António Moreira · Otto Benavides
António José Mendes   *Editors*

Media in Education

Results from the 2011 ICEM and
SIIE Joint Conference

≋ Springer

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Editors
António Moreira
Department of Education
Campus Universitário de Santiago
University of Aveiro
Aveiro, Portugal

Otto Benavides
Department of Curriculum and Instruction (CI)
California State University
Fresno, CA, USA

António José Mendes
Faculty of Sciences and Technology
Department of Computer Engineering
University of Coimbra
Coimbra, Portugal

Preface

Media in Education: Results from the 2011 ICEM and SIIE Joint Conference is the title of a collection of blind peer-reviewed papers that were selected for a special publication by Springer. It represents points of view from the authors of the papers on the topic "Old meets new—media in education", a topic central to the conference jointly organised by ICEM and SIIE, that took place at the University of Aveiro, Portugal, September 28–30, 2011.

ICEM-CIME is a non-profit, non-governmental organization, which has been active in the field of educational technology since 1950 and has been organizing an Annual International Conference in a different country each year. Its seat and treasury are currently in Vienna, Austria, and it maintains operational relations with UNESCO and an NGO affiliate.

ICEM's goals are to provide a channel for the international exchange and evaluation of information, experience and materials in the field of educational media as it applies to pre-school, primary and secondary education; technical, vocational, industrial and commercial training; teacher training and continuing and distance education, and to cooperate in the development and application of educational technology with other international organizations involved in practice, research, production and distribution of educational materials.

The International Symposium on Computers in Education (SIIE) is a professional meeting organized alternately in Spain and Portugal, and lately also in Latin America, where it associates with the Red Iberoamericana de Informática Educativa (RIBIE), and it has long become a reference gathering of researchers, particularly in the Iberian-American context. It gathers practitioners and researchers in the field of educational media, promoting the presentation, reflection and debate of the latest advances in research and practice in the field of Information and Communication Technologies applied to Education.

This book offers reflections that are different in nature, culture and posture as to media in education. Nelson Pretto, with his text "Old meets New: culture and digital technologies in schools", analyses the overflow of information and its impacts on

culture and the education that derives from it, and how it empowers people to transform the educational system that he associates with the dangers of industrialism and economics, criticizing it and bring to discussion the concept of "a pedagogy of difference" opposing it to a "pedagogy of assimilation".

Johannes Cronje's text "What is this thing called "Design" in Instructional Design research?—the ABC instant research question generator", criticises the recurring confusion between the process of design and design itself, proposing, in his own words, "an adaptation of Burrell & Morgan's four paradigms of social science research to produce four research questions that can be used as a point of departure for instructional design research".

Fernando Albuquerque Costa discusses the various competencies required to "Designing Educational Multimedia Resources", alerting to the fact that the teacher does not always possess the possibility to resort to a multidisciplinary team, proposing a design model "that aims to systematise and carry out some of the main aspects to be considered in the planning of educational multimedia products".

"An evaluation model for quality assurance of blended learning—exploring the lecturers' perspectives" is then offered the reader by Lúcia Pombo and António Moreira, where the process of evaluation in blended learning courses is discussed, offering a model for blended learning courses based on lecturers' opinions on "what is evaluation for?", "who should evaluate?", "how and when to evaluate?" and "what should be evaluated?".

Ronaldo Nunes Linhares and Simone de Lucena Ferreira describe the public policies of introducing information and communication technologies in education in Brazil, how the policies were implemented so as to offer training courses for teachers, therefore preparing them for the use of an ubiquitous and decentralized means of learning. Their text "Reflective map about the limits and challenges of continued training of teachers for the use of mobile technologies: the experience of PROUCA", presents data pertaining to the teacher training program as it took place in the state of Sergipe.

"Web 1.0 and Web 2.0—An Anglo-Portuguese research project on the impact of using technology in Science Education programmes" reports on a study conducted by Lúcia Pombo, Cecília Guerra, António Moreira, Leigh Hoath, Dave Howard and Malcolm Smith, focusing on the impact of Science Education programmes that resort to innovative methodologies for the professional development of student teachers and in-service primary teachers. The team collaboratively identified quality evaluation criteria of teaching practices and defined the evaluation criteria for improvement of the curricula.

Finally, Teresa Cardoso and Filipa Matos offer the reader a text on "Learning Foreign Languages in the twenty-first Century: An Innovating Teletandem experiment through Skype", presenting an innovative experience with students from the University of Salerno (Italy) and the Universidade Estadual Paulista de Assis (Brazil), communicating using Skype.

It is our hope that these seven chapters depict the variety of views, tools, strategies and approaches that are at our disposal in this ever-changing and fascinating world, and that they give rise to further discussion, therefore making our knowledge evolve and offer education a new, valuable and productive meaning.

Aveiro, Portugal   António Moreira
Fresno, CA, USA   Otto Benavides
Coimbra, Portugal   António José Mendes

Contents

Chapter 1
Old Meets New: Culture and Digital Technologies in Schools

Nelson De Luca Pretto

The field of education has always been called upon to try to solve problems that go beyond the field itself. Educators are often invited—in fact sometimes driven!—to take part in the solution of various problems that ultimately require other interventions which are not only those of the area of education, despite its wide scope.

The systematic observations we have made in formal educational experiences which happen inside schools and non-formal experiences which are carried out by Non Government Organisations (NGOs) enable us to understand that some areas of knowledge, such as culture and technology, always come back as important issues to the educational scenario but often assume a secondary role, or at least without the prominence that we think they should be approached. We consider both these fields (culture and technology) important to understand the education challenges and the necessary transformation of schools including curriculum, buildings and teacher education, among others.

This analysis consider as important to a better understanding of the educational process, consider the ubiquity of images in our times, the instability brought by the complexity theory and the importance of the cultural approach for the education field.

Contemporary Challenges

To start this analysis, it is important to think about the ubiquity of images in our times. With the instability brought by the complexity of the contemporary world, it is necessary to re-introduce the cultural approach which has been forgotten recently

N. De Luca Pretto (✉)
Federal University of Bahia/School of Education, Av. Miguel Calmon,
s/n - Campus Canela - 3 andar, Salvador 40110-100, Bahia, Brazil
e-mail: nelson@pretto.info

because of the intense presence of the commoditisation of education, including school curricula and in particular teacher education. We want to understand education beyond the linear processes, perhaps trying to build a school labyrinth in which digital technologies can play a key role.

Considering these aspects, the aim of this paper is to develop the idea of using the difference as the main approach to education, instead of thinking about homogenisation and the production line, rescuing the concept of craftsmanship for educational processes.

We live in a cyberworld, full of images and information that flood through the channels of television, radios, Internet, advertising and so on. There is a dominant view that leads us to think about globalisation only through its most obvious aspect, the economic. This has often generated a series of misunderstandings that we do not want to perpetuate here. Much has been written about it (Santos, 1999; Santos, 1996, 2000) and here we are focusing our attention on the proliferation of images in the contemporary world and its relationship with culture. Marc Augé (1999) in his book *War of Dreams*: *Studies in Ethno Fiction* speaks of the invasion of images that, in a broader perspective, is a "new regime of fiction" that affects us today, penetrating and contaminating social life. According to him, this happens because, in fact, the image is the condition of "circulation between the individual imagination (for example, the dream), the collective imagination (e.g. myth) and fiction (literary or artistic, visually constituted or otherwise) which have changed" (Augé, 1999:6).

He continues his analysis of the actual status of the imagination, which has been profoundly changed by the systematic "fictionalisation" the world has undergone. Augé again:

> we can ask ourselves fresh questions about the actual status of the imagination (…) and this turning into fiction itself depends upon a set of power relations which is very concrete and very perceptible, but those terms are not easy to identify. To put it in a nutshell, we all have the feeling that we are being colonised but we don't exactly know who by; the enemy is not easily identifiable; and one can venture to suggest that this feeling now exists all over the world, even in the United States (Augé, 1999:6).

The multiplicity of points of view and ideas appears in opposition to the idea of fixed extremes that are opposed, and there is therefore no longer any space for the idea of polarities. Events, intensity, languages, meanings, contexts, subjectivity, vicinity, ubiquity among others, are new concepts that are already part of our "deluded" quotidian and give us new tools to analyse phenomena and events including education. These are some of the elements that constitute the foundations of what today is known as cyberculture, which immerses us in a world intensely impregnated with digital technological devices. The presence of such technologies, especially those related to information and communication (ICT), resounds all over the planet inducing many Western countries to develop public policies for the area in the 1990s, constituting what was known as Information Society, Knowledge Economy or Informationalism, as Manuel Castells refers to it (Castells, 1996). In the last decade of twentieth century some countries developed projects to prepare

themselves for this Information Society and to deal with the so-called digital divide. These projects were important because in many poorer countries even now, thinking about access to ICT means considering the need to develop public polices to introduce the infrastructure to connect people, houses, schools and public places. The figures in these countries show low levels of immersion in these technologies[1], particularly in developing countries.

In such discussions we found thoughts and reactions from all sides and like Marc Augé, we are not tempted to make a pure and simple criticism about cyberculture as many already have done. Some speak as prophets, others as sceptics. Others still range from the apocalyptic and integrated, such as Umberto Eco 1994 book (*Apocalyptic and Integrated*). Times have changed and we should avoid the trap of such polarities. An alternative and holistic approach to understand the world outside the school system is taken to understand the world as a hole to look inside the school with new eyes and new ways of looking. These change of attitudes and perceptions about the world force us to rethink basic values concerning education. One important aspect here is the role of the culture.

Culture can be identified as an aspect which is often overlooked when the subject is traditional curriculum in recent years. Education has become impregnated with procedures typically associated with industrial production, often leading education debate into the Economics field, introducing strange vocabulary such as productivity, effectiveness, efficiency, among others. Instead of using these words and concepts we re-introduce the importance of culture and its potential role to transform the educational system. But culture here needs to be understood as a dynamic concept since, as Augé asserts,

> first and foremost, quite clearly, culture does not inherently imply any refusal or incompatibility, in so far as it remains culture, which is to say, something creative. A culture which goes on reproducing itself exactly (a culture of the reservation or the ghetto) is a sociological cancer, a death sentence, just as a language which is no longer spoken, which no longer borrows and no longer invents, is a dead language. There is therefore always a certain danger in wishing to defend or protect cultures and the search for their lost purity is somewhat illusory. They have only ever been alive in so far as they transformed themselves. (Augé, 1999:17).

The contemporary moment, impregnated with information and communication digital technologies, requires cultures that mix themselves and can resonate on each other in a cultural remixing which modifies itself. This is a continuous process because it is not limited to receiving or giving. It is contamination and resonance. It is a permanent and constant exchange without external hegemony previously defined from outside. What's more, the presence of all those involved is important, be they primary or secondary characters. This is relevant because we consider the existence of primary and secondary characters but their relative position is assumed dynamically and as part of the process, as a chaotic phenomenon, with moments of varying degrees of resonance. Sometimes someone involved in this process plays the main role and other times play a secondary role. But everyone, without distinction, is involved in the process as a whole and not just a small part of it, like a gear in a machine. They experience all moments of varying degrees of resonance and interactions, like a dance.

This is the dance of the universe.

This is our existential dance.

This movement with relationships and interferences is what gives life to our life and creates culture. It is a process of contamination which introduces another dynamism into our lives because when one specific culture receives influence from another, different dynamics go on to be established, creating new stirring, and probably introducing variables that we are not accustomed to dealing with, like instability.

Within the field of culture, these movements and context affect culture as "living cultures are receptive to outside influences; in one sense all cultures have been contact cultures (…)" says Marc Augé (1999:25) and often we resist it and "we sometimes are inclined to regard culture and ethnicity as reflections of one another, turning the intangibility of the former into the condition of the latter's existence. Within this perspective any penetration from the outside is regarded as deculturation and all deculturation as de-socialisation, a loss of identity" (Augé, 1999:17). The view of protecting culture from outside influences is important here because the education system, and schools in particular, are spaces of exchange, and we want to consider the entire culture as full of life, vibrating, something alive that can change when in contact with other cultures. This contact and interaction, in other words, the coexistence among cultures, could be a kind of exercise, a kind of proof about culture itself, which leaves us some important issues. Marc Augé (1999:25) asks: "what are the reactions of the culture in contact? Does it give signs of life or signs of weakness?" He answers: "The answer is often ambiguous" (17).

Two issues arise from Augé's assertion. On the one hand, I agree with the importance of ambiguity for culture and education. However, in relation to the "signs of weakness", the question seems to suggest a similar dichotomy mentioned earlier on. It is not one thing or another, but the potential that emerges from this coexistence and processes of exchanges which enrich human groups. However, this is only possible if the horizontallity of the relationships is taken into account, which does not fit into the idea of weakness or strength. What we have then are interactions between "particular subjectivities", which create and recreate new subjectivities.

Returning to the question of ambiguity is important because the educational process cannot be considered far from it. This is because it is in the field of ambiguity that the wealth of experience in the daily lives of people, students and teachers can be found. It is here that school work becomes exciting exactly because it is ambiguous, non-linear and not necessarily predictable. Everyday life practices, values and feelings can be considered and have been previously established, controlled and without external definitions and determination.

Teachers have an important role in this context because they have to be able to negotiate the differences constantly emanating from human relationships. Henry Giroux, proposing a post-modern education, talks about the sensitivity of teachers. According to him,

> postmodern pedagogy must be more sensitive to how teachers and students negotiate both texts and identities, but it must do so through a political project that articulates its own authority within a critical understanding of how the self recognizes others as subjects rather than as objects of history (Giroux, 1999:111).

Indeed, this "new" pedagogy has to deal with the chaos and indetermination of the learning process coping with ambiguity. It is this ambiguity that we consider basic to education. This was mine and my colleagues' perspective when writing a plan for the School of Education at the Federal University of Bahia/Brazil for two mandates as director (2000/4–2004/8). The goal of this institution is teacher education and we considered the possibility of "constructing a school adrift" ("Construindo uma escola sem rumo"). To develop this idea, we worked on the construction of what we are calling "the pedagogy of the difference", as opposed to traditional "pedagogy of assimilation". In the pedagogy of assimilation we observe a focus in practices centred on repetition, in the distribution of information, which we call "school-broadcasting", where the main method is to separate context, culture and, more importantly, wisdom. Instead of this, the "pedagogy of the difference" considers as key element the presence of cultures, here in the plural, and we deal with the differences brought by students, teachers and the community into schools. We work, therefore, based on the complexity of the phenomena, bringing to the school context many and diverse aspects of cultural life. At the same time school preserve and transform cultures from their singularities. This perspective design the education system as communication space and time, in constant expansion, based on networks of relationships as those that "connect the differences without the worry of homogenized and are heavily reliant on technological connections" (Pretto & Serpa, 2001:29), which can then link the schools and the community around them, making each network node in areas of expressive culture and knowledge.

The pedagogy of the difference is based on a curricula that overcome the idea of disciplines as a set of subjects and contents, working from the knowledge of students, their wisdom, with the popular culture, techniques and creativity, and dialogue permanently with the established knowledge. More than using information and communication technologies it is possible to connect to other spaces, times and cultures over the world. In the recent past, without these potential communicative system, propose something like that could be an induction to country or community isolation of the world.

In a seminal Brazilian book of the 1970s written by Carlos Rodrigues Brandão entitled "The political question of popular education" this debate was raised.[2] In the introduction, Brandão used the speech of the farmer Antonio Cicero de Souza, called Ciço, to explain what education is. We do not know if this conversation between Brandão and Ciço took place or if it was a construct created by Brandão, but this is not relevant in our analysis (see Pretto & Arapiraca, 2000). Ciço asks Brandão about what education is for him. Ciço words: "You ask me this as though you already know the answer. But I will explain. The education that comes to you is yours, for your world. Now, my education is yours. It has the knowledge of its people and is for everyone, isn't it?" concluded Ciço explaining with popular words the top-down model of education that spread knowledge and values. This dialogue, real or hypothetical it does not matter, brought to the discussion the idea of "school-broadcasting" and the necessity to stop thinking of the educational process as focusing on the transforming of *the other into I*.

Again Henry Giroux, now based on Fabienne Worth's paper "Postmodern Pedagogy in the Multicultural Classroom: For Inappropriate Teachers and Imperfect

Spectators", point out the need to address how teachers can work to stimulate democratic processes (not "pedagogical terrorism") to "offer representations, histories, and experiences that allow students to critically address the construction of their own subjectivities as they simultaneously engage in an ongoing *process of negotiation between the self and other*" (Giroux, 1999:112; Worth, 1993:26, emphasis added).

It is not enough, therefore, to assemble educational programmes that consider popular culture only to incorporate them as elements to start the education process, as a departure for further transformation at the end. In most cases, some aspects from popular culture are included in the curriculum just to illustrate the process of transformation because the aim is, as already said, transformation of *the other into I*, focusing on the homogenisation of cultures. These transformations have in mind pure and simple preparation or adaptation for the market that ultimately defines the rules and procedures in all areas of science, culture and education. In other words, educational public policies, programmes and projects that are concerned with the immediate training of people for the market—not necessarily to be citizens—able to adapt to the market, is already imposing a new way of being: the consumer-kind.

In this perspective schools have been structured to receive the experiences of the different only as mere illustrations and not as basic (foundational) element of the process. Schools are still based on the Fordist approach (school-factory-Fordist), where the production process is what determines the whole education process. Each school element such as the curriculum, classes, teachers, are pieces of equipment like gears in the machine controlled by a few, and therefore powerful people normally outside the classroom and the school. Concerning to curriculum, it is important to emphasise how much it has played an important role to control the system, reducing processes to achieve a mere pursuit of knowledge "enlightened". According to Alfredo Veiga-Neto (2002:170–171) '[…] the curriculum is an artifact that has been engendered both to "service" of the order and the representation as to "service" of new spatial and temporal logics that settled at the threshold of Modernity'.

We suggest thinking of another approach to the education system which goes against the industrial design approach, with subjects divided in parts. Such parts will join in the future, in an effort made basically by the students themselves. The filmmaker Wim Wenders, in his book "L'atto di vedere/The Act of Seeing", in an interview to Peter W. Jansen, said that in the preparation of a good photographer or film director, the most important thing is to see, see and experience many movies and pictures. We can learn with Wim Wenders when indicating the best school for professional filmmakers is the one where students get to know films in-depth and are able to communicate their impressions of the movies. According to him "The best school is one of diving into the activity. And do everything: shoot, think, write, go around the world, meet people, and also have a coffee"(Wenders, 1992:49). *Mutatis mutandis*, this applies to contemporary education in the sense of including an understanding of the whole process of education, with their internal and external relations rather than just a pile of parts that might be assembled in the future.

Indeed, maintaining the perspective of education as an industrial process, as a system of gears, is once again maintaining the system to favour a few. It privileges

those who, through their external social standing have the opportunity to establish the major links and thereby develop the process of such immersion outside the school. These links, once again, will probably be only by those who already have privilege and opportunity to understand the processes as a whole because they have access to all facilities of the contemporary word. They have access to a broadband Internet connection at home, access to satellite TV, opportunities to visit museums, cinemas, parks, access to books, newspapers and magazines, among many others, and what's more, the resources to travel and to get to know other cultures.

The last main basic education curriculum reform in Brazil, promoted by the Fernando Henrique Cardoso government (1995–2002), and maintained in the government of Luis Inácio Lula da Silva (2003–2010), introduced cross-sectional elements ("eixos transversais") which aimed to connect different topics of the curriculum. However, what has been observed is that in the learning process, knowledge and popular wisdom remain separate with only a fragile connection. This connection does not support the whole curriculum structure because it was built on isolated content and knowledge. This content and knowledge are indeed brought to school like a read-only file, material which is to be taken in by students as a passive recipient of culture produced elsewhere, without or at least with few student participation. The distance between the school world and the "real world" is immense.

Outside schools, life goes on with emotion and subjectivity being brought into the school as mere illustration of the learning process. In addition, these "real" processes have elements that act exactly in opposition to the idea of a simple juxtaposition of parts, reinforcing the idea of synchronicity and resonance, inducing deep immersion in the whole educational process itself. In this sense there is no pure and simple way to be a spectator. He/She is also part of the process, with his/her own subjectivity.

Some experiences have been carried out by Brazilian Non-Governmental Organisations (NGOs) and consider wider approaches to the educational process, including arts, music, sports, social integration with relaxed and more flexible methods. Much of these NGOs are supported by international funds and attempt to include emotion and subjectivity to prepare students as citizens and not merely "consumers". Notwithstanding, the distance between these two worlds—schools and NGOs projects—is huge. On the one hand school deals with cognitive aspects, centred on a closed curriculum and linear time and processes. On the other, the NGOs emphasise the emotional, political, existential and subjective dimensions of life. On the one hand Science and Culture, both with capital letters while on the other, cultures, diversity, experiences, challenges, creativity, emotions, in short, life.

We have learnt from these projects and from others such as hackers and open source movement. Pekka Himanen describes the hackers' learning model as based on a immersion into the problem and a collective participation of the community. He argues that it "starts out with setting up an interesting problem, working toward a solution by using various sources, then submitting the solution to extensive testing" (Himanen, 2002:73).

In this process the creation and the dialogue with the knowledge established is intense, mixing all sources available with an exchange of information and findings. Himanen suggests that the "hacker model resembles Plato's Academy, where students were not regarded as targets for knowledge transmission but were referred to as companions in learning (synthesis)" (Himanen, 2002:75/6).

Re-mixing and recombination of everything could be a basic approach for this moment connecting all areas. Imbued with the spirit of Brazilian avant-garde artist Helio Oiticica from the middle of the last century, Marco Silva (2000) re-introduces the idea of open work ("opera aberta"): "A new era is beginning: the era of wider participation. […] The proposition tends to be of free, creative, and immediate access to everyone to participate". (OITICICA apud Silva, 2000:125).

This participation is based on the creative process and not, therefore, to seek the integration of parts (contents, areas, subjects, cultures, among others) that remain isolated, distant from each other. Instead, what is important in this approach is to consider the multiplicity and immeasurably of all of these phenomena. In addition, Marco Silva (2000:194) explains Helio Oiticica's Parangolé and its relationship with schools: "the Parangolé and digital art suggest the teacher be a proposer of creative activities which can be insightful, navigated, modified […]. A proposer of questions and dialogue, and with access to available data on multiple network connections" (2000:194).

The network connections—technological or otherwise—suggesting, once again, new possibilities for the different, brought together throughout the walk. Again, we talk about chaos: "From chaos to the mud", according to the Brazilian musician Chico Science who died prematurely, and his group Nação Zumbi, in "Da Lama ao Caos".

"Can I get out of here to disorganize
    From the mud to the Chaos/From Chaos to the mud
    A man who has been robbed is never fool
    The sun burned, burned the mud from the river
    I saw a Chieé[1] walking slowly
    I saw a crab going from here to there
    I saw another crab walking to the South
    It came out of the mangrove and became "gabiru"[2]
    Oh, Josué, I have never seen such terrible thing
    The more misery there is, the more vultures circle
    I pick up the tray, went to the market steal tomatoes and onions
    On the way an old woman stole my carrot
    Hey old lady, leave my carrot alone
    With an empty stomach, I can't sleep
    With my belly full, I start to think
    I' m getting myself organized, so I can disorganize
    I'm getting disorganized, so I can organize.
    From the mud to the Chaos/From Chaos to the mud
    A man who has been robbed is never fool."[3]

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[1] Species of crab.

[2] Species of mouse but could be used as a reference to a poor men.

