Rosemary Papa *Editor*

Media Rich Instruction

Connecting Curriculum To All Learners

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ISBN 978-3-319-00151-7 ISBN 978-3-319-00152-4 (eBook)
DOI 10.1007/978-3-319-00152-4
Springer Cham Heidelberg New York Dordrecht London

Library of Congress Control Number: 2014942520

Printed on acid-free paper

Springer is part of Springer Science+Business Media (www.springer.com)

Preface

Learning theories, knowledge generated, and the skills to strategies for educators at all levels are changing so rapidly that even the private sectors attempting to deliver public schooling products fail to deliver. This book is unique in that it will take the reader/learner from (1) the changing learning theories on how we learn (2) to specific content disciplines and the impact multimedia is having on those disciplines, (3) to an examination of specific learners, and (4) to the array of all learners in today's classrooms and the multimedia-rich strategies found today and especially for tomorrow. This edited book features author experts in learning and motivation, primary curricular disciplines, online learning, and experts focused on teaching and learning across the new twenty-first-century media-rich avenues. Presented are specific learning/teaching strategies based on the learner utilizing multimedia tools and are framed around three primary questions:

1. How are learning theories changing for the learner due to the increasing use of media technology tools?
2. How are curriculum instructional strategies changing due to media/software digital delivery platforms for the learner?
3. What impacts does the changing landscape for the learner have on the delivery strategies?

Experts in curriculum and media software explore these questions from three broad perspectives: *Part I: 21st Century Learning Environments for the Learner* focuses on the changing teaching and e-Learning theories. *Part II: Curriculum for e-Learners* covers specific discipline fields including reading, writing, language and literacy, mathematics, science, art, social studies, and the new assessments technology requires. And *Part III: Dynamic e-Instructional Strategies* emphasizes media-rich learner characteristics and the strategies to meet their needs. Each of the three sections provides experts in specific academic fields. Every chapter has an undergirding focus on diverse learners and diverse learning strategies and examines the knowledge-to-learning practices driven by multimedia tools.

It is a book for K-12 site-based educators and a graduate/advanced undergraduate in careers that place them in the classroom or in leadership school positions.

Chapters begin with key questions and end with application activities written for K-6, K-12, or K-16. The authors and I believe that all can be adapted to the needs of the particular reader.

In Part I, 21st Century Learning Environments for the Learner, four chapters explore the learner in relationship to achievement motivation as e-Learners. Chapter 1 authored by the Editor, Rosemary Papa, presents human knowledge acquisition and how it is being reshaped given the advent of e-Learning. Learning today uses social learning arrangements that involve peers and teachers as never before and is a notable addition promoted by situated cognition theory and practice.

Chapter 2 authors Gypsy Denzine and Ric Brown guide the reader through the theories of motivation and how learning is enhanced by understanding such theories as self-regulated learning, locus of control, self-efficacy, student engagement, task value, beliefs about intelligence, and goal orientation with an eye to the technological environment.

Chapter 3 explores the personal learning environment (PLE) as a new concept for effective teaching and learning. Web 2.0 tools integrated with the concept of PLE enable authentic learner-centered and learner-driven applications for more individualized learning instructions. The authors, Chih-Hsiung Tu, Cherng-Jyh Yen, and Laura E. Sujo-Montes, describe learning as always personal, constructive, ubiquitous, collaborative, and connective and believe that though PLE is powered by technology, its design and applications should be firmly rooted in the theoretical framework of pedagogy.

The final chapter in Part I, authored by Mary I. Dereshiwsky, identifies challenges that students face in their online courses. She offers specific strategies that online instructors can use to assist students with these challenges.

Part II, Curriculum for e-Learners, presents seven chapters individually focused on specific discipline curriculum. Chapter 5 authors Pamela Powell and Jennifer Prior present oral language development as critical to building overall literacy. These authors believe that supporting growth in literacy is vital to the development of multiple literacies in children and can be scaffolded and encouraged through multiple means.

Chapter 6 author Michael R. Sampson describes how learning to read and reading to learn are being reshaped as text moves from paper to digital formats. Increasingly, writing is being done on computers and smartphones though the theory on how children learn remains constant, regardless of the place where reading and writing occur.

Chapter 7 authors, Vicki Ross, Jennifer Prior, and Shannon Guerrero, are excited by the sweeping changes under way in both the fields of education technology and mathematics education. They look at Common Core State Standards for Mathematics and specifically at the Standards for Mathematical Practices and how these work together and suggest ways in which classroom teachers might use these together to enhance the work that they do with their students.

Chapter 8 authors Shadow Armfield and Cynthia Conn introduce the National Educational Technology Standards for Students (NETS*S) and their alignment with the Next Generation Science Standards (NGSS) and the Common Core

Standards to demonstrate how the standards of technology can be integrated into science education and support language arts and mathematics education as well. Readers will receive background on the standards, instructional strategies to use, examples of technologies to support the strategies, and scenarios from across the K-12 spectrum.

Chapter 9 authors Jennifer Prior and Pamela Powell highlight the overall importance of the arts in education and how art in all its forms contributes to the development of human beings as well the connection between the arts and the Common Core State Standards. The authors further describe how the arts and technology can be integrated in ways that stimulate student creativity using a variety of technology tools to enhance visual arts, music, drama, and dance.

Chapter 10 author Barbara Torre Veltri informs, applies, and integrates theories with national standards, content-rich activity modules, and developmentally appropriate classroom strategies. This offers teacher education candidates, university students, practitioners, and teacher educators practical, proven, and cost-effective methods.

Completing Part II, Chap. 11, authored by Cynthia Conn, is focused on the growing assessment demanded in education today. The revised Interstate Teacher Assessment and Support Consortium (InTASC) Model Core Teaching Standards (2011) advocate for the real integration of assessment planning and instructional strategies through the consistent collection, review, and use of data from multiple types of assessments. The increase of cost-effective computing devices and applications is presented.

Part III, Dynamic e-Instructional Strategies, offers seven chapters. Chapter 12 authors Shadow Armfield, Dawn M. Armfield, and J. Michael Blocher inform the reader on how collaborative learning as an instructional strategy supports students in the learning process. Readers are introduced to collaborative learning in online environments and shown how these collaborative environments can further support what they do in their own classes (face to face or online). Numerous examples of collaborative tools, social media, course management systems (CMS), and collaborative development environments are presented.

Chapter 13, Gamification, is described as the use of game mechanics and game dynamics to drive gamelike engagements and actions in a nongame setting. Authors Chih-Hsiung Tu, Laura E. Sujo-Montes, and Cherng-Jyh Yen, in their discussion of gamification, apply game mechanics, game dynamics, and frameworks to promote desired learning behaviors. They believe that positive and effective gamification can enhance learning and engage learners in more social and context-rich decision making for problem solving in learning tasks. They believe that effective gamification design should understand learners' game personalities, social engagement styles, and intrinsic and extrinsic motivated user styles initially and evaluate and select appropriate game mechanics and game dynamics to create ideal gamification instructions. This chapter proposes a Model for Constructing Gamification to assist educators in designing effective gamification to support their existing instructions.

In Chap. 14, gamers are explored by J. Michael Blocher who believes that they often engage for hours at a time in online multiplayer gaming environments. As educators, Blocher contends that we can ill afford to dismiss the impact gaming might have on our society, as gamers are in our classrooms as learners and teachers. This chapter sheds light on gaming and the impact gaming has on learning.

Chapter 15 authors, Laura E. Sujo-Montes, Shadow Armfield, Cherng-Jyh Yen, and Chih-Hsiung Tu, envision that collaborative learning interactions happen in a technology-mediated format. They explore the form of collaborative learning known as problem-based learning (PBL), offering how to design and implement collaborative learning.

Chapter 16 authors Christine K. Lemley and John Martin describe their research in a high school–university partnership that used oral history projects to connect school to community. Drawing on funds of knowledge and culturally relevant pedagogy the authors used Google Sites as a platform to collaborate between preservice teachers and high school students. A sociocultural framework of learning underscored the importance of group interaction and collaboration in this learning experience.

The final two chapters, Chaps. 17 and 18, are authored by Chih-Hsiung Tu and Laura E. Sujo-Montes. Chapter 17 explores mobile learning environments as human networks that afford learners the opportunity to participate in creative endeavors, for social networking, to organize and reorganize social contents, for learner-created cognitive space, and to manage social acts at anytime and anywhere through mobile technologies. This chapter utilizes the Model of Mobile Social Interaction to understand effective mobile interaction. Chapter 18, the MOOC, Massive Open Online Course, is described by the authors as an innovative, disruptive, Educational Evolution, Come the Revolution, the campus tsunami, Faducation, False promise, to hype, shallow, McDonaldization of global higher education. All elements of what MOOCs mean to teaching and learning are discussed.

We hope you are excited and creatively drawn to most or all of the concepts offered in our book.

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Part I
21st Century Learning Environments for the Learner

Chapter 1
Transitions in Teaching and eLearning

Rosemary Papa

Key Questions

1. How are learning theories and teaching practices changing with eLearning?
2. How does a socially constructed learning environment change the teaching and learning process?
3. How are the new learning designs impacting the teaching and learning processes for all children, rich and poor?

Emotion and Cognition

Ubiquity, in technology, and dissonance, in teaching and learning, are expressions of explanation for the complex change we are living in. How we roll with change and envision the new world we live in and hope to explain through information and knowledge is the motivation of this chapter. Cognition is one's ability to think and resolve situations based on our own experiences as a learner. Learning to the learner is continuous throughout life, as experiences continue to shape and change the ways we interact with the environment.

How one feels when one is learning is the emotion(al) element. Sad, happy, frustrated, etc. are all subjective characteristics that humans experience, especially when they are engaged in the learning process. Encouraging emotions from those around us requires us to understand that feelings do have a strong impact on how we learn and on how others learn. Critical in understanding the learning process, is how environmental and social learning is designed.

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R. Papa (ed.), *Media Rich Instruction: Connecting Curriculum To All Learners*,
DOI 10.1007/978-3-319-00152-4_1,

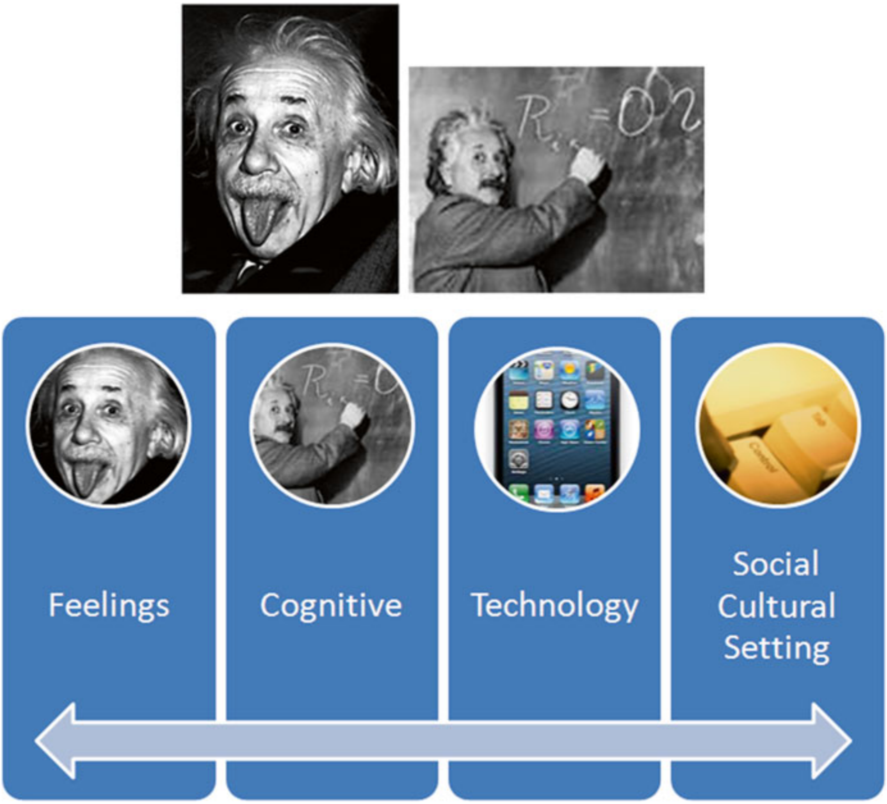

Fig. 1.1 Emotions and Cognition Combined with Technology in the Social Cultural Setting

Cognition is distinguished by how we think about sadness, happiness, frustration, etc. How we know what we know is left for some to debate. Gardner (1985) explained *cognition* as "efforts to explain human knowledge" (p. 6); Neisser (1967, as cited in Jenlink, 2013) notes learning as "all processes by which the sensory input is transformed, reduced, elaborated, stored, recovered, and used" (p. 4 as cited in Overskeid, 2008); Brunig, Schraw, and Norby (2011) view cognition as "human perception, thought and memory" (p. 1); and Vygotsky's theory of social mediated learning (1997; 1978) leads to scaffolding, that is, learning that is done with an expert to assist the novice, which leads to the social cognitive theory by Bandura (2006), "most human functioning is socially situated" (p. 165).

Is it within the complexity of emotion and cognition, which is enmeshed in new ways of learning, that both must be considered when discussing the learner and the action of learning? Both contexts faced with the explosion of technological gadgets require the educator to understand the interactions to maximize the learning quadrant. What is the relationship between feelings and thinking? As you can see from the pictures in Fig. 1.1, Albert Einstein displays emotion and cognition: his ability to feel silly by sticking out his tongue and his cognitive intellect used to teach a class in quantum physics displays emotion and cognition. Jenlink (2013) feels that cognitive science is a not very developed field and that emotion and cognition are to be considered the new tools of learning. The processing of this information has been likened to how a computer works, “The human mind takes in information, performs operations on it to change its form and content, stores the information, retrieves it when needed and generates responses to it” (in Woolfolk 1998, p. 250, as cited in Jenlink, 2013). Using this metaphor the humorous and scholarly pictures of Einstein offer the opportunity for us to conceive how multimedia tools can be thought of.

The interplay between feelings and thinking greatly influences how we approach our personal learning and the learning dynamics as to how others learn effectively and efficiently if one accepts the premise that it is emotions that allow compassion towards others. Many researchers, from Dewey (1938) to Vygotsky (1978, 1997), have viewed learning as situational dependent on the social cultural setting.

The Twenty-First Century Context of Learning Theories

From the late nineteenth century to the early twenty-first century, Table 1.1 (Papa & Papa, 2011) displays learning theories that attempt to explain how we learn. These theories guided how we taught in our schools and universities.

How we construct knowledge influences the practices of teaching and the tools utilized. *Behaviorism* as begun by Watson and further developed by Skinner relates to stimuli and response. *Cognitive constructivism* theorists ranged from the late 1880s theories from Freud, Piaget in the mid-1920s were exponentially furthered by Erickson and Bruner founded on the ideas of pedagogy focused on how children grow and develop their learning patterns. Bloom’s taxonomy combined the cognitive/knowledge acquisition with the affective/emotional aspects of the learner. Parallel to these theorists interlacing with behaviorism and cognitive constructivism was Vygotsky’s development of social constructivism and later Bandura which ascribed to a learning that occurs first on a social level and interfaces strongly with motivation. Also, during this time Maslow’s hierarchy as to how we learn is based on the humanist aspects of the learner which lead to Rogers’ inclusion of feelings and emotions. Both agreed that learning is begun within the personal. Dewey like Maslow believed the greatest learning environment initiated in an experiential learning environment which is there was strong motivational stimuli and nuanced the differences on how boys and girls learned, found in the writings of Gilligan and Levinson, and combined with one’s locus of control (Brown) fairly encompassed the learning theories of the nineteenth and twentieth centuries focused on children. By the 1970s, several of these theories were expanded to how adults learn, from Knowles to Cross, and Gardner’s multiple intelligences instituted learning from birth to grave.

Educational technologists have yet to identify how multimedia tools can best be used to engage, motivate and expand human learning. The exponential growth of technology tools in combination with the Internet have 21st learning theorists still trying to make sense of where we are in explaining how we teach and learn. Learning today can be personalized visually, audibly, and within simulations and is embedded in one’s learning through activity.

