliettaz & S. Billett (Eds.), *Francophone perspectives of learning through work: Conceptions, traditions and practices*. Dordrecht: Springer.

Mauss, M. (1936). Notion de technique du corps. *Journal de Psychologie, 3–4*, 365–386.

Mayen, P. (2015). Vocational didactics: Work, learning and conceptualization. In L. Filliettaz & S. Billett (Eds.), *Francophone perspectives of learning through work: Conceptions, traditions and practices*. Dordrecht: Springer.

Ouellet, S., & Vézina, N. (2015). Activity analysis and workplace training: An ergonomic perspective. In L. Filliettaz & S. Billett (Eds.), *Francophone perspectives of learning through work: Conceptions, traditions and practices*. Dordrecht: Springer.

Peirce, C. S. (1998). *The essential Peirce* (Vol. 2, The Peirce Edition Project, Ed.). Bloomington: Indiana University Press.

Poizat, G. (2015). Learning through interaction with technical objects: From the individuality of the technical object to human individuation. In L. Filliettaz & S. Billett (Eds.), *Francophone perspectives of learning through work: Conceptions, traditions and practices*. Dordrecht: Springer.

Rémery, V., & Merle, V. (2014). French approaches to accreditation of prior learning: Practices and research. In T. Halttunen, M. Koivisto, & S. Billett (Eds.), *Promoting, assessing, recognizing and certifying lifelong learning: International perspectives and practices* (pp. 265–280). Dordrecht: Springer.

Rogoff, B. (1982). Integrating context and cognitive development. In M. E. Lamb & A. L. Brown (Eds.), *Advances in developmental psychology* (Vol. 2, pp. 125–170). Hillsdale: Erlbaum.

Schutz, A. (1996). *Collected papers vol. 4*. Dordrecht: Kluwer Academic Publishers.

Scribner, S. (1985). Vygotsky's use of history. In J. V. Wertsch (Ed.), *Culture, communication and cognition: Vygotskian perspectives* (pp. 119–145). Cambridge, UK: Cambridge University Press.

Singleton, J. (1989). The Japanese folkcraft pottery apprenticeship: Cultural patterns of an educational institution. In M. W. Coy (Ed.), *Apprenticeship: From theory to method and back again* (pp. 13–30). New York: SUNY.

Smith, R. (2005). Epistemological agency and the new employee. *Australian Journal of Adult Learning, 45*(1), 29–46.

Smith, R. (2012). Clarifying the subject centred approach to vocational learning theory: Negotiated participation. *Studies in Continuing Education, 34*(2), 159–174.

Troger, V. (2002). *Vocational training in French schools: the fragile State-employer alliance*. Paper presented at the Towards a history of vocational education and training (VET) in Europe in a comparative perspective, Florence.

Van Lehn, V. (1989). Towards a theory of impasse-driven learning. In H. Mandl & A. Lesgold (Eds.), *Learning issues for intelligent tutoring systems* (pp. 19–41). New York: Springer.

Veillard, L. (2015). University-corporate partnerships for designing workplace curriculum: Alternance training course in tertiary education. In L. Filliettaz & S. Billett (Eds.), *Francophone perspectives of learning through work: Conceptions, traditions and practices*. Dordrecht: Springer.

von Glasersfeld, E. (1987). Learning as a constructive activity. In C. Janvier (Ed.), *Problems of representation in the teaching and learning of mathematics* (pp. 3–17). Hillsdale: Lawrence Erlbaum.

Webb, E. (1999). Making meaning: Language for learning. In P. Ainely & H. Rainbird (Eds.), *Apprenticeship: Towards a new paradigm of learning* (pp. 100–110). London: Kogan Page.

Wegener, C. (2014a). A situated approach to VET students' reflection processes across boundaries. *Journal of Education and Work, 27*(4), 454–473.

Wegener, C. (2014b). Would you like a cup of coffee? using the researcher's insider and outsider positions as a sensitizing concept. *Ethnography and Education, 9*(2), 153–166.

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