[3] http://www2.faced.ufba.br/administracao/planos/gestao_2004_2008/plano_g estao-2000_2004_2004_2008

It is this instability to organize and disorganize referred to by Chico Science that is basic to an understanding of this world full of images and generalised connections. New procedures are emerges all the time, allowing the occurrence of new tensions between the finite and infinite, life and death, between life-living and life-lived. It works between game-playing and a game-played. A labyrinth full of possibilities, which brings back more powerfully the idea of a game-played, developed by Luis Felippe Perret Serpa and which was incorporated into the plan of the Faculty of Education at UFBA in the period 2000–2004:

> […] Consider a dice. Potentially, the dice's main characteristic is having six faces, namely the difference. It is the uniqueness of the dice release which is the same view of one of its six sides. At the same time, the intensity of the display of one of the six sides (i.e. the "acontecimental" with sense) that helps to clarify the dice's identity. Thus, part of its identity is the expression of "acontecimental" space of the difference through the uniqueness of each play and the intensity with which each side presents itself in the event (Pretto & Arapiraca, 2000, online)[3]

From this perspective, new elements are being incorporated into all educational and cultural processes, giving another dimension to the idea of negotiation. This includes the difference among students, teachers and people from the community around the school, and negotiation of other values not always present at school such as subjectivity, emotion, happiness and unhappiness, and dreams. Consequently the new role of teachers is to be a permanent negotiator of differences.

Looking to the Dream: School Labyrinth

The enchantment with the work carried out by NGOs outside formal schools may be due to the fact that such projects appeal to emotions and this is always closely connected to the fact that they depart from dreams, exciting dreams, which in essence stimulate new dreams.

Historically it was from dreams—sleeping or waking, it makes no difference—that we could build new theories and interpret nature to explain the world. The dream, working with what is unimaginable, enables us to make new flights, mainly because it is not stuck in reality, by the abstraction of the real creating new possibilities for the production of the imponderable.

Reality is always the smallest part of the event exactly because it is what is in the potential condensed into digestible pieces: Reduced to the real. Potential is rich exactly because could be transformed in the real which is palpable and hereafter will not have much chance of attracting new potential. It is already collapsed! It is like the game-played, with the dice face already exposed: It was a three, It was a five. That's all!

The dice in the hand. The potential. All projects that consider creation, emotion and dreams could introduce richness into life. The artist Chen Zhen working in "Quietude da Terra" (Stillness of the Earth) project, carried out by ONG Projeto Axé in Bahia during 1999, was able to identify this richness in each child. Zhen saw

the creative potential of every child and remarked that these children "managed to transform their experience into something beautiful, into an extraordinary dream". These dreams will collapse again, and turn into reality. Then, become a dream again promoting interaction among other children and other new dreams.

This world of dreams and possibilities requires a different perspective. To manage this world, full of images and sensations, it is necessary to pay more attention to subjectivity, more than rationality, to enhance a new perspective or rather, multiple perspectives. It is the immeasurable importance of moments like these experienced by the young people in "Quietude da Terra" which combine subjectivity, emotion, culture, art, creation and, for course, education, in which we can feel and think about our realities. In "Quietude da Terra", we observed children experiencing processes of thinking and feeling at the bottom of their soul. A feeling that, as Roland Barthes points out when writing on photographic images, "come to closed eyes". In his words: "Ultimately—or at the limit—in order to see a photograph well, it is best to look away or close your eyes" (53). And more: "shutting your eyes is to make the image speak in silence […] to say nothing, to shut my eyes, to allow the detail to rise of its own accord into affective consciousness" (Barthes, 1984:54/5).

This perspective implies an attitude of feeling more and looking less, to observe or to analyse. A light and loose look. That is the look that touches, moves, which fidgets and which uses one of the most important organs of the body and the subject of many studies: the eye. The eye, the window of the soul, as Leonardo da Vinci said and the Brazilian filmmakers João Jardim and Walter Carvalho so magnificently portray in the documentary "Window of the Soul: a film about the look". (4) In this film, 19 people with differing degrees of visual impairment discuss how they see themselves, see others and perceive the world. The approach is: the depth of sight and the opportunity to look with other organs. Oliver Sacks, in his testimony in the film, describes the look from inside and outside: "It's not just look at what is visible but also look at the invisible. In some ways, this is what I mean imagination".

The imagination that runs wild and in the educational processes often tends to be trapped. Trapped in a room, in a curriculum or, sadly, by a teacher.

And now, it is time to start to close this reflection about education, culture and technologies and to do this implies that we have to think further about the teacher and the nature of his/her work.

We argue that it is necessary to revive the artisan aspect of the teacher's work. An artisan knows the whole production process and uses dexterity and creativity to produce something unique. The work of a teacher has been forced to become something specialised, transformed in a process within the rhythm of the "production line". This is connected to the widespread idea of linking the school with factory processes, concerning separate tasks as a set of sequential operations established from outside the school, as if they were working to produce an end-product, the components of which are assembled to make a finished product: the citizen (or better: the consumer-citizen). In this model, each person is just a gear in the system, in

continuous movement as an object (historically like a car part) which will be assembled by workstations or classes and teachers.

Instead of this, we propose the artisan approach which implies the knowledge and mastery of the education process as a whole, not only parts of the whole. Digital technologies and the Internet enable teachers to make the necessary connections to another group of teachers, experts, or databases to remix information and knowledge. Inspired (again) by the "hacker ethic" we can think of the necessary dialogue with Science and Culture—in this case, no problem to use capital letters—to produce more knowledge. Pekka Himanen says that hackers do not hesitate, from the very beginning, "to ask for help with questions in areas in which he has not yet acquired expertise" (Himanen, 2002:74).

In the artisan school the artisan teacher is a complete teacher, deeply immersed in the school and in education, living fully their subject to the full and, what's more, the whole education process, or, as noted my colleague Maria Helena Bonilla, creating a "school that learns" (escola aprendente). Alternatively, we could call this a "school labyrinth". As stated by Tyler Park in 1950 when writing about the painter Jackson Pollock in a text shown in his exhibition at the Tate Gallery in London in 1999,

> […] we live in a deliberate confusion of hypothetical hidden orders, or multiple labyrinths […] and these labyrinths are by their own nature, insoluble. They can not be achieved by simple trails or yarn Ariadne but are to be observed from outside, as a whole, as a show of intertwined paths, just as we observed the sky with its inseparably mazes, result of revolutions of the stars and the universe infinitude.

Navigating these labyrinths requires audacity. This requires doing what kids do when they encounter new sensations, when they close their eyes and spin, spin, spin… enjoying the dizziness of uncertainty. But this requires trust. Confidence in other. Other ethics are necessary to establish such trust. These are other ethics which overcome the idea that all issues can be resolved on the basis of individual and isolated initiatives. According to the Spanish philosopher Jose Antonio Marina, we must overcome the idea of an "ethics of survival". For him, "the ethics of the survivors seem to me perverse for its myopia. To be safe by—which includes, of course, live—man must have a lynx look. It is not the life that is the most important ethical value, but *the right to life*" (Marina, 1996:215, emphasis added). These ideas are developed in the book *Ética para Náufragos* (Ethics for the Shipwrecked), ethics for those who, like a child who spins a lot, is in danger of imbalance and instability.

Indeed, imbalance is responsible for the movement of things. A body in a state of equilibrium does not change its state of inertia. In Newton's words, "The *vis insita inertia*, or innate force of matter is a power of resisting, by which every body, as much as in it lies, endeavours to preserve in its present state, whether it be of rest, or of moving uniformly forward in a straight line" (Wikipedia). Thus, movement only occurs from the brink of an imbalance, an imbalance that destabilises temporarily and, again, creates the movement.

Finally, it is important to recover from a contemporary social movement what it has taught us from the approach they put into action in their way. We are referring here to the Zapatista movement in Mexico, considered the first post-modern guerilla

movement. In a beautiful text in the book "Global Resistance: from Seattle to Porto Alegre", the researcher Ana Esther Ceceña (2001:196) from the Institute of Economic Research of the National University of Mexico (UNAM), describes truly passionately the liberation movement that seeks to build a new utopia, the Zapatista utopia. A utopia that, as we have said, does not seek to transform the other in the I. Instead, a utopia that strengthens differences, which enhances movements. A utopia which dialogues with rebellion with which it constructs and dreams. According to her,

> The Zapatistas are the only armed movement to date which does not use the State as a reference, rather, society. This is where utopia begins. It is not a conquest nor a request for concessions. Their central point is Society, the rebellious from the five continents. Dialogue with these rebellions with which they build and dream. (…) Zapatistas put hopes on people, on civil society, on the excluded, on the persecuted, on the rebellious. They dream about a world i which all worlds fit and construct every day life and patiently with the help of everyone without a predetermined path with the will of the majority. The utopia of the Zapatistas is not intended as a present day sacrifice to one day achieve the goal set, but as a unweaving of locks to further weave and give body to what is meant by the new world. Utopia is to be able to start to break the social atomization and mediation or mercantile state of human relationships today to begin building the possibility/reality of new ways to understand and express popular sovereignty and create the foundations of mutual respect and recognition, sustained in the moral authority of those who do what they say, *walking to the rhythm of the collective and commanding while obeying*. (Ceceña, 2001:196, emphasis added).

Maybe one day we can have education and schools imbued with digital technologies forming a "school labyrinth", with teachers and students getting to know each other with "mutual respect and recognition, sustained in the moral authority of those who do what they say, walking to the rhythm of the collective and commanding while obeying".

Notes

1. See http://www.internetworldstats.com/orhttp://www.oii.ox.ac.uk.
2. We have to remember that the field of education undergoes theoretical waves and at that time Brazil was experiencing a boom in "popular education"
3. In Portuguese:

   - Posso sair daqui para desorganizar
   - Da lama ao caos/Do caos à lama
   - Um homem roubado nunca se engana
   - sol queimou, queimou a lama do rio
   - Eu vi um Chié andando devagar
   - Vi um aratu pra lá e pra cá
   - Vi um caranguejo andando pro sul
   - Saiu do mangue, virou gabiru
   - Oh, Josué, eu nunca vi tamanha desgraça
   - Quanto mais miséria tem, mais urubu ameaça

- Peguei o balaio, fui na feira roubar tomate e cebola
- Ia passando uma véia pegou a minha cenoura
- Aí minha véia, deixa a cenoura aqui
- Com a barriga vazia/Não consigo dormir
- E com o bucho mais cheio comecei a pensar
- Que eu me organizando posso desorganizar
- Que eu desorganizando posso me organizar
- Da lama ao caos/Do caos à lama
- Um homem roubado nunca se engana

4. http://www.adorocinema.com/filmes/janela-da-alma/janela-da-alma.asp

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Chapter 2
What Is This Thing Called "Design" in Instructional Design Research?—*The ABC Instant Research Question Generator*

Johannes Cronje

Introduction

The traditional "Addie" (Analysis, Design, Development, Implementation, Evaluation) model of design, first introduced in 1975 (Branson et al., 1975) is often criticised for being a process model, rather than a design framework (DeSimone, Werner, & Harris, 2002). This is confirmed in the work of Branch (2009) who provides a comprehensive inventory of activities to be executed during the "Design" phase, without actually clarifying what really happens in the execution of these activities.

This chapter considers four positions of design thinking, specifically as described by Rowe (1987). It compares these elements with Burrell and Morgan's (1979) four paradigms of social research and then propose a model for the development of research questions that are aligned with the basic aims of each paradigm. The model will be called the *ABC instant research question generator*. This model is designed to assist in conceptualising design research studies and ensuring their conceptual design integrity by aligning the research questions and the research aims.

Theoretical Underpinnings

Tom Reeves (2001) suggested that socially responsible research took place in what Stokes called Pasteur's quadrant. For Stokes (1997) there are two dimensions of research—research inspired by a quest for fundamental understanding, and research

J. Cronje (✉)
Cape Peninsula University of Technology,
80 Roeland Street, Cape Town, 8000, South Africa
e-mail: cronjej@cput.ac.za

Applied and Basic research			
Quest for fundamental understanding?	Yes	Pure basic research **(Bohr)**	Use-inspired basic research **(Pasteur)**
	No	--	Pure applied research **(Edison)**
		No	Yes
		Considerations of use?	

Fig. 2.1 Pasteur's quadrant (Stokes, 1997)

influenced by considerations of use. Research which is aimed both at understanding and usefulness falls into Pasteur's quadrant (Fig. 2.1).

Working in Pasteur's quadrant Peter Rowe sees design essentially as a form of problem solving. This could be a limiting view given that there may well be designs that were not overtly aimed at solving a specific problem but were even the result of some serendipitous happy coincidence. Roger Martin (2009:8) hints at a link between design and research when he envisages a three-stage "knowledge funnel" (Fig. 2.2) that leads to elegance in the design of businesses.

For Martin design involves identifying the mystery by asking the appropriate research question, then developing a set of heuristics or rules of thumb that address the problem, and finally to develop an algorithm that will solve the mystery every time. Design for Martin, therefore, is an on-going process of improvement, rather than once-off problem solving.

In this way Martin (2009:45) regards *design thinking* as a 50/50 mix of analytical thinking and intuitive thinking, where analytical thinking is considered to be aimed 100% at reliability and intuitive thinking as 100% validity driven (Fig. 2.3).

Burrell and Morgan's (1979) four paradigms of social science research, first published in 1962, are postulated on two dimensions along which social science research is conducted. These are the nature of social science and the nature of society. They place these two dimensions at right angles, and thus create four mutually exclusive paradigms. The nature of social science research varies between positivist and anti-positivist. The nature of society varies from a society of regulation to a society of radical change. The end result is a two-by-two matrix.

Figure 2.4 shows the four quadrants identified by Burrell and Morgan. The following section will describe each of the paradigms in one sentence, and give my interpretation of the *aim* of each of the paradigms.

Radical Humanist

Radical humanists are interested in the subjective world, but feel the need to transcend or even overthrow current societal arrangements. Their aim is to *explore* alternatives.

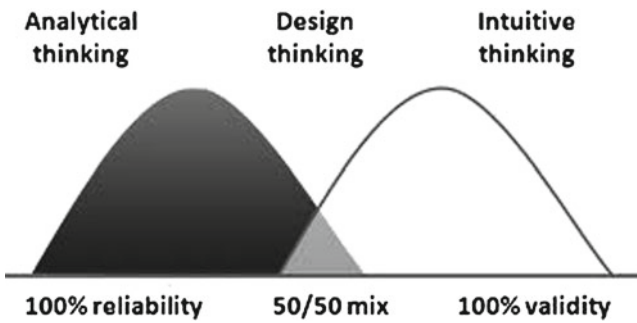**Fig. 2.2** The knowledge
Funnell (Martin, 2009:8)

Fig. 2.3 Design thinking—reliability and validity (Martin, 2009:54)

Fig. 2.4 Four paradigms for the analysis of social theory. Source: Burrell and Morgan (1979:22)
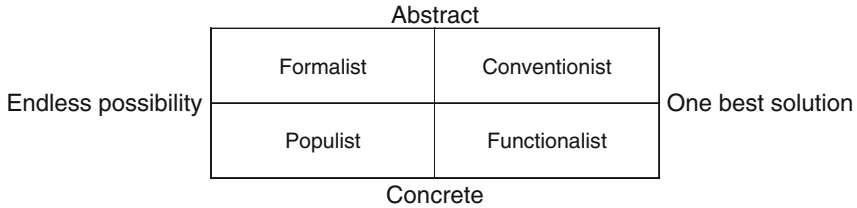
Fig. 2.5 Four design positions—developed from Rowe (1987)

Interpretive

Interpretivists believe that the human experience of the world is subjective, and they have a concern to understand it as it is. Their aim is to *explain* situations.

Functionalist Paradigm

Functionalists believe that the world is objectively discoverable, and that things can be improved by "tightening up" the rules. Their aim is to *develop* solutions.

Radical Structuralist

The radical structuralist view is based on an objective world view. They concentrate on structural relationships, believing that radical change is built into the very nature of society. Their aim is to *describe* the position as it is.

Peter Rowe (1987) presents a very useful analytical framework based on the *purpose* of design. He identifies four positions that architects take in their design of spaces: "First there is a *functionalist* position, distinguished by an emphasis on the accommodation of activities and the influence of building technology. Second there is a *populist* position, characterised by an acknowledgement and interpretation of contemporary commonplace building practices and user preferences. Third, there is a *conventionist* position, using a largely historical reference; and finally, a *formalist* position, using an architecture of formal possibilities for their own sake" (Rowe, 1987:124).

Rowe stresses that the four positions he describes are but four out of a much greater number of instances. A researcher working in Pasteur's quadrant needs to take a very clear stand in terms of one's belief in what constitutes fundamental understanding, as well as the nature of usefulness. In other words, is my position regarding the nature of fundamental understanding primarily objective, or primarily

subjective? Furthermore one needs to establish whether one's concern is for the use to be abstract or concrete. I propose that if Rowe's four positions are analysed thus, then they can be placed on a 2×2 matrix, as is shown in Fig. 2.5.

The first dimension relates to the existence or not of a "best way". At the one extreme of the dimension is the belief that there is one implied best way to do something and that whether or not that ideal can be realised, reaching it remains the ultimate goal. At the other extreme lies the belief that there may be an infinite number of solutions and that these solutions are dependent on an infinite number of contexts. This dimension corresponds with Burrell and Morgan's positivist/anti-positivist dimension.

The second dimension relates to the abstract or concrete nature of the design problem or message. This dimension relates to Burrel and Morgan's dimension of radical change vs. regulation. The extreme of regulation is concrete, while radical change is abstract.

The Adaptation of the Model to Embrace Socially Responsible Research in Educational Technology: *The ABC Instant Research Question Generator*

The purpose of the *ABC instant research question generator* is to assist relatively inexperienced researchers to reach an initial understanding of what it is that they wish to do. In order to help them understand the relatively complicated terms used by Burrell and Morgan (1979) and Roode (1993), it was simplified in the following way. On the horizontal level students are asked to position themselves in terms of their belief of the role of scientific knowledge and the role of technology. They have to chose between a subjective or an objective approach. To refine this they should consider the envisaged answer of their research question. Are they hoping for one definite, final objective answer—such as "yes/no" or "75.09%", or are they hoping for a more complicated subjective answer such as "it depends…"? Burrell and Morgan's concepts of a Society of Radical Change and a Society of Regulation are reduced to a conceptualisation of the role of the research in society. Students have to decide if their eventual research output will be a primarily abstract picture of what a situation looks like (that requires radical change) or a set of rules or heuristics that show how something works, and may therefore be the first steps towards regulation.

In this way students are able very quickly to plot their beliefs in the scientific nature of the truth as Subjective/Objective and their conceptualisation of society as Abstract/Concrete. Once they have plotted themselves, we automatically know the answers that they are looking for. There are two sets of answers. The first set is "yes/no or it depends". The second set is "It looks like this" or "It works this way". So when we have the answers, then it is really easy to derive the questions. If the answer is "Yes/no", then the question is "Should we do it this way?" If the answer

		Abstract		
		What are...?		
		Sociology of radical change		
	Explore	**Describe**	
Anti-positivist	Radical Humanist	Radical Structuralist	Positivist
How does...?	Formalist	Conventionalist	**How should...?**
Subjective	Interpretive	Functionalist	*Objective*
Endless possibility	Populist	Functionalist	One best solution
	Explain	**Develop**	
		Sociology of regulation		
		Why is...?		
		Concrete		
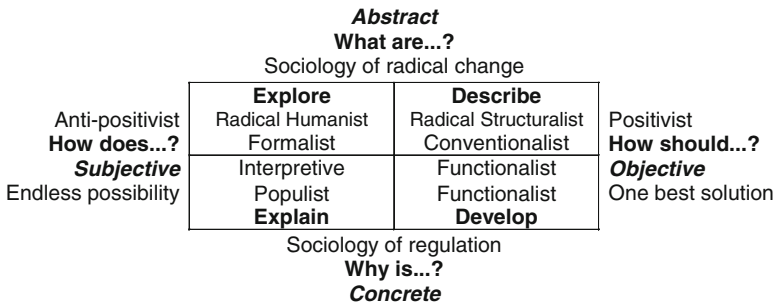
Fig. 2.6 Research aims and research questions

Fig. 2.7 The design
research cycle
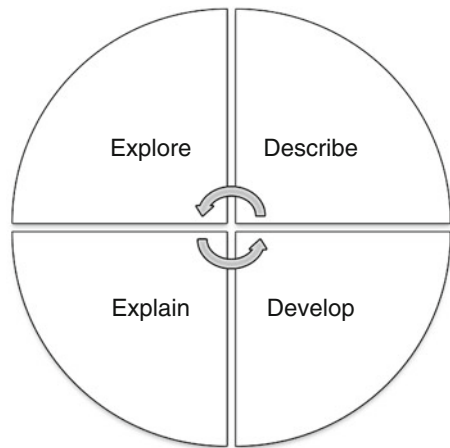
is "It depends" the question is "How do we deal with this?" If the outcome is a picture, then the question is "What is the composition?" If the outcome is a set of rules, then the question is "Why is this happening?"

Four Research Questions to Achieve the Aims

Roode (1993) identifies four research questions: *What is; how does; why is; and how should*? For Roode these questions are not structurally related and, depending on a given situation, researchers may select any combination of questions. I argue that the questions are, indeed, related. Questions may be either subjective or, objective; or concrete or abstract. Objective questions have only one possible answer. In a sense they are therefore normative—things are correct or they are not. Thus the stem of an objective question is likely to be "How should…?"

Subjective questions, on the other hand can have any number of answers, the answers are most likely to be "It depends…" Thus, the stem of a subjective question is likely to be "How does…?"

The second pair of questions are on the "radical change/regulation" dimension. In a world of regulations it is essential to know what the rules are meant to achieve, thus the question should be "Why is…" In a society of radical change it is essential to know what the current situation is, so that it might be overthrown or transcended, thus the question would be "What is…?" In my model I add the concepts of abstract and concrete to this dimension. Radical humanists and radical structuralists are primarily interested in the abstract concepts underlying society, while interpretive researchers and functionalists are interested in concrete understanding, or concrete solutions.

If one were to combine these research question stems with the research aims, then the four paradigms look like Fig. 2.6. It would seem possible to map Burrell and Morgan's four quadrants onto Rowe's four positions. Functionalist appears in both, and they seem to be pretty much aligned.

To achieve each of the four research aims it is necessary to answer two research questions. One question will be about the nature of research into science and technology and the other about the nature of society. Figure 2.7 shows how the four research aims can be achieved by the four research questions. If the research aim is to *develop* a solution, then the researcher needs to ask "Why is this not working?" and "How should it be fixed?" If the researcher wishes to *explain*, then the questions are "How does this work?" and "Why is it working?" If the purpose is to *explore* the questions are "What is going on here?" and "How does it affect those involved?" Finally if the aim is to describe, then the questions are "What are the elements of this model?" and "How should they be combined or related?"

In formulating the research questions it is important not to phrase questions using incorrect stems. In other words a question "What are the reasons for…?" is not a correct question. The question should be "Why does…?" Similarly, "What is the best way to…" is another way of asking "How should…?"

Given that one is either subjective or objective, or one supports either regulation or radical change, it holds that one cannot conduct research in more than one quadrant at a time. Diametrically opposed questions are mutually exclusive. One cannot ask "How does and how should…?" This is simply because one cannot be both objective and subjective at the same time. Should a researcher have more than one aim, then those aims should be achieved separately. Thus, if one wishes to explore and explain, it holds that the research should be conducted in two cycles, firstly a cycle that explores, then one that explains. Similarly one could explain a problem, then develop a solution, or one could develop a solution and then describe it. In the case of development research, of course one can go the full circle. Describe a situation, explore its parameters, explain its causes, and develop a solution. The key remains to work in one quadrant at a time.

Research projects aim to achieve an outcome. The outcome is the result of the answered questions. The relationship between the aims and the outcomes are best described metaphorically. In other words, if the aim of research is to explore, then the result of the exploration will be typographic representation. Traditionally an

explorer would be armed with a map, compass and binoculars, and would be expected to return with a typographic chart of the area. Likewise if the aim is to explain, the outcome will be a set of laws, rules, heuristics or algorithms. Newton, for instance, was able to explain the fall of the apple by formulating the law of gravity. If the aim is to develop, then the outcome will be a solution. If the aim is to describe, the outcome will be a model.

What Next? The Aim and the Rationale

The word "rationale" means "reason". As has been indicated the full development research cycle, involves working anti clockwise through all four quadrants. The rationale tells people what you hope to do once the outcome has been delivered. Thus, if your research has a certain aim, the rationale will be found in the previous (anti-clockwise) quadrant. If your aim is to describe, then the rationale will be that, once you have a description, you would want to explore that field. Similarly, once you have explored certain tendencies, you would want to do further research to explain them. Once you have an explanation for a problem you would want to develop a solution, and once you have a solution, you would like to describe it in the form of a model so that other people could use it too.