Table 1.1 Learning theories and timeline of theory development

Behaviorism
Watson (1900–1930) *and Skinner* (1940–1980) *Behaviorism*: The study of objective behavior and learning as response to positive or negative stimuli.
Cognitive Constructivism
Freud (1880+) & Erikson (1959+): Stages of the Life Cycle included adult development beyond adolescence. Erikson took Freud's work that ended with adolescence and developed a theory that reached to old age.
Piaget and Cognitive Constructivism (1920+): Four stages of development: final stage Formal Operations (ages 11–15) assumes this age reaches adult cognition and conceptual reasoning abilities. Knowledge is constructed through individual experiences.
Bruner (1950+): A founding father of constructivism which found that learners construct ideas based upon previous learned knowledge
Bloom's Taxonomy of Educational Objectives (1965+): Learning occurs both cognitively (knowledge) and affectively (beliefs, values and attitudes).
Lave (1990+) & *Wenger's* (1999+) *Communities of Practice*: Situated learning and engagement in communities of practice for adults is the focus of their theory.
Social Constructivism (*learning occurs first on a social level*)
Vygotsky and Social Cognition (1920+): Development of the individual occurs on first a social level and later on an individual level. The potential for development occurs when children participate in social behavior. This is called the Zone of Proximal Development.
Bandura's Observational Learning (1960+): Operant view of learning that is comprised of four steps: attention, retention, reproduction, and motivation.
Humanist (*learning occurs at the personal level*)
Maslow (1930+): Experiential learning with an emphasis on choice, creativity, values, self-realization, and dignity.
Rogers (1960+): Inclusion of feelings and emotions in learning. Learning occurs at a personal level.
Motivation
Dewey (1930+): Experiential learning leads us to more learning.
Glasser Control Theory (1990+): The theory of motivation and what a person wants most at any given time. Choice is at the heart of this theory.
Brown Locus of Control (*LOC*) (1980+): Internal and external locus of control factors that influence how we view ourselves and others.
Gilligan (1980+): Feminist voice given to adult learning and cognition.
Levinson (1970-): Male and female adult life stages identified.
Intelligence (multiple attributes to defining creativity)
Guilford's Structure of Intellect (1950–1980): The intellect is comprised of operations, contents, and products, with a focus on creative abilities.
Gardner's Multiple Intelligences (1980+): Individuals possess distinct forms of intelligences in varying degrees.
Adult Learning and Pedagogy
Knowles (1970+): Founding father of adult learning views learning as cyclical: experience leads to reflection that leads to action which leads to concrete reflection, and so on. Andragogy refers to adult learning vs. pedagogy that focuses on children.
Cronbach & Snow Attitude Treatment Interaction (1970+): Learning is best achieved when strategies are geared directly to the learner's specific abilities.
Cross (1970+): Adults as learners model (CAL) views learning as lifelong
Freire (1970+): The critical analysis of experience and acting on that analysis leads to more learning.

Reprint from Papa, R. & Papa, J. (2011). Leading adult learners: Preparing future leaders and professional development of those they lead, pp. 91–107. In R. Papa (Ed.) *Technology leadership for school improvement*. Thousand Oaks, CA: Sage Publications, Inc.

Situated Cognition Theory

Situated cognition theory was built upon and described by the research of Brown, Collins, and Duguid (1989) as

> The activity in which knowledge is developed and deployed…is not separable from or ancillary to learning and cognition. Nor is it neutral. Rather it is an integral part of what is learned. Situations might be said to co-produce knowledge through activity. Learning and cognition, it is now possible to argue, are fundamentally situated. (p. 32)

Learning and cognition experiences are necessary components when considering the interaction with learning designs to reach all learners. How situated cognition theory addresses the sociocultural context or activity complicates the individual learner and the artifacts surrounding the context. It is not possible to consider one's situation outside the affective domain of emotions. As Jenlink (2013) describes the goals of situated cognition,

> The focus is on assisting the learner to move from novice to more capable and independent expert, a person who learns to use their expertise, intuition, and deep understanding to solve problems of their choosing. This requires authentic experiences with opportunities to examine ideas, develop underlying concepts, and engage in activities to successfully complete a learning experience. (p. 186)

How situated cognition theory connects to eLearning is primarily through Web-based learning communities. Information on the Internet is presented as a one-size-fits-all approach, that is, all learners read the same page. Through professional learning communities and the peer-to-peer interactions that occur in Web-based learning communities, this theory has merit. Jenlink (2013) notes there are still many issues to be resolved which makes sense given the complexity and rapid growth of tools being developed. Figure 1.2 depicts the four questions that Jenlink believes represent the future is yet to define.

Disruptive Learning Design

Digital natives are those now in K-12 schools. They are being taught by mostly digital immigrants. How can the generational chasms be crossed? The coming 5 to 10 years will be a bumpy ride according to Hill (2012, November–December) for traditional institutions.

> The investment community, particularly venture capital and corporate mergers and acquisitions, have a built-in trial-and-error approach. There will be successes and there will be failures. Failures are to be expected, and one attribute of investment-based new models is quick failure and quick adaptation. As a system, higher education is not structured for rapid change, and there will be a battle of cultures as investment- backed educational technology intersects with slow-paced, conservative educational structures. (p. 2)

This chapter's focus is on the individuals cognitive and emotive characteristics aligned to learning. What are the lessons for the educational institutions that have as their primary mission the creating of optimal learning environments? According to

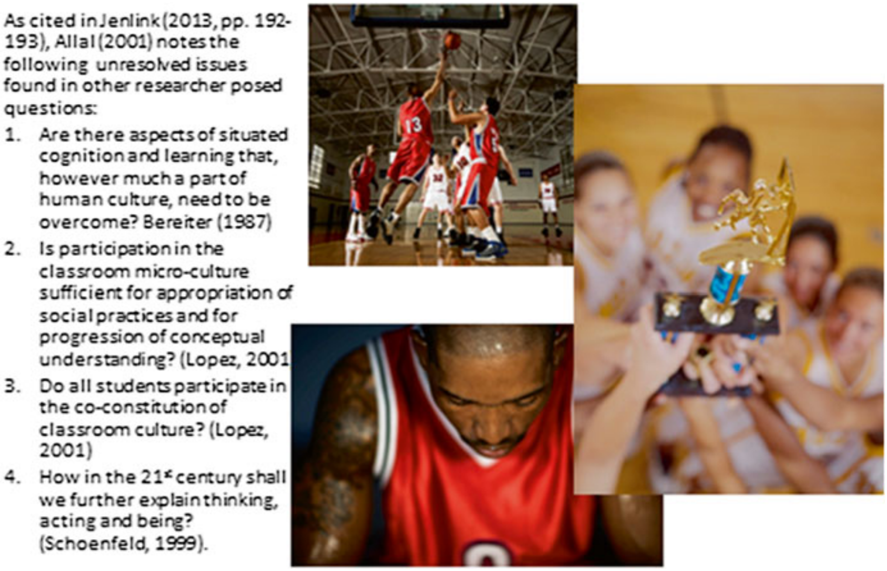

Fig. 1.2 Imagined Future Through Thinking, Acting, and Being

Hill (2012, November–December) universities and schools as they are constructed are facing disruptive influences on their primary mission of teaching and learning. Growth in new online technologies means schools and universities must directly face:

1. Multiple delivery models;
2. Dissonance in policy and practices due to new alternating old delivery models;
3. Online programs should lower not raise student costs;
4. Online education provides a leveling competitive field for especially the research and regional comprehensive institutions and public schools by increasing alternative providers.

The disruption to the heart of the mission of universities and public schools questions the motivation of some politically appointed boards. The Libertarian perspective of total and complete marketplace competition with little regulation can lead to a rising mediocre future in knowledge generation. Online technologies are being used politically by conservatives to further their interests. These are mentioned here briefly to emphasize how essential it is for educators to understand the political as well and most importantly, the nature of multimedia learning and the impacts on the learner through teaching practices and philosophy.

The list by Hill is correct but lacks the broader educational picture which is the need for learning theorists, constructive cognitivists, and practitioners to aid in the resolve of this dissonance. Mayer's (2009) cognitive theory of multimedia is focused on technology tools tangently while it is primarily focused on the learner and the relationship between pictures and words and their effects on learning. The ongoing development of this theory, which is approximately 20 years old, will potentially guide teachers at all levels and the educational software designers.

We will now explore the variety of new learning avenues.

Game Play

Games and structured play is not new to educational settings. Word and bingo type games or history simulations, open-ended scenarios to singing rhymes and poems are all evidence to the power of making education *fun*. Game play is theoretically based in situated cognition learning and in a study researchers have found that gaming videos are successful in some disciplines and not as in others. Young et al. (2012, March) recommend, "separating simulations from games and refocusing the question onto the situated nature of game player–context interactions, including meta-game social collaborative elements" (p. 61).

The advent of video games and the educational use of increased gaming in classrooms require all educators to determine if increasing the use of these multimedia tools enhances learning and is there evidence to prove it? Young et al. in their research performed a meta-review of studies that focused on curriculum impacts and the impacts from video games. Briefly, their findings were that there are no conclusions in science achievement that can be positively linked to video gaming, while in mathematics, language, history and physical education they found several positive relationships. Their positive findings include the following:

(a) Mathematics—educational games need to be designed and researched with careful attention to contemporary learning theories, including customization of task difficulty to the learner's capabilities, metacognitive reflection on the learning taking place and consideration of the rich situated interaction among learner, game environment, and classroom environment. (p. 68)
(b) Language Learning—video games bring learners into an immersive exolingual environment that has historically been the most efficient way to learn a language … although some may argue that language learning is more of an innate ability than learning mathematics or science concepts, we believe that it is reasonable to suggest that the immersive environments that video games create, and the human instinct to adapt and survive in those environments, can lead to more than just language learning. (p. 75)
(c) Physical Education—there are potentially interesting connections between exergames and cognitive research on embodied or grounded cognition. (p. 78)
(d) History—Knowing that gamers have a tendency to bypass information that is nonessential to completing game tasks, educators who develop historical games and mods might be better served by (a) using information delivery systems that are more integral to the game experience or (b) creating additional game elements that require reflection on the historical variables presented. (p. 80)

The Young et al. meta-review found that most research is done on the individual learner and excludes the teacher/instructor. This finding of the individual learner concentration is why they believe that "games cannot succeed as stand-alone solutions to education" (p. 83). Further, they found that a facilitator, teacher, or guide needs to be present for a progression of learning design is intentful, "that information being taught is indeed generalizable outside the context of the game, and (b) that deeper metacognitive gains are attained as a result of socially constructed game play" (p. 83).

Their advocacy based on their findings of a teacher/guide/facilitator as necessary for video gaming in classrooms is a strong recognition of the pedagogy required for creating sound situated learning environments that affects, "engagement, student behavior, and overall academic achievement" (p. 83). Again, using social learning arrangements involving peers and teachers is a notable addition to situated cognition theory and practice.

For profit interests, as found in a Pearson research report (McClarty et al., 2012, June) on gaming assumptions from the literature that included learning principles, engaging the individual learner with twenty-first century educational goals that are tested is what is aimed for. The report noted what most educators know that a motivated learner is the goal of producing and selling video games. Young et al. stated this notion as well in pursuing gaming as a viable educational tool. Where the company Pearson and the research from Young et al. differ is that the former focused on products for the individual learner and the latter focused on the need for more research on the teacher as facilitator of the learning environment and the role of social learning communities.

Learning not steeped in technology tools w*here appropriate* is what twenty-first century teaching and learning is all about. Company technologists along with philanthropists (looking to make money off their technology products) want to convince us that teaching children in isolation of each other will improve learning. For-profit companies are motivated by profit. Educators must be at the center of understanding all the ramifications of technology to determine *when it is appropriate.* The concept of school and play are not new.

Mobile Apps

Currently there are "some 80,000 [mobile] apps available through Apple and 700,000 apps on Google Play (Flaherty, 2013, p. A2). Given that free apps are available on almost all mobile devices, such as cell phones and smartphones, iPads, iPhones, the accessibility to the grade and middle school student is unlimited. There are Federal Trade Commission rules that keep advertisers 13 and younger from being tracked how this is being determined is not clear. The need for this age group to use Facebook is not only not legal but more importantly less likely given the range of free apps available to them. Children of today do not use their parents Facebook.

B.Y.O.T.

Some school and university teachers are calling for students to bring their smartphones, tablets, video game players, iPhones, and laptops in an effort to stay on top of the technology and with little public dollars to support schools/universities purchasing the latest and best technology. This approach is called B.Y.O.T. (bring your own technology). Richtel (2013) in a New York Times, Business day article March 23, 2013, cited officials from schools in Central Florida and outside Houston believe

B.Y.O.T. is, "the simplest way to use a new generation of learning apps that can, for example, teach them math, test them with quizzes and enable them to share and comment on each other's essays" (p. B1). Missing from this optimism is those students that do not have access to iPads etc., to bring to school. The schism between poverty and rich increases schooling opportunities that must rely on parental economics.

MOOCs: Adapt, Adopt, and Scale

Teaching thousands or tens of thousands of students at a time are online courses called MOOCs—Massive Open Online Courses. If individualized instruction is in dissonance with multimedia tools, this takes the class of 25–30 students and attempts by revolution to turn the classic classroom into a mega-class. The advent of MOOCs is a movement that began with the elite institutions, such as Stanford, MIT, Harvard, and the University of California—Berkeley and now others, to create *uber* tools online to influence education teaching and learning. Scaling up to an enormous number of students that in and of itself is meant to be *unlimited* numbers for many reasons. The idea originated to solve the need for duplicating course content offered by multiple sections (Hill, 2012, July). Hill believes that MOOCs can be successful as an educational model if the following is considered:

(a) Develop revenue models that will make the concept self-sustaining;
(b) Deliver valuable signifiers of completion such as credentials, badges, or acceptance into accredited programs;
(c) Provide an experience and perceived value that enables higher course completion rates (in most MOOCs today, less than 10% of registered students actually complete the course); and
(d) Authenticate students so that accrediting institutions or hiring companies are satisfied that a student's identity is known. (p. 1).

Hill (2012, July) developed the Figure used below as a timeline of MOOC genesis (Fig. 1.3).

The ultimate scalability is yet to be determined. This approach is no more than 5 years old and currently prestige universities in the USA are generating the *university bred companies*, e.g., Coursera developed by two Stanford computer scientists (Friedman, 2013), as a precursor to taking courses from the most elite universities and professors.

Flipped Classrooms

EDUCAUSE defines flipped classrooms as, "a pedagogical model in which the typical lecture and homework elements of a course are reversed" (2012, p. 1). Students watch video lectures at home and go into the classroom at school for the

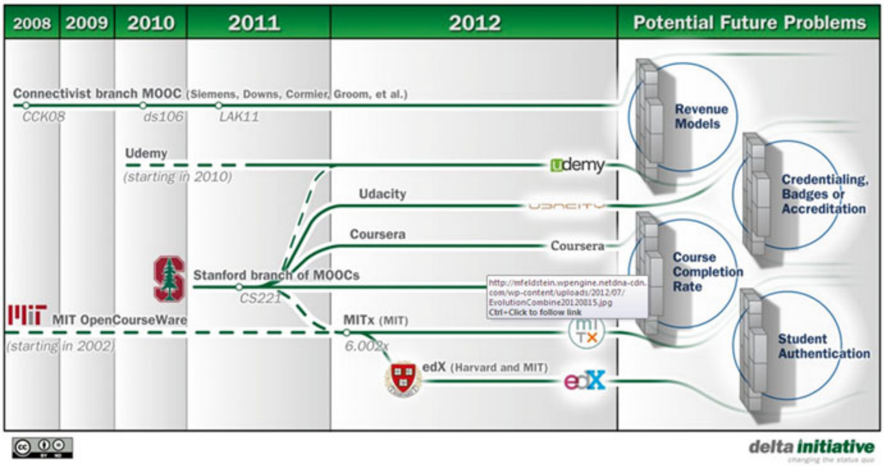

Fig. 1.3 MOOCs Timeline of Development

discussions, exercises, and projects. This makes the lecture synchronous, meaning that the student can watch the lecture at home on their time.

> The notion of a flipped classroom draws on such concepts as active learning, student engagement, hybrid course design, and course podcasting. The value of a flipped class is in the repurposing of class time into a workshop where students can inquire about lecture content, test their skills in applying knowledge, and interact with one another in hands-on activities. During class sessions, instructors function as coaches or advisors, encouraging students in individual inquiry and collaborative effort. (EDUCAUSE, 2012, p. 1)

Prerecorded lectures are the hallmark of flipped classrooms. The advantage of this model is that students come prepared having watched the video for a robust discussion with the teacher facilitating. Teachers have to be organized to prerecord their lecture and students must have access to Internet capable of handling the connection speed. The emphasis in this classroom model is the engagement of active learning in class and out of class requires students to be responsible to do their homework and watch the class video. The disadvantage is the student's home Internet access speed and computer. Again, parental economics are a part of this model that is not addressed.

Software Creation and Data Mining

Software creation for test taking is being created through various for-profit companies and elite higher education institutions, such as MIT and Harvard, so as to relieve teachers from grading exams. For the student this process is instant feedback on an exam. MIT and Harvard (Markoff, 2013) are developing this software and are offering it free to anyone who will use it. In return they are data mining those who use it to further develop the algorithm and perfect the software. This is being done so that grading can be automated using artificial intelligence that has been mined from the thousands who uses the software product. Educationally, for test takers this is a great service to have immediate feedback. Part of the justification for this type of software development (free to the user while data mining to improve the algorithm) for the teacher is that as MOOC size classes continue to expand, teachers will not be able to keep up with large numbers of student papers to grade.

Clearly, the role of the university is being tested as never before. Are universities to prepare students ala factories as only disseminators of job skills? What type of cognitive development do universities as institutions of knowledge generation undergo? Where is online education taking the traditional university that began the twenty-first century yet already feels outdated? In this infancy known as the dissonant innovator of multimedia, social media, and MOOCs, most of the discussions today are framed around the technology itself.

This conversation needs to shift to how the twenty-first century learner can and will learn best in this futuristic setting where universities have undergone their transition remembering that they are the purveyors of knowledge.

Educational Media and Textbooks of the Twenty-First Century

The enormous dissonance in print copy textbooks and e-books, videos, social media tools is cataclysmic as traditional textbook publishers rush to restructure and follow the illusive new multimedia market. In the preponderance of new software and tools, from free apps to online availability, there is a sizable shift from the noting on a class list or syllabus the book(s) you must purchase for a specific class to the world of online education that may already have embedded videos, as found in MOOCs or flipped classrooms, as well online readings.

Young (2013, January) positions this movement away from print in this way: textbook publishers feel that their "newest digital products shouldn't even be called textbooks" (p. 1) and quotes a publisher who defines their product as "personalized learning experiences" (p. 1). In Fig. 1.2, educational delivery models are visualized by Hill (2012, July, p. 1). The figure depicts the dramatic shift in course design to the radical and new delivery methods and providers of educational software (Fig. 1.4).

At the time of this chapter writing, universities are moving in the direction of hiring companies to help them build the MOOC and flipped classroom content. Young (2013) also reports that other large publishing houses are pursuing elite universities to explore partnership options in this new personalized learning environment; Pearson publishers call their products (formerly known as textbooks) "customizable learning experience" (Howard, 2013, p. 3). And textbook companies are expanding their ability to stay afloat by purchasing software companies and

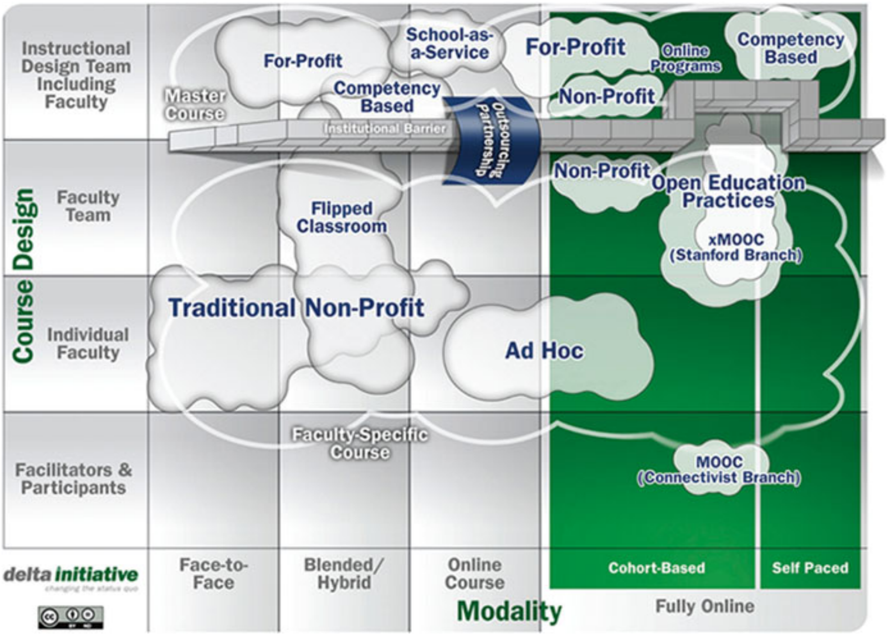

Fig. 1.4 Educational Delivery Models as of 2012. Hill, P. (2012, November-December). Online educational delivery models: A descriptive view. *EDUCAUSE Review Online*, *46*(12). Retrieved April 13, 2013 from http://www.educause.edu/ero/article/online-educational-delivery-models-descriptive-view

developing in-house multimedia teams to translate the former print products into eLearning opportunities.

Habits are still hard to change among students. The digital native Shaffer (2012) finds in his recent study that students still desire hard copy books. At this point, one might project that hybrid tools, such as hardcopy books used with PowerPoint presentations, videos, URL's, all will be also accessible on Kindles and iPads.

Participative Learning

What is meant by participative learning? A community of learners? In today's complex world of the merging of visual and written with instantaneous social feedback and artificial intelligence assessment, participative learning fosters the environment to motivate the learner into interconnected linkages of disparate knowledge acquisition faster. For example:

(a) Using the non-static Whiteboard vs. the static PowerPoint;
(b) Integrating simulations into the curriculum of history;
(c) Teaching philosophy through the use of blogs;
(d) Conducting social media eKnowledge exchanges with other teachers and their students;
(e) Doing virtual mathematics tutoring classes using software;
(f) Learning writing through wikis, blogs, and podcasts;
(g) Developing webcams for online teaching enhancements for science activities; and
(h) Understanding instant feedback loops in free social media apps.

Privacy

As with data mining, the potential for student data collection that is part of the twenty-first century terrain being mined for uses beyond the school and district are exponential. Who decides who sees or can access the data? New software such as inBloom "offers a vision of new uses for data in education" (Singer, 2013, October 6, p. 15). Through the financial support of the Bill Gates foundation, inBloom is a product that will become part of the $8 billion education market to work with Common Core State Standards' assessments to analyze individual student performance. Singer, in the New York Times article, notes that federal education privacy law, the Family Educational Rights and Privacy Act, have recently changed to help the industry grow, has updated rules permitting "schools to share student data, without notifying parents, with companies to which they have outsourced core functions like scheduling or data management" (p. 15). She calls this a techno-utopia plan found on inBloom's Web site. The concern becomes does the school district have policies that limits this data mining?

Conclusions

This chapter has focused on many aspects eLearning affords the learner and the teacher. It also has raised some startling questions that relate to parental increasingly disparate confluence between the rich and the poor. Finally, as political polices continue to support the industry in education growth, what is being lost or abandoned requires all in education to question.

Application Activities

Idea 1

In your classroom, design a social media activity using Facebook, Twitter, Blog, Instagram, etc., to discuss the changing educational landscape embedded in social media platforms.

Idea 2

Within your community of learning peers, develop a MOOC series of courses for a terminal degree (high school diploma, Associate Arts, Bachelors, Masters) focusing on the teaching and learning components.

Idea 3

Develop a plan to handle teacher resistance and options for addressing it using situated cognition theory. Consider the potential causes of resistance—access grade affiliations, knowledge/skill (cognition) levels, and attitudes (emotion).

Idea 4

Write a district/university policy on protecting student privacy.

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Chapter 2
Motivation to Learn and Achievement

Gypsy Denzine and Ric Brown

Key Questions

1. What is achievement motivation and why does it differ in children?
2. What are achievement goals and how do they foster self-regulated learning?
3. Why are students' attributions for success and failure important to know?
4. Why is engagement a critical aspect of student achievement?
5. What are the three components of task value?
6. What can teachers do to increase children's motivation to learn, set mastery oriented goals, and enhance student engagement?

Introduction

Maintaining students' enthusiasm for school and motivation towards learning is a challenging task for many teachers. Jenkins (2012) found that students' self-reported enthusiasm for school is about 95 % in kindergarten and drops to 37 % by ninth grade. Enthusiasm recovers to about 40 % in grades 10, 11, and 12. This high school recovery is attributed to students seeing an end to schooling, availability of more elective courses that they may prefer and reflects only the views of those who remain in school after ninth grade. Jenkins suggests that a major reason for this increasing lack of enthusiasm can be tied to the external reward structure of schools—stickers,

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R. Papa (ed.), *Media Rich Instruction: Connecting Curriculum To All Learners*,
DOI 10.1007/978-3-319-00152-4_2,

popcorn parties, etc. Jenkins argues that these external rewards may work for the short terms, but soon the focus shifts from an enthusiasm to learn to learning tied to outside rewards. When the rewards become mundane, motivation may suffer. Teachers are constantly trying to figure out the motivation underlying student behaviors and academic achievement. While one student may be motivated to learn if offered an extrinsic incentive, another student will only be motivated by intrinsic sources of motivation such as the need to achieve or fulfill their commitment to others. Although it is generally agreed upon by educators and researchers that "unmotivated" learners do not exist, there are incredible individual differences in the sources and levels of students' motivation to learn.

Overview of Motivation and Achievement Motivation

Motivation as described by Schunk and Mullen (2013) is a process where goal directed activities begin and then eventually are sustained. When applied to educational settings, researchers focus on achievement motivation. According to Elliot & Church (1997), achievement motivation is enacted when an individual strives to be competent (Elliot & Church, 1997). A related construct is Brophy's "motivation to learn," which is describes as more than doing the bare minimum to meet the requirements, but deliberately engaging in academic tasks with the intent to acquire new knowledge or skills.

For decades, researchers have argued about how to define and measure achievement motivation. Early theorists suggested that achievement motivation is caused by instincts, traits, needs, or drives (Schunk, Pintrich, & Meece, 2008; Weiner, 2013). The trait or need approach specifies that achievement motivation is determined by innate dispositions or personal characteristics that are shared by individuals but vary in terms of strength. It was believed students who have "more" of the achievement trait or drive will be more motivated towards success. One of the more well-known drive theorists is Abraham Maslow (1954), who is credited with substantially advancing the understanding of needs with his hierarchy. According to Maslow, needs are arranged in a five category hierarchy: physiological, safety, social, esteem, and self-actualization. Once individuals' physiological needs (food, water, etc.) are met, they can move on to begin the other four needs. In the classroom, safety needs are met by providing a healthy and safe environment with a caring teacher. Peer involvement is the primary way social needs are met, which calls for the use of cooperative learning team-based activities. Esteem needs require that teachers find ways to help build students' confidence in academic tasks and recognize their achievements. Self-actualization typically refers to the self-fulfillment a learner feels after successfully completing a task. Maslow's hierarchy of needs model specifies that if needs are not met at each level, achievement motivation and academic performance may be thwarted. On the surface, Maslow's Hierarchy of Needs theory makes sense. We often hear educators claim children cannot learn if they are hungry. However, one of the criticisms of Maslow's theory is that people can actually proceed to satisfying a higher need even if they have not me the previous need(s). For example, we can often thing of instances in which we became so engaged in a task, we were capable of learning and we forgot that we were hungry or thirsty.

While Maslow focused on the order of humans' needs, more recent theorists focus on the strength of the needs that drive motivated behavior. For example, in their Self-Determination Theory (SDT), Deci and Ryan (2000) claim that students seek experiences that fulfill their fundamental needs and identities. According to SDT, all individuals have fundamental psychological needs for competence, autonomy, and relatedness. *Competence* refers to the need to experience oneself as effective in one's interactions with the social and academic environment (Elliot & Dweck, 2005). Thus, a student's need for competence is fulfilled when they know how to effectively achieve desired school or learning outcomes (Skinner & Belmont, 1993). SDT conceptualizes *autonomy* as the extent to which an individual experiences oneself as the source of action. For instance, we would observe an autonomous learner as one who perceives the academic task as relevant to his or her interests, goals, or career potential. We would also observe a student fulfilling his or her need for autonomy when a student experiences choice in determining his or her own behavior (Assor, Kaplan, & Roth, 2002). The third component of self-determination theory is *relatedness*, which refers to the need to experience oneself as connected to other people (Connell & Wellborn, 1991). Thus, a student's level of achievement motivation for a task is influenced by the degree to which they perceive that the school context meets their psychological needs for competence, autonomy, and relatedness (Deci & Ryan, 2000).

As a final trait theory of achievement motivation, we turn to the concept of Need For Cognition (NFC). According to Cacioppo, Petty, and Kao (1984) students vary in their tendencies to engage in and find enjoyment from effortful thinking. NFC specifies that students have a relatively stable intrinsic predisposition that can account for individual differences in cognitive processing of information (Cacioppo, Petty, Feinstein, & Jarvis, 1996). Rather than placing emphasis on students' aptitude for learning and intellectual endeavors, NFC focuses on student's attitude toward learning and level of achievement motivation (Cacioppo et al., 1996). Researchers have found a correlation between students' level of NFC and their performance on a wide variety of cognitive and academic tasks (i.e., verbal intelligence tests, arithmetic problems contained in standardized tests, and reading comprehension) (Cacioppo & Petty, 1982; Dai & Wang, 2007). A significant correlation has also been found between NFC and high school Grade Point Averages, and the ability to acquire new knowledge in a learning setting (Cacioppo et al., 1996). Kardash and Scholes (1996) provided evidence that NFC is related to how individuals solve problems. They found evidence supporting the hypothesis that individuals high in NFC are better able to accurately deal with complex and conflicting evidence compared to individuals low in NFC.

In an effort to understand the behaviors of contemporary youth, researchers are investigating the impact of NFC on students' media and Internet usage. As we might expect, researchers found students high in NFC are more likely to use technologies that require effortful thinking and reasoning (Cacioppo et al., 1996). Moreover, individuals high in NFC report significantly lower television viewing rates than compared to those low in NFC (Henning & Vorderer, 2001; Shrum, Burroughs, & Rindfleisch, 2005). In regard to social media activity, NFC has been studied in relation to the cognitive processes associated with social media activity. Individuals with a high NFC show a preference for online interactivity and social media (Sicilia, Ruiz, & Munuera, 2005). Some of their online media use may be related to the fact that individuals high in NFC are drawn to the visual and verbal aspects of Web sites (Martin, Sherrard, & Wentzel, 2005). Although they tend to be highly engaged in some aspects of the Internet, individuals high in NFC do not appear to be obsessive users of the Internet or social media. Of interest, Shi, Chen, and Tian (2011) found people low in NFC were more likely to be problematic Internet users compared to people high in NFC. Their research revealed those high in NFC tend to more effectively manage their Internet time for employment and academic tasks.

Self-Regulated Learning

In contrast to previous motivation theorists who focused on traits and drives, contemporary motivation researchers emphasize the extent to which learner are self-regulated. Self-regulated learners (SRL) are known to use both motivation and learning strategies. As teachers experience every day, students differ in the extent to which they behaviorally, metacognitively, and motivationally participate in their own learning. A self-regulated learner is defined as a student who deliberately generates his or her own thoughts, feelings, and actions to achieve his or her learning goals. Although there have been many theoretical perspectives on SRL over the past 30 years, most typically integrate goal setting, self-observation, and self-evaluation (Zeidner, Boekarts, & Pintrich, 2000). In addition to self-regulation processes, SRL also involves the enactment of specific behavioral strategies (e.g., study skills, time-management skills, and organizational strategies). A third component to SRL are the self-motivational beliefs the learning brings to the task. More specifically, students bring beliefs about their likeliness of being successful in the learning situation, as well as their intrinsic interest for the task. Zimmerman's (2000) model specifies three cycles in the SRL process: (1) forethought (i.e., processes that precede any effort to act), (2) performance control (i.e., processes occurring during learning efforts), and (3) self-reflection (i.e., processes occurring after learning or performance).