Worked Examples: Four Case Studies

Over the years a number of doctoral students have used the model described here to refine their research questions. This section will briefly describe one from each quadrant. For the sake of brevity and clarity the research aims and questions may be paraphrased from the more florid versions in the various theses.

Explore (Radical Humanist/Formalist)

Linda van Ryneveld (2005) set out 'to explore the complexities involved in teaching and learning in an adult online learning community that had adopted a metaphor of the television reality show, *Survivor* © (2005:2). Her research questions were "How do learners construct meaning via online communication?" "How does participation in computer-mediated collaborative work affect learners' motivation and identity? [and] What is the right role for teachers to play in the computer-mediated learning environment?" (Van Ryneveld, 2005:2)'. The rationale for her research is to enable us to understand (interpretive) the dynamics that she identifies in her research. In terms of her design, she is exploring the metaphor of the reality television show, and considering the implications of modifying this form and applying it to a distance education setting.

Explain (Interpretive/Populist)

Salome Meyer (2005) wanted to explain some elements of the behaviour of online adult learners. Here research objectives were to determine "How online students cope in an online learning environment; why online students ask for help; why online students offer help; the principal causes of motivation and frustration; the nature of the cooperation between students (the nature of peer support); how (and to what extent) affective experiences of students contribute towards the successful completion of an online course; [and] what could make a student drop off a course regardless of volition" (Meyer, 2005:7). This collection of how and why questions place Meyer's study firmly in the interpretive quadrant. (What could make a student drop off… could be rephrased as Why do students…). Meyer's rationale is, once again, in the next quadrant anti-clockwise: "Should it be possible to determine the affective experiences of students in an online environment, mechanisms could be built into future courses to improve the affective support of students in such an environment (Meyer, 2005:9)". This obsession with how people do things, and why people do them also confirms the populist nature of her design.

Develop (Functionalist)

Linda Cloete (2006) has 11 research questions, sub-divided into four categories. For the sake of this article only a two of these will be extracted and discussed. Question 7 states "What are the problems and limitations in the education of cataloguers in distance education?" (Cloete, 2006:14). This is an example of a "Why" question that has been phrased as a "What is…?" question. In essence what she is really asking is "Why is it so hard to train cataloguers at a distance?" Question 11 is "How should training by means of a mix of media and technology be designed to serve as an appropriate training mode?" (Cloete, 2006:14). The combination of why and how questions put Cloete's research in the Functionalist quadrant where the aim is to develop. This resonates with her stated objective "to investigate the improvement of cataloguing courses, especially by utilising computer-assisted training and web-based training applications" (Cloete, 2006:12). Essentially her aim is to develop an improved course for cataloguers using multimedia and web-based technology. This is confirmed by her anticipated results, that include: "A self-paced flexible learning course, a training resource using a mix of media and technologies, interactive distance learning web utilisation, and a cataloguing laboratory or virtual classroom in the Web environment" (Cloete, 2006:18). Functionalist design can result in an artefact. However, once she has done developing her programme and evaluating its success, she hopes to provide a description of what she had found—in other words, the rationale for her research is to describe, which puts it in the radical structuralist quadrant—one quadrant anti-clockwise from her aim.

Describe (Radical Structuralist)

Jill Fresen (2005) worked in the field of quality assurance for web-based learning. The research was a reflective study of her own work as an learning practitioner at the University of Pretoria, and she set out to develop a model for the quality assurance of online learning. Although she calls her thesis an exploratory study models typically occur in the radical structuralist quadrant. She wanted to find one best way of ensuring quality in such a way that it could be compared across different courses. Furthermore she was concerned with the abstract nature of quality and quality assurance as a discipline, rather than with the day-to-day operational running of quality assurance interventions.

Her research questions were (1) "What factors promote quality web-supported learning?" (Fresen, 2005:4). (What are the factors…=What is…?) (2) "What factors contribute to client satisfaction (or frustration) with web-supported learning?"(Fresen, 2005:4). (What are the factors…=What is) and (3) "What lessons were learnt in applying standard quality assurance theory to the instructional design process for web-supported learning?" (Fresen, 2005:4) (lessons learnt=How should…?) Fresen employed a number of strategies to tease out, firstly what the key indicators were for successful online learning, and secondly how those indicators should be achieved. The outcome of her research was a conceptual framework for quality assurance in higher education—in other words, a model—a description. Fresen's obsession with rules and regulations also confirm the relationship between the radical structuralist paradigm and the conventionist design position. Contained in her model was a taxonomy of critical success factors for web-supported learning. In her own later work, as in the work of others, Fresen has continued to explore the possibilities and constraints of her quality assurance model—showing that the rationale (to explore) is removed by one quadrant anti-clockwise from the aim (to describe).

Table 2.1 provides a quick overview of the four studies presented above.

Conclusions and Recommendations

The four case studies show how doctoral research can be conducted in either of the four quadrants suggested by Burrell and Morgan (1979). Moreover it shows how the use of four questions, used in pairs, help with framing the research.

The Key Aims, Beliefs and Concerns of Researchers

The Burrell and Morgan (1979) model tells us that researchers believe either in a positivist (yes/no) reality, or in an anti-positivist (it depends) reality. Their concerns

Table 2.1 Four case studies

Author	Paradigm	Aim	Questions	Outcome	Rationale
Van Ryneveld	Radical humanist Formalist	The purpose of this study is to *explore* the role of the metaphor of a game in the interaction, dynamics and complexities of a web-based module that is presented to adult learners	What are the opportunities and challenges presented to adult learners when they play online learning games? How do these learners respond to the challenges and opportunities?	An indication that the introduction of a game metaphor can inspire high levels of motivation in adult learners and provide a stimulating, all be it challenging, online learning environment	Further research could indicate the conditions under which online games prove motivational or challenging.
Meyer	Interpretive Populist	The purpose is to interpret the participants' affective experiences in an online learning environment and to *explain* why they remain studying	How do adult learners feel about their online learning experiences? Why do some of them continue with their studies in spite of extreme negative experiences?	Three categories of affective factors that adult learners' experience of online learning.	The understanding achieved in this study could assist with the development of methods to improve the retention of online learners
Cloete	Functionalist Develop	To *develop* an integrated training resource programme for the education and training of cataloguers	Why do cataloguers experience problems with the mastery of certain subject content, particularly in distance education? How should a certain mix of media and technologies be applied to enable the successful training of cataloguers?	A multimedia programme that was designed to meet the learning needs of cataloguers that was shown in a summative evaluation to have been successful in meeting its training objectives	The results of this research could provide a blueprint for the developing of further multimedia training programmes for cataloguers in similar positions

(continued)

Table 2.1 (continued)

Author	Paradigm	Aim	Questions	Outcome	Rationale
Fresen	Radical Structuralist Conventionalist	To *describe* what happens at the intersection of quality assurance of web-based learning for higher education	What are the key indicators of quality in higher education? How should web-supported learning be designed to achieve quality?	A conceptual framework (model) of quality assurance in higher education, that includes a taxonomy of critical success factors for web-supported learning	To provide a precedent and contribute criteria that would be useful to other higher education institutions. (i.e. to contribute to the further exploration of the theme)

are either with radical change or with regulation. When these two dimensions are placed orthogonally, four quadrants emerge, with four different aims, which I define as to explore, explain, develop or describe. When these aims are achieved in the specific sequence shown above, a complete design research cycle is formed.

Alignment Between Aims and Research Questions

The two pairs of diametrically opposed question stems (How does…? – How should…? and What is…? Why does…?) assist with the alignment of the questions and aims, provided that their mutually exclusive character is respected. One cannot ask "How does…? *and* How should…?" The reason is clear, since one cannot be a little bit subjective and a little bit objective. Neither can one support a little bit of regulation and a little bit of radical change. Selecting one question from each pair, however, will triangulate with the aim of the research. One should however be cautious not to phrase questions incorrectly "What is the reason for…?" actually means "Why is…?".

Recommendations for Policy and Practice

As a supervisor of many students I have found Burrell and Morgan's framework very useful in categorising the work of all my students to ensure some common basis. Of course there are numerous other models too, and any could be used, but what makes this one particularly useful is that any other type of research could be classified in these two dimensions. All researchers have to position themselves as either subjective or objective, and all researchers have to work either with abstract or concrete realities. The most important recommendation in terms of policy and practice, though, is that nobody should try to work on both sides of the divide simultaneously. Nobody should try to be a little bit subjective, and also a little bit objective, or predominantly concrete with a slight hint of the abstract. Such research confuses readers and also prevents the researcher from demonstrating proficiency in either dimension.

Recommendations for Further Development

The ABC instant research question generator is still in its infancy, but it has shown itself to work well in helping novice researchers to find a point of departure. What is required now is to consider the extent to which the quadrant within which the research is conducted has any influence on the nature of the research. It is tempting to say that Radical Humanist research is predominantly qualitative while radical structuralism is mainly quantitative, but at this stage it is still speculation.

Furthermore the model is useful to classify ongoing research. I have on more than one occasion found it very useful to take a whole set of conference proceedings and to classify them into the four different quadrants, and in that way to obtain a philosophical footprint of the particular conference. In such a way a school, or a professional or research body could determine what their focus is, or maybe what it should be.

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Chapter 3
Designing Educational Multimedia Resources

Fernando Albuquerque Costa

Introduction

Although the research about the process of development of educational multimedia resources still is growing (Mayer, 2005; Boyle, 2002; Carvalho, 2002; Viseu & Costa, 2001; Najjar, 1998; INUSE, 1996; Koper, 1995; Riley, 1995; Barfield, 1993; Giardina, 1988), we can say that there is a certain convergence in the main development stages of this kind of educational products. This helps us envision a model that integrates both pedagogical and didactical concerns, as well as more technical aspects of the development process. Thus we should have:

(a) A *conception stage*, i.e. a moment of research, study and decision about every aspect considered relevant to get a quality product that is appropriate to its purposes.
(b) A *development stage* that is characterised basically by the execution of the project, using the instruments and the techniques that best suit the type of product defined in the previous stage.
(c) A *test and validation stage*, which is the opportunity to verify if the application works, if it fits its purposes and if it corresponds to the desired product, considering all the different aspects that need to be analysed (technical, didactical, aesthetic, etc.).
(d) Finally, a *diffusion and exploration stage*, which dedicates a special attention to all the aspects related to the divulging and distribution, or to the usage in the situation for which it was created.

F.A. Costa (✉)
University of Lisbon, Institute of Education,
Alameda da Universidade, Lisbon, 1649-013 Portugal
e-mail: fc@ie.ul.pt

Each of these stages ends with the creation of a specific product. The first two, the *preliminary draft* and the *authoring guide*, in the shape of a written document, constitute two differentiated levels, not only in terms of specification and detail but also regarding the role they play in the process itself: (a) the *preliminary draft* basically contains general ideas about the final product, allowing us to make a decision about the relevance and viability of producing it; (b) *the authoring guide* is a detailed view of each one of the aspects (didactical, technical, functional, aesthetic, etc.) involved in the application and previously outlined in stage one.

The last two, *prototype* and *final version*, are the result of the production work, i.e. the carrying out of the authoring guide. However, these two stages differ not only in the technical instruments used and products created but also in their purpose (a) the *prototype*, is mainly useful to test and evaluate the quality and the functionality of the application (contents correctness, balance and integration of multimedia elements, general functioning, compatibility with the defined pedagogical purposes, etc.); (b) the *final version* which has, obviously, the purpose of use by final users in a determined situation of teaching and learning, although maintaining the concern of verifying how it is accepted and to what extent it fits its aims, before proceeding to its reproduction and diffusion.

The Conception Stage

In an educational perspective it is important to distinguish two essential stages in the conception stage. One referring to the guiding questions, which can be previously made and that can serve as basis for the work. Here the objective is to help the trainer decide on the relevance and utility of conceiving a multimedia training system. As far as the other stage is concerned, the intention is to detail the multimedia project, that is, to come up with an explication of each one of the aspects that should be considered in the development and implementation.

Preliminary Research

The first stage is particularly pertinent in the case where the trainer (or training team) is at the service of a company, in which case they usually have to justify certain options and certain type of investments, namely in the area of professional training. It is important for the company to previously clarify the profits that the training will bring, due to financial reasons and considering the costs it might involve, especially if that training includes the conception of multimedia learning products. The trainer's task at this stage will be to proceed to the necessary studies in order to be able to demonstrate and justify to those who decide the relevance, utility and feasibility of a training system with such characteristics.

Discussion on the Strategic Interest

This first moment is mainly about giving information that allows decision makers to verify and decide about the relevance the project might have to the institution. It is a work directly related to the identification of training needs, which aims to discuss, above all, the benefits and the reasons that might justify its production. According to Blandin (1990), the analysis of the advantages may be examined from different perspectives: the market, the training costs, the social gains or the technological component. In order to help organise this task, the author suggests a set of essential questions that we resume here (a) *The training market*: what will the aim of the conception of a multimedia training system be? To answer a training need that is not covered yet? To improve the answer to an already covered need? To increase the number of trainees included in the training? To reach a new kind of audience? To instigate progress or to improve the company's image? To keep up with the competition? (b) *The training costs*: what will the conception and production of multimedia material enable? To reduce the training costs? To modify the way the training expenses are distributed (e.g. to avoid displacement expenses)? To make investments already made in other areas profitable (in the computing and communications system, for instance)? (c) *Social gains*: what will the production of a multimedia formation system enable? To capitalise already existing knowledge and competencies? To make that knowledge and competencies accessible to others? To acquire new competencies? To originate changes in the trainers and the company's workers? To reinvigorate different categories of users, allowing them to access new technologies and new knowledge? To transform the organisation and/or work division? (d) *Technological component*: what will the multimedia training tools production enable? To diffuse or broaden the existing application field? To acquire and be able to use new technologies? To walk along with the technological development? (Blandin, 1990:193–194).

In articulation with the answers to these questions, come two other stages, which are also very important from an institutional point of view, right before defining the pedagogical purposes properly said: the elaboration of *viability studies* and the *delimitation of the training referential system.*

Viability Studies

The viability studies are directly related to the analysis of the available resources and of the conditions that the company can offer for the project development. Therefore, it will be convenient to distinguish the organisational dimension and the economical dimension.

In the organisational dimension we discuss and evaluate mainly the aspects related to the knowledge, competencies and technical means necessary to the conception and the production of multimedia products. It is important to know if the company has the necessary human resources, what its competency areas are, who

can assume the responsibility for the tasks, for how long and in what conditions, etc. On the other hand, if it becomes necessary to resort to the exterior, we need to know in what conditions or for which specific tasks it will occur, etc. From the technical point of view, it is important to make a survey of the existing equipment, to know to what extent it is adequate to the multimedia production, if it is available and for how long, etc.

Regarding the economical dimension, the focus should be on the gathering of elements that would allow a cost–benefit analysis, so as to decide on the relevance of this kind of material for the institution strategic purposes. The trainer, who has to justify and prove the value of the product, should be interested in gathering elements like the global production costs, the investment on the acquisition of material and equipment, the time and the human resources necessary to test and produce the prototype, the necessary investments to proceed to the product updating, and all the other aspects which, from the economical point of view, assume may determine the success of the project. It is also be interesting to reflect upon the number of users to whom it is addressed, the maximum duration foreseen for its usage before the product becomes obsolete and stops accomplishing its purposes, the potential evolution, and so on. This work should result in a production agreement that will support the decision making regarding the economical and financial viability of the training system or product proposed.

Delimitation of the Training Framework

If in the previous stages the focus is on the discussion about the profitability and the strategic interest regarding institutional purposes, this stage should preferably fall upon the varied pedagogical solutions and feasible strategies to accomplish the project. The pedagogical aspects and the discussion on the didactic pattern to adopt (training strategy) assume at this time a decisive significance and, we can say, the time has come when the trainer has to make good use of his knowledge and experience in the training area. Therefore, it makes sense to reflect about the advantages that may derive from the use of the multimedia systems (for example, to discuss the value it adds to the conventional training solutions). But, above all, we should try to integrate the use of those materials in the global planning of training. Still without the detail of the following stage of conception (*specification*), the trainer or the team in charge of the project should reflect on the features they intend the project to have. For instance, will it be a project focused on the trainee individual activity or on a group work? Is it about sensitising trainees to certain themes or do we wish them to acquire a determined type of competencies? What kind of purposes do we aim to attain and what needs do we want to fulfil (is it about acquiring knowledge, knowing how to do, attitudes, etc.)? How will we evaluate if those purposes were achieved? How can we organise and structure the pedagogical advance and what are the didactical situations more adequate to attain the foreseen purposes? In each one of those situations, what are the most appropriate ways to deal with the contents to be taught and the

competencies to be learnt? In short, in this stage there should already be a first explication that considers and establishes relations between the main pedagogical elements that integrate any training plan, namely (a) the target-audience features; (b) the training needs to accomplish; (c) the pedagogical purposes of the training; (d) the contents; (e) the general strategy of the training and the methods adopted; (f) the expected results and the evaluation strategies.

The outcome of the reflection and the work developed in this first stage, called *Preliminary Research,* will result in the *preliminary draft*. This, as mentioned before, is the document in which the trainer outlines his training proposal and that will serve as a basis to make decisions concerning the carrying out of the proposed system. From the practical point of view, preparing the *preliminary draft* can include different types of activities. The sequence and investment to be done in each one of them depends on each concrete situation (a) identification and analysis of the needs; (b) analysis of the available resources; (c) elaboration of viability studies; (d) study of alternative solutions; (e) description of the specifications; (f) definition of the target-audience; (g) the project negotiation with the decision makers; (h) definition of the training general strategy; (i) project team constitution.

Specification

It is in the second stage of the creation phase that a detailed description of the product being developed will be made. It is probably one of the most important steps in the creation of a multimedia application, as it is the right moment to reflect and make decisions about the multiple aspects that will configure the final product. This implies a careful reflection and the getting to the bottom/thoroughness of some elements identified in the preliminary draft and it constitutes the opportunity, in case the project will be carried out by other than the trainer or the teacher, of assigning tasks and responsibilities to each member of the project team.

The document resulting from this stage is the *authoring guide*, which is a written document in which the author has the opportunity of formalising (specifying) all the aspects related to the desired product. In order to do it, and for operational reasons, it is convenient to distinguish clearly between the three types of components that we will later explain:

(a) A component concerning the project's management and framing
(b) A component concerning the configuration of the training pedagogical model
(c) A component concerning the specifications of the product itself and of the multimedia elements that will give mould to the final product, this is, the *storyboard*

We must point out that the authoring guide acquires special value when the author doesn't have the means and conditions to accomplish the application himself and chooses to work with specialised companies during that part of the project.

In this case, it has mainly the function of creating a detailed product request, so as to guarantee an efficient and clarified communication with the different experts involved in the production.

Project's Framing and Management

This component has the main purpose of framing the development of a determined multimedia product in the company strategic goals (institutional goals), articulating it also with the global planning of the rest of the training approach. It also seeks to identify all the resources and technical requirements necessary to its execution (human and material resources, equipment, etc.), apart from a budget programming necessary to its development. In case there is a team working on it, it also includes distributing tasks and assigning responsibilities to the different members of the group. In this stage, it is especially important to determine the project coordination structure, to establish the relevant tasks and to redefine the role each team member plays. If the human resources needed are not available inside the company, it is also the moment to redefine a plan for training or recruiting technicians from the exterior. This is the right moment to establish a chronogram of activities, i.e. the programming of the necessary time spans to accomplish the different tasks, the definition of the monitoring moments and the setting of the dates in which it should be concluded. Since the beginning, it is important to determine the procedures of the implementation or the definition of the prototype testing conditions (validation stage), such as places, equipment, the number of test groups, etc. In short, and although it is a process with interactive and recurrent aspects, the following steps should be followed by the author at this stage:

Step 1: To establish and clarify the institutional reference purposes
Step 2: To frame the multimedia product production in the global planning of the training and to specify its purposes and usage contexts
Step 3: To determine the necessary human resources, define the project team and assign roles and responsibilities
Step 4: To specify the features and technical requirements of the equipment needed to the project development
Step 5: To define the budget
Step 6: To identify the most relevant tasks and create the activities' chronogram

The bulky part of these activities has already been discussed and examined in the stage of the preliminary research, so some of the data of the *preliminary draft* can be recovered for the *authoring guide*. The difference will only abide in the specification level, as the data that integrates the authoring guide should present a much larger detail. In case it is not necessary at all to introduce a preliminary draft (for instance, because, there is no need to discuss the institutional benefits or to justify the investments), only the authoring guide will probably be needed, therefore, starting at this stage the reflection and decision about the different aspects mentioned above.

In case the author is the one producing the training material, the authoring guide can be less deepened in this first component, although it is very important a thorough reflection about the previously mentioned aspects.

Pedagogical Model

As it was mentioned in stage, *Delimitation of training framework*, with this component we aim specify the pedagogical and didactical aspects that should integrate any training plan. Now, with a higher definition level, it is necessary that the author identify the needs that should be fulfilled, through what competencies, processes or knowledge. It should also make those dimensions operational, presenting specific action units that will determine the detailed design of the multimedia product and the organisational aspects of the training experiences. Starting with the needs analysis, the moment has come to define the pedagogical purposes and to determine the accomplishment levels desired, as well as the most appropriate evaluation methods. In the case of professional training, it can be particularly useful, for example, the observation of workers or the direct questioning. For the preparation of the *"pedagogical model"*, similarly to the previous question, the author should go through the following steps:

Step 1: *Detailed analysis of the target-public*. Analysis of interests and personal motivations, representations and attitudes towards training, the use of new technologies, and previous knowledge in the area to deal with, competencies, professional experience, working conditions, and so on.
Step 2: *Identification of the training needs*. Identification of areas in deficit, arrangement in degrees and hierarchy of the types of needs, etc.
Step 3: *Characterization of the users' profile or profiles*. Specifying the different types of needs, the types of learning methods, the different levels of structuring and access to information, etc.
Step 4: *Definition of pedagogical purposes.* Established in direct relation with the contents to be included in the application and with the results of the decisions taken in the previous steps.
Step 5: *Selection and specification of the strategies and specific situations of training.* Defined according to the decisions made concerning the purposes and the organisation of the information itself. It constitutes the bulk of the pedagogical action, i.e. the learning environment itself.
Step 6: *Definition of evaluation methods*. Decision on the most suitable types, forms and techniques to monitor the learning process and verify the results achieved.

"Storyboard"

The third and last component of the authoring guide concerns the content of the application and constitutes a global vision of the multimedia product. This is the

right moment to establish the application quality pattern and to proceed to the specifications that, in this component, are carried out in two distinct levels, although in straight relation and interdependency at:

(a) The level of the *contents*, i.e. of the information and of the way it is internally structured
(b) The level of *the visual configuration*, i.e. the aesthetic aspect of the application and all the multimedia elements that integrate it

As far as the first one is concerned, we can say that, above all, it is a work made of research, selection and organisation of the information considered pertinent about the theme to handle, whereas the second is mainly about giving shape to that same information. In practice, and as we can easily understand, these are aspects that have to be thought of together, and they should have as background the decisions made in the previous component regarding the pedagogical model to implement. Thus, the selection or wording of contents, as well as the choice of multimedia elements, should arise from the knowledge about the users to whom the application is addressed and the pedagogical purposes defined for the product usage. The final goal is to create a learning environment that "works", that is appropriate to the public to which it is designed for and that allows the defined pedagogical purposes to be achieved. Although the contents determine, to a large extent, the multimedia elements that can be used, this is a stage in which the author has an enormous freedom of creativity, being able to try several solutions before choosing the one that best suits the established purposes. In fact, if in the preceding components we stressed out the pedagogical competencies of the trainer, at this moment it is mainly required that he/she has a large creative ability and combines it with the capacity of mediatising information using his/her knowledge about the possibilities of multimedia resources. It is not absolutely necessary that he/she knows how to "produce" (as we have already seen, we can consider the alternative of not being the author that produces the training material), but it is extremely important that he knows and has enough understanding about what the multimedia technologies can offer, in order to know and to be able to formulate a clear and grounded request of the desired product type.