Pintrich (2000, 2003) and his colleagues have demonstrated that effective and non-effective self-regulated learners differ in both will and skill. In particular, they found the extent to which learners find a task interesting, important, and valuable is related to their use of SRL strategies (Pintrich & De Groot, 1990; Pintrich & Schunk, 2002). Similarly, Wigfield (1994) reported that achievement values are related to students' choices about whether or not to become cognitively engaged in a task. Further evidence comes from Schiefele (1992), who found that students who were interested in the reading materials processed them at a deeper level and used more elaborate learning strategies while reading than did less interested students. The research suggests that students who view a learning task as valuable are more likely to use effective and adaptive SRL strategies that lead to better learning outcomes (Pintrich, 1999).

There are three keys issues for us to keep in mind regarding SRL. First, it is important to recognize the developmental nature of self-regulated learning. Children younger than 8 years of age may struggle with SRL because they have not yet able to differentiate their competence in various academic tasks. Moreover, researchers believe SRL is related to a child's global sense of self. According to Harter (1999), children begin to develop a sense of self-worth typically around age 8. Also, Nicholls and Miller (1984) found that children younger than age 8 also struggle with distinguishing mood from interest and they have trouble making accurate self-judgments of their abilities.

A second key issue is that allow the emphasis is on "self," self-regulated learners do not operate in an isolated or completely independent manner. In fact, self-regulated learners are resourceful and will frequently seek help from others in order to be successful (Butler, 1998).

A third and final issue is that SRL skills can be explicitly taught. Teachers can model SRL and directly teach the phases of SRL and allow students to practice SRL with real tasks. In a study of high school students, Labuhn, Zimmerman, and Hasselhorn (2010) found that learners who were taught SRL skills through monitoring and observing a teacher model were more likely to demonstrate higher levels of academic confidence and perform higher on measures of academic achievement compared to students who did not receive direct instruction on SRL. However, modeling and teaching SRL to students is necessary but not sufficient to guarantee success. Teachers must also provide students with progress feedback through the SRL phases. In one study, Labuhn et al. (2010) reported teacher feedback on the use of SRL strategies can actually improve mathematics achievement of fifth grade students. For more information about a school-wide approach to SRL, readers are referred to Cleary and Zimmerman's (2004) Self-Regulation Empowerment Program (SREP) that utilizes SRL coaches who use microanalytic assessment procedures to assess students' self-regulation beliefs and study strategies. SREP also train students to learn how to set and adjust their learning goals, select and monitor strategy effectiveness, and make strategic attributions for their academic successes and failures.

Locus of Control and Self-Efficacy

Related to motivation are the similar concepts of locus of control and self-efficacy. Both describe the source of reinforcement that stimulates behavior and the sense that one is capable to actually complete a task. *Locus of control* as a concept with a deep research base is usually credited originally to Rotter (1954, 1971). Accordingly, the theory suggested that behavior could be predicted by knowing one's values, expectations and the situation. Rotter's work led to the notion of locus of control. In his case, it was whether one received reinforcement for behavior from internal sources or external sources. Over the years, many researchers expanded on Rotter's concepts and expanded the notion of locus of control. Brown and Marcoulides (1996) further developed the concept of external social locus (an individual seeks reinforcement from close, personal others, e.g., family, friends) to complement internal locus of control (the individual sees himself/herself responsible for their reinforcement and actions); and external other locus (reinforcement comes from luck, chance and/or some unseen spiritual being).

As a teacher, think of driving to work and getting a ticket for rolling through a stop sign. To whom do you attribute the ticket? Someone with a more internal locus of control might say that the error was their own, they did roll the stop sign and they were indeed at fault. Someone with a more external social perspective might attribute the ticket to the police officer who should have not been hiding between parked cars with the sole intent to give tickets. And after all, it was close to a full stop. An external other person might blame the ticket on simple fate, knowing that they roll the sign every day and this was just chance.

While all three perspectives are part of each individual, for the most part one perspective is dominant (yes, you did roll the sign, but what bad luck the officer just happened to be there). Why do these differing perspectives matter? They matter because they have implications for future effort. Why would one continue to try to succeed if they believe that any reinforcement they receive is simply luck? Contrast that with one who believes success is rewarded internally; they made it happen because of their hard work.

Self-efficacy is described as the perception that one has the capabilities to actually complete a task (Bandura, 1997; Pajares, 1996). This perception is often based on past experience and the accumulation of skills related to a task that allows a person a reasonable expectation of success. Self-efficacy should not be confused with hoping for success without the necessary prerequisites. Self-efficacy may differ in the same individual across different contexts. For example, an assistant principal may feel a high degree of self-efficacy in their respective administrative role, but not so much so on the golf course. That is, self-efficacy is context specific.

Let's look at the perspectives above using examples from educational settings. Understanding the locus of control of yourself or those you lead may assist in developing appropriate actions. One of the most important implications of locus of control is that of persistence. If you encounter students who believe that their actions (internal) lead to their success, you will want to ensure that perspective persists by reminding them that they are in charge of their own achievement. As well, bringing others to observe their actions may reinforce their internal perception and provide a little external gratification.

Self-efficacy is said to be promoted in individuals in at least three major ways (Bandura, 1997). First, direct mastery experiences raises self-efficacy. Thus, a student needs to experience a wide array of activities in which they can be successful. As a teacher, take the basic learning from your teaching course work and supplement it with reading and opportunities to attend workshops. As well, form a mentoring relationship with a successful leader and volunteer for assignments in areas in which you feel less confident. In an effort to promote mastery experiences that will increase a student's sense of self-efficacy, teachers must find ways to break down the task so that all students can experience some aspect of success.

Second, vicarious experience is also related. Take opportunities to observe others and be aware of activities that lead to both successes and failures. A third source of self-efficacy development is through verbal means. Talk to other teachers about their successes and discuss issues you may have. For a student, working in teams and sharing successful experiences may be helpful.

Student Engagement and Motivation to Learn

It is currently argued (Lawson & Lawson, 2013) that student engagement is of critical importance in today's competitive environment. Further they add that engagement is a dynamic and synergistic process and that early school success enhances academic engagement through increased self-efficacy. In their model, teachers set up the conditions for engagement by linking student learning to their specific context. As well, they suggest that student's disposition for engagement is linked to their will and skill. The conditions for engagement and dispositions to engagement lead to student acts of engagement (sticking to a task, developing mastery, etc.). Engagement can be conceived as the quality of one's interaction with a task, which can vary from shallow and superficial processing to motivate and strategic processing (Guthrie et al., 2004).

Task Value

Student engagement is more likely to occur when students value the learning task. Eccles and Wigfield (2002) describe four types of task values: utility value, attainment value, intrinsic value, and cost. *Utility value* refers to the belief that a task is applicable to one's future goals. For example, a student may want to take a biology course because he or she believes it will be useful in his or her future career as a doctor. *Attainment value* refers to the degree of importance the learner places on a task for confirming or disconfirming core aspects of one's self-schema or identity. For example, a student may want to get a high grade in a history class because he or she believes good grades are a reflection of his or her academic abilities. *Intrinsic value* can be defined as the level of the student's interest or enjoyment for a task. As teachers, we can envision the student who knows the task has utility value but does not find the task to be particularly interesting. Alternatively, a student may find great enjoyment for a task and yet not be able to see how the task applies to his or her future goals (i.e., utility value). Finally, the task *value of cost* is the expense or negative consequences for engaging in a task. For example, it is not uncommon to hear college students admit they attend certain classes only because they have paid their tuition and do not want to waste money.

In a recent study, Johnson and Sinatra (2013) explored the relationship between task values, engagement, and conceptual change. One hundred and sixty-six college students were randomly assigned to one of two task value instructional conditions (utility, attainment) and a control condition. The researchers designed the experiment to study the extent to induced task values would result in different degrees of engagement and conceptual change when participants read a refutation text about the common cold. Consistent with their hypotheses, the researchers found statistically significant differences among the participants in the task value and control conditions on perceived engagement, as well as conceptual change. Participants in the utility condition rated their engagement as significantly higher than those in the control condition. More importantly, participants in the utility condition showed the greatest degree of conceptual change. The usefulness of task value inductions for facilitating engagement and conceptual change is discussed.

Because current theories on perceived task value comes from expectancy-value theory and the work of Eccles and Wigfield (1995, 2002), teachers are encouraged to simply ask students about the extent to which they find the task interesting, useful, and worth their time and effort. In understanding task value, it is also important to ask students the extent to which they think they will be successful. Expectations for success are key beliefs in most contemporary models of motivation, and are correlated with students' learning goals, self-efficacy beliefs, interest in a task, and the reasons students give for why they engage in the task.

Beliefs About Intelligence

Related to the issue of motivation are beliefs about one's intelligence. For over 40 years, Carol Dweck and her colleagues (Dweck, 2012; Dweck & Leggett, 1988; Elliot & Dweck, 2005) have studied learner's beliefs about the origins of intelligence. She has found evidence that some learners adopt a "growth mindset" of intelligence, meaning they view intelligence as a malleable attribute that can change over time be developed through effort. In contrast, some learners hold to a "fixed mindset" in which they believe intelligence is an inherited and uncontrollable trait. For example, we have all heard the student who claims "I am not good in math," which is an example of a fixed notion of ability or intelligence. Of equal concern is the student who announces "I received a high grade on the test because I am smart." Thus, if a student believes success is because he or she is smart, they are also at risk to believe "failure means I am dumb." Without intending to do so, we often send subtle messages to students that can further a belief of fixed notion of intelligence. For example, the very labeling of "gifted programs" may instill a belief in some students that academically successful students are born with certain abilities or gifts. Students who hold a growth mindset are more likely to persist when the task becomes difficulty and they are more likely to ask for help compared to students who hold a fixed mindset (Dweck, 2012; Dweck & Leggett, 1988; Elliot and Dweck (2005)).

One example is the mounting body of research revealing Dweck's research is particularly relevant to understanding women's persistence and success in STEM (science, technology engineering and math) disciplines. Good, Aronson, and Inzlicht (2003, 2012); Good, Rattan, and Dweck (2012) have found that for both middle school and college students, a growth mindset serves as resilient buffer and protects girls and women from the influence of the widely held stereotype that girls are not as good as boys at math and science. Another concern is that girls and women who hold a fixed mindset of intelligence may be more likely to take easy or low level courses so they can earn an "A," which puts them further behind their male peers.

Dweck continues to recommend that parents and teachers should emphasize and model how learning involves challenges, requires effort, and mistakes should be encouraged and highly valued. Any effort to help students adopt a growth mindset or malleable view of intelligence needs to include an assessment of students' goal orientation.

Goal Orientation Theory

Achievement goal theorists focus on the reasons students give for engaging personally in specific academic tasks. Researchers typically examine two types of goals (mastery and performance goals), each of which is presumed to have both approach and avoid components. Most recently, there is empirical support for a 2×2 achievement goal framework in which four goals are proposed: mastery/learning approach, mastery avoidance, performance approach, and performance avoidance (Anderman & Patrick, 2012; Huang, 2012). An extensive amount research shows the many positive effects of a mastery/learning goal orientation for learning, motivation, and achievement. Students with a mastery goal orientation are less concerned about how their performance compares to others. Instead, they are likely to set self-referential goals and strive for improvement. They are motivated to learn as much as they can about a subject and are not likely to raise their hand in class and ask "will this be on the test?" In general, students with learning goals are likely to seek out challenges, persist when tasks become difficult, view failure as a sign that they need to exert more effort, evaluate their own performance in terms of the progress they made (Covington, 2000; Ormrod, 2011). As we would expect, students with a mastery goal orientation also tend to have a growth mindset about intelligence and tend to have a high sense of self-efficacy. Students with performance goals strive for competence in order to demonstrate their abilities to others. A performance goal orientation frequently involves normatively based standards and students may appear competitive as they at times fixate on outperforming their peers. The consequences for having only a performance goal orientation can be severe for student achievement and their well being. Students with a performance goal orientation are more likely to choose easy tasks that will allow them to look competent in the eyes of others and they may avoid challenging tasks. They are often motivated by extrinsic rewards and frequently use rote learning strategies such as repetition or copying. Because they are likely to show high anxiety prior to and during exams, students who only adopt a performance goal orientation are at risk to engage in academic dishonesty behaviors.

In the past, these two types of achievement goals were separated, however, recent research indicates students can adopt both learning and performance goals (Conroy, Elliot, & Hofer, 2003; Wolters, 2004). Performance goals are further separated into two types: approach-performance and avoidance-performance (Elliot & Church, 1997). Approach-performance goals are related to students' desire to outperform their peers, whereas students who adopt avoidance-performance goals are motivated to avoid looking incompetent or "stupid." Avoidance-performance goals appear to have the most detrimental effects on teaching and learning. For example, students who adopt avoidance-performance goals are typically not open to receiving negative feedback regarding their performance (Elliot & Church, 1997; Skaalvik, 1997). Learning is not always fun for students who hold strong performance goals. They may not appear interested the task and they often struggle to find the utility value of the task. We can often see them drilling themselves with stacks of flashcards and they may view their teacher as less of a resource and more of a "gotcha" figure who is trying to test them only about what they do not know.

Conclusions

In discussing effective teaching and learning methods, Feldon (2010) emphasizes that what a student bring to the classroom in terms of goals, interests motivation and prior knowledge is key. This is directly related to self-regulated learning and self-determination theory. He argues that the deliberate management of engagement opportunities for students that allows focus on achievement of goals is the critical component. While technological devices and software often enhance this engagement, it is clear that engagement is crucial.

In terms of teacher expectations of students, research has consistently shown a small, but statistically significant effect on student achievement. The Education Commission of the States (2012) provides an annotated bibliography of research and the effect of teacher expectations on student achievement. In general, lower teacher expectations of students leads to setting lower standards, less feedback to students, positive or negative, more disciplinary referrals, and less time for student responses to questions. And while lowered student expectations are not seen to be from malice or pervasive, teachers need to be aware of potential biases especially to students from impoverished and/or traditionally underrepresented groups.

In a report by the *Principal Leadership* journal (Hartzman & Mero, 2011) operationalizing the concept of changing expectations was discussed. Facing low student performance, the teachers and school worked collaboratively to enhance the instructional program. What was most interesting were the goals established: each student succeeds every day and bell to bell engaging instruction. Interventions including tutoring systems were established so that students who were straggling received they help they needed rather than seen through the eyes of negative expectations. The school in question is now seen as a model of a turnaround success.

For engagement, research suggests a broad set of activities that deal not only with a student's time in school but also with bringing in out-of-school experiences. And engagement cannot be seen as a program to be implemented, but more as a set of behaviors that address student prior knowledge, in home experiences and community influence (Lawson & Lawson, 2013).

Archambault, Janosz, Fallu, and Pagani (2009) and Wang and Eccles (2013) conducted longitudinal studies in which the findings provided support for the multidimensional perspective of student engagement proposed by Fredricks, Blumenfeld, and Paris (2004). According to their perspective, student engagement encompasses behavioral, affective, and cognitive dimensions. Behavioral engagement refers to student conduct that is beneficial to psychosocial adjustment and achievement at school. The three main axes that divide the dimension are: positive behaviors, involvement in school-related tasks, and participation in extracurricular activities (Fredricks et al., 2004). Behaviors defining all three axes range on a continuum and may be positive and negative. For the positive behavior axis, following school rules versus oppositional behavior demonstrates the engagement/disengagement continuum (Costenbader & Markson, 1998). The extent to which a student completes his or her homework is an example of the axis "involvement in school-related tasks" (Prosner & Vandell, 1999). The third axis of school engagement can be identified by simply looking at the frequency of a students' participation in extracurricular activities (Mahoney, Cairns, & Farmer, 2003). The affective dimension of engagement refers to feelings, interests, beliefs, perceptions, and attitudes toward school. Researchers have operationalized this variable using perceptions of belongingness (Goodenow, 1993), the perceived benefits and value of education (Eccles, Wigfield, Harold, & Blumenfeld, 1993), and specific importance of school in helping students reach specific goals (Bouffard & Couture, 2003).

Cognitive engagement is comprised of the student's psychological investment in learning and the use of self-regulation strategies by the student. Cognitive investment in learning covers perceptions of competency, willingness to engage in learning activities and engage in effortful learning, and establishing task-oriented goals (i.e., performance, mastery, and performance-avoidance goals (Debacker & Nelson, 2000)). Self-regulation strategies focus on specific learning tools such as memorization, task planning, self-questioning, and self-monitoring (Ablard & Lipschultz, 1998).