This final stage of the creation of the multimedia products can be developed around the following steps:

Step 1: *Preparation of a descriptive summary of the application.* The descriptive summary of the application, also named *script*, is a brief explanation of the idea that the author has of the final product. We can consider it the first draft of the application and it constitutes the point of departure for the next steps. When a team is responsible for the project, it is the document that allows every member to get an identical image of what is intended and, because of that, it will work as a reference point for future decisions. It is important because it demands the clarification, although brief, of the initial idea with the advantages that it can bring, for instance, to the research and the selection of information needed for the type of application envisioned.

Step 2: *Research and selection of the contents.* As one can easily recognise, the contents are an element that will hugely determine the quality of the application. A technically perfect application will be worth nothing if the quality of the information that integrates it does not achieve the same performance level. It is, therefore, one of the activities to which the author, playing the role of a content expert, should dedicate more attention to and one of the tasks that demands greater investment. Although it is convenient to have, at a certain moment, all the information needed to the development of the project, this is a task that can happen at the same time and in interaction with the rest of the activities of this stage of the authoring guide preparation. The main idea is to gather all the available material, in the feasible supports and formats (text, photography, animation, sounds, videos, etc.) in order to later select the contents according to the outlined purposes and to the profile of the users. One of the main concerns of those who have the responsibility of designing the contents should be the appropriateness, usefulness and relevance of the contents, for instance in terms of language use, for the future users. Since afterwards, in step 5, we will proceed to the specification and wording of the contents that will constitute each one of the information screens, it does not seem necessary that this research work be formalised in an individual document.

Step 3: Organising information and representation of the application structure. As the nature of the contents determine, to a large extent, the type of structure of an application, it is extremely important that the author schematises and represents on paper the existing relations between the different modules and concepts that integrate the application content. The so-called *macro-structure* is a schematic draft or a general map of how information is organised. That map can be represented in graphics (for example, through a diagram) or it can be written, by explaining each one of the topics that composes it (information nodes), with the respective sub-divisions and so forth. Together with the descriptive summary of the application (step 1), the macro-structure can also work as a precious instrument for clarifying ideas and helping the communication between the different elements of a casual working team.

Step 4: *Interface design.* The different experts involved in the producing stage might accomplish the visual style, as well as the graphic and multimedia elements. However, it is important that the author develops a clear idea of what is aimed and that he/she utters his/her opinion about what constitutes the place of communication between the human user and the computing device—the interface. In the case of multimedia applications, the interface is learning environment itself and it should result from the pedagogical and didactical specifications of the former stage, in which the configuration of the training model was defined. Therefore, it is strictly related not only to the decisions concerning the users' profiles, the pedagogical purposes and the contents but also to the previously identified training situations and the evaluation methods. In practice, we can say that a multimedia system interface is made from what the user sees on the screen and the possibilities of interaction that can be established with the system. In a careful articulation with the following step (step 5), this is the moment to reflect and decide, among other things, about the screen configuration or graphical style, types of objects that integrate it

and their functions, its spatial arrangement, forms of communication and interaction with the user, type of feedback provided, etc. We can even say that it is not only about supplying certain information, mainly about structuring the environment that will allow access to that information. As one can easily understand, it is not only a matter of graphical design, but it is, above all, a matter of deciding about the different elements that allow the user to make the most of the multimedia tools. Also important is making an effort to minimise the problems that the users may find when interacting with the material. We can even say that the quality of a multimedia application depends on the quality of the conception of the interface and the ways the several aspects previously mentioned are conceived and implemented.

Step 5: *Preparing the contents and specifying the multimedia elements.* In this last step all the tasks related to the execution of the aspects previously analysed are included, as well as the preparation of the contents to be presented in text form. It is also the moment for the author to decide about the rest of the contents and multimedia elements, so as to consolidate the interface design. It can be done with a simple description, screen to screen, of each one of the elements or effects wished or, when it is possible, through the sketch of the respective drafts.

Although playing a vital role in the quality of the final product, one cannot say that there is a clear, universal rule for the design of a good interface. We can, however, identify some factors that are determinant and upon which we should reflect, so as to adapt the technology to the user (and not otherwise!):

(a) *The types of connections between the different information nodes and the navigation ways supplied to user.* This aspect has to do with the possibilities, given to the user, of consulting the available material. It depends on the structure type (sequential, linear, reticular, mixed, etc.), but it should also result from the choices made about the type of learning. In practice, the author has to decide about the means that will allow the user to navigate within the application (Carvalho & Moreira, 2008). The examples are the connexion maps and the contents itinerary and also the theme menus, the keywords (which, especially in the case of hypertext structures, are the best way of activating the semantic bindings), the buttons for going forward or moving backwards, the guided ways, etc.

(b) *The orientation, control and feedback models.* In order to diminish the possibility of the user to be disoriented, it is necessary to inform him about his place in the application and supply information about what he is doing. Furthermore, it is important to do it in such a way that might give him the sense of control and understanding of the application (and not otherwise). As a complement of the choices made with regard to the previous question, the author should decide about the better ways of supplying that information. Some of the alternatives may be: the simple identification of the content (through titles in each information screen, for example); the reference to the present page number as well as to the total number of pages; the inclusion of help modules (for instance, about how to navigate in the system); the existence of a back button (which allows users to go back consecutively to the last screen or information node consulted, granting the possibility of reconstructing the path); the activation of marks in

each one of the pages already visited; the register of the path done or the information about what was not consulted yet; the possibility of choosing different degrees of difficulty or complexity of the contents, etc. Colour can also work as orientation means (different modules with different colours, for example), whereas sound can suit specific situations in which it is necessary to give feedback on the user's actions.

(c) *The interaction modes and resources of the interactive environment.* Another aspect that requires special attention in this stage of the authoring guide has to do with the higher or lower richness degree of the elements that compose the interface. This is true namely when it comes to the different ways of representing the information and to the kinds of interaction we want to establish with the user. It is mainly not only about deciding which type of material should be included and its form of representation (text, image, sound, etc.) but also about the application interaction degree and the different ways of obtaining it. We can consider several alternatives, from a system limited uniquely to the possibility of clicking in navigation buttons to environments with numberless possibilities of exploring the different elements of the interface. Likewise the two preceding questions, the main concern is to maintain the user properly informed about what the system offers and what degree of initiative is expected from him/her. It seems obvious, however, that the richer the environment is, offering more interaction possibilities, the bigger the probability of the user to be involved in the search of information will be. Therefore, the user will have more probabilities to experiment what Barfield (1993) calls "feeling of discover", which is actually considered to be a fundamental ingredient of interactive environments.

Final Remarks

Just as in any other type of educational projects, the development of multimedia resources starts with a simple idea (for instance a learning problem), that will then be developed into something tangible. It goes through different phases until we get to the use and exploration of the final product in a specific pedagogical context. This is, therefore, a progressive and iterative process in which the information and the experience acquired in each phase will allow us to adjust and improve the previously considered aspects. On the other hand, and considering the high degree of flexibility of the technology we now have, namely the authoring-systems, it is also a process that allows a modular construction, in which the teacher can produce the products he/she needs, according the new needs that emerge from each specific pedagogical situation.

Thus, instead of acquiring products produced and sold in large amounts, which not always fit the specific purposes of training nor reveal a great deal of pedagogical and didactic concern, the trainer or the teacher can now create, test and readjust their own material. In doing so, they put all their products, knowledge and experiences to good use. Although there are different models for the development of

multimedia applications, they usually result from a large-scale production and often don't match the trainer or the teacher's perspective on how an application should be developed. Most of the times, they emphasise the technical aspects of the different stages of production itself, leaving behind questions related to pedagogical and didactic issues.

Nevertheless, these questions are of vital importance, namely for those who operate in an educational or training context. In these situations, the main concern is finding the right material for a specific audience and deciding how it can be properly used.

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Chapter 4
An Evaluation Model for Quality Assurance of Blended Learning: Exploring the Lecturers' Perspectives

Lúcia Pombo and António Moreira

Introduction

The development of technologies and faster Internet connections have resulted that more and more Higher Education Institutions (HEIs) adopt online learning, which allows learners to have access for educational content and communicate with other learners and instructors, using computer networks, Intranet, Internet, which provides quick, easy and flexible access for all kinds of content through digital devices, such as CD-ROMs, DVDs, computers and mobile phones (U ur, Akkoyunlu, & Kurbano lu, 2011). There have been a number of factors propulsive of the use of a large quantity of technology in education across all sectors, as well as in HE. In recent years factors as information development, twenty-first century skills, demands of workplaces, and easy access to technology have emerged, which have strengthened and encouraged the adoption of technologies into classrooms and learning settings (Kaznowska, Rogers, & Usher, 2011).

Although online learning has many benefits in means of flexible interaction, various media available, among many others, standards and methods that have been used to teach in f2f sessions cannot simply be doubled-clicked into an online environment.

For Means, Toyama, Murphy, Bakia, and Jones (2009:9), online learning is defined as "learning that takes place partially or entirely over the Internet". This definition excludes purely print-based correspondence education, broadcast television or radio, videoconferencing, videocassettes, and stand-alone educational software programs that do not have a significant Internet-based instructional component. These authors distinguish between two purposes for online learning (1) Learning

L. Pombo (✉) • A. Moreira
Department of Education, Research Centre Didactics and Technology in Education of Trainers, University of Aveiro, Campus Universitario de Santiago, 3810-193 Aveiro, Portugal
e-mail: lpombo@ua.pt; moreira@ua.pt

conducted totally online as a substitute or alternative to face-to-face learning; and (2) Online learning components that are combined or blended (sometimes called "hybrid") with face-to-face instruction to provide learning enhancement.

Although blended learning (bLearning) has become somewhat of a buzzword in corporate and HE settings, there is still quite a bit of ambiguity about what it means (Graham, 2006). The different definitions of bLearning show us the diversity and strength of this type of learning. Generally, bLearning is defined as a combination of learning delivery methods which include f2f instruction with asynchronous and/ or synchronous computer technologies (Graham & Robison, 2007) but the concept of blend can be interpreted in various ways. Its conceptualization, considering that to blend is to mix or combine things together, depends on the focus of the definition and can consider, for instance, a blend of (1) *pedagogical strategies*, combining problem solving activities and debates, as proposed by Donnelly (2006); (2) *supporting technologies*, using different tools, such as forum, podcast, wiki, blog, and twitter, as referred by Walker and Beats (2008); or (3) *delivery modes* in which f2f and online activities are organized taking the strengths of both approaches (Garrison & Vaughan, 2008; Stacey & Gerbic, 2008).

The literature highlights that when designing blended modes of teaching and learning, strategies and/or tools, we need to consider the teaching and learning context to obtain the most appropriate mix or blend. In this contribution, and since we think Graham's (2006) definition is the most accurate and widely accepted, bLearning is taken as the integration of f2f activities with technology-supported activities at a distance (Graham, 2006; Conole, Oliver, Falconer, Littlejohn, & Harvey, 2007). By practicing bLearning the conveniences of online courses are gained without the loss of f2f contact (Ginns & Ellis, 2007). Thus, a learning environment is created which is richer than either a traditional f2f environment or a fully online environment (Harding, Kaczynski, & Wood, 2005).

Furthermore, HEIs adopt bLearning for several reasons (1) they recognize that students may not be able to deal with a fully online course; (2) they wish to introduce students to technology; (3) they propose to offer extra support to weaker students; (4) they intend to reduce the f2f component of the teaching so that part time students and those with family responsibilities have better access to learning, or (5) for many universities the move to bLearning occurs for financial and staff management reasons (Harding et al., 2005).

Independently of the above-mentioned reasons as to why bLearning is more and more used in HE, the imperative for quality assurance initiatives for eLearning, or particularly for bLearning in HE is highly acknowledged (Weaver, Spratt, & Nair, 2008; Ireland, Correia, & Griffin, 2009). Oliver (2005:183) explains this "quality agenda" in the following terms: "As more and more universities seek to use e-learning as a mode of delivery for their units and courses, and as more and more they are held accountable for the quality of the services they provide, the need grows for accepted standards and benchmarks against which performance can be judged." Indeed, HE leaders are challenged to position their institutions to meet the connectivity demands of prospective students and meet growing expectations and demands for HE quality learning experiences and outcomes (Garrison & Kanuka, 2004).

In Portugal, some institutions, in part due to the Bologna Declaration, reorganized the HE system, encouraged people to go to university as well as promoted students' mobility, which is highly related to the need of assuring (and also enhancing) teaching and learning quality. Currently, in Portuguese HE systems, almost all or even all Universities and Polytechnics already have eLearning initiatives, although they are more focused in the use of eLearning platforms as a complement to f2f modules (Magano & Vaz de Carvalho, 2008) to support the learning process in order to improve the quality of training and to allow access and learning opportunities to other potential users. As far as bLearning is particularly concerned, there are 11 institutions that already have bLearning course offers implemented in their curricula. Thus, bLearning is pervading HE compelling educators to confront existing assumptions of teaching and learning.

Most studies about evaluation of teaching concerning the specificities of bLearning tend to report more varied aspects of the students' learning experience (Bliuc, Goodyear, & Ellis, 2007; Kaznowska et al., 2011), and a small number of studies take a more holistic approach considering also academics or lecturers' perspectives. Moreover, among several and different terms, concerning the areas of online, eLearning, bLearning or hybrid Learning, we select the mode of bLearning to explore in this paper because this study is part of a wider project that seeks to develop and test evaluation and assessment strategies in bLearning contexts. This paper is also related to a previous one (Pombo & Moreira, 2010) that examined the evaluation practices of teaching and learning, concerning the perceptions of course directors.

This work aims at offering (1) an evaluation model to help decision makers and bLearning course designers in terms of assuring an effective, efficient and flexible teaching and learning environment; and also (2) the lecturers' views about how they think evaluation of bLearning courses should be done taking into account the curricular proposals of the first, second and third cycles of HE. First we provide a framework about evaluation goals, quality assurance and quality criteria presenting the evaluation model, which combined together four essential dimensions of evaluation; and secondly, we introduce the empirical study, including the adopted methodological approaches and the main findings on exploring the model with the lecturers who have wide experience on online Teaching and Learning, specifically on bLearning. Finally, we present the final considerations and recommendations.

Evaluation, Quality Assurance and Quality Criteria

The evaluation goals and process might be either to provide a means to check (process evaluation) or to improve (result evaluation) the teaching and learning process. Evaluation is a procedure that involves the comparison between a real situation and what is (highly) expected; it is guided by a theoretical referential (Hadji, 2001) about what is expected of the evaluation object. The complexity of the evaluation objects imposes diverse perspectives about them (using various sources and actors)

as well as a subjective process of negotiation among the actors involved. Evaluation is also taken as a process of finding ways to improve the quality of the object under evaluation, i.e., quality enhancement.

Initially it seems paradoxical to talk about the quality of bLearning as quality is often linked with checking against externally imposed standards. However, quality can also be understood from a development-oriented perspective, which means enabling learners to develop themselves in their own learning process and consequently produce better results as far as quality is concerned. In this view, methods of self-evaluation, reflection and peer-evaluation are seen as very important. This kind of quality methodology does not have anything to do with normative, universally valid standards, but aims at improving the quality of learning process (Ehlers, 2009). The imperative for quality assurance (QA) initiatives for eLearning, and particularly for bLearning in HE is highly acknowledged (Weaver, Spratt, & Nair, 2008; Ireland et al., 2009). HEIs are looking for QA for their e- or bLearning offerings. For example, the European Association of Distance Teaching Universities (EADTU) is a Europe's institutional network for open and flexible HE. At present its membership comprises the open and distance teaching universities, national consortia which connect conventional universities and associate members from non-European countries. Its membership covers over 200 universities and around three million students across Europe. E-xcellence, EADTU is leading a European movement on QA in e-learning; more specifically, the building of an e-learning benchmarking community of Associates in Quality. The E-xcellence Associates are focusing on the improvement of four priority elements of progressive HE: *Accessibility*, *Flexibility*, *Interactiveness* and *Personalization.* The EADTU strategies fit into the European Area of HE (Bologna Declaration) and the Lisbon Strategy of the EU. The objectives of EADTU address (1) the advancement of open and flexible education in Europe in a lifelong learning perspective; (2) the institutional development of the members; and (3) research and innovation of open and flexible education (http://www.eadtu.nl/e-xcellencelabel/default.asp?mMid=1).

Other example is the Open & Distance Learning Quality Council (ODL QC), which is the UK guardian of quality in open and distance learning, including home study, correspondence courses, e-learning, blended and work-based learning. ODL QC standards guarantee quality in all open or distance learning. The standards are subdivided into six categories (1) outcomes; (2) resources; (3) support; (4) selling; (5) providers; and (6) collaborative provision (http://www.odlqc.org.uk/index.htm).

But, what should be evaluated? What should be the benchmarks for QA? Is it the cost effectiveness? Is it the practical benefits for particular groups of students? Is it the attitude of students? Is it the improvement in learning? And how can we assure the quality of those particular courses? The key question of this contribution is how can we evaluate a learning environment to ensure effective, efficient and flexible learning for the learner? Combining the general variables mentioned in previous studies (Pombo, Loureiro, Balula, & Moreira, 2008; Pombo, Loureiro, Balula, & Moreira, 2009; Pombo, Loureiro, & Moreira, 2009; Pombo & Moreira, 2010), with the extra perspective of the workplace environment, we suggest an evaluation model,

EVALUATION MODEL			
Why?	**Who should be involved?**	**How and when?**	**What should be evaluated?**

Assuring and enhancing the quality of:
 	
.Course
 	
.Teaching & Learning
 	
. Resources
 	
. Student support
…
	. Lecturers themselves
	
	. Other lecturers
	
	. Students
	
	. Coordinator
	
	. Institution
	
	. External agents
	…
		. Students' questionnaires
		
		. Discussion forums
		
		. Students' Individual reflections
		
		. Lecturers' Individual reflections
		
		. Evaluation reports
		…
		
		- before starting the module
		- along the module
		- at the end of the module
			. Teaching
			activities
			communication tools
			f2f sessions
			online sessions
			  . Lecturers
			  competence
			  dynamics
			  quality of feedback
			…
			Learning
			interaction
			assessment strategies
			competences
			type and adequacy of
			assessment
			tools/tasks/products
			…
			Resources
			…

GLOBAL PROCESS			

Fig. 4.1 Model for evaluating blended learning courses

shown in Fig. 4.1. This framework can be useful to guide the evaluation of bLearning for technical professionals, where learning involving network technology and work-based activities reflect Jara and Mellar's (2009) first principles for an important part of the course.

Our aim is to prepare these guidelines to provide a practical tool to help students, parents, educators and policymakers to create, use and evaluate bLearning courses (see Fig. 4.1). To evaluate a course, first of all we have to know *why*, i.e., what evaluation is for; what are the main goals of evaluation. The model shows four main reasons, but the model does not pretend to be exclusive (there might be other reasons), so the model always contemplates suspension points in each category. Evaluation is also considered as a process of finding ways to improve the quality of the object under evaluation, i.e., quality enhancement. The literature (Jara & Mellar, 2009) discusses the difference between assurance and enhancement. While some opinions tend to look at them as two mutually exclusive positions where improvement is mainly seen as the result of internally focused enhancement processes led by academics (Harvey, 2005), there are other perspectives which integrate assurance and enhancement, recognizing their differences, but seeing them as parts of the same process. Assurance is concerned with determining whether objectives and aims have been achieved and enhancement being concerned with making improvements; both should be seen as part of a wider framework, as stages in the management of quality.

As evaluation should be linked to the concept of quality assurance, reinforcing the relevance of internal quality assurance procedures and their effectiveness in improving the quality of (1) the *course*, for example, the external image of the course, syllabus, adequacy to the students' profile, etc.; (2) *teaching and learning*, for example, students' learning outcomes, adequacy of faculty profile, adequacy of teaching strategies (e.g., inclusion of individual/group work), students' success, expectations of students before entering the course, etc.; (3) *resources*, for example, support of non-teaching staff (secretarial, photocopying, library…), support structure (LMS, network, bandwidth, help desk), logistics (availability of computers, wireless access, adequate rooms…), etc.; (4) *student support*, for example, before entering the course (access), during the course (skills development), at the end of the course (career opportunities), etc.

When focusing on the process of evaluating, we have to think about *who should be involved* in the evaluation (e.g., the actors of evaluation) and the model suggests *lecturers* who are lecturing the course, *other lecturers* (peer evaluation), *students*, course *coordinator*, the *institution* itself or *external agents* (other entities outside the institution). The model underlines that subjectivity decreases when there are several evaluators; the evaluation should not only be made by the lecturer but also by students, teaching peers and external evaluators. We also have to think about the instruments that should be used in the evaluation process; e.g., *how and when to evaluate*. The model proposes five main instruments (1) *students' questionnaires*; (2) *discussion forums*; (3) *students' individual reflections*; (4) *lecturers' individual reflections*; and (5) *evaluation reports*. When designing those instruments, we also have to considerer *when* they will be applied (a) *before* starting the module, as an early-diagnosis of curricular units (e.g., of students' profiles and expectations about the course; (b) *along* the curricular units (e.g., discussion forums that can be held among students and among lecturers throughout the process and also between lecturers and students throughout the process); (c) *at the end* of the module (for example, evaluation reports can be periodical or only final). The general tendency is to evaluate only at the end of the course, but our evaluation framework recommends, also considering results from previous studies (Pombo et al., 2008; Pombo, Loureiro, Balula et al., 2009; Pombo, Loureiro, & Moreira, 2009), that quality evaluation of bLearning should be focused on the learning process, during the development of the tasks, and not just at the end, providing a means to check the process in order to have the opportunity to improve it before its end.

Last but not least, another important dimension is *what should be evaluated*, e.g., the evaluation objects or the evaluation criteria. In this category the model includes three main categories (1) *Teaching* (which includes teaching but also the lecturers), (2) *Learning* and (3) *Resources*. In the *Teaching* category, we might evaluate the relevance of the proposed activities/tasks, the quality of available teaching materials, the communication tools used, the organization of f2f or online sessions, the organization of the curricular units (e.g., if the activities reach the objectives, etc.), among others. Concerning specifically the "Lecturers" category we can evaluate their scientific or pedagogical competence; their dynamism and monitoring in conducting f2f and online activities, their kills at motivating students, the quality of

the feedback they give to students, etc. In the *Learning* category, we may evaluate the interactions (communication between students) within groups, among groups, the assessment strategies adopted, the development of specific competences defined for the curricular unit; the development of transversal competences (e.g., development of values and attitudes, autonomy, capacity for research and group work, etc.), type and adequacy of assessment tools/tasks/products (if the literature tools are appropriate to the proposed tasks), etc. As to the "*Resources*" category we may evaluate support provided by non-teaching staff, the support structure (LMS, network, wireless access, adequacy of rooms…), etc.

In this contribution, researchers/senior teachers/lecturers with experience in bLearning were asked about their understanding of the evaluation goals of a course, and the whole processes, obtaining information that can be related to the above-mentioned model and, therefore, obtain a wider spectrum of opinions about the importance of each dimension and categories contemplated in the model.

The Study

Methodology

The study has an exploratory and descriptive nature. The research method is mixed, using mainly quantitative techniques of data collection and analysis (Creswell, 2003). The aim was to design the evaluation model presented above and gather lecturers' perspectives about the dimensions of the model. The data used in the study was collected through the administration of an online questionnaire to researchers/lecturers with experience in bLearning at national level. The instrument was sent directly using the institutional email of each respondent, personalizing the request and raising the importance of filling in the form, exposing the main aims of the study. The questionnaire was answered by 79 of 100 lecturers (95% confidence level, according to Cohen, Manion, & Morrison, 2007) from 11 public Higher Education institutions that offer courses in a bLearning mode. The selection of lecturers had into account their experience and expertise in bLearning courses. The questionnaire designed for the above-mentioned purpose included 4 main topics in a total of 54 closed questions, except for the items where other topics that were not considered in the questionnaire (a total of 7 open questions) were required from respondents if they so wished. The data presented here only show the analysis of the closed questions. The instrument was divided into the four dimensions contemplated in Fig. 4.1. Despite the lecturers' evaluation practices, lecturers were asked about their perceptions of what should be changed in the evaluation in order to improve the quality of the course. The questions were (1) what the evaluation goals should be?; (2) who should be involved in the evaluation for the improvement of the course?; (3) how and when the evaluation of the modules should be made?; and (4) what should be evaluated? The data were analyzed using quantitative techniques, namely descriptive statistics, using "Paws Statistics 18" and "Microsoft Excel".
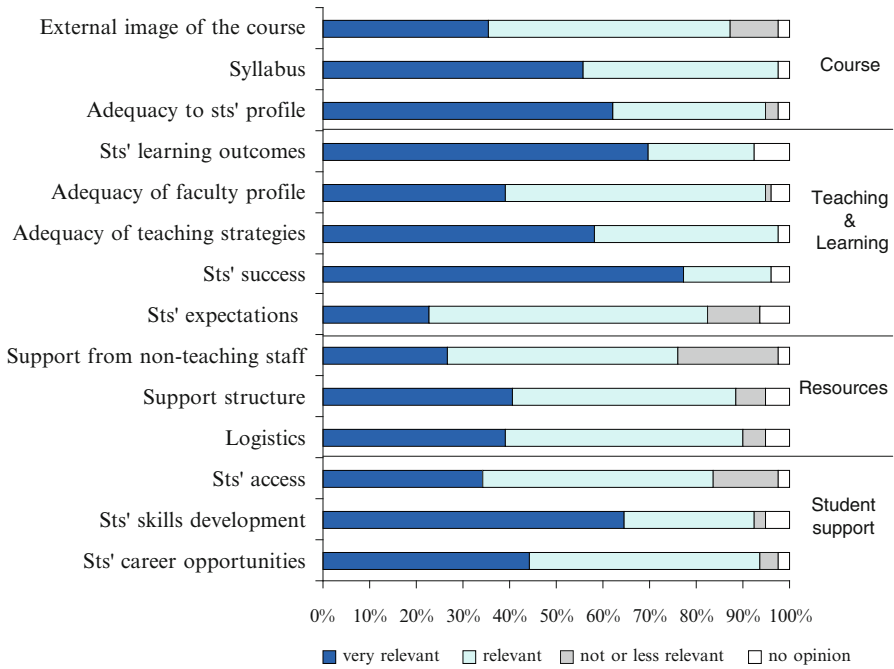
Fig. 4.2 Lecturers' opinions about what the evaluation goals should be (*Sts* students)

Findings and Discussion

Lecturers were asked about the *goals of the evaluation* that they thought should be implemented in their courses, i.e., what to evaluate for? (Fig. 4.2). Most lecturers (more than 50%) found "students' success", "students' learning outcomes" and "students' skills development" a *very relevant* goal. In the categories "students' expectations before entering the course", "adequacy of faculty profile" and "external image of the course" more than 50% of the lecturers found those goals *relevant*.

When asked about the degree of relevance of *who should be involved* in the evaluation for the enhancement of the quality of the bLearning course (Fig. 4.3), the majority of lecturers responded that "lecturers' (68 respondents, 86%) should have an important role in the modules' evaluation" (Fig. 4.3). However, less respondents considered "students" (29 respondents, 37%) and "external agents" (20 respondents, 25%) *very relevant* to be involved in the evaluation. They almost equally considered the other topics (around 40 respondents) as *relevant*. Only 20 respondents (about 25%) considered "other lecturers", the "coordinator", the "institution" and "external agents" as *less relevant*.

As to *how and when the evaluation* of the modules should be made, i.e., what instruments should be used in the evaluation (Fig. 4.4), and according to the lecturers' opinions, final instruments are more valued than the during-modules ones. For
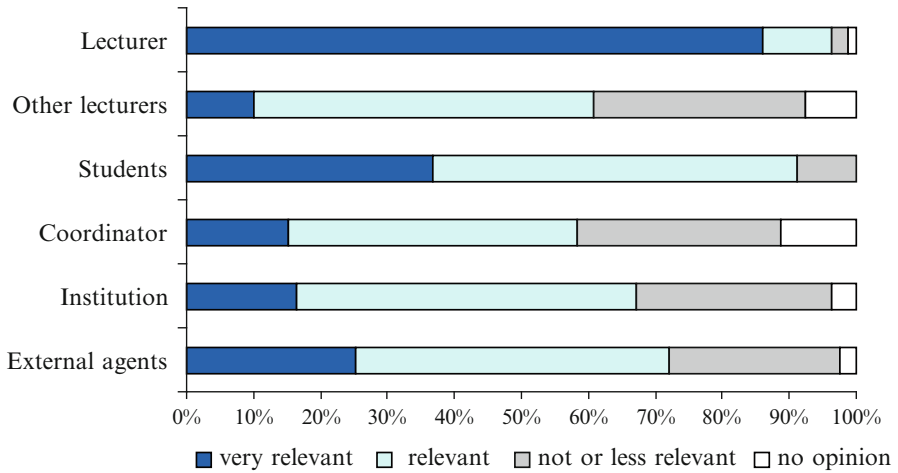
Fig. 4.3 Lecturers' opinions about who should be involved in the evaluation for the improvement of the course
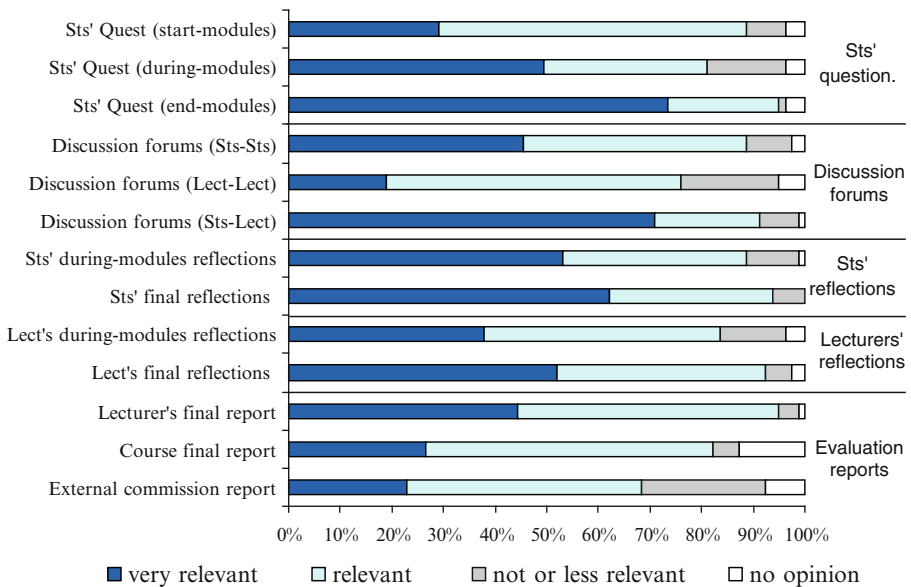

Fig. 4.4 Lecturers' opinions about how and when the evaluation of the modules should be made for the improvement of the course (*Sts* students; *Lect* lecturers)

example, most respondents valued as *very relevant* the "students' questionnaires applied at the end of the modules" (58 respondents, 73%), ascribing less relevance to "questionnaires applied by students at the start and during the modules" (23 and

39 respondents respectively). These results show that few lecturers considered diagnostic questionnaires *very relevant* for the evaluation of bLearning courses, but they consider them important at the end of the modules. Then, where is the comparison about the development of skills before and after the modules, and what are the learning achievements proposed for each module? Furthermore, we can infer that evaluation is strongly associated with final products and less with the process itself, i.e., with the development of skills during the tasks. As to the lecturers' opinions about the degree of relevance of using discussion forums as evaluation instruments, some consider them very valuable for the improvement of the modules, namely "discussion forums between students and lecturers" (56 respondents), "between students" (36 respondents), and "between lecturers" (15 respondents). This might be related to the importance of collaboration between lecturers and students and also to inter and intra group collaboration, providing opportunities for students to acquire the skills of working in teams and to negotiate, discuss and constructively criticize solutions to problems (Naismith et al., 2007).

Now, as to the degree of relevance of using individual reflections as evaluation instruments more lecturers considered *very relevant* rather than *relevant*, with the exception of "during-modules lecturers' reflections", probably due to the assumption that lecturers' reflections during the process do not enable students to develop their knowledge individually and/or collaboratively by re-thinking and re-discussing the module contents over and over again, as Draper (2007) defends. Once more, "final lecturers' reflections" are valued by more respondents at the end of the module (41 respondents, 52%), as compared to the "during modules reflections" (30 respondents, 38%).

The "evaluation report made by an external panel" is considered *less* or *not relevant* by 19 respondents (24%) but the "course final report" and the "lecturers' final report" are also considered *relevant* (by 44 and 40 respondents, respectively) or *very relevant* (by 21 and 35 respondents, respectively). This could be interpreted as a result of bLearning courses being very recent and associated practices not yet fully implemented at an institutional level, although directors find them important. In addition, Harvey (2005:273) argues that the internal quality procedures are the place where an enhancement process can be carried out: "… In most institutions where it occurs, improvement of the student experience is a function of internal review and monitoring processes, usually heavily reliant, nowadays, on student feedback, examiners reports, internal improvement audits, periodic revalidation of programs of study and staff teams critically self-reflecting on their everyday practice."

Finally, considering the topic "*what should be evaluated*", i.e., which evaluation objects should be adopted in Portuguese institutions (Fig. 4.5), most lecturers (46 respondents, 58%) mentioned the "pertinence of the tasks" and the "organization of online sessions" (42 respondents, 20%) as *very relevant* in the "Teaching" category. When asked about the lecturers' evaluation, most respondents mentioned their "quality feedback" and "lecturers' motivation" (60 and 59 respondents, respectively) as *very relevant*, which is in accordance with Hummel (2006) who defends that feedback can be considered an important, if not the most important support mechanism in a variety of educational contexts as bLearning calls for individualized support to reach the learner's needs of heterogeneous groups.
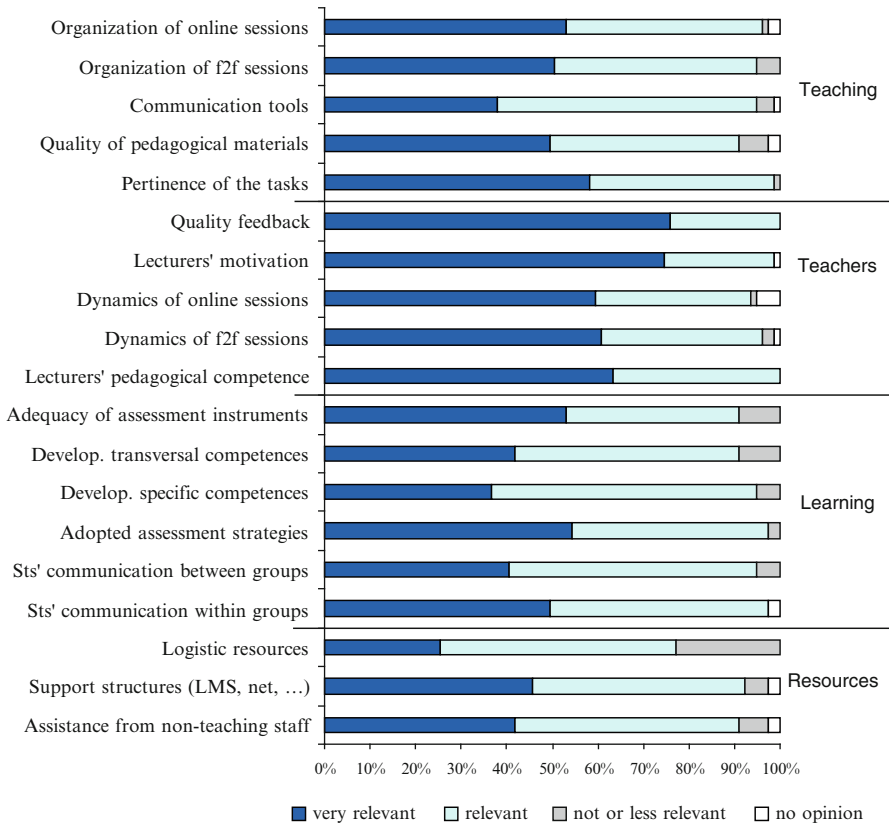
Fig. 4.5 Lecturers' opinions about what should be evaluated

With respect to learning strategies, 43 lecturers mentioned the "adopted assessment strategies" and 42 respondents mentioned the "type and adequacy of assessment instruments" as *very important* categories. Thirty-nine lecturers considered "Communication between students" *very relevant*. "Logistic resources" was mentioned by 20–36 respondents as *very relevant* when compared to all the other categories.

Final Considerations

The need for determining and maintaining quality in the process of designing, developing and delivering bLearning courses is becoming an important issue for universities and institutions worldwide. Course leaders and the other directly involved entities need to distribute responsibilities explicitly and collect feedback to be used for the enhancement of the quality of the course. Online learning evaluation

should be implemented to serve a variety of functions, such as to explore the potential effectiveness of online courses, compare online courses, and also as a formative tool to guide and inform the development of online learning materials. It is a process that some Portuguese institutions have recently taken seriously and are now in the process of formalizing. Course leaders and the other directly involved entities need to distribute responsibilities explicitly and collect feedback to use it for the enhancement of the quality of the course.

The evaluation model proposed in this paper aims to be a guide for the main evaluation dimensions, which are linked together, that decision makers might consider when planning evaluation of bLearning courses. Our evaluation framework recommends, also considering results from previous studies (Pombo et al., 2008; Pombo, Loureiro, Balula et al., 2009; Pombo, Loureiro, & Moreira, 2009; Pombo & Moreira, 2010), that quality evaluation of bLearning should be focused on the learning process, during the development of the tasks, and not only at the end. For example, it is clear that one end-modules students' questionnaire will not be enough to capture the data that will be needed for either formative or summative evaluation. When it comes to evaluation, subjectivity decreases when there are several evaluators; evaluation should be made not only by the lecturer but also by students and teaching peers.

Lecturers also pointed out that bLearning require a stronger definition of planning strategies, namely the organization of the modules. It is also noted that they emphasize the coordination of online sessions as more relevant than the f2f sessions, which is in accordance to Jara and Mellar (2009) who mentioned that in eLearning courses, whether fully online or blended, the risk of a lack of ownership, and a shifting of responsibilities between parties may affect the quality of the course. Moreover it is also highlighted that the communication between the involved people (within and between students and among students and lecturers) have to be considered when evaluating the course, as the opportunities to directly interact with students become more limited and tutors increasingly have to depend on the students' willingness to login and respond in order to establish communication with them (Walmsley, 2004).

The quality of feedback is also largely mentioned as a very relevant criteria, which is in accordance with Hummel (2006) who defends that feedback can be considered an important, if not the most important, support mechanism in a variety of educational contexts; as bLearning calls for individualized support to reach the learner's needs of heterogeneous groups.

The type and adequacy of assessment instruments is considered also very important, because of the particularities of this kind of provision that can allow a more in-depth continuous and accurate monitoring of activities, when compared to more traditional provision, as content, resources and communication among participants are mainly text-based and are usually automatically saved in the online environment (Fielding, Harris, & King, 2004), so the assessment strategies to adopt in bLearning should also take that into consideration.

Using more than one instrument allowing for triangulation of data and using several different quality criteria having in mind the improvement of teaching and learning quality, also guarantees the quality of the course.

Online learning evaluation should be implemented to serve a variety of functions, such as to explore the potential effectiveness of online courses, compare online courses, and also as a formative tool to guide and inform the development of online learning materials.

As more and more educators and researchers realize that effective teaching and learning with technology must be driven by pedagogical principles, it is of paramount importance to ask questions such as how this could be achieved and what aspects should be considered for a more effective evaluation that ensures the quality of web-based teaching environments. These findings, linked to the evaluation categories mentioned in the model and added to the opinions of lecturers (directly involved in the process), bring some contributions to those who are in charge of bLearning courses, providing a useful framework that covers all aspects of quality assurance in order to improve the enhancement of teaching and learning.

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Chapter 5
Reflective Map About the Limits and Challenges of Continued Training of Teachers for the Use of Mobile Technologies: The Experience of PROUCA

Ronaldo Nunes Linhares and Simone Lucena

Introduction

For a long time teaching and learning were linked to word and writing. The presence of mass media and, nowadays, that of the Information and Communication Technologies in contemporary society is a major revolution in the action of teaching and learning. The technical and scientific advances on the field of social communication resulted in the establishment of media and its languages, as mediators and essential instruments for social relations, the production and dissemination of knowledge and the education area.

We are aware that with technological development, contemporary society has restructured and redefines the socioeconomic, cultural, and educational role of ICTs at all levels of social life. There are new ways of communication and work, new forms of constructions, socialization, and use of knowledge. Understanding this phenomenon in all its dimensions allows us to come up with other teaching and learning practices.

In this universe, the technologies have contributed to transform the concepts of space and time built in modern times, redirect old contradictions, and create new ones. With the new connections, the production, movement, organization, and use of information and knowledge through communication is redefined by different kinds of "multimidiatics," cultural, cognitive, and social networks that are constantly being synthesized and amplified by technological innovations. Science as a productive force transforms fields of knowledge achieved by the crazy pace of technological innovations (Lima, 2007), in the awake of the digital revolution.

In education they provide the feasibility of creating new virtual learning spaces which in turn make possible the creation and recreation of different teaching and

R.N. Linhares (✉) • S. Lucena
University Tiradentes,
Sergipe, Brazil
e-mail: linhares@ua.pt; slucen@yahoo.com.br

learning practices as teachers' intellectual work acquires new forms and new meaning in these spaces, the result of substantive changes of technologies, which cause alterations in subjectivity.

On the other hand, like the beginning of modernity, the teachers' intellectual work moves to the centrality and the need to build a new relationship with knowledge, especially one related to teaching and learning. A pedagogy of virtuality is necessary, the ICTs and digital networks put education at the crossroads of knowledge and expertise in an emergency and a temporal fluidity, in a multiplicity and inter-local/global, subject/world never experienced before.

The presence of the teacher with another posture and training is essential, because as advocate Tardif and Lessard (2005), far from being a secondary profession sector, teaching is a nerve in contemporary societies, one of the keys to understand their transformations. These professionals are function of its quantity and its function, one of the major occupational groups and one of the most important parts of the economy of modern societies. Gatti and Barreto (2009:15) points out that besides its economic importance, the teacher's work also has a central role in terms of politics and culture. The school for more than two centuries is a dominant form of socialization and training that continues to expand, but in the universe of reflection into focus, education brings three challenges: teacher training, new digital learning environments, and teaching on-line.

In Brazil, the changes and difficulties provided by these technologies have been more forceful in economic structures and processes of informal education, than in formal education. The school still stands as not being part of this process, even with the policies of digital inclusion and computerizing in education, imposed by governments since the 1990s of the twentieth century with the introduction of IT in Education Program—PROINFO.

At the beginning of the century the government launches another program—appropriating the apparatus of mobile technologies, it creates the program "One Computer per Student" (PROUCA)—the result of a policy which seeks to enforce the presence of information and communication technology in the school as propellant for the development of education and, according to the Ministry of Education—MEC, this program is meant to be an educational project using technology, including digital and densification of the commercial production chain in Brazil. Introduced in 2007, as an experimental project in five Brazilian schools, PROUCA became a government program in 2010, ushering in the pilot phase.

MEC's site for the Program "One Computer per Student—PROUCA" proposes that the presence of Information and Communication Technologies (ICT) in schools has become an important tool and a great challenge, especially for teacher training policies. The site notes that these technologies contribute to "improve inclusion and quality of educational outcomes and develop the skills required in the XXI Century." According to the government, "schools need to incorporate ICT as part of inclusive, holistic, and integrated strategies" (Ministry of Education, 2011).

The experiences and lessons learned in the pre pilot phase (during 2007) have guided the support bases for the pilot phase and contributed to the construction at this stage of the implementation of training, monitoring, evaluation, and studies

strategies, to identify the results, measure the impact, and strengthen government's efforts with public policies related to the use of ICT in education, particularly in the use of One Computer per Student. However, this phase has not provided consistent guidelines for a policy of continuous training of teachers for coexistence, integration, and use of ICT's in teaching practice and school routine.

The simple transference of the responsibility of the continued education for teachers, to develop the program, to the universities does not solve structural problems and sociotechnical, cultural, and pedagogical issues of these teachers and schools. As punctual partners, these institutions do not solve, with short courses, the deficiencies in basic training in technical and pedagogical experience, technical support, and financial management and structural units of the school where the program was implemented.

This article seeks to build an initial map of the limits and initial challenges in the field of continued education of teachers for the use of mobile technologies by PROUCA in schools. The technological profile and observations of teachers about their facilities and difficulties, were presented during the training workshops developed in Itabaiana Pole, Sergipe, by professors from the Federal University of Sergipe (UFS). Furthermore, we point into this map the lines that define the area surrounding the management of ICT in school and the difficulties that this program creates in this environment.

Training of Teachers for the Use of ICT: A Challenge to the Teaching in Schools

The discussions about the presence and use of information and communication technologies in schools, with particular attention to the communication media, has come from the analysis of some of these differences to justify both the need to overcome barriers and to establish a possible relationship between the two camps, and the ultimate impossibility for such action. However we can evidence that, as far as the school, ICT has a place in today's society, and many times a more attractive place in the universe of children and youths. There is a "technological and mediatic culture" that competes with the "school culture." They are technological devices and languages that contribute to a new relationship with research, information, production, reproduction, and dissemination of knowledge and that directly or indirectly affect the subject's relation to the school.

For a long time, school has taken and defended their status as a single space for learning and knowledge production. This is because as a result of a technical rationality the institution school adopted positions that disregard the relationship pupil/media; the new networks and social practices of communication mediated by technology, just as all kind of knowledge that not is based on the structures of modern scientific knowledge, linear and simplified (Morin, 2005). In this sense, other collective spaces of knowledge construction, important to the education process of contemporary subjects are not considered as boosters spaces of new knowledge and learning.

By ignoring the role and influence of media and ICT's in the subjects training, the school maintains a myopic focus on the socio-technical diversity of socio-cultural realities and new learning spaces. Linhares (2007) notes that the origin of this position may be in the influence, shortly depth, of theoretical currents that formatted teacher's look against the media and the policies that government have deployed especially after the 1980s, programs with the use of media and digital technologies, in a technical perspective that disregarded the reality from the school office until the continued education of teachers. The criticism of the media and their presence in schools have hampered the development of a relationship of cohabitation, esthetic, recreational, and educational with these facilities and with these new communication technologies in schools.

On the other hand, multimedia technological development in society showed, among other things, the limitation of the model of formal education produced by the liberal society, today called into question. Assuming that is a function of the school to train and inform the subject, its distance is evident, as an institution that persists in teaching practices that do not consider the mediation of the media and their languages and technological devices as partners in the practice of teaching.

At the beginning of the century, in a statement about the Information Society, the UNESCO draws attention to the fact that information and knowledge can be the two main forces of social transformation, if the skills and abilities for their use are used and shared in an unsystematic and equitable manner. For UNESCO, the exclusion of the majority of the population to access and understand of ICT has shown a "cognitive gap," characterized by digital illiteracy, lack of access and use of information and by the, limited or not, competence of citizens to manage information in a critical perspective, independent and liberating. In case of the school, besides the students, teachers are also subject to this process. Besides the absence of a critical look at the use of information resources, in most cases, teachers have less knowledge, domain, and expertise on ICT than their students. So the challenge of teacher training in the contemporary is to reorient our thinking about what we mean by teaching today? What is the social and political role of teachers in a society defined by many as "knowledge society," of "information and communication"? and the extent to which digital technologies can contribute to learning at school?