Teacher strategies in terms of student motivation to learn are complex. Unfortunately, there is no list of activities that a guaranteed to work. As with all educational research, motivation of students for positive outcomes is context specific. One must take the broad theoretical ideas and apply them in particular situations.

With such in mind, what is known is that students in all grades need a safe, secure, and friendly environment. Any methods that bring the student's personal background and prior knowledge to enhance relevance of the learning are key. Undeniably, students need the requisite foundational knowledge, but learning always involves the components of "will and skill." However, the self-regulated learner does not learn in a vacuum. Cooperative learning through teams (including social media) can addresses the affective component of motivation. Finally, feedback that addresses self-efficacy and modeling by the teacher assist in developing student behavior related to goal attainment.

Application Activities

Idea 1

For engagement, a broad set of activities that deal with both a student's time in school, and out-of-school experiences is critical. Design a writing assignment around a student's favorite hobby or out-of-school activity.

Idea 2

Teacher expectations of students have shown a consistently small, but statistically significant effect on student achievement. Discuss in small groups behaviors that might be seen for both high and low teacher expectations of students.

Idea 3

Feedback that addresses student self-efficacy and modeling by the teacher assist in developing student behavior related to goal attainment. Identify five ways you can provide feedback to students that model self-efficacy.

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Chapter 3
Personal Learning Environments and Self-Regulated Learning

Chih-Hsiung Tu, Cherng-Jyh Yen, and Laura E. Sujo-Montes

Key Questions

1. What is Personal Learning Environment (PLE)?
2. How does PLE relate to Self-Regulated Learning (SRL)?
3. How does one create effective PLE?

Introduction

Personal Learning Environment (PLE) a new concept for effective teaching and learning? Shouldn't learning always be personalized and individualized? How may digital technology enhance PLE? Web 2.0 has become synonymous with a more interactive, open, networked, and collaborative Internet for learning. Mott (2010) argued that many educators consider the Learning Management System (LMS) as being too inflexible because it is a closed system and they are turning to Web 2.0 for tools to support their communication, productivity, and collaboration needs. Therefore, educators have replaced the LMS with Web 2.0 tools, blogs, wikis, social networking sites, Twitter, Google Apps, and other Web-based applications to enhance teaching and learning. Siemens and Matheos (2010) suggested that

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R. Papa (ed.), *Media Rich Instruction: Connecting Curriculum To All Learners*,
DOI 10.1007/978-3-319-00152-4_3, © Springer Science+Business Media New York 2015

learners currently have more freedom to access, create, and recreate their learning contents, opportunities, and environments upon which to interact outside the institutional learning system. Educators who focus on the "social," "open," and "network" aspects have integrated multiple Web 2.0 technologies as the best strategy for learning (Dede, 2008) and supporting their existing online instructions. The integration of multiple Web 2.0 tools (i.e., multi-tools platform) has been recognized as an instructional tool with autonomy, diversity, openness, and connectedness (Van Harmelen, 2006).

Personal Learning Environments

New technologies enable individuals to personalize their learning environment through the integration of learning networks, *people*, *resources*, *and tools*, *referred to as Personal Learning Environments* (*PLEs*), *to meet their learning interests and needs. Van Harmelen (*2008*) perceived PLE as* an important factor in learner empowerment and self-directed learning facilitation. PLEs allow learners to control and manage their learning processes. They will also support setting their own learning goals, manage their learning contents and processes, and can communicate with others as part of the learning process so that their learning goals can be achieved Van Harmelen (2006). PLEs are a concept related to the use of technology for focused learning via the appropriation of tools and resources by the learners (Buchem, Attwell, & Torres, 2011). A PLE is composed of multiple subsystems, tools, and technologies. As suggested by Siemens (2007), PLE is a collection of tools integrated under the conceptual notion of openness, interoperability, and learner control. Therefore, learners are required to utilize a personalized portal in which multiple tools are organized in one central location to create a system of open network learning, such as Symbaloo, Netvibes, My Yahoo, and mobile app platform. In addition to the personal portal-based or personal dashboard-based PLE, there are other types of PLEs, such as the blog-based PLE, E-mail-based PLE, and RSS-based PLE.

Personalization and appropriation of technologies based on learning goals are essential to the development of a PLE. Personalization and a sense of control are key factors in the successful use of Web 2.0 technologies. Importantly, if students do not perceive the technology or platform provided by their institutions as useful and practical, they are motivated to favor their own personalized approach and preferred tools (Conole, 2008). Furthermore, if students are not clear of their learning goals and how to appropriate relevant technologies to achieve these goals, an effective PLE will not occur. PLE is more than just technology or applying technologies to build virtual people and resource networks. Educators should focus on the utility of PLE in connecting people, tools, and resources networks. Therefore, PLE is both a technological and pedagogical concept. As suggested by Buchem (2012), the PLE concept focuses on the management and appropriation of different tools and resources by individual learners situated within a complicated social context.

The social context will influence their way to use media, participate in activities, and engage in collaborative communities. Specifically, three characteristics of PLE have been identified as ownership, control, and literacy.

PLE is more than just a digital PLE. More precisely, effective PLE should be built to fuse both physical and digital PLEs. Physical PLE and digital PLE should enhance, extend, and enrich each other. Digital PLE does not occur in a vacuum. Frequently, it commences with physical PLE and affords individuals to explore digital worlds to extend their physical PLE. With digital technologies support, physical PLE would transcend the physical boundary and spatial and temporal constrains. With more advanced digital mobile technologies, mobile PLE becomes more critical to building PLE. See more details in Chap. 17 in this book.

Many apply PLE and Personal Learning Network (PLN) interchangeably, while many see them as different entities. Distinguishing them would assist us to obtain better understanding on PLE. Cormier (2010) argued that *PLEs are the ecologies within which PLNs operate. The human interactions engaged in PLNs are the driving forces to catalyze and provoke individualize learning and to form organic environments. Instead of being a static system, PLE is alive, organic, and constantly evolving through constructing, building, and cultivating PLNs. A PLN is considered for informal learning network that affords learners to interact with others to obtain knowledge. PLN mainly focuses on human interaction in social aspect while PLE has a broader sense that encompass tool networks, and resource network in additional to people networks in fusing both physical and virtual worlds. An ideal and effective PLE connects both physical and virtual networks although digital technologies may play a critical role in PLE. Physical environments, such as FTF contacts and interaction, people networks, communities, and physical tools (pens, notepads etc.) should not be overlooked in PLE. Technological tools function as driving forces to empower learners to build a people network, or networks of resources and tools. PLE solutions aim at empowering learners to design environments for their learning activities, mashing-up contents, people and apps at different learning contexts (Modritscher et al.,* 2011).

PLE is constructed with three networks (i.e., tool, people, and resources) and those three networks are connected to learners via personal portal tools (see Fig. 3.1). Furthermore, *PLE learners' visions of how Web 2.0 tools (e.g., blogs, wikis, and personal Web portals), services (e.g., Delicious, Flickr, and YouTube), people arrangement, and data sharing (e.g., social networking and RSS) can be integrated and applied to learning processes* (Casquero, Portillo, Ovelar, Benito, & Romo, 2010). Learners integrate personal portal technology, such as Netvibes, Symbaloo, mobile apps, or My Yahoo, to connect, access, manage, organize, and collaborate different Web 2.0 tools to form a personal tool network that supports learners to build different people networks, such as professional, friends, family, local community, and global networks, to reach effective learning resource network.

Tu, Sujo-Montes, Yen, and Chan (2012) *integrated multiple Web 2.0 tools to engage network learners in a an Open Network Learning Environment (ONLE): Twitter for course announcements, Google Calendar as a course calendar, Google Sites for course content and instructions, Nabble and VoiceThread as the course*

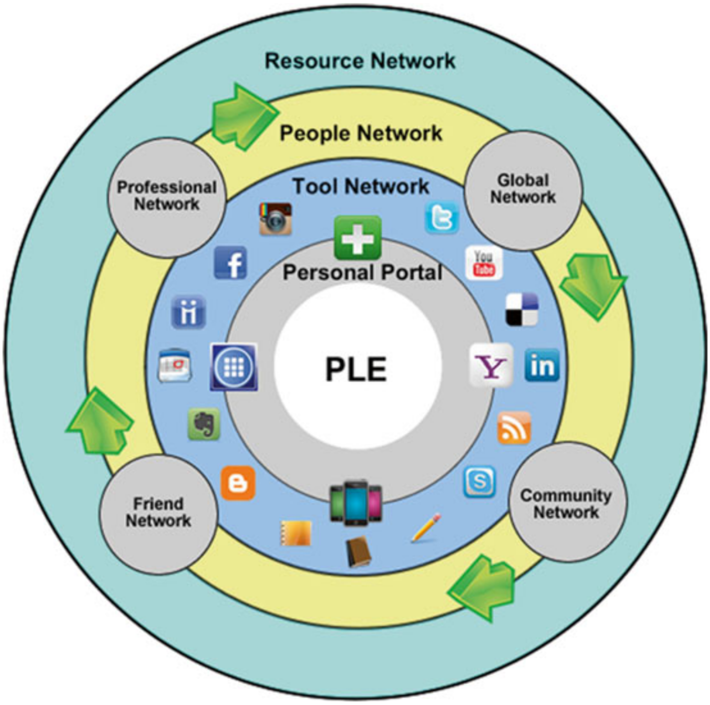

Fig. 3.1 PLE and three networks

discussion board, Google Drive for assignment submission, and Delicious and Diigo for sharing learning resources. With the social interaction capability, Web 2.0 tools allow network learners to connect to right and relevant learning resources via Web 2.0 tools' embedded people network features, such as social networking, sharing, communicating, collaborating. Reaching relevant learning resources via each individual people network makes network learners' learning more relevant, meaningful, context specific and rich. Network learners' PLEs go beyond formal learning. With the capability to network multiple people networks, in one central location, network learners can engage in multiple types of learning, formal, informal, and lifelong learning. Through different people networks, network learners can reach more meaningful network learning resources for different types of learning. In other words, integrating PLE is more than just for formal course learning or training although it is difficult to allow learners to gain ownership of their PLEs due to the time constraints (a few weeks to a semester) of informal learning and instruction.

PLE is a potentially promising approach, pedagogically, to integrate formal and informal learning by the use of social media while supporting student self-regulated learning (Dabbagh & Kitsantas, 2012). As suggested by *Ivanova and Chatti* (2010), educators should foster the organization of self-directed learning with the open network environments in which learners can select their own learning tools, services for the access to contents, and human intelligence inside and outside educational institutions. PLE goes beyond institutional learning and formal learning. PLE is for formal, informal, and lifelong learning.

Are learners ready to build effective PLEs? Castaneda and Soto (2010) contended that learners might not be ready to build effective PLEs, particularly without good understating on the concept of PLE, and effective guidance and support. When learners were allowed to build their PLEs, most of them had only a basic understanding and perceptions of their PLEs and few of them established more complex relationships between tools, contents, tasks, social interaction, and themselves in an enriching manner. The majority of learners did not possess the self-regulatory skills, competency, and understanding of social learning paradigms. But they did value the application of the multi-tool platform to support the tasks, save time, simplify complicated tasks, and have fun.

Self-Regulated Learning

Self-regulated learning refers to the active and resourceful behaviors on the part of individuals to achieve their learning (Woolfolk, Winne, & Perry, 2000). "Self-regulated learning is seen as a mechanism to help explain achievement differences among students and as a means of improving achievement" (Schunk, 2005, p. 85). Self-regulated learning is closely related to academic outcome. Barnard-Brak, Lan, and Paton (2010) noted that learners with higher self-regulated learning skills have more positive academic learning outcomes relative to their counterparts with no demonstration of self-regulated learning behaviors.

According to Barnard-Brak et al. (2010), self-regulated learning skills include goal setting, time management, task strategies, and environment structuring. Goal setting involves selecting personal learning standards for short- and long-term learning goals. Time management consists of allocating, scheduling, and distributing time for learning. Task strategies include behaviors to curtail the distractions to learning, such as taking notes, reading aloud, preparing questions, and pursuing extra work. Environmental structuring is regarding how the physical environments may be rearranged to avoid distractions and enhance learning.

PLE and Self-Regulated Learning

Kitsantas and Dabbagh (2010) noted that the pedagogical capability of Web 2.0 can support and promote self-regulated learning by enabling the construction of PLEs. Furthermore they contended that self-regulated learning and PLE building are interdependent and synergistic. Self-regulated learning is based on the assumption that learners will act as causal agents in their learning and lives (Martin, 2004, p. 135). Their choices may include setting personal goals, managing time, tasks, networks, and environments, and progressing to socially mediated knowledge and networked learning (Dabbagh & Reo, 2011; Turker & Zingel, 2008).

To examine PLEs from the social cognitive perspective, the development of self-regulated learning skills and strategies is a function of the bidirectional interaction of personal, behavioral, and environmental factors, which take the form of triadic reciprocal causation (Bandura, 1986; Schunk, 2001; Zimmerman, 1994). The development and the process of self-regulated learning skills and strategies depend on personal, behavioral, and environmental factors that enable learners to adjust, modify, organize, and manage their learning acts. Therefore, learners are required to apply a personal, customized portal to organize multiple digital tools in one central location. For example, in the Web 2.0 PLE construction, the development of a personal factor allowing learners to customize and personalize PLEs by managing digital widgets, mobile apps, and feeds into personal Web portals (e.g., Netvibes, Symbaloo, mobile platform). Learners must develop a custom to regularly monitor personal portals to support their formal, informal, lifelong, and personal learning goals on different equipment and devices. The effective development of PLEs will require learners to take charge of their PLE constructions, organizations, and managements. Since PLE building requires learners' to initiate and control, PLEs engage learners in a more focused manner by *allowing them to design their own learning environments and by emphasizing the self-regulated nature of the learning* (*Valtonen et al.,* 2012).

Goal setting, time management, and task strategies skills are critical factors in constructing effective PLEs (Tu et al., 2012). They concluded that goal setting, time management, and task strategies of self-regulated learning could predict the level of initiative in PLE management while goal setting and task strategies were predictors for the sense of control in PLE management.

Level of initiative in PLE affects management (i.e., search, evaluate, select, add, delete, or move) of PLE widgets and tools to construct effective PLEs. On the other hand, sense of control is demonstrated by taking control of the learning environment via managing different learning widgets and tools. Level of initiative is evidently related to initial preparations for network learning while sense of control is derived from the subsequent learning acts. Therefore, it is not feasible to assume that self-regulated learning will result in stronger self-related learning skills and effective PLE construction. Instead, learners may initially construct their PLEs but not feel a strong sense of control in the subsequent management of their PLEs.

It is clear that new sets of self-regulated learning skills and strategies are critical to build effective PLEs due to more diversified learning forms, learning platforms, learning strategies and skills. Educators should prepare network learners to gain new sets of self-regulated learning skills and strategies. Since the learners may not be acquainted with new sets of self-regulated learning skills and strategies, they feel less sense of control over their network learning. Learning is always perceived as formal learning. PLE can be integrated to support formal, and informal learning. In fact, a central PLE is able to support learning, both formal and informal, and personal uses in a central location to reach lifelong learning goals.

Commonly, learners may not truly understand that PLE is more than technical constructions. In addition, they may not grasp the prominence of connectivist learning in PLE via nurturing human network, resource network, and tool/technology network.

They may have seen the convenience of PLE but failed to perceive PLE as a living and constantly evolving environment. To many learners, PLE may mean desktop or laptop computer platforms. Mobile devices, such as smartphones, and tablets, emerge as additional tools for learners to access and to manage their PLEs. PLE has potentials to bear wider ranges of learning than learners may understand. PLE can be accessed from more traditional self-regulated learning, securing ideal location, allocating specific time for studying, and avoiding any distraction, to just-in-time, bite size, just in enough learning with frequent accessing learning networks through desktop and laptop computers and mobile devices. For mobile PLE, see Chap. 17 in this book.

PLE Guidelines

PLE can be linked to three main divisions—tool network, people network, and resource network. Individual PLEs should go beyond connecting content and human networks in addition to connect tool networks. When designing network teaching and learning, teachers can apply an Open Network Learning Environment linkage design model (Tu et al., 2012) to build their online instructions that allow each individual to build their PLEs. PLE's primary function is to link network tools, people, and resources through personal portal tools, such as Netvibes, Symbaloo, and mobile platforms. Under each personal tool, learners can gather different online sources and display them in a dedicated area on a Web page/site or a mobile device. Learners configure each online source based on personal preferences. Each displayed online source is called differently, widget on Netvibes, tile on Symbaloo, and app on mobile platforms. In this chapter, it is referred as widget in general. Networking people on a personal portal allows students to share their PLE experiences and to collaborate. Each widget in a personal portal tool can be shared, and students can work together to achieve better learning experiences with other network learners. Learners should be encouraged to constantly monitor, evaluate, evaluate, add or delete, edit, and manage their personal portal so that it reflects and speaks to their learning needs and learning goals. Additionally, by rating and evaluate each widget they use, students provide a good resource for other network learners to use when selecting widgets and tools to enhance their PLEs. Using the users' ratings and evaluative information, called social navigation, each PLE learner can benefit each other's PLE building processes and find the widgets and tools that best fit their needs.

To Select Personal Portal Tools

Selecting a personal portal technology is the first step to build a PLE, such as Netvibes, Symbaloo, mobile platforms, and My Yahoo. Regardless of which portal tools selected, one can personalize portal tools to custom-build a PLE to communicate and collaborate with other learners.

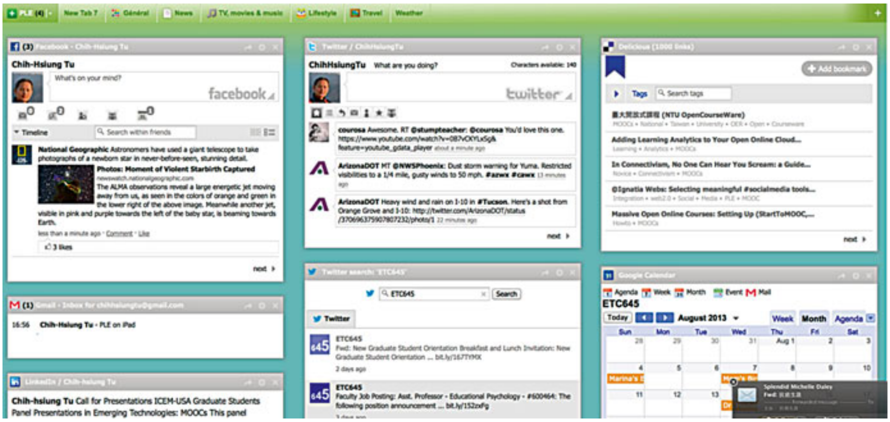

Fig. 3.2 PLE examples on Netvibes

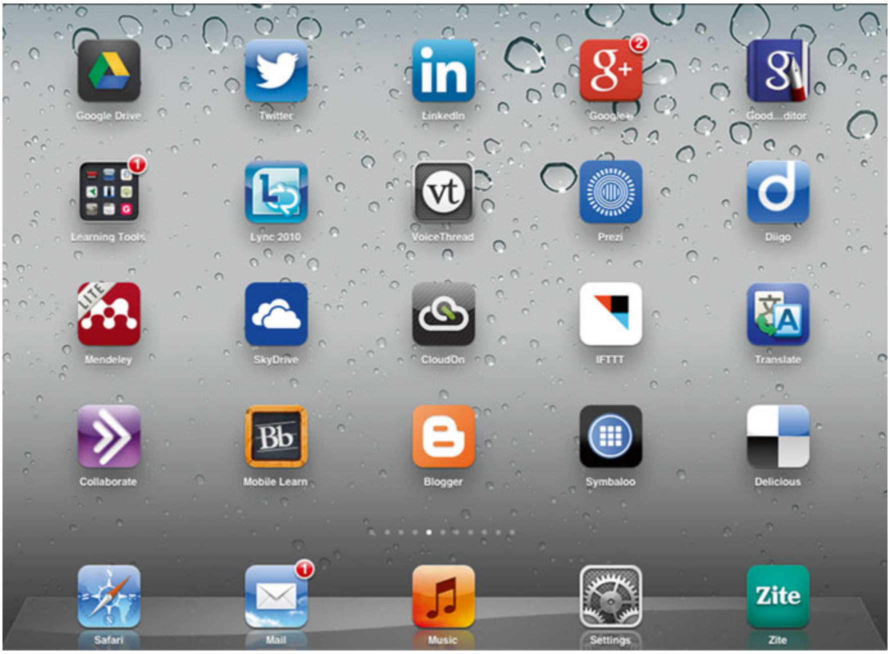

Fig. 3.3 PLE example on mobile apps

Generally, the PLEs created by learners are private. Some tools, such as Netvibes, Symbaloo and RSS, allow users to make certain parts of or their entire PLE public. When visiting a personal portal page/sites, learners can view different widgets in one location that display the widget information, resources, or communications without logging on to each individual Web 2.0 tool (see Figs. 3.2 and 3.3). As instructors, consider whether the Web 2.0 tools you integrate into instructions have relevant widgets available for your students to add to their personal PLE portals. Not every Web 2.0 tool offers widgets. However, most popular Web 2.0 tools do have widgets for personal portal tools, such as Facebook, Twitter, Delicious, RSS, YouTube, e-mail, and calendars.

At the beginning of the class, ask students to select a personal portal tool. Be sure to appropriate ample time to assist students in selecting the tools they need. If students have less experience with technology or in managing learning tools, consider choosing a common one for all learners to use in creating their PLEs. You can also encourage those who would like to explore different personal portal tools to build their PLEs to do so. Regardless of which tool learners select, they should not have any difficulty with communicating, sharing, and collaborating. Many learners may own mobile devices, such as smartphones or tablets, encourage those who have access to mobile devices to build their PLE on their mobile devices in additional to their online PLE. Some personal portal tools, like Netvibes, or Symbaloo, synchronize users' online PLEs with their mobile PLE; therefore, users' PLEs are always present. the most current tools can be updated seamlessly.

To Organize PLE

After learners choose their personal portal tools, ask them to search, select, and organize relevant widgets and add them to their personal portal tool. Let students know that they must add the widgets required by your course to their PLEs, which are the Web 2.0 tools that you have integrated into your instruction, such as Google Docs, Facebook, Twitter, Google Calendar, YouTube, and e-mail. Since these tools directly relate to the instruction, it is mandatory that everyone has these widgets on their PLEs. Learners should be encouraged to add additional, optional widgets to their PLEs, to make them more relevant to their learning. These widgets might include a dictionary, translator, news, bookmarks, educational news, or other e-mail accounts, but they are not limited to these.

Within personal portal tools, each Web 2.0 tool can have multiple related widgets added—for example, e-mail, Twitter or Facebook widgets. Allow students to select and add their preferred widgets, rather than requiring a specific one, unless there is a need to do so. Generally, popular tools such as Twitter offer multiple widgets to select from. This offers them an opportunity to apply and expand their knowledge in evaluating and selecting the right widgets for their PLEs. For example, if you're requiring a Facebook widget, encourage students to search relevant Facebook widgets and select one(s) to add to their PLE. Ask them to evaluate and add different widgets throughout the instructions. After all widgets have been added, learners should organize and reorganize them on a regular basis. All widgets added to a personal portal can be moved and placed in any location simply by clicking and holding the widget. Learners can also select different layouts to organize widgets, such as two or three columns, or different backdrops/backgrounds, or wallpapers to personalize to their preference.

Personal portal tools frequently have tab, page/screen, or folder feature that allows learners to organize their widgets onto multiple tabs or pages. This can be particularly helpful when individuals would like to group their widgets by purpose or functionality. Too many widgets appearing in the same tab creates crowding and causes confusing PLEs. Therefore, multiple tabs could be an effective feature to make PLE better organized. For example, separate tabs could be designated as Learning tab, Work tab, or Entertainment tab. The same widgets can be added to multiple tabs if needed. Even if located in different tabs, the same widgets would display the same content, resources, or communications. For course learning, a PLE tab would be appropriate that would contain different course learning-related widgets, such as Twitter widget for course announcement, Delicious widget for course social bookmarks and resources, Google Calendar widgets for course calendar, Google Docs widgets for course assignment files, or RSS widgets for course RSS feed subscriptions.

To Share and Collaborate on PLE

PLE involves linking tools and resources via human networks. It is critical that social sharing and collaboration must be integrated to enhance the effectiveness of PLE. Each individual can share widgets with their friends, collaborators, or on any social media etc. Widget rating is another way to share and to collaborate with PLEs. This refers to users' ratings on each widget. The rating can function as an effective means of social navigation that supports PLE users in selecting the right widgets to enhance their PLEs. It is important to encourage learners to analyze any existing widget ratings by carefully reading the comments submitted by other users, and then selecting the widgets right for them. This is another great opportunity to engage learners in critical thinking and practicing effective decision-making. As competent community members, learners should be encouraged to provide and share their ratings and evaluations of the widgets they experience to support the community. The more ratings and evaluations shared, the more accurate a rating and evaluation will be.

To Link Tools to PLE

Although linking tools to PLEs reside in the PLE's personal portals, it is critical to also link a PLE to other tools, such as mobile devices via mobile apps and platforms. Learners generally view and access their PLEs on any Internet browser, desktop or laptop computers, such as Firefox, Internet Explorer, Safari, and Chrome. It is vital to advise learners to set up their PLE screen as the home page for their browser. That way, they can immediately view and monitor instructions when they open their browsers. Additionally, many mobile apps and platforms support PLE, so learners can add Netvibes, Symbaloo apps to their mobile devices, such as smartphones and tablets. PLE thereby becomes more mobile and supports learning anywhere and at any time. For mobile learning, please see Chap. 17 in this book.

Assessing PLEs

Assessing a PLE is a challenging task since PLE is highly personalized, and is in constant flux. Each individual organizes and cultivates their PLEs with different goals, objectives, and needs in mind. It is inappropriate to take one frame as evaluation criteria to assess others' PLEs. Currently, there is no consensus on how to assess PLE effectively; future research should examine this particular area of PLE. The evaluation strategies suggested below are considered more effective and provide learners with more room and freedom to self-assess and self-reflect on their own PLE construction process.

Suggested PLE assessing strategies:

- Learners reflect on their PLEs based on their learning goals, objectives, and needs regularly, such as in the beginning, the middle, and the end of instructions.
- Learners compare and contrast their current PLEs to the past ones and project how they may continue updating.
- Learners draw their PLE diagrams to obtain visual reflections on their PLE and reflect on their PLE diagrams by discussing why the diagram drawn as evolutions of linear, hierarchical, spoke, network/web, etc. formats. See more information in "Application Activities" in this chapter.
- In more formal learning instructions, learners should be allowed to determine how and what they would like to be evaluated, such as using different grade points allocations, self-evaluation, peer evaluation, or collaborative evaluation (combining self, peer, and teacher evaluations).
- Including PLE evaluation as part of learning portfolio.

Conclusions

Current Web 2.0 tools integrated with the concept of PLE will enable authentic learner-centered and learner-driven applications for more individualized environmental structuring, goal setting, time management, and task strategies. Self-regulated learning is critical to both face-to-face learning and online learning. When positioning self-regulated learning in the context of connectivist learning, self-regulated learning becomes indispensable in PLEs. Effective PLE construction and management require learners to have an adequate understanding of the utility of the PLE and the capability to master multiple learning widgets and tools on diverse learning platforms and environments (e.g., mobile devices, & tablets) as PLE.

Regardless of the type of learning (e.g., formal, informal, personal, or lifelong learning), learning is always personal, constructive, ubiquitous, collaborative, and connective. There are imperative needs for pedagogies and research in designing effective network learning in which learners can personalize learning tasks and environments through various self-regulated learning skills and strategies. Simply providing Web 2.0 tools in the absence of effective PLE building and task scaffolding is insufficient (Mayer, 2004). While network learners are free to organize their own set of network tools, people, and resources, many of them may feel overwhelmed by the complexity of networks, particularly the network tools (Fini, 2009). PLE can be personalized, but still it is networked, connective, and collaborative. Furthermore, while PLE is powered by technology, its design and applications should be firmly rooted in the theoretical framework of pedagogy.

Application Activities

Idea 1

Discuss the strengths, weakness, and the challenges in integrating and constructing PLEs.

Idea 2

Select a personal portal tool to develop a PLE that is able to build tools, people, and resource networks that facilitate formal, informal, and lifelong learning.

Idea 3

Use any concept mapping application to diagram your PLE. Be creative to apply concept map tools to show, to demonstrate, and to visualize your PLE. Examples of PLE diagrams can be found at (http://edtechpost.wikispaces.com/PLE+Diagrams). There are many Web 2.0 concept-mapping applications to complete your diagram: Gliffy, Mindomo, MyWebspiration, Prezi, etc. For more online mind mapping tools see: http://cooltoolsforschools.wikispaces.com/Mapping+Tools. Reflections: Analyze, explain, and discuss what and how you organize your PLE or how you use your PLE to support your formal, informal, and lifelong learning.

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Chapter 4
Building Successful Student Learning Experiences Online

Mary I. Dereshiwsky

Key Questions

1. What specific skills do students need to be maximally ready for successful online learning?
2. What specific technology skills do students need in order to learn successfully in an online classroom?
3. How can instructors model and facilitate optimal online classroom communication skills for their students?
4. What specific study skills are especially important for successful online learning?
5. How can instructors help students develop critical thinking skills in the online classroom?

Introduction

The online classroom is arguably the defining innovation of twenty-first century instruction. It allows for maximum flexibility in the learning experience. No longer are teachers and students tied down to the same fixed day, time and place to all study together as in the traditional brick-and-mortar classroom. Instead, students have far more discretion in scheduling their study times to fit their needs. This is a huge plus, particularly for busy working adults and those with family responsibilities who might find it burdensome to attend a regularly scheduled in-person class. Instead, class occurs when and where the student needs it to be.

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R. Papa (ed.), *Media Rich Instruction: Connecting Curriculum To All Learners*,
DOI 10.1007/978-3-319-00152-4_4, © Springer Science+Business Media New York 2015

This increased flexibility also brings with it special attention to the unique needs of successful online learning. What do students need to know and do in order to have a maximally successful learning experience? This chapter will discuss these needs, challenges and solutions that instructors can implement in order to assist their online students in five critical areas: readiness for online learning, technology issues, communication, study skills, and critical thinking skills.

Readiness for Online Learning

Computers are present everywhere in our personal and professional lives. Just about every student has used one at some time. But is simple exposure to computer enough to assume that a student is ready to learn online?

Successful online learning is more than using a computer. The online classroom has some unique characteristics that may be new and different from the traditional face-to-face classroom to which students may be accustomed. They need to be aware of what their online classroom will look like so that they are primed for success when they begin their online course.

For one thing, there's the asynchronous, text-based nature of the online classroom. Text-only is the primary way that subject matter is taught and learned, unlike the classic spoken interaction in the traditional classroom. This is true even if the online class has some face-to-face meetings built into it (known as "blended" courses) or real-time video-conferencing chat sessions.

This visual mode of learning means that students need to be comfortable with comparatively large amounts of text content. It will consist of Web pages with instructional materials, which may also have additional embedded hyperlinks within them. Such visual content is in addition to a traditional textbook with assigned reading. Even the typical online syllabus is several times the length of a syllabus for a face-to-face course. This added syllabus detail is recommended to ensure that as many potential contingencies regarding the online course are thoroughly covered, so that students know what to expect from their online course. For an excellent guide to constructing an effective online syllabus, please see Boettcher and Rita-Marie (2010).

For these reasons, students need to be prepared to handle much more reading than they may be accustomed to for their face-to-face courses. Good reading comprehension skills are even more important when most of the learning material is delivered visually. The National College Transition Network (NCTN) has a Web site with valuable resources on how to help college students with reading comprehension skill development, including an extensive bibliography (http://www.collegetransition.org/promisingpractices.research.readingstrategies.html).

This additional reading also necessitates stellar time management skills on the successful online student's part. One of the most pervasive myths of online learning is that it is "easier" or "less work." Not having to attend a physical classroom regularly in real time is undoubtedly behind this myth. Online students may be tempted to "load up" their current schedule with more online courses than they can comfortably handle if they believe this myth. Yet if anything research has shown that successful online learning may take more time than a typical face-to-face class (Van de Vord & Pogue, 2012).