Teachers have been subjected to relaxed and linear formations, built under the auspices of an instrumental rationality, institutionalized by centralized and vertical politics, where the teacher is challenged to put into practice skills unknown in the initial training period. So it is required that him/her [the teacher] pass from mere transmitter of knowledge to a formulator of problems, provoking questions, coordinating work teams, systematizing experiences, and living memory of an education that, instead of clinging to the past [transmission], enhances and enables the dialogue between cultures and generations (Martín-Barbero and Rei, 2001), skills that are not yet part of their basic training.

The challenge of teacher training for the use of ICT also goes through the consciousness of learning to learn, learning to the uncertainty, learning to "becoming," as the natural condition of life in a digital world, prepare for the

unknown, or as stated by Morin prepare for uncertainty, for the human condition. "The thought that faces uncertainty can teach strategies for an uncertain world" (Morin, 2003: 77).

In this sense, the role of culture in society changes when the technological mediation of communication is no longer merely instrumental to thicken up, bolstered up, and become structural. Because today's technology refers not the novelty of the apparatus but the new modes of perception and language, new sensibilities and scriptures (Martín-Barbero, 2002). Another challenge to which we direct our reflection concerns to the relation among teachers, ICT, and social media. For Levy (1989), intelligence technologies are one of the leading agents of change in today's society, since they emerged with new ways of thinking and living. In a globalized world, telecommunications and information technology have changed the relationships among men. The work and their intelligence depends on, in fact, the constant metamorphosis of technological devices of all kinds. Writing, reading, viewing, listening, creating, and learning are captured by a more advanced technology.

Therefore, the current scenario requires an effort to overcome the idea of "tecnomania" involving old educational proposals and at the same time, overcome critically the Salvationists conceptions about technologies. If we consider that "(…) we now live in these neighboring times in which all the ancient order of representations and knowledge swings to make room for imaginary modes of knowledge and styles of social regulation, poorly stabilized" (17), the understanding of a diversity of elements that today involves the productive process redefines the characteristics of this society—cyberculture—as a creative process and a new way to read and live in the world. Go beyond the sequence of the pages of the book in unitary and continuous order for a hypertext practice, jumping from one point to another by making your own script reading. The one who does not submit to the recitation of the issue, but the one who, in not identifying only as a receptor, interfere, manipulate, modify, and thereby reinvents the message. In this sense, Levy (2001a, b) calls attention to the enclosure of the school before this new reality and understands today's society as a society constantly in motion, in which the relations or interconnections that the school establishes with diversity of other social practices that are still weak and passive and the school center is not a node of flows, but a centralized space. The challenge then is to understand how the teacher establishes relationships with these technologies, as mediators of their practice without the school is bound to lose its basic function, entering an action in which by overthrew its walls, loses itself in a territory without direction, and a society that imposes demands from the cultural transformations that it cannot solve.

The presence and use of information and communication technology in the school change the speak-centered model and allows the student to dictate and authorship, participation, manipulation, and information co-authored and the most diverse facilitating exchanges, associations, and formulation in the post changes (Silva, 2006). Using ICT in the classroom, the teacher can provide multiple information (images, sounds, text, etc.), interactive and collaborative actions that enhance considerably the teaching practices resulting in knowledge; build and traverse multiple paths for connections and expressions with which students can count on

the act of manipulating intelligence, with new devised routes and new practices of collective construction of knowledge.

The challenge is to think the teaching professional as a subject of innovation facing a tradition of school uniform. Contribute from their training and the exercise of training of others for a position that Martín-Barbero and Rei (2001) defines as "systematize of experiences," which is about give rise (when the offer) and weaving (warp arrange weave together). This teacher's role will only be possible if it has access and systematic use of information and communication technology; a program of continued education with monitoring and evaluation of results and a training curriculum that has the ICT and the media presented in the whole process of training in an interdisciplinary way.

In Brazil, since the creation of the Institute of Educational Film, in 1936 by the Ministry of education and health, to the PROUCA the presence of media and their technologies in education have always been guided by public policies that focus more on building a national project built from the outside. The relationship between ICT and education, and the use of media in the training process goes back to radio program broadcasts as Minerva to the use of TV of computer programs as a Leap to the Future, School TV, Media in Education, and the National Informatics Education—PROINFO.

Entering the twenty-first century, added to speech actions and projects for digital inclusion, the Brazilian government launched in 2007, the project "One computer per student—Institute," which in July 2010 turns into a Government Program through Decree No. 7243, changing its name to PROUCA. With this program, the Ministry of Education recognizes the importance of information and communication technology in the school as a development policy and brings forth the challenge of continued education for teachers to use these technologies in schools.

Law 12,249 of 6.10 and later Decree No. 7243 that creates the program does not advance in the pedagogical issues and the guidelines have technical/financial, technical, and manufacturing processes of bidding for the purchase of computers. In regard to education, the decree makes only a small reference when prioritize solutions to Free Software and Open Source and without licensing costs, according to the guidelines of the educational policies of the Ministry of Education. Since the first experiments, the inclusion of ICT projects in schools have revealed problems in the initial training of teachers that present compelling as to continued education, both for the pedagogical use of ICT as for knowledge of the impact and results arising from that use in pedagogical practice of teachers and, consequently, improving students' learning. Even when these programs include continued education as an important moment of their deployment, the official documents do not describe the results of this training in teaching practice and learning.

The concept of "One computer per student" is born from the OLPC project, presented at the World Economic Forum in Davos—Switzerland, in January 2005 by researchers at MIT, Nicholas Negroponte, Seymour Papert, and Mary Lou Jepsen. This idea is being developed in several other countries considered underdeveloped.

In Brazil the first experiment was conducted in 2007 with five schools located in different states, as initial experiments, in São Paulo, São Paulo, Porto Alegre, Rio Grande do Sul, Palmas, Tocantins, Piraí, Rio de Janeiro, and Brasilia, Distrito

Federal. With Decree No. 7243, it has begun the pilot phase. In this phase 150,000 educational laptops were acquired to be distributed to approximately 300 public school education networks belonging to state and local, distributed in all units of the federation and selected based on criteria agreed with the National Council of State of Education Secretaries (Consed), the National Union of Municipal Directors of Education (Undime), the Department of Distance Education of the Ministry of Education (SEED/MEC), and the presidency.

Each school distributed laptops to students and teachers and it was provided infrastructure for Internet access. In this same period, it has begun the process of training of managers and teachers in the use of technology, monitoring, evaluation, and research of impact and results. This work was developed under the coordination of the Working Group of the Institute Program—GTUCA, formed by experts from public universities in the use of ICT in education. In the analysis of government programs for the integration of ICT in school, we found that PROUCA is the first to submit a proposal in which training, monitoring, and evaluation are present and defined as constituted actions of a policy concerned with the impact and results from the presence of these technologies at school and learning.

For the implementation of the project, GTUCA was divided into three areas: Training, Evaluation, and Research. As for teacher training, the program describes the process of training involving three levels in addition to the participating schools, universities (IES), Departments of Education (SE), and the State Educational Technology Kernel (NTE). Proposes training in a semi-presence mode, split into modules, covering the theoretical, technological, and pedagogical dimensions.

With regard to monitoring and evaluation, the program provides a diagnostic evaluation prior to implementation of pilot formative assessment during its execution and an impact assessment. The monitoring activities shall develop and implement monitoring tools and a monitoring room, with trained staff to monitor the progress of the project. In Sergipe, the program was initially launched in June, 2010 with the delivery of computers and the implementation of the Project "UCA Total" in the city of Barra dos Coqueiros. Four thousand hundred twenty seven laptops were delivered for students and teachers from 11 public schools located in the city and in the state. At the launch of the program, students have defined the use of computers. In the speech published on the SEED website, we have the following statements:

"Many of my colleagues who have no Internet access were always going to Internet cafes, which was often not possible because it is expensive to use these computers every day. Now yes, we have a computer and we are able to do our research, further enriching our knowledge" (LB, 13 years old).

"We are thinking of creating a blog that addresses issues about natural environment, fight against drugs, among other issues. Our teachers already talk to us to create an e-mail so we can communicate and ask questions of particular issues anytime. I'm very happy, proud of my city and my school", celebrated the student. (A. J. 13 years old).

"I hope to learn more. We have a good library in town. Now with the Internet at our fingertips, we have access to libraries, authors of important novels and magazines, as well as increased contact with teachers and peers. Indeed, this project is very good and makes me very happy"(G. J. 12).

As it can be seen, the expectations for students are many. However, in most cases this means for the teacher, new demands, it falls under their responsibility the need to meet these expectations. So the challenge of teacher training in contemporary reorient our thinking about how teachers should act to improve the learning in the "knowledge society". "What skills the teacher should build to insert ICT in schools as an efficient mediator of the learning process?"

With special attention to this reality, Cortés y Lau (2009, 18) observe that

> En la literatura, adicionalmente, se repite constantemente que las habilidades de pensamiento, expresadas a través de un pensamiento crítico, constituyen un factor que complementa las competencias que participan en el dominio de la información. Al mismo tiempo, el pensamiento crítico se favorece en su desarrollo en la medida en que las personas se van volviendo más autosuficientes en el proceso de aprendizaje, a través, entre otras cosas, de un uso más efectivo de los recursos de información. Es por tanto necesario que los sistemas educativos se preocupen porque los estudiantes desarrollen un pensamiento crítico, aunque en la realidad existe aún muy poca teoría sobre cómo puede apoyarse este proceso.

The set of skills and competences acquired through the use of information technologies and media should be part of the concerns of learning process of education systems, especially in the initial training of teachers. From the curriculum to the training practices, it must be considered the need of training teachers to develop literacy skills for the informational analphabetism, in new media, digital/computing and visual that allows access to information, to knowledge and creates a range that guides their pedagogic practice as critical and reflexive action about the presence of ICT in society and in school.

On the map below, the authors suggest a set of communication skills that guide the path to be built in this field (Picture 5.1).

The result of government programs on ICT in education, are dissonant with the improvement in learning levels, improving the quality of education, and training of teachers. Moreover, they are incompatible with the costs and the speech made by the advertisements about these programs. No inclusion or social infoinclusion pace at which society needs. When ICT and media are used in school, they do not make much progress on the cognitive and creative possibilities of media in learning or about teaching possibilities, new ways of learning and teaching.

Programs summarize the continued training of teachers in small classes or workshops from 40 to 80 h, insufficient for critical reflection about media and ICT. When the workload is bigger, as the project Medias in Education from School TV, the dropout rate is high and the evaluation process results in the pedagogical practice of teachers who can complete a nonexistent course. The vast majority of these "training" is about the responsibility of states, with small teams, without financial resources, technological and supporting infrastructure enough; technical with a reduced critical insight into the sociopolitical, economic, and cultural magnitude training as both technologies in the media and its relationship to education.

By observing the map proposed by Lau y Cortez, we saw that these "skills" can contribute as much for teachers to reach the level of literacy, should become the level of skills using ICT and media and information literacy for those interested in

Mapa de habilidades de comunicación
Constelación de habilidades de comunicación

Definición y articulación de un a necesidad informativa	Localización y acceso a la información	Evaluación de la información	Organización de la información	Uso de la información	Comunicación y uso ético de la información	Otras habilidades informativas

ALFABETIZACIÓN INFORMACIONAL

Uso de tecnología digital	Uso de herramientas de comunicación	Uso de redes		Filtraje de mensajes de los medios	Análisis de mensajes de los medios	Otras habilidades relacionadas con las TIC y los medios

HABILIDADES EN EL USO DE LAS TIC Y DE LOS MEDIOS

Lectura	Escritura	Habilidades numéricas	Otras habilidades básicas

ALFABETIZACIÓN

Hablar	Escuchar

COMUNICACIÓN   ORAL

Habilidades de pensamiento

RAZONAMIENTO

Picture 5.1 Mapa de habilidades e de comunicación. Constelación de habilidades de comunicación. Source: CORTEZ Y LAU, 2009

continuing their journey of self-learning. For most of these short courses "disable" the teachers to work with the ICT and media in school. These are challenges that go back to teacher training in a broader concept that goes beyond the teaching of courses and degrees, that the concept of trained teachers from literacy. The first experiences and living with the concept of teaching, and teaching well, the result of cognitive and affective relationships built on school time and space.

The consensus is for everyone involved in the use of information and communication technologies in education, invest in infrastructure and training of teachers is not enough to cause consistent changes in teaching practice and consequently in the process of school learning. Moreover, it is necessary to develop assessment processes that can describe the impact of ICT in education and more than that, these structuring processes for policies and programs to be recognized with a return on investment.

Unlike the immediate changes offered by ICT in economy, production, culture, and processes of social communication, when inserted in education these technologies do not allow changes so quickly. The classroom does not change overnight as well as the mentality of the teacher regarding teaching strategies and teaching practice, learned from everyday experience and everyday relationship with students and administrators. In a defined pedagogical model, the inclusion of ICT in schools has been restricted to only one structural modernization, without however causing significant changes in the teaching and learning.

Furthermore, the introduction of ICT in education causes many different tensions. In education, illiteracy is also an informational reality, as well as the inability to integrate digital resources to not dominant digital in its practice, should be considered among other things: the gap of generations and the problems of training, initial and continued, the impact of economic and wage; the demands of technology comes from students and society and the difficulty in understanding the relation everyone–everyone in the school communication process and the need of a collaborative practice and copyright in the production of knowledge in the classroom. For learning to occur it is essential that the teacher to take ownership of ICT, a contemporary sociotechnical tool, integrating it into their teaching.

Perceptions of Teachers in Relation to Laptop and on Training for PROUCA: Some Reflections on the Possible Study Case in Sergipe/Brazil

The formation of PROUCA, answers the guidelines set by the National Program, according to which the training process should occur at three levels or actions, and will involve, in addition to participating schools, universities (IES), Departments of Education (SE) and Centers for Educational Technology (NTE). The training will have a semi-presence character and will be divided into modules, covering the theoretical, technological and pedagogical dimensions. In Sergipe, teacher training was coordinated by the teaching staff of the Federal University of Sergipe that organized the training courses by groups of cities. Besides the "UCA Total," which brought

Table 5.1 Training linked to school—module/content/workload

MÓDULO	CONTEÚDO	C.H.
I	Apropriação Tecnológica	40 h
II	Introdução ao Projeto UCA	36
III	Execução da Proposta de Ação	40
IV	Análise e depuração da proposta de ação e elaboração	40
V	Seminário para apresentação de Resultados	24

Source: Education Ministery—http://www.uca.gov.br

together teachers of all municipal and state schools in the municipality of Barra dos Coqueiros, 04 working groups were created: GT1, with teachers of the cities of Moita Bonita (a state school), Itabaiana (a public school), and Nossa Senhora da Glória (a public school); GT2, teachers of the cities of Poço Verde (state school), Tobias Barreto (a public school), and Simão Dias (a state school); GT3, Capela teachers (public school), Aracaju (a public school), and Santa Luzia do Itanhy (a public school), and finally GT4 with the teachers of Colégio de Aplicação UFS (CODAP).

Under the responsibility of the group of trainers established by UFS, the action of teacher training in school occurred with workload of 180 h, distributed in the following modules/content (Table 5.1).

What we propose to present below is a cut of this process. After initial conversations with the teachers of GT1, we have disquiet ourselves with the difficulties of the initial domain of ICT (50% of teachers) and the difficulties of thinking about the mediators of the ICT pedagogical practices of most teachers of this group. The few time to prepare the training did not allow the team to identify the technological profile of the teachers. So the training was made considering: the urgency of time, because schools had already received the computers and distributed to students and the guidelines and materials provided by MEC. After the first stage of presence training, and recognition of the difficulties of most teachers, it was tried to identify these problems by defining a technological profile of the teachers by knowing the level of ownership and computer use in their daily lives, through a questionnaire, produced and applied to teachers during this first moment. In a universe of state formation involving 05 poles, it was made a cut for a more detailed study, analyzing Itabaiana pole seeking to identify and analyze the difficulties in two special fields, the management, covering school organization, infrastructure, and technical support, and pedagogical practices related to the teacher with the laptop at school. Then we propose a look at poll results, building a look at the presence of ICT in the daily lives of teachers, outlining the courses needed to understand the difficulties.

The proposed questionnaire was constructed with 40 questions, divided into three parts: the first collected data on the teacher, the second with data on their basic knowledge of computers, and the third on difficulties and skills with computers and the Internet.

For both, research and planning programs and training initiatives, it is also important to identify the context, the subjects for whom we intend to develop a plan or action, having clear in mind who we are talking about and who are planning or defining training strategies. In this sense, the first part of the questionnaire tried to identify some information that defines this subject. In total, 35 teachers participated in this study. From these, 98% are female, the vast majority, 91.4% are college graduates, only 1.5% of teachers do not have higher education. From teachers with degrees, 54.2% have a background in education and 42% have expertise latusensu.

With regard to professional experience, we are talking about 80% of teachers with experience over 15 years. However, only 54% have participated in some project about technologies in school, such as school TV, media in education or actions of educational computing through PROINFO, 37% say they did not participate in any ICT project. As simple interest does not translate into experience and integration of ICT in their cultural and school daily lives, we also identify the level of knowledge of teachers about technology.

One of the main factors for the integration of ICT in schools is related to the domain and regular use of these technologies in everyday life to satisfy desires and solve personal issues, common in day by day. Bringing technology to make your day as an important utility, present in his universe also contributes to sociocultural integration of these practices in your school. Despite 91% claim to use the computer to more than one year, 68% say they have a computer at home, 80% attended computer courses, which shows they have a minimum knowledge, initial information about computering and 62% of teachers have access to computers when not in school or at work, which puts them in front of other computerized living spaces. Of those who have home computers, 42% are the main users, with 28% of the children as primary users. Even considering this information, more than half (54%) of these say their experience with the computer is reduced. Computer use by these teachers is limited to typing job, use of word processing (82%), Internet access (60%), for the production of presentation programs (31%), and research in encyclopedias. Only 11% use educational software.

When they were asked if they believe that using the computer in school should change their students' learning, all of them gave positive answers. Although 34% did not point to the advantages of computer use in the classroom, 22% pointed advantage in the quality of education, another 22% said information could be accessed faster and 17% believed that changes occur in stimulating learning. As for the disadvantages, only nine teachers pointed out two problems: the loss of the habit of reading (3.5%) and problems in the relationship pupil/teacher (22%).

To identify some specific difficulties of teachers in relation to computer, questions have been proposed in which teachers describe how they feel with this technology. The questionnaire established for each question a number from 1 to 6, 1 being totally disagree and 6 totally agree. The table below presents a first reading of the responses. The data were presented in percentages that represent the sum of the numbers scored by teachers as shown in Table 5.2.

The table shows a positive feeling on the part of teachers in relation to the computer. The role of computers in school brings positive contributions to the learning

process, making it easier and more interesting, however, also confirm the difficulties with the use of new systems and programs, in addition to Windows. Nearly half is still unsure about their computer skills, has difficulties with new programs, and finds that the computer does not make work more productive. Important considerations that attest to the need for a living everyday with the machine and more particularly in a continuous training process that puts the teacher in front of the challenges of always updating. Teachers do not find it difficult to learn to use the computer, however, they raised questions during the training that should be considered in the planning of courses and programs of initial and continued training: a series of difficulties are here organized into two major blocks: educational difficulties and management difficulties of ICT in schools.

During the training, teachers insisted in a more objective format and straightforward about the pedagogical use. The continued education courses seek to train working professionals, which reinforces the need for teachers to know and to appropriate experience and practical strategies that can be inserted into their daily practices. Even though often without a consistent critical analysis, the access to these practices, and knowledge of their methodology, they advance in time to incorporate these practices in teaching. It's unanimous the complaints about the short time of training courses and workshops offered to teachers as well as claims about the continuity of space within the same school as part of their own workload. Most schools, although they have already proposed continued education as an important element in the Pedagogical Political Plan, none of them present a program of continued education. This reality also extends to the Departments of Education both municipal and state levels, offering occasional refresher courses as the demands or requirements due to the implementation of new programs.

The observations on strengthening of practice over theory proposes that according to teachers, characterize most continued education courses attests in addition to a distorted view about understanding of the theory and its practical importance in the construction of the educational process, an eminent need for a change and an immediate transformation of the practice charges taken in response about teachers and their practices in relation to the principle of using ICT as a condition of a "modernization" required by the global market.

In the speech of teachers it is also perceived as a lack of technologies effectively contributes to the learning process and insecurity about the use of changing technologies in constant transformation, and devices that require ongoing updates. For learning, it was resumed some questions related to basic training, the knowledge of new theories of learning and clarity of how these theories help to understand their teaching and its effective action in the process of learning the subject of a global, technical, informational, and networking society. Regarding uncertainty, we enter the block of management difficulties.

The management of ICT in schools is a major problem for an efficient and effective insertion of these technologies in schools, contributing to the improvement of educational quality indices and proposes to hold public policies until then under development such as the PROUCA compelling questions are: how is the access to

Table 5.2 Difficulties and facilities with the computer

Nº	QUESTÕES	Emdesacordo(1/3)	Emacordo(4/6)
1	Habitualmente consigo resolver a maior parte das dificuldades com que me deparo quando uso o computador.	18	
2.	Acho que é muito fácil trabalhar com o computador.	29	
3.	Sinto-me muito inseguro(a) quanto às minhas capacidades para usar o computador.	27	
4.	Creio que tive dificuldades com a maior parte dos programas que tentei usar.		24
5.	O computador assusta-me.	23	
6.	Eu gosto de trabalhar com computadores.		25
7.	Acho que os computadores se adéquam à aprendizagem.		29
8.	Os programas de computador baseados em Windows não me causam muitos problemas.		20
9.	O computador torna-me muito mais produtivo(a).	29	
10.	Tenho frequentemente dificuldades quanto tento aprender a usar um programa novo.		18
11.	Foi fácil usar a maior parte dos programas de computador que já experimentei.	20	
12.	Estou muito confiante nas minhas capacidades para usar o computador.	18	
13.	Acho que é muito difícil conseguir que o computador faça o que eu quero que ele faça.	22	
14.	Às vezes acho que é muito confuso trabalhar com o computador.	22	
15.	Eu preferia não ter de aprender a usar o computador.	29	
16.	O uso do computador torna a própria aprendizagem mais interessante.		29
17.	Alguns programas de computador tornam a aprendizagem definitivamente mais fácil.		26
18.	Usar o computador é algo que eu aprecio pouco.	27	
19.	Não me considero muito competente no uso do computador.	23	

Source: Research poll/Itabaiana Nucleous—dez. 2010

the Internet, still crashes? How will be the technical support for laptops with problems? There is need to regulate the use of computers in the classroom, which leads us to the field of pedagogical understanding by the teacher, the role of ICT in the classroom.

With no field of management concepts and strategies of minimum school management and used to dealing with everyday problems of the school, with the solutions and strategies that have been tested, are faced with a problem that goes beyond this everyday management of their school. They are problems of basic infrastructure in relation to the electricity grid, preparation of school space, preparation of network Internet access, technical support, knowledge and acquisition of educational software and other digital products, and the construction and maintenance of a model management of communication and their technologies in schools.

It's noted in here the need for knowledge and ICT by the manager, in addition to his leadership and guidance of teachers and employees in this new challenge to regulate, structure, and provide conditions for the study and permanent updating of teachers, for the creative development of new practices and a proposal for monitoring and evaluating the impact of these technologies, and in the specific case of PROUCA, in pedagogical practice, in the process of learning and thus improving the quality of education.

On the book "Managing communication and education," Linhares (2007) argues that education is facing a major challenge, think and build a new paradigm in education, society, info-informational, to the post-industrial society. For the author, the urgency of new teaching practices put the school in front of issues that only arise in the last two decades with greater importance in school, the certainty that ICT and its languages contribute to the improvement of the construction/appropriation/dissemination of knowledge and the school must be prepared to cope with, manage, and use ICT in teaching and learning.

Final Thoughts

When we analyze educational technology projects implanted in Brazil since the NCE in the 1930s until today, we see, among many difficulties, that teacher preparation is one of the most affecting and contributing to the failure of these experiments. In this sense, the inclusion of ICT in the school environment should occur at the same time that teachers and students incorporate these technologies in their sociocultural daily lives, from the technical to the reflective and in the case of the process the didactic teaching.

With PROUCA is no different. Even though its training proposal has this concern, as a government policy is perceived a gap between rhetoric and practice, the action and socio-cultural, economic, and technological preconditions, for the effective and efficient implementation of this action for both teachers and for school and, finally, between the continued education training. For the state rests also acting in the curriculum guidelines and educational projects of training courses for teachers to consider, from the beginning, the presence of ICT as mediators of learning and training content.

If in the socio-cultural field, the profile of the teacher described here puts him in a state of almost digital semi-literate, with regard to ICT-mediated teaching practice is the situation of complete illiteracy. The difficulties range from the lack of

cognitive possibilities of ICT to the ignorance of the role of these technologies and their use by their students on a daily basis. Because they have seen or reflected little or almost nothing about these technologies during their initial training, these teachers do not feel safe and relaxed with some consistent training, moreover, far from their classroom needs.

Too many, to have home computer with network access is not enough to think of it also in the classroom, in addition to domestic use. To insert this technology as a mediator of their practice with all the implications that this action allows, based on the concepts and principles, passing through planning, organization, and management and the process of impact assessment and learning outcomes requires much time, guidance, and preparation of schools as a system.

We talk about the experienced teachers' "pedagogical work" (above 15 years) who participated in a project with and about technology in school, however as an important factor for the integration of ICT in schools goes beyond the use of simplified for specific questions of communication and scanning work, these same teachers say their experience with the computer is reduced. Although they believe in the computer as an assistive technology to learning, they don't access much, they are not aware about educational software and do not know the possibilities of educational technology.

This reality must be considered in programs of continued education. In addition, capabilities cannot disregard the importance of infrastructure and an appropriate management model, to meet the proposed objectives. In the school context for each broke computer, and with slow Internet problems, lack of cooperation of colleagues and managers we lose the hope of a teacher, we feed the resistance of students to understand other uses of ICT and make sense of their presence in school.

Finally, we call attention to the failure of specific actions for capacity building, with a short time, that disregard the time of the teacher, school organization, and the level of knowledge and the role of local government bodies on ICT and its importance for education itself.

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Chapter 6
Web 1.0 and Web 2.0: An Anglo-Portuguese Research Project on the Impact of Using Technology in Science Education Programmes

Lúcia Pombo, Cecília Guerra, António Moreira, Leigh Hoath, Dave Howard, and Malcolm Smith

Introduction

Many institutions are responding to recently imposed pressures by embracing new technologies. Technological evolution and its increasing accessibility has led several European Higher Education institutions (HEI) to adopt constructivist approaches to teaching and learning methodologies (Uğur, Akkoyunlu, & Kurbanoğlu, 2011), whereby students are actively involved in the process. Addressing the particular needs of students who will be primary teachers in the future, technology should have a vital role to play in the development of transferrable and specific skills. These include broadening access to education and personalising the learning experience to adapt teaching to the unique needs of each learner. Many students already come with existing knowledge and skills in the digital world and ready acceptance of new technology.

One of the important areas within research on Science Education is to recognise the potentialities and constraints of the integration of information and communication tools (ICT) in the teaching and learning process (Arnold, Padilla, & Tunhikorn, 2009; Juuti, Lavonen, Aksela, & Meisalo, 2009). Osborne and Dillon (2008) defend

L. Pombo (✉) • C. Guerra • A. Moreira
Department of Education, Research Centre for Didactics and
Technology in Education of Trainers, University of Aveiro,
3810-193 Aveiro, Portugal
e-mail: lpombo@ua.pt; cguerra@ua.pt; moreira@ua.pt

L. Hoath • D. Howard • M. Smith
Department of Teaching Health and Care, Bradford College University Centre,
McMillan Building, Trinity Road, Bradford, BD5 0JE, UK
e-mail: L.Hoath@bradfordcollege.ac.uk; d.howard@bradfordcollege.ac.uk;
malc.s.smith@gmail.com

the importance of developing and implementing new teaching and learning strategies in order to motivate students to learn about Science; this would include the use of developing technologies.

Primary teachers need to understand that, by using a specific technology, they can change the way pupils understand scientific and technological concepts (Arnold et al., 2009; Juuti et al., 2009). Technological pedagogical content knowledge (TPCK) refers to the knowledge required by teachers to integrate technological resources into their teaching of any content area (i.e. Science). TPCK requires that primary teachers understand the representation and modelling of concepts using technologies, as well as pedagogical strategies that use ICT to improve pupils' learning (Juuti et al., 2009; Schmidt et al., 2009).

The outcomes for TPCK development in a teacher education course should be: an overarching conception of what it means to teach a particular subject integrating technology in the learning process; knowledge of instructional strategies and representations for teaching particular topics using technology; knowledge of students' comprehension, thinking, and learning with technology in a particular subject; knowledge of curriculum and curriculum materials that integrate technology with learning in the subject area (Graham et al., 2010).

TPCK in science addresses both the perspective and essence of how science subjects are transformed by specific technological environments. TPCK in science represents knowledge of the technologies and representations that are relevant to functioning within a scientific domain: the technological knowledge that a scientist would have and that educators want pupils to acquire (Graham et al., 2010).

Graham et al. (2010) state that TPCK requires in-service teachers know how to: find and use online animations that effectively demonstrate a specific scientific principle; use the Internet to discover common learner misconceptions related to a science topic; use digital technologies to facilitate scientific inquiry in the classroom; use digital technologies that facilitate topic-specific science activities in the classroom; help pupils use digital technologies: to collect scientific data, to organise and identify patterns in the data, to observe scientific phenomena, to create and/or manipulate models of the phenomena, to analyse results and present findings.

In the science education domain there are four critical elements for development of (primary) teachers' TPCK: knowledge of science; knowledge of pupils' preconceptions; knowledge of science pedagogy; knowledge of technology (Jimoyiannis, 2010).

In addition, it is also important that teachers integrate those strategies and resources, including technologies, for very young children onwards (Guerra, Moreira, & Vieira, 2010). For that purpose, it is crucial that primary teachers recognise three essential aspects before deciding to integrate ICT in their classrooms. First, not all children have the same levels of digital competence when they first arrive in school. Second, primary teachers role should focus on the teaching activity purpose and subsequently on which technological tool (hardware and software) can best support the pupils' learning in Science. Third, primary teachers who try to use new areas of ICT for children at the same time as they teach them new science content will often fail in both endeavours (Department for Education and Skills, 2004).

Moreover, the lack of technological and pedagogical ICT competences found in most primary teachers, associated with the few digital resources available in schools and with the undefined curricular regulations of the government agencies responsible for education in Portugal to integrate ICT in the teaching and learning process, seem to be the main obstacles to their use in the classroom (Moreira, Loureiro, & Marques, 2005). Additionally, the integration of ICT in curriculum areas and its effective use in teaching and learning are not yet indispensable aspects of teacher training courses (Costa, 2008). Taking into account these considerations, it is essential to empower research in science teaching and ICT in Education, to design, implement and evaluate training programmes for teachers, which will enhance students' literacy, both scientific and technological, from the earliest years of schooling. In this sense, it is fundamental to invest in the educators' training in terms of strategies of integrating ICT in teaching and learning in general and, in particular, in science. Thus, the impact of the advanced professional education programmes is now becoming relevant. According to the National Education Research Forum/NERF (2000), the concept of impact refers to the influence or effect that educational research exerts on its audience(s) whether they are researchers, financial agencies, political leaders or mass media. Pombo and Costa (2009) classified the impact as: macro impact, if the impact is evaluated in the Education system; meso impact, in schools, teachers and their peers or micro impact, within the classroom. This contribution will focus mostly on micro impact, as the emphasis will be on pupils' learning.

Recently, Portuguese HE institutions had to reorganise their teacher education programmes based on the underlying principles of the Bologna process, such as flexibility, lifelong learning, mobility and the integration of information and communication technologies (González & Wagenaar, 2008; Uğur et al., 2011; Guerra, Moreira & Vieira, 2010). The UK also signed the Bologna agreement. The Higher Education Unit outlines the UK's position in relation to the second cycle with regard to integrated Masters courses. This provided the Postgraduate Certificate in Education, a well established, internationally recognised qualification. However this is a one year course, not two as is commonly found within Europe (Europe Unit, 2009).

Given this context, the proposed work will enable researchers from two HEIs, the University of Aveiro (UA) and Bradford College University Centre (BC), to evaluate the quality of the teaching and learning programmes offered to science education teachers. Both institutions share a common focus on the professional development of teachers using innovative teacher education methodologies supported by Web 1.0 and Web 2.0 technologies.

The project was approved by a Joint Coordinating Committee consisting of representatives of British research institutions and Portuguese universities and polytechnics, appointed by the British Council and the Portuguese Council of Rectors and the Coordinating Council of the Polytechnics respectively. The work started in April 2010 and the two institutions developed, evaluated and compared two case studies in similar curriculum areas related to primary science education in a postgraduate context. The context of the two programmes is different in that UA is looking at in-service training whereas BC is looking at pre-service training. Specifically, the team explored innovative methodologies, such as the adoption of a blended

learning context, using both Web 1.0 and Web 2.0 technologies to encourage creativity and engagement of students; these include word processing, power point, online discussion forums, social bookmarking, mindmeister, boxnet, wiki, blog, social networking, etc.

This paper will focus on the outcomes of the research offering valuable insights related to the impact of science Education programmes, which use innovative methodologies for the professional development of student teachers and in-service primary teachers, within the classroom.

Methodology

The work adopted a case study approach and was of an exploratory and descriptive nature. The method is mixed, using quantitative and qualitative techniques of data collection and analysis (Creswell, 2003).

The study included the following stages:

1. Selection of a curriculum area within a postgraduate context, namely in a primary teacher education programme in both institutions
2. Design of innovative teacher education methodologies to be implemented in the selected curriculum area in both institutions
3. Identification of quality evaluation criteria of teaching practices, in order to develop the data collection instruments (questionnaire and interview)
4. Implementation of the questionnaires applied to the student teachers and in-service primary teachers at the end of their programmes of study
5. Administration of the interviews with the student teachers and in-service primary teachers at the end of their programmes of study
6. Analysis of the results from the questionnaires and interviews for each institution

The Portuguese selected curriculum areas to be involved in this study aimed at developing innovative pedagogical competences in ICT related to in-service primary teachers' professional lives, namely: (1) integrating ICT into science teaching practices; (2) promoting and exploring interaction practices when planning pedagogical activities (for formal and/or non-formal contexts); (3) developing collaborative work; and (4) developing research competences (Guerra, Moreira & Vieira, 2010).

The British context is the pre-service training of prospective primary teachers. This is a 1 year course at Postgraduate level. The student teachers study a number of curriculum areas to develop subject knowledge as well as appropriate pedagogies. The course makes extensive use of a Virtual Learning Environment (VLE) to support the students, as well as providing a conduit through which the students can share best practice.

The design of innovative teacher education methodologies to be implemented in the two institutions included the use of Web 1.0 and Web 2.0 tools. An outline of the ICT key concepts aligned with examples of learning activities and digital

Table 6.1 Outline of examples of the ICT key concepts aligned with learning activities examples and digital technologies embodied in the teacher education programmes

ICT Theme/ICT concept	Learning activity	Description	Technological tools "Web 1.0 → Web 2.0"
Finding things out — Searching and selecting of data	Find information	Searching, selecting and evaluating relevant information about a particular subject	Online databases with a .org or .gov suffix; Google search; Social bookmarking tool (Diigo—http://www.diigo.com/)
Exchanging and sharing information — Refining and presenting information	Collaborative mind-mapping activity	Brainstorming activities where pupils can interact and discuss ideas with text, diagrams, images or video	Kids Inspiration (http://www.inspiration.com/Kidspiration); Mindmeister (http://www.mindmeister.com/pt)
	Publishing learning findings	Presentation of information appropriately to a specified audience	Collaboration tool (wikispaces—http://www.wikispaces.com/); Boxnet (http://www.box.net/); Prezi (http://prezi.com/); Blogging tool (http://wordpress.com/); MicroBlogging tool (Twitter—http://twitter.com/); Podcast hosting tool (iTunes—http://www.apple.com/itunes/download/)
Communication of data	Asynchronous: Viewing videos linked to the course site; Reading an online article; Writing a report	Activities that take place outside real time in the classroom	E-mail; Online discussion (Fórum); Social networking (Ning—http://www.ning.com/)
	Synchronous: Chat sessions; Audio or video feeds to the computer	Everyone gets online in the same chat room and types questions, comments, and responses in real time	Instant Messaging (Messenger—http://explore.live.com/windows-live-messenger?os=other); VOIP (Skipe—http://www.skipe.com)

Table 6.2 The impact of learning matrix

Objective	Instrument	Example of question
To determine the effectiveness of the Web-based course management systems in supporting progress on the students' course of study	Questionnaire	Closed question example: "The strategies implemented in the ICT element allowed you to develop/improve/implement activities in science teaching using ICT"
	Interview	Open question example: "Which ICT competences have you developed during the attendance of the teacher education programmes?"
To inform course providers about the value of including Web 2.0 technologies within ICT provision e.g. blogs, wikis and cloud computing	Questionnaire	Open question example: "Please list the advantages and disadvantages of using the Pb Work tool".
	Interview	Open Question example: "Considering the Web 2.0 tools used in the teacher education programmes (or others) point out which of them are you using in your professional practice and how."

technologies embodied in the teacher education programmes of both institutions is presented in Table 6.1, specifically for searching and selecting data, for refining and presenting information and also for communicating data (Department for Education and Skills 2004; Guerra, Pombo, & Moreira, 2011).

Each institution highlighted the ICT content and ways in which student teachers and in-service primary teachers were encouraged to integrate appropriate uses of ICT into their classroom practice, in each curriculum area.

The research team collaboratively identified quality evaluation criteria of teaching practices, in order to develop the data collection instruments (questionnaire and interview), and defined the evaluation criteria (1) effective teaching; (2) impact on learning; (3) suggestions for improving future versions of the curriculum areas. A matrix was developed linking the formulated objectives from the data collection instruments with core questions, common to both institutions.

Table 6.2 represents a part of that matrix, as this contribution only focuses on the second evaluation criterion, the impact on learning. The matrix relates the evaluation criteria, one objective and an example of an adopted question from the two instruments, the questionnaire and the interview.

The aim of the questionnaire was to collect student teachers' and in-service primary teachers' perceptions regarding the above mentioned criteria. The administration of the questionnaire at the UA took place during the end of the second

semester of 2010 and was answered by all in-service primary teachers ($n=9$) who attended the "Science Teaching methodology" curriculum area of the Science Education Masters degree. At the same time, the questionnaire at BC was given to 86 Bradford student teachers with 45 responding. The questionnaire was disseminated through the VLE and completed electronically. The results that emerged from the questionnaires implemented by each institution were fully described in a previous paper (Pombo et al., 2010).

This was followed by a group interview to clarify and triangulate the data harvested from the questionnaire. The interviews at BC were applied immediately after the administration of the questionnaire, while at UA the interviews were applied 9 months after the end of curriculum units, using a focus group methodology (Morgan, 1988). The purpose of this focus group was to collect data regarding the impact of the use of technologies developed in the education programmes into the classrooms (micro-impact).

Results

This section will focus on the presentation of the student teachers' and in-service primary teachers' perceptions about the impact of the ICT provision developed in each teacher education programme (UA and BC) on their pedagogical and professional skills. Data provided by the questionnaire and the interview were triangulated in order to understand which strategies and technological resources (Web 1.0 and Web 2.0) contributed to their pedagogical and professional development.

Regarding the effectiveness of the Web-based course management systems in supporting progress on the students' course of study, all the UA respondents of the questionnaire considered that the "implementation of activities in science teaching using ICT" allowed them to develop and improve their pedagogical and professional skills. This could be related to the fact that this strategy aimed to provide in-service primary teachers with opportunities to implement small research projects that effectively utilise ICT-based research tools in their science classroom contexts. As previously researched, ICT-based research tools should be available at their schools and/or accessible via the Internet (Guerra, Moreira & Vieira, 2010).

Analysing the interviews concerning the ICT competences that they developed during their teacher education programmes, Portuguese in-service teacher A (with 15 years of teaching experience) mentioned that: "*I've already had basic ICT competences, such as working on word processing tools, power point and e-mail and I was an autonomous learner. This programme allowed me to develop ICT competences to a higher level, including Web 2.0 to be used in the classroom.*"

In the BC questionnaire, 66% of student teachers indicated that their pedagogical and professional skills were developed through the ICT provision. However, in relation to science-specific activities 67% of respondents felt that they did not develop or improve these skills as they anticipated. It is interesting to note that 82% of respondents positively evaluated the impact of the ICT programme on their teaching practice

and 100% were able to use ICT effectively to access resources for use in the class-room. The development of subject-specific ICT skills and pedagogy within BC is moving towards a model where it is delivered within a subject-specific context, i.e. through subject sessions. Presently subject tutors are developing their skills to further integrate and model ICT within their teaching. The evidence from the questionnaire suggests that there is still work to do before ICT becomes fully embedded within subject areas. During the student teachers' interviews this was explored further and it became clear that this was an issue for all curriculum areas—not just science. Additionally, most students are positive about the overall ICT provision recognising development in both understanding and application of ICT within the primary class-room: "*I feel that I have extended my knowledge of ICT and that the sessions were very appropriate to both teaching ICT and using ICT in my own teaching and making ICT available for children in the classroom*" (British student teacher A).

Regarding the course providers' decision to include Web 2.0 technologies within ICT provision, e.g. blogs, wikis and cloud computing, Portuguese in-service pri-mary teachers' learning outcomes followed continuous and formative assessment approaches, concerning the use of those technologies. This was based on the scru-tiny of products developed using Web 2.0 tools, such as: a scientific paper (Pbworks); a digital portfolio (Blog); a concept-map (MindMeister); and the interactions in the Ning forums (Guerra, Moreira & Vieira, 2010). One of the respondents of the UA questionnaire negatively evaluated the use of the wiki tool (Pbworks) to write the collaborative scientific paper. One of the open questions was intended to collect in-service primary teachers' perceptions about the potentialities and constraints of this Web 2.0 tool. The respondent explained that one of the constraints identified was that this wiki tool did not allow him/her to integrate Endnote (bibliography tool) during the writing of the scientific paper. Such Web 2.0 tools should be linked to the task/activity proposed in the programme.

Eight of UA's respondents totally agreed that the use of WordPress helped them to organise their e-portfolio during the curriculum units. These results demonstrated that it is important to rethink the integration of wikis and blogging tools in in-service teacher education programmes. Additionally, WordPress is a blogging tool that could give the student teachers and in-service primary teachers the opportunity to develop an e-port-folio. UA's in-service primary teachers felt that this Web 2.0 tool allowed them to take on a self-regulating role in their own learning, integrating critical reflections, activity resources and other artefacts developed during the learning process.

One Portuguese respondent, interviewee B (with 4 years teaching experience), mentioned that Ning platform has more potentialities than Moodle (VLE). "*Moodle is more static and it doesn't allow interaction among users, compared to Ning. Our experience in other curricular areas, Moodle was used by other teacher trainers only as an information repository (tasks, grades …).*"

In order for Portuguese in-service primary teachers to write a scientific paper collaboratively, the wiki tool (Pbwork) was introduced. However, during the inter-view, the Portuguese in-service teacher B identified some constraints in using this Web 2.0 tool: *"… this tool constantly unformatted the article … it was easier to write the paper using a word processing tool and send it to our partner and teacher trainers by e-mail or sharing it using the dropbox tool…"*. This result

highlights that it is also possible to use Web 1.0 tool potentialities for collaborative writing papers, for instance, using word processing functionalities such as Track Changes.

The programme at BC was developed for student teachers and, as such, concentrated on the basic pedagogical skills appropriate for this stage of their career. For example the use of some of the more advanced tools available in Microsoft Word such as Track Changes within paired writing activities, the Forms feature to develop questionnaires and worksheets that could be available over the school intranet and so on. The use of Web 2.0 technologies was introduced more as an awareness-raising exercise than an essential component of the course. The use of wikis for example was introduced as a way of enabling student teachers to share Web-based resources such as websites, online tests and so on. Nevertheless 30% of BC questionnaire respondents stated that they would use wikis and blogs as part of their classroom practice in the future. The use of Google Docs (cloud computing) was introduced as a way of gathering and analysing data from pupils with 40% of BC questionnaire respondents stating they would use this resource in the future as part of their teaching. Results from the BC interviews show that some respondents stated less confident students can be deterred from posting on the VLE due to the type of post made and the responses to the posts. Many teacher students gave positive feedback about the use of Virtual Learning Environments (VLE) to support them on the course. For example: *"It's a good resource for knowledge and questions/answers which you can return to again and again throughout the course"* (UK student teacher A) and *"It makes you feel part of a community who understands the everyday pressures of the course"* (UK student teacher B). This sense of "community of practice" (Lave & Wenger, 1991; Wenger, 1998) is a significant feature of the BC programme, addressing such concepts as professionalism, Continuing Professional Development, teamwork, "expert others", all of which are reflected in the Qualified Teacher Status Standards that all English student teachers must address before becoming qualified teachers. Interactive whiteboards (IWB) were also commented upon very positively both in terms of professional and pedagogical use: *"Appeal to all learning styles, able to use a multitude of web-based resources to enhance teaching"* (UK student teacher C)*, "Access to online resources"* (UK student teacher D), *"Easy to involve children and make the lesson interactive"* (UK student teacher E). Nevertheless, many respondents recognised some possible disadvantages of using IWBs and commented upon the unreliability of technology: *"A lesson is only considered good if it has a "wow" whiteboard presentation too"* (UK student teacher F). This caveat must be addressed within the development of TPCK so that technologies are relevantly and effectively utilised to progress learning.

Final Thoughts

The integration of ICT in the curriculum areas and their effective use in teaching and learning are not yet crucial aspects in teacher training courses (Costa, 2008).It is therefore essential to empower research in science teaching and ICT in Education,

to design, implement and evaluate training programmes for teachers, which could enhance the students' literacy, both scientific and technological, from the earliest years of schooling. In this sense, it is essential to invest in the educators' training in terms of strategies of integrating ICT in teaching and learning in general and, in particular, in science. Thus, the impact of the advanced professional education programmes is now becoming relevant.

The main purpose of the project is to contribute towards the evaluation of the quality of Science Education programmes that use Web 2.0 tools in each institution; specifically, it is important to evaluate the impact of using technological tools, such as Web 1.0 and Web 2.0 tools, in the professional development of teachers. Despite obvious differences in the programme contexts and stages of professional development of the two cohorts, what emerges is the benefit of integrating Web 1.0 and 2.0 technologies into teaching practice, recognising the usefulness of the concept of TPCK.

According to defined evaluation criteria for this paper, the main results show that:

- The overall ICT provision was appropriate to each Higher Education context, which allowed the endorsement of effective teaching in the curriculum units involved in this study. Specifically, in the Aveiro programme, it was important to introduce in-service primary teachers (with experience in the field) to innovative Web 2.0 tools for their professional and pedagogical development, recently re-designated as TPCK. Regarding the programme at Bradford, the integration of basic digital tools (such as Word, PowerPoint etc.) for student teachers' pedagogical skills development was valued and deemed most appropriate for this stage of their career. Thus, it is possible to assume that the important aspect is to balance the two types of technology, according to the learning tasks while broadening the students' experience of other technologies, such as those found in Web 2.0 applications.
- Each institution's ICT provision positively contributed, according to participants' perceptions, towards their professional and pedagogical development. Some student teachers recognised that using technology effectively in science learning may not always equate with applying high-level technological tools. Results suggest that teacher education programmes should help teacher students to develop basic ICT competences, i.e. using a word processor tool to collaboratively draft a text for a scientific report. Then, as teacher students become more competent in using this type of technological tool, it is important to give them opportunities to apply other innovative digital tools in their practices, such as using a wiki for collaboratively writing a report. This development of TPCK will support more effective practice across all areas of the curriculum.

As more and more educators and researchers realise that effective teaching and learning with technology must be driven by pedagogical principles, it is of paramount importance to ask questions such as how this can be achieved, and what aspects should be considered for more effective assessment to ensure the quality of education programmes that use Web tools.