In order to avoid student frustration due to overload, and a temptation to quit their online courses, we need to raise their awareness of the additional time investment that is required in an online course. They may need a little extra help in prioritizing and setting doable boundaries in their lives so that they will have adequate time to devote to their online course.

What can we do to help our online students prepare to manage their time effectively? Our online syllabus should include the standard reminder of how many hours of study time students are expected to devote to learning activities. Most universities have separate guidelines for undergraduate students and graduate students. They are usually stated in out-of-class study hours (e.g., 2 h of study time for every hour spent in class). We need to remind our students that if we are not meeting in person for a stated number of class sessions, they need to add the in-class meeting hours to their overall weekly study time "budget." These expected study totals may be an eye-opener to some students in terms of the commitment required to succeed in an online course.

This is how I alert online students to the required investment of time and self-direction in my EDR 610 Introduction to Educational Research syllabus:

> ***The biggest single cause of problems that arise is PROCRASTINATION!! It leads to unnecessary stress and difficult--hich can be avoided by pacing yourself appropriately
>
> You should plan to set aside regular study time (daily, weekly, etc.) to make regular progress on your course reading, assignments, and related study responsibilities. The Graduate College mandates a minimum of 15-20 hours a week per course of related study and preparation (proportionately multiplied for our intensive summer session)! This Graduate College expectation was computed for the usual 14-week semester and is increased proportionally for winter session and summer sessions!

We can also build time management tips into our syllabus. They include YouTube videos on effective time management skills for students (https://www.youtube.com/watch?v=mfUcRhyONdg) and Web sites with helpful tips (http://collegelife.about.com/od/academiclife/a/timemanagement.htm). We can also provide some estimates of how long to plan for, draft, and revise each online assignment in our syllabus (papers, projects, case studies, etc.) so that students can plan ahead when they prepare these assignments.

Along with this greater time commitment, online students need to be prepared for the greater self-directed nature of online learning. They won't have their instructor standing in the front of the room explaining things to them. As a result, they will need to be more in the driver's seat of their own learning. This includes keeping up with reading and planning ahead for upcoming assignments. It also involves taking the initiative to contact their instructor if they have a question. As I like to tell my own online students: "Help is *always* available. *Always*! All you have to do is ask!" This is quite different from having a teacher say to a student in class: "You look confused. Is there anything I can clarify for you?" Rita-Marie and Donaldson (2011) explain our role as effective motivators of our online students in terms of power sharing: empowering them to take charge of their learning experience.

In summary, readiness means knowing what to expect. We can raise our online students' awareness of the unique features of the online classroom and how some of them differ from their traditional face-to-face instruction. To help reinforce these ideas, there are a number of self-assessment surveys that students can take online to assess their readiness for online learning. They include the Online Learning Readiness Questionnaire developed by the University of North Carolina at Chapel Hill (http://www.unc.edu/tlim/ser/) and the Online Learning Readiness Assessment developed by the San Diego Community College District (http://www.sdccdonline.net/assess.htm). These links can be embedded into an online syllabus or the first module of an online course for students to complete. We can then develop a discussion topic asking students to reflect on their results and share any newly acquired insights regarding effective online learning.

Technology Issues

The idea behind online courses is to streamline delivery of instructional content to students. This means that the technology is ideally a facilitating factor: a means to an end in delivering course content.

Above all, we don't want the technology to be the main focus of students' attention…or even a potential barrier to effective online participation. Yet this is what can happen if students spend more time on figuring out course room navigation than on mastering the subject matter content contained within that online classroom.

We can help prevent problems in this area by some careful advance planning. For one thing, we can alert our students to the need for continual, dependable connectivity in our syllabus. Here is how I do it in my EDR 610 Introduction to Educational Research syllabus:

> It is *each student's* responsibility--*not* the instructor's or NAU's--to secure dependable access to computing equipment and/or facilities in advance of the beginning of the course.

As in life itself, a backup plan is helpful to have in case our primary source of technology fails. I routinely offer the following suggestions to students in helping them create a Plan B for access: "Might you be able to use another computer as a back-up just in case? For example: at a library, an Internet café', a friend's, relative's, neighbor's or co-worker's computer?" With those two sentences, students now have six alternatives for keeping their online learning momentum going and keeping up with course requirements even if their primary computer temporarily breaks down.

With regard to connectivity issues and potential loss of Internet access, I recommend that students invest in an air card. They come with usage plans similar to those of cell phones and are convenient in their portability. Students can take them along even while on a business trip or vacation and have dependable Internet access on the road.

In addition to hardware access, students can minimize problems by knowing the sources of help that they have available with technology-related issues. While you can and should respond to any student questions about course room navigation to the best of your ability, at the same time, according to Schweizer (1995), your primary role as an online instructor is to deliver content and not function as the help desk. As Draves (2007) puts it, when it comes to the best possible technical troubleshooting, you should advise students to "get a techie!"

All online institutions will have technical support available to students. In addition, many schools will have labs available on campus. Students can either walk in to request hands-on computer help under the watchful eye of a lab aide during stated office hours, or they can make an appointment to do so. You should post the toll-free number for tech support, as well as hours of operation and location of any computer labs, as an announcement or in your syllabus at the start of your online class.

If you get technical type questions from students throughout the term, particularly complex ones that you can't readily answer, you should gently remind your students of this tech support contact information. I like to add in my reply to students: "I'm confident tech support will be able to resolve this issue for you! Please let me know what happens and what they say." The last statement indicates that you are still maintaining primary responsibility to ensure that the problem was resolved satisfactorily.

Some online instructors affiliated with traditional brick-and-mortar institutions also arrange to have a hands-on practice session in a local computer lab. These orientation sessions can be team-taught with a lab aide if possible. The instructor and the lab aide can walk the students through some basic steps of navigating their online classroom. Then the lab aide and instructor can circulate throughout the room, offering additional individual help as students practice these course room navigation skills.

In addition to such hardware issues, technology involves maximizing the use of latest communication developments and social media in creative ways for, and with, students. For example, most learning management systems such as Blackboard and Desire2Learn will allow you to record a short audio and video to add to your online course content. LearningHouse shares some valuable tips to consider as part of including audio in your online course (http://www.learninghouse.com/blog/publishing/how-to-add-meaningful-audio-to-your-courses). VanderMolen (2012) has shared additional examples of online audio tools and how to use them. Two especially user-friendly types of audio software are Jing (http://www.techsmith.com/jing.html) and Camtasia (http://www.techsmith.com/camtasia.html).

In addition to audio, just about anyone can make a YouTube video these days (www.youtube.com). You and your students can find a wealth of instructional videos on just about any topic. Assignments can be enhanced beyond the typical PowerPoint by asking students to create a short YouTube video on a learning topic of interest and sharing it with the class.

Finally, the growth of social media such as blogs, wikis, Twitter, and Facebook has exponentially increased the potential for applied creative learning opportunities. Students can be encouraged to blog their perceptions and experiences as part of assignments. Wikis are an alternative to discussion forums in encouraging student interaction. For additional helpful suggestions on how to incorporate blogs, wikis, and Twitter into online teaching, please see McIntyre (2011).

With these types of advance planning and learning activities, your online students can fully realize the maximum potential of technology as a facilitator of effective online learning. In doing so, they are also likely to acquire and develop some new technology skills of their own.

Communication

As discussed in the first section of this chapter, communication in an online course is primarily or solely text-based in nature. This can lead to some challenges in effective communication.

Tone and intent of the text message can be problematic to interpret without the verbal and visual cues of real-time audio communication. In addition to content, the length of the message itself can be misinterpreted. What is seen as efficient or focused by the writer risks coming off as abrupt and cold to the reader.

Students may need some coaching in issues of netiquette unique to effective online communications. The Network Etiquette Web site (http://www.networketiquette.net/) has separate links with specific helpful tips for such areas of communication as Internet, e-mail, and use of mobile devices.

Misunderstandings in tone and content of communications can occasionally erupt into unfortunate "flame wars" in discussion forums. Experts such as Stavredes (2011) have shared effective guidelines for cooling down such flare-ups in the online classroom. We may need to act quickly and remove any content that is overtly discriminatory or offensive. In addition, we should use this occurrence as a teaching opportunity to remind students of the rules of proper netiquette. America Online (AOL) has trained its online forum moderators to advise posters that while disagreeing with ideas is always OK, attacking individuals is never acceptable. Along these lines, AOL has urged its forum moderators to coach members that "I" statements can be perceived as confrontational in nature. Focusing on ideas in the third person is a much safer way to convey thoughts and depersonalize any potential for conflict in communications.

Finally, you should confer privately with all parties to inappropriate online postings to explain in a non-threatening way why the behavior was unacceptable. Experts such as Ko and Rossen (2014) recommend that you reference university policy such as published codes of student conduct and communications when doing so.

Of course, the vast majority of online communications will not be problematic in nature. How then can we encourage positive communications on the part of our online learners?

The best strategy for doing so can be summed up in the classic saying, "Actions speak louder than words." We can set the tone and expectations for effective communications with our own example. In this regard, we should attempt to model continual engagement and presence in our online classroom (Dereshiwsky, 2013). Palloff and Pratt (2011) refer to this trait of instructor visibility as presence.

How does our mere presence in our online classroom directly impact effective student communications? For one thing, by regularly logging in, we are modeling for students how they can more efficiently keep up with postings and messages. This is because they will have fewer messages at a time to catch up on, thereby better focusing their attention and enabling them to respond more thoughtfully.

We can also respond more promptly to any student communications we receive, thereby more efficiently addressing any questions they may have. This in turn helps to debunk the myth of online learning as a cold, impersonal correspondence school where it takes forever to get help from a real, live human being.

Along these lines, our prompt return of assignments with comments that reinforce what they did right as well as what can be done better communicates to our students that their work has received individual attention. They can then follow up with us on any recommendations where they may be unclear, further enhancing their applied understanding of the learning concepts being assessed.

Discussion forums deserve special mention in terms of an online communication channel, since they are our equivalent of a classroom exchange among students and instructor. The challenge for us as instructors is to devise engaging discussion questions that relate to our learning material and that will encourage students to share their ideas on that topic. Furthermore, we want more than a one-time, last-day-of-the-week drop-in by our students to post their thoughts. Instead, we want them to revisit that discussion forum throughout the week to see what their classmates (and you) have posted, and to reply to others with their follow-up thoughts as well. This is the equivalent of "keep coming to class" to build on earlier discussion.

Draves (2007) shares an excellent array of practical suggestions for creating such engaging discussion questions and keeping discussions going strong. They include how to revitalize a lagging instruction with a thought-provoking follow-up question, and how to find the right balance of instructor participation in the discussion forums so that you are facilitating student-to-student communication without accidentally prematurely shutting it down. Ko and Rossen (2014) share helpful examples of how to craft focused and engaging discussion topics, as well as how to set guidelines for effective student discussion communication throughout the unit.

Some students may need coaching with regard to what constitutes a "substantive" discussion communication. Boettcher and Rita-Marie (2010) and Dereshiwsky (2013) share specific guidelines for such substantive communications. Here is what I include in my EDR 610 Introduction to Educational Research syllabus:

> You will be expected to post *at least 3 substantive messages* regarding this topic during the allotted time period.
> These may include ***any*** combination of
> -- your own thoughts on the topic, and/or
> -- your reactions to your classmates' postings.

("I agree with John/Jane" is **NOT** an example of an acceptable substantive posting.)
Tell us **WHY** you agree or disagree for it to be 'substantive' in nature.

The idea is for you to actively participate in the discussion topic. This involves reading others' posts during that time frame and demonstrating that you have thought about this topic.

Before we leave the topic of online communications, a special look is warranted at group work. The inherent challenges of group communication on assignments and projects can be exacerbated in the online environment. We have already considered how the lack of visual and verbal cues can cause misunderstandings in communication. These problems can be exacerbated by the challenges of busy working adults with full plates of professional and personal responsibility who may have never met one another in person and are located in different places.

In order to help prevent as many misunderstandings as possible, I ask online students to create a group contract as an initial non-graded housekeeping activity. The purpose of such a contract is to get them to think about some potential challenges of effective online group communication and create a mutually acceptable plan to help prevent them. I cue them to develop a plan for such issues as how they will communicate (e.g., asynchronous postings in the group forum; live chat sessions in a designated group chat area; e-mail; text message; telephone calls); how long to allow for a reply to a communication sent to a fellow group member; who will be responsible for which parts of group assignments; and a calendar for developing, revising and assembling such group assignments. I also ask them to consider whether there will be a group leader and if this designated leader will be rotating or permanent in nature.

In particular, I ask group members to consider how they will handle any intragroup conflict that may arise. In this regard, I tell them to think of me as a higher court of appeals. That is, I will always be happy to step in to help resolve any conflict, but only after they have documented to me their initial good faith attempts to resolve such problems among themselves.

Having such a contract will not guarantee is of course no guarantee of perfect group communications. At the same time, it does help to reduce some commonly occurring group problems as lack of timely response or participation of fellow group members. (You'll also see far fewer of the "tattling" type e-mail messages in your in-box, such as "John/Jane isn't participating with us on the group assignment! It's not fair that I have to do his/her share!"). If and when such communication problems occur, you can simply pull up and reference the contract that the group members mutually negotiated. "Let's see what your contract says about that issue!"

For other helpful tips on facilitating effective group communications in online courses, please see Ko and Rossen (2014) and Boettcher and Rita-Marie (2010).

While not exhaustive in nature, this section has highlighted some areas of focus for effective online communication in your classroom. In particular, it has focused on some specific channels of online communication, how to prevent problems, and how to maximize positive communications.

Study Skills

The online classroom seems ideally matched to one of the key study strategies, according to Effective Habits for Effective Study (http://www.studygs.net/attmot4.htm): find your prime time for learning. Online students are not tied down to a predetermined day, time and place to all study together, as in the traditional face-to-face classroom. This means greater flexibility to schedule study times to fit individual preferences, be they morning, afternoon or evening. Honoring one's prime learning time equates to greater efficiency in study activities.

By the same token, Effective Habits recommends locating an ideal learning space for quiet, comfortable, focused study time. The growing popularity of notebook computers means that online students can literally take their classroom with them to any study location of their choosing.

One danger that online students need to be mindful of when settling down to a study session is minimizing distractions. According to Cal Poly, San Louis Obispo (http://sas.calpoly.edu/asc/ssl/gettingfocused.html), social media such as Facebook, Twitter, and e-mail are tempting distractions from placing full focus on the study activities at hand. As Cal Poly points out, returning to the learning activity after detouring into one of these distractors invariably results in lost time to re-gear one's thinking towards the interrupted learning activity.

Along with such distractions, online students often battle the temptation to procrastinate. According to College TidBits (http://www.collegetidbits.com/college-life/College-Life-How-to-Avoid-the-Procrastination-Trap-in-College.html), such procrastination affects 90 % of college students at one time or another. Furthermore, once a student falls into the procrastination habit in school, it tends to spread to other personal and professional areas of his or her life. The University of Buffalo (http://www.student-affairs.buffalo.edu/shs/ccenter/stressprocrast.php) identifies some common causes of procrastination as fear and anxiety at the prospect of facing an overwhelming learning task, self-sabotaging negative beliefs about one's ability to succeed, finding the upcoming learning task to be tedious and boring, and perfectionism fueling unrealistic expectations of "anything less than an A performance is worthless…so why even try?!"

As with distractions, such procrastination can become especially challenging in the online classroom. Given the self-directed nature of most online courses, the student does not have an instructor to remind him or her periodically at the start of the class about upcoming due dates. Without such external reminders, and with the student in the driver's seat in terms of pacing his or her learning progress, it's all too easy to put things off.

What are some remedies for overcoming such procrastination? College TidBits recommends breaking up a learning task into small chunks and just diving in to get started as a method of combatting such procrastination. Furthermore, SUNY Orange (http://www.sunyorange.edu/ol/faq/procrastination.shtml) recommends making online learning activity plans as specific as possible. For example, a student should decide "I will locate and narratively summarize five sources of literature on my topic to add to my annotated bibliography" instead of "I will do a library search for information." This makes it easier to determine when the study goal is completed, which is in itself rewarding and motivating. Both of these sources also recommend building in periodic rewards as motivators. Perhaps for the online student, an appropriate reward might be a 10-min break to check the aforementioned tempting Facebook and Twitter accounts?! Finally, since procrastination and perfectionism go hand in hand, SUNY Orange cautions online students to be realistic in terms of what they can and can't accomplish in a given study session. Setting realistic, specific study goals for each online study session is helpful in recognizing what can be accomplished towards an overall learning goal.