The intention of this paper is to be firmly grounded in the realities of life in the primary classroom and help understand that digital tools can be used in different and innovative ways to promote innovation in primary science teaching and learning. These findings offer suggestions to those who are responsible for educational programmes, providing a useful framework covering aspects concerned with Web integration technologies in science teaching and, more holistically, the learning process. Therefore, individually or in groups, teachers may use Web technologies, from Web 1.0 to Web 2.0, in their science activities: to search and select topics (using online databases or a social bookmarking tool), to develop reports about their research findings (using a word processing tool or a wiki); and present their research findings to colleagues and teachers (using a PowerPoint presentation or Prezi).

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Chapter 7
Learning Foreign Languages in the Twenty-First Century: An Innovating Teletandem Experiment Through Skype

Teresa Cardoso and Filipa Matos

To learn a foreign language is to learn new ways of communicating; an act that involves both the subject, individually, and the others, as culturally diverse beings. It is also to acquire communicative, relational, and behavioural competences, which will help develop a spirit of understanding, tolerance, and adaptation to an ever-changing society, i.e., that will afford professional training, and also help form a responsible and proactive individual and citizen.[1]

Introduction

With the ongoing development in the new technologies, and their diverse applications in education, their use as valuable instruments in pedagogical activities has been confirmed as effective. As a matter of fact, these tools allow for not only the diversification of strategies and modes of learning, but also the consolidation and development of student competence in various areas, while simultaneously promoting the teachers' personal and professional advancement.

As Maio et al. (2008) state, direct communication via the Internet has been considered a motivating form of interaction, through which users become directly involved in the tasks undertaken. From the teaching point of view, it enables a deeper involvement and greater student participation in learning tasks, as *"the use of communication in a web-based classroom can be the most exciting and rewarding use*

T. Cardoso (✉)
Open University/Universidade Aberta, Lisboa, Portugal
e-mail: tcardoso@uab.pt

F. Matos
Università degli Studi de Salerno, Salerno, Italy

of the web in education. It enables a tremendous freedom that addresses many of the problems with face-to-face communication and provides a number of new educational possibilities." (McCormack & Jones, 1998:231 in Maio et al., 2008:24).

Many researchers have delved into the availability of information on the Web, as well as into the curiosity about knowledge it enhances, and the teaching and learning opportunities it affords. Due to this concern, there has been a growing tendency to adapt the new communication and information technologies to the teaching/learning process, so as to enhance student motivation and lead to their success. As far as the teaching of languages is concerned, along with the development of mobility programmes for students and professionals,[2] there arose the need to learn languages and to muster cultural and linguistic skills, giving rise to such concepts as, for instance, "linguistic culture", which comprises three dimensions—cognitive, affective, and behavioural (Simões, 2003)—deemed indispensable for the promotion and enhancement of student multilingualism, and breaking down cultural and geographical distances.

Nowadays, there are many systems that address the constant need not only to promote a teaching/learning method that will ensure the students' success, but also to motivate student participation in their own learning process. In view of this, we propose what we consider to be an innovating learning context, permitting the breaking down of space-time and linguistic barriers, and thus confirming that it is possible to learn "anywhere in the world" (as Universidade Aberta's motto underscores), and anytime.

We shall then begin by clarifying the very notion of *teletandem* and some of its fundamental principles, as well as the concepts leading up to it.

What Is *Teletandem*?

The designation *in tandem* first appeared in Germany, under the sponsorship of Helmut Brammerts (Ruhr-Universität, Bochum), who actually coined the term, inspired by the two-person bicycle, which in German is precisely "tandem".

Initially, the *tandem* method was developed with the aim of revolutionising foreign-language teaching, by pairing up two people with different mother tongues, interested in learning autonomously and simultaneously, and placing them in contact with each other, so as to learn from one another. Brammerts (2002:23) clarifies that the "programmed didactic use of the tandem concept, as well as its name, date back to the "binational language courses" of the Deustsch-Franzosisches Judendwerk (DFJW), during the second half of the 1960s". Therefore, henceforth, studies in the field of tandem language learning began being developed. This method is based on three main principles,[3] and may be used independently, or complementary to language courses, its main advantage being flexibility.

The tandem method was later adopted in other countries, such as, Spain and France, and after the 1980s, it expanded to other European schools (mainly private),

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[2] Such as, among others, the Erasmus, Comenius or Leonardo Programmes.

[3] cf. Brammerts (2002:22–3) in Telles and Vassalo (2006): partner autonomy, code reciprocity and independence (that is, the languages involved in the teaching/learning process do not mix).

as an alternative or complementary to foreign-language teaching/learning,[4] and also to universities (Rosanelli, 1992:13).

Later, at the beginning of the 1990s, *e-tandem* (distance tandem method) arose, allowing for synchronous or asynchronous use (through chat or email, respectively), as part of the international project *E-mail Tandem*, in which 12 universities participated, under the coordination of Brammerts. Simultaneously, a network of tandem sites was created—http://www.slf.ruhr-uni-bochum.de/—through which it is still possible to search for partners to learn in tandem.[5]

Besides the (so-called classical or traditional) *tandem*, and the *e-tandem*, there has recently been a new development, the *teletandem*. Therefore, studies focussing on this field have started to emerge (Telles & Vassalo, 2006, or Bedran, 2008, for instance). *Teletandem* is different from the previous methods in that it incorporates the webcam as a tool, thus ensuring the partners' presence in real time. The concept of *telepresence* (Steuer, 1992) is thus taken up once more, as this recent tandem method permits the visualisation of features that enable a better cultural understanding, namely of hints that allow for the processing of language through non-verbal communication elements (Telles, 2007).

Therefore, *teletandem* has been considered a new option within CALLT (*Computer Assisted Learning Language and Teaching*), and a very useful one in foreign-language teaching/learning, in so far as it favours oral comprehension and expression (as well as written comprehension and expression, as we shall see further on).

This third type of *tandem* has undergone a huge development in Brazil, namely at the Universidade Estadual Paulista, in Assis, where it has been under study within the scope of the *Brasil Teletandem Project: Foreign Languages for All (TTB Project),* of the Linguistic Studies Post-Graduation, supervised by Prof. João Telles, in which we have collaborated.[6] We shall now attempt to expound some of the characteristics of this new virtual foreign-language teaching/learning context, clarifying some aspects of the project of which it is part.

How Does One Teach and Learn by Teletandem?

In conceptual terms, it is possible to state that this new virtual teaching/learning context—the teletandem—is based upon three fundamental principles (Panichi, 2002), namely, the principle of:

1. *Equality*, since both participants are given the possibility of monitoring the teaching/learning process of their respective mother-tongues:

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[4] The International Language School Network (http://www.tandemcity.info/ca_index.html), founded in 1983, is a wide network of private language institutes that use the tandem method. Mostly, they are European schools, but there are also schools from Peru, Chile, and Canada.

[5] About tandem projects in France and Germany, in particular, http://www.tele-tandem.net/sommaire.html.

[6] For more information, please access http://www.teletandembrasil.org.
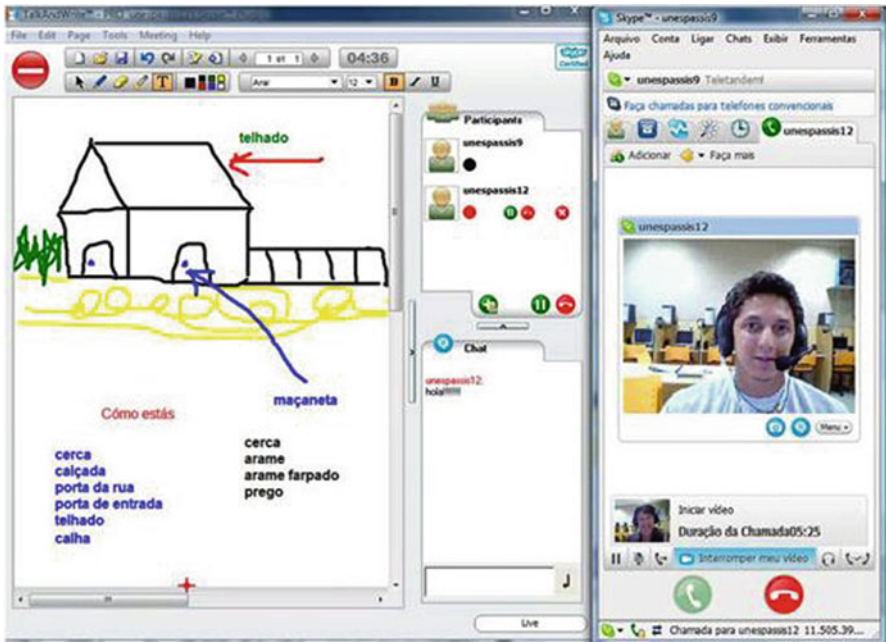
Fig. 7.1 *PrintScreen* of a *teletandem* session, in which the interactive board/device *Talk And Write* is used

2. *Reciprocity*, since horizontal (synchronous) communication, and (distance) collaboration in the mutual exchange and sharing of knowledge prevail:
3. *Autonomy*, since each participant involved is responsible for the personal and individual management of his own learning process.

In practical terms, and more precisely as regards the applications (Apps) that may be used to operate *teletandem*, various options of *Instant Messaging and VoIP* may be selected. However, within the *TTB Project*, *Skype* has been chosen, mainly because it is a free, stable, and easy to use App, that can easily be downloaded, and that has many users. Besides being compatible with all operating systems, it also enables a multimedia convergence, for an endless amount of time (since we can exchange files synchronously, and make use of *chat*, *videocall,* and/or the interactive board/device *TalkAndWrite,*[7] for example, which permits drawing, writing, showing Web pages, working on a text, etc, simultaneously with another user—Fig. 7.1).

Given the importance of communicative competence, of learning with resort to "authentic materials", it is very relevant to offer the student a real time experience of learning from another student (live language) who is on the other side of the

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[7] http://www.talkandwrite.com/english/index.php.

screen, far away, but at the same time, close, showing signs of his own culture, and cooperating towards building knowledge. To all the important previously mentioned positive characteristics, regarding the application choice, one can add the fact that the equipment necessary to use it consists merely of a headset (microphone and earphones), and a webcam (video camera), together with an Internet connection.

On the other hand, in this twenty-first century, it is no longer advisable or possible to fail or neglect to adopt online tools and resources to facilitate the teaching/ learning process, as society increasingly tends to depend on, develop, and construct itself on the Web 2.0 (and 3.0), as well as on virtual and social community networks. This is a very versatile and promising context, which is permanently undergoing development, and which calls for that adoption. It is therefore a context in which the diversity of competences and strategies is always present, making it indispensable to language learning—always a unique and unpredictable venture in itself. As Tavares (n.d.) mentions, "to learn a foreign language is to take a trip abroad. We travel to a destiny of our choice, we meet with some obstacles, we move on, we get lost, we find places which were not originally in our itinerary". Or still, establishing a parallel with the directives of the Common European Framework of Reference for Languages:

> "Communication and learning involve the performance of *tasks* which are not solely language tasks even though they involve language activities and make demands upon the individual's communicative competence. To the extent that these tasks are neither routine nor automatic, they require the use of *strategies* in communicating and learning." (p.15)

To sum up, resorting to *Skype* software application and to its writing, reading, audio and video tools, we attempt to promote participant involvement and autonomy, through *teletandem,* in particular, through interaction activities. This type of interaction allows for the development of collaborative work, teaching one's mother tongue whilst learning the other's, through synchronous, real-time mediated communication. That is, *teletandem* pairs of partners must simultaneously teach their own mother tongue and learn a foreign language, thus developing competences within a teaching-learning context that is far remote from the formal classroom environment. In a word, they actively participate in the development and progress of their own learning process, whilst furthering the growth of their communicative and pluri-lingual competences.

The Brazil/Italy *Teletandem* Project

If we now turn to the specific Brazilian *teletandem* context, the pairs of partners involved are mostly being supervised by mediator teachers (many of whom researchers in TTB Project), who attempt to collaborate and understand the development of this new way of teaching and learning, in this case, foreign language teaching and learning. It is a complement to formal teaching/learning, in which pairs of Brazilian Linguistic Studies post-graduates and Italian Humanities undergraduates (future language teachers) participate, respectively from Universidade Estadual Paulista de

Assis (UNESP),[8] and from Università degli Studi di Salerno. The languages involved are, thus, Portuguese and Italian; in the case of the former, with the advantage of allowing contact with a different variety of the language (the American variety).

Due to the wide adherence this project has been witnessing, and the general acceptance it implies, it is possible to foresee an increase in target audience,[9] as well as an expansion in exchange experiments, which will eventually include other institutions, since "the proposal […] is to introduce researchers, educators, teachers and students, to the *teletandem* concept, theoretical fundaments, and practice, as an innovating foreign language teaching/learning context in the twenty-first century." (Telles, 2009:17) Therefore, it becomes particularly important to understand the impact this innovating context has been having on its users, and this is what we have been assessing through a specific exploratory study, which we are herewith expounding.[10]

Determined as we are to look for innovating teaching/learning practices, and sharing Mason and Rennie (2008:01) opinion that *"popularity of a wide range of social software, particulary with young people, has led many educators to think that this practise and entusiasm could be turned to educational use"*, we set about to formulate the following research questions, at the initial stage of our study:

- Which use do students make of instant messaging programmes, namely, which use do they make of the Skype application, as a foreign-language teaching/learning tool, through the innovating *teletandem* method?
- What motivates students to learn, particularly in an innovating foreign-language teaching/learning context, such as *teletandem*?
- Which are this new CALLT option functionalities and potentialities, and more specifically, what is the impact of Skype *teletandem* on foreign-language teaching/learning?

On the other hand, and so as to find answers to these questions and to pursue the previously defined objectives, we visited a laboratory created at UNESP for the practice of *teletandem,* during our 1-month internship. We then became familiar

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[8] As regards material infra-structures, this University has a laboratory with 18 computers connected to the Web. The *Teletandem Laboratory*, as it is called, was created with the aim of giving all students the opportunity to engage in *teletandem* sessions. Therefore, all the computers are equipped with webcams, microphones, earphones, and a screen/data show projector, which give students the possibility to have video-conference mediation.

[9] Initially, in its experimental phase, we opted for giving access to the *teletandem* project as an extra-curricular asset, available only to third year Italian students, as their linguistic proficiency level was already high. However, considering the institution as a live structure, profoundly inscribed in society, and that the teacher today must invest in other types of teaching (more practical, more interactive, and relying on diversified resources and techniques), access to that project has been granted to Italian students from other years of the same course.

[10] And which was part of the Master's thesis in E-Learning Pedagogy, at Universidade Aberta (Portugal), of one of the authors of this text. The main objective of this research project lies within the area of VoIP (Voice over Internet Protocol), and IM (Instant Messaging) educational context programme utilization study and analysis.

with its functioning and organisation, as well as with all the procedures fundamental to its use (which we have previously mentioned). In addition to that, we observed and recorded *teletandem* sessions, and asked the students participating in the experiment to fill-in questionnaires, and we later carried out interviews (which is a procedure we may take up again at a later stage, if any of the preliminary analysis results—to which we shall presently refer—have to be clarified or corroborated).

As far as an initial survey of the results obtained through the implementation of the above mentioned research instruments is concerned, and above all, through the content analysis of the open-answer questions, we may infer that, in general, the students' level of satisfaction, regarding *teletandem* sessions, is rather high. In particular, and taking up our research questions once again, we think it is possible to identify the type of use of a programme such as Skype, in the context we have been describing of virtual distance foreign-language teaching/learning. To give an example,

> Thus, through an instant messaging programme, we can practise the language in question, and not just study its grammar, which is what happens at university [respondent #22]

As for the reasons behind those students' motivation to resort to this innovating method, we can put forward a few, which we have underlined in the words of one of them:

> So as *to learn more* about this subject, *more conveniently* and practically. As we live in a world of technology, we have to adapt to the tools which can *make our task easier*. Besides being a great opportunity to meet people from different countries. [respondent #6]

As regards an advance evaluation of this specific *teletandem* experiment, we are pleased to note that one of those students acknowledged this process as being

> more dynamic and enabling a contact with the language "as it takes place". This is very different from learning through a method of didactic repetitions, etc. [respondent #5]

That is, it appears that *teletandem* enables a successful teaching/learning experience, allowing for significant learning to take place, and affording plenty of linguistic and cultural opportunities to all involved. Therefore, and in view of the fast development of society, and of the advancement in the new communication and information technologies, we agree with Alves and Gomes (2007), in that one of the steps essential to education (namely to foreign-language education) is the current tendency of pedagogical practices to encourage student involvement in richer and more diversified learning experiences. As a matter of fact, the literature in this field demonstrates that *"one of the key factors in designing courses with a high level of flexibility must be developed off a student-centred, rather than a teacher-centred learning environment"* (EIC, 2004; Gudmunsson & Matthiasdottir, 2004; Meyers & Jones, 1993; Motschnig-Pitrik & Holzinger, 2002; quoted in Mason & Rennie, 2008:28). We also believe that the quote below, by one of the students who responded to the questionnaire, addresses those concerns, when he/she declares that

> it enables me to practise directly, in a prompt, illustrative, and efficient manner, with a native speaker of the foreign language that I am learning [respondent #10]

Besides, according to Bruner (2000), Dewey (2002) and Vygotsky (2000), we maintain that this learning process is mostly upheld by the individuals' social

interaction, and by the development of their capacities—a development which tends to be encouraged by the reciprocal exchange we establish with the others, and through the experiences promoting dialogue, sharing, and reflection. Therefore, if *teletandem* via Skype ensures those conditions, why not experiment with this new virtual distance teaching/learning context? As regards its potentials, and bearing in mind the examples we have been presenting, we consider them to be evident, even if others may eventually be explored at a pedagogical-didactic level. As we have mentioned above, we have also ascertained that there are definite advantages to the use of this method, both in formal and informal contexts. Yet, there are certainly some limitations and challenges involved, to which we shall briefly, and in the way of conclusion, allude.

Current Limitations and Future Challenges

One of the few limitations which we can call to mind, based on our experience, and which we still encounter in our professional activity, is that there is still a long way to go to improve the level of digital literacy among some of our audience. On the other hand, the lack of generalized access to broadband Internet connections may result in network instability or failure, which is obviously not desirable, as it may compromise *teletandem* sessions.

As for the challenges that *teletandem* via Skype can pose, we believe that new horizons may (continue to) open up in the field of education, and of distance teaching, which, among other factors, may depend on encouraging those involved to participate actively, so that they become producers of their own teaching/learning materials, with the aid of Web 2.0 and 3.0 tools, available in opensource. In addition to diverse forms of teaching and learning, there is the possibility of diversifying (written and oral comprehension) activities, and of developing various competences and strategies, in a word, of contributing towards the training of the individual of the future, through collective knowledge construction, and foreign-language learning, "anywhere in the world", and anytime.

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Authors' Biography

Fernando Albuquerque Costa is an Assistant Professor at the Institute of Education of the University of Lisbon. He has a degree in Psychology and a Ph.D. in Educational Sciences in the area of Curriculum and Evaluation. Recently he coordinated the national study about ICT Teachers Competencies (http://www.pte.gov.pt/pte/PT/Projectos/Projecto/Documentos/index.htm?proj=47) for the Ministry of Education and lead the team who developed the Learning Outcomes in the area of ICT (http://www.metasdeaprendizagem.min-edu.pt/), also for the Ministry of Education of Portugal. He is currently the national coordinator of the Distance Learning Project for Itinerant Students (http://edi.blog.dgidc.min-edu.pt/) and integrates de european team of TACCLE2 (http://eacea.ec.europa.eu/llp/funding/2011/selection/documents/sub_programmes/dl_com.pdf) project (Teachers' Aids on Creating Content for Learning Environments). Fernando is an Associate Editor of Educação, Formação & Tecnologias (http://eft.educom.pt) and member of the editorial board of the Digital Educational Review (http://greav.ub.edu/der)

Teresa Cardoso is an Assistant Professor at the Department of Education and Distance Teaching of the Universidade Aberta (Portuguese Open University). She holds a Ph.D. in Didactics by the University of Aveiro and a degree in Modern Languages and Literatures by the University of Coimbra. She has been involved in several national and international projects and has published several papers. She has been supervising M.A. and Ph.D. students, both in Distance Education and Elearning and in ICT in Education.

Lúcia Pombo is an Auxiliary Researcher at the Research Center "Didactics and Technology in Education of Trainers"/CIDTFF-UA, where she is a member of the Laboratory of Digital Contents. She holds a Ph.D. and a Masters degree in Biology; she concluded a post-doc project on the impact studies of post-graduation education of Science Teachers. Her research interests are related to evaluation of educational quality using ICT in online contexts and also on the assessment of students in higher education. She also wrote and published papers in the area, and she was/is a member of international projects. She lectures curricular units such as Natural Sciences

and Distance Education at the Department of Education of the University of Aveiro. She supervises/ed several M.A. and Ph.D. students both in Didactics and in ICT in Education.

Cecília Guerra is a Ph.D. student in Multimedia in Education at the CIDTFF-UA research centre, where she is a member of the Laboratory of Digital Contents. She holds a Masters degree in Communication and Science education since 2007 and a degree in Teaching Biology and Geology since 2002 at the University of Aveiro. Her research interests are related to the development of science teacher education programs and development of technological resources for teaching and learning sciences. She also wrote and published papers in the area, and she was/is a member of international and national projects. She is a member of a multidisciplinary team that developed the educational digital resource "Courseware Sere—The Human Being and Natural Resources".

António Moreira holds a Ph.D. in Didactics of Languages and is currently the Director of the Department of Education of the University of Aveiro. He also coordinated the Laboratory of Digital Contents and the Nónio Competence Centre. He has been involved in several national and international projects and has published several papers. He supervises/ed several M.A., Ph.D. and post-doctoral students, both in Didactics and in ICT in Education. He was also the founder and chief editor of the online journal *Indagatio Didactica* until last May.

Leigh Hoath is Head of Science Education teaching across undergraduate and postgraduate degree programs. After teaching Secondary Science for 8 years, Leigh moved into Initial Teacher education where she has presented at a number of International and UK conferences on a range of pedagogical areas including Effective Questioning and her research interests are rooted in teaching science outside of the classroom—this focus of her doctoral studies.

David Howard was a primary teacher for 16 years including 5 years as a deputy headteacher before moving into Teacher Education. For the last few years he managed education and professional studies colleagues before becoming Head of Primary ITE at Bradford College. His academic interests include children's self and peer assessment; the inclusive practice of ITE tutors and the transition from school teaching to lecturing in ITE.

Malcolm Smith became involved in teacher education as a mentor for students training in his school and then as a senior lecturer in the Department of Teacher Education at Bradford College specialising in ICT. At Bradford he was responsible for the ICT curriculum throughout the primary and secondary ITE courses. Over the last 12 years the use of ICT to support teaching and learning expanded rapidly and Malcolm became interested in pedagogies associated with online learning and virtual learning environments. This led to involvement with a number of European Universities researching and developing strategies to maximise this rapidly emerging resource both within the classroom and for the professional development of serving teachers. This work is reflected both in his teaching and in curricular development within the ICT courses at Bradford College.

Ronaldo Nunes Linhares (UNIT) Ph.D. in Communication Sciences from University of São Paulo (USP). Professor, Master in Education, University Tiradentes. Coordinator of the Research Group Education, Communication, and Society (GECES/CNPq/UNIT), Member of the UFS training team for PROUCA in Sergipe.

Simone Lucena (UNIT) Ph.D. in Education from the Federal University of Bahia (UFBA). Master in Education, Professor at the University Tiradentes. Has experience in Education, focusing on Educational Technology, acting on the following subjects: Education, Information and Communication Technology, Interactivity, Teacher Training, and Digital TV. Member of the Advisory Board of Human Sciences, Linguistics, Languages, and Arts of the Foundation for Research and Technological Innovation of the State of Sergipe (FAPITEC/SE). Member of the Scientific Journal of Education, Training, and Technology (EFT). Coordinator of the Research Group Education, Information Technology, and Cyberculture (GETIC/CNPq/Unit) (http://www.getic.info).

Index