Students sometimes post requests online to locate study buddies. This is a helpful strategy to help one another stay on track, especially if the study buddies are taking the same online course. Without having to commute to the same physical location to study together, the time saved can be applied to the study partnership activities. Ideas can be shared by instant message in real-time simultaneous log-ins, or via an online blog or wiki. This is a great way to stay motivated and benefit from a peer learner's perspective as long as the study sessions stay on track and do not veer off topic into distractor-type chat.

The online classroom poses a unique study challenge in terms of the format of study materials. Many online learning materials take the form of Web pages and digital textbooks. This format, along with the inherent speed that computers in general are known for, makes it all too tempting for online students to equate true studying with skimming a Web page.

In reality, effective study of visual learning materials requires more than that. Concordia University Online (http://education.cu-portland.edu/blog/educator-tips/5-ways-to-help-students-improve-reading-skills/) reminds us that attention to detail is vitally important in understanding the study concepts it contains. This may require careful rereading, rethinking and reflecting as the student relates current reading material to past material. Birkbeck University of London advises that several readings are necessary to first understand the overall context of what is being learned. They do recommend skimming, but as a preliminary first step to identify particularly important areas to revisit with slower, more careful rereading as a follow-up step.

Along with such careful reading for detail, online students need to engage with what they are studying. This involves good note taking. While digital record keeping has streamlined note taking beyond the traditional paper-and-pencil process, the principles of effective note taking remain the same. Penn State Online suggests the Cornell method of dividing a Microsoft Word file down the middle, typing key words and phrases on the left side and corresponding summary notes on the right side. Graphing software also makes possible another of Penn State's recommendations: the creation of mind maps to diagram the flow and interrelationship of concepts being learned. Outlines are also a popular way to organize ideas. Of course, traditional paragraph-type summaries are effective as well.

Any discussion of effective online study skills invariably means revisiting the idea of time management discussed earlier in this chapter. Setting aside periodic adequate study time is important. It will result in much better comprehension and retention of the learning material than marathon study sessions on weekends or right before a paper or exam is due. With the aforementioned portability of computers and greater flexibility of online learning, it's easier to make the most of those small but significant blocks of time—waiting for an appointment, a meeting cancelled at the last minute—to apply towards one's study activities. As with any goal, time management for online learning simply means *making* the time: as many sources call it, making an appointment with yourself to block out the time necessary for learning.

Good study habits are as important for online students as for face-to-face students. Despite some special challenges and distractions of the online classroom, with proper planning and determination, an online student can succeed in mastering the most complex concepts by applying good study habits to the learning process.

Critical Thinking

Before considering the impact of the online classroom on critical thinking, it's important to consider what this concept means. Scheffer and Rubenfeld (2000, (n.d.)) explain that critical thinking consists of analyzing, applying standards, discriminating, information seeking, logical reasoning, predicting, and transforming knowledge. The University of Michigan has developed a checklist that students can apply to ensure that they are meeting each of these criteria. The Critical Thinking Community (http://www.criticalthinking.org/pages/defining-critical-thinking/766) indicates that critical thinking involves applying intellectual standards to a scenario, problem, or topic under consideration.

The benefit of such thinking, according to the Critical Thinking Community, is enhanced ability to assess credibility of information before using it to make a decision or take action. This would seem to be an especially important skill to possess with the information avalanche that the Internet has made possible. Knowing how to sift through abundant amounts of information and determine what is trustworthy is critical to ensuring that we make the best possible use of that information.

Barriers to effective critical thinking include emotionally loaded arguments, unwarranted assumptions, ambiguity of communications, and incomplete substantiating evidence (Haskins, 2010). Lynch (2012) has developed a checklist of questions that students should ask themselves in evaluating the soundness of their argument.

The online learning environment poses some special challenges to effective critical thinking skills. The limitations of text-only communication are well known in terms of inability to convey such important cues as tone of voice and visual signs. Anyone who has ever seen the public postings following a politically related news story has very likely seen the flame wars that can erupt when passion and emotion cloud objective judgment. As mentioned earlier in this chapter, the speed and efficiency of information retrieval on the Internet may accidentally encourage rushing through the information search for a given topic. As a result, the writer's argument may be inadequately supported by the best possible credible outside evidence. In addition, many online learners are busy working adults juggling family and career. As noted in the preceding discussion on time management and study skills, they may have limited time to apply to their learning activities. For this reason, they may rush through their required discussion postings, papers and other assignments to get the bare minimum done by a certain deadline. These circumstances do not support the types of reflection and in-depth information search and retrieval characteristic of good critical thinking.

How, then, can we help our online students develop effective critical thinking skills? Most of the strategies used in traditional face-to-face instruction can also be adapted successfully to the online classroom. Adsit and Walker (2007) recommend ongoing assessment of learning, cooperative learning activities, case studies and discussions, and Socratic questioning. These recommendations are readily adaptable to online classrooms, even in combination. For example, instructors can interject thought-provoking Socratic-type questions into discussion threads, not only to make their presence known (as has been discussed earlier) but to reignite student participation in the discussion and encourage students to substantiate their initial assertions more strongly. Case studies can be assigned as group projects in virtually every subject matter area. The inherent complexity and ambiguity of such case studies can wean students away from seeking "the one right answer/one right way" and encourage them to weigh the relative pros and cons of various alternatives. In addition, the group setting means increased peer communication and therefore, the need to persuade one's peers of one's position as part of preparing and compiling the final version of the overall group submission. Ongoing short-assignment assessments are a prime opportunity to give feedback on areas that can be improved, including the persuasiveness of the claims in the student's writing.

The online classroom environment also possesses some desirable characteristics in terms of the development of critical thinking skills. Unlike in a synchronous face-to-face classroom exchange, online students can take time to formulate and edit what they are going to say before they say it, e.g., posting a discussion response. This allows for the opportunity for revisiting one's argument and, if necessary, shoring it up with additional library research. By capitalizing on such strengths and employing the strategies discussed above, online instructors can help their students develop maximally beneficial critical thinking skills that will serve them well in their professional and personal adult lives.

Conclusions

1. The online classroom has enabled busy working adult learners to continue their education in a more flexible manner than the traditional brick-and-mortar classroom.

2. The lack of visual and verbal cues in the asynchronous classroom means that we should be particularly aware of our students' needs and concerns regarding their online learning experience. With careful advance planning, we can anticipate many of their potential needs regarding readiness for online learning, technology, communication, study skills, and critical thinking.
3. Online students need to process greater amounts of text content than in the traditional classroom in order to have a successful learning experience.
4. We should raise our students' awareness of the increased time commitment required to succeed in online learning. This includes sharing effective time management and anti-procrastination strategies with them.
5. Online students need to have dependable access to computers, including backup plans for such computer access, so that their online classroom engagement is uninterrupted.
6. We should inform students of access to technology help, including contact information for computer technical support and real-time computer lab access.
7. We should also explore innovative use of social media such as blogs, wikis, Facebook, and Twitter as added sources of interest to our online course.
8. Adding audio and video components to an asynchronous online classroom humanizes the learning experience, as well as instructor presence, for our students.
9. Misunderstandings are more likely to occur in text-only communications because of the lack of visual and verbal cues to augment the intent of the message. As a result, we should alert our online students to issues of tone, content and overall netiquette regarding their online communications.
10. We need to be continually present and visible to our online students in the classroom. This will model the importance of regular engagement in the learning process for our students.
11. Our continual presence includes prompt return of assignments with specific feedback on both strengths and areas of improvement. It also includes regular interaction in discussion forums to facilitate the exchange of student ideas on each discussion topic.
12. Students may also need coaching on how to make a substantive contribution to a text-based online discussion forum.
13. Students can work successfully in assigned online groups with some careful advance planning. A group contract of expectations that they negotiate with their teammates is a convenient reference regarding how they will communicate and allocate the group work among their teammates.
14. Effective studying in a Web-based course means avoiding the temptation to skim a Web page or other learning resource quickly. Given the greater amount of text-based learning material in an online course, students may need additional help with study skills. This includes learning how to distinguish between reading and studying this learning material for maximum retention of learning concepts.

15. Good study habits also go hand in hand with effective time management. We can help our online students with how to recognize and apply even small time increments in their busy lives towards their online learning activities.
16. We can help students apply study aids such as mind maps, outlines, and note taking in online learning.
17. Students need to learn to critically evaluate the information they receive in order to determine if it is credible (valid) and dependable (reliable).
18. The rapid access to abundant information that the Internet has made possible makes it even more important for students to be critical consumers of information.
19. Critical thinking activities such as case study analysis, Socratic-type discussions and cooperative learning can all be successfully used in the online classroom.
20. Our awareness of unique needs of online students allows us to plan and facilitate maximally productive learning experiences for them.

Application Activities

Idea 1

Suppose you are teaching an online class. During the third week of the term, you received a panicked e-mail from one of your students, John Doe. Your course is also John's first-time online course. In his self-introduction post, he mentions that he is married with two small children and has to travel frequently, often unpredictably, as part of his job duties.

John's e-mail message to you contains "HELP!!!!!" in the subject line. In the content of the e-mail he says, "I'm just so overwhelmed with our course! I thought taking an online course would be easier, with all I have to do at home and at work! But instead I feel like I'm drowning in all of the reading I have to do. And there never seems to be enough time to get my discussions and assignments done by the deadlines. When I signed up for an online course, I thought it meant that I could do things when I want to do them, or when I can. I didn't expect due dates and deadlines throughout the course. What should I do? The last day to drop the course is coming up this week. Should I just give up and try to take this course face to face instead?"

Required: How will you respond to John? Please draft an e-mail reply to him. Please also identify and discuss any additional steps you will take in communicating with him in addition to your e-mail reply. For example, they may include a telephone outreach, and development of a specific plan of action that you will use to work with John in order to help him succeed in your course.

Idea 2

Two weeks before the start of your online course, you receive an e-mail message from a prospective student, Jane Smith. In this message, Jane states: “I am really interested in taking your course online. I live in an isolated rural area 50 miles from campus. I also have two toddlers at home. For these reasons, it would be difficult for me to make a regular commute once or twice a week to the main campus for a face-to-face course. But because of where I live, Internet connection can sometimes be spotty. It tends to go out unpredictably. Can I still take your online course?”

Required: Please draft an e-mail response to Jane Smith regarding her question. Please be sure to identify any additional resources or options that you would recommend to her in her situation.

Idea 3

Please create a specific group learning activity for an online course that you might teach, or are already teaching. As part of this learning activity, please incorporate at least one use of social media (e.g., wikis, blogs, Facebook). Please draft specific instructions to share with your students for how to successfully complete this learning activity.

Idea 4

Your online course is currently in its fourth week. It includes weekly discussion forums. Students are required to post their own thoughts on each discussion topic and post substantive replies to at least two classmates.

You have noticed the following issues occurring in your weekly discussions:

(a) About 75 % of the class waits until the afternoon or evening before the discussion ends to post their own thoughts on the discussion topic,
(b) As a result, you typically receive numerous e-mail messages from the other 25 % of your students the day before the discussion ends, saying “Help! I know I’m supposed to make two responses to other students by tonight. But what do I do if no one has posted yet? I have no one to reply to! Are you going to dock me on my grade?”
(c) In addition, you notice that many of the students’ replies to others are little more than “Good job!” or “I agree” or “You helped me understand this topic.”

Required: What will you do in the above scenario? Please outline the specific steps you will take, including any communication, public or private, with your students, you would initiate.

Idea 5

Suppose you have a group project currently underway in your online course. A few days before the group project is due, you start to receive e-mail messages from some students saying: "Help!! Mary Smith is in my group but hasn't done anything. My team members and I have reached out to her but she hasn't replied or sent us any drafts of her part of the group project. The deadline is coming fast. Are the rest of us going to get docked on our grade because she didn't do her part of the group assignment? It's not fair; we shouldn't have to make up her share of the work!"

Required: Please share how you will respond, including the content of any e-mail replies you would make to these students, and other specific actions you would take.

Idea 6

Please locate another online course, other than your own, in a subject area that you teach. Please provide a detailed review of the requirements of this online course in terms of how its course requirements engage students' critical thinking abilities. Can any assignments, discussions, or other learning activities be improved in this area of critical thinking? If so, how? What would you change?

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Part II
Curriculum for e-Learners

Chapter 5
Language and Literacy

Pamela Powell and Jennifer Prior

Key Questions

1. What is language development?
2. How can we encourage and support language development in children?
3. How is oral language development tied to overall literacy development?
4. What is emergent literacy?
5. How do we support literacy growth?

A newborn's head cupped in the hands of a loving parent initiates the tender communication needed for later literacy skills. The child hears the utterings and intonations of the parent and learns the cadence and sounds of the native languages spoken.

It is important to distinguish between language, speech, and communication. "speech is a verbal means of communication (Owens, 1996, p. 7); language can be defined as a socially shared code or conventional system for representing concepts through the use of arbitrary symbols and rule-governed combinations of those symbols (p. 8); and communication is the process participants use to exchange information and ideas, needs, and desires" (p. 11). Wolfe and Flewitt (2010) assert, "The purposes for which literacy is used range from expression of everyday needs through words, gesture and action to the human desire to participate in wider social and cultural practices and to 'fix' ideas for distant or future audiences" (p. 387).

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R. Papa (ed.), *Media Rich Instruction: Connecting Curriculum To All Learners*,
DOI 10.1007/978-3-319-00152-4_5,

One can readily see, then, that infants communicate long before they utilize speech as we know it. Also, one can communicate without the use of speech. However, the purpose of this chapter is to elucidate the importance of language development, especially in young children, and its connection to later conventional literacy. Additionally, means and activities to enhance this development will be outlined and explored.

Theoretical Background

Language development, though seemingly straightforward to the parent observing the neuro-typically developing child, may seem simple and without great effort. This is deceivingly naive though, because the development of language is a complex endeavor employing many systems of the child and his surroundings.

As Hirsh-Pasek and Golinkoff (2012) note:

> Moving back to the basics, we have seen that language learning can be distilled into three main tasks: a) finding the units of speech (or handshapes) that will become the sounds, words, phrases and sentences, b) finding the units in the world (objects, actions and events) that will be labeled by language, and c) mapping between word and world in ways that move from speech to meaning and meaning to speech in the native tongue (or tongues). (p. 25)

This, in the context of relationships, relegates caregivers to prime purveyors of language, communication, and speech. By conversing with infants and young children, "caregivers expose infants to the rules, contexts, and patterns of language" (Martin & Fabes, 2006, p. 196). This language is enhanced and expanded as the child grows through interactions with adults and more capable peers.

Hirsh-Pasek and Golinkoff (2012) further offer "six principles of language learning that are consistent with the literature and that might guide practice in the living room and the classroom" (p. 25).

Principle 1: Children learn the words that they hear most.
Principle 2: Interactive and responsive rather than passive contexts favor language learning: Social interaction matters.
Principle 3: Children learn words for things and events that interest them.
Principle 4: Children learn words best in meaningful contexts.
Principle 5: Vocabulary learning and grammatical development are reciprocal processes.
Principle 6: Keep it positive.

Furthermore, they assert, "taken collectively, the 6 research-derived principles of language development offer a way to alter the trajectory of a child's language development. The principles dictate a kind of pedagogical approach that yields optimal language growth" (pp. 25–32).

The child hears language from infancy (and most likely in utero) and both ingests and responds. "The foundations of optimal language and literacy development are formed in the earliest months and years of life, when the primary "educators" are the main care providers - most often parents and members of the extended family" (Johnson, 2012, p. 30).

Oracy is the root of literacy in typically-developing children. " Successful reading requires both a foundation of oracy – expressive and receptive language facility including meaningful vocabulary paired with content knowledge, grammar and syntax , and literacy – sequential and directional discrimination of symbols and collections of symbols, phonemic perception, sound-symbol connection for letters and letter clusters, and facile naming. And reading requires motivation rooted in relationships, joyful modeling, curiosity, meaningful reading affordances, and freedom from fear of failure or embarrassment" (Johnson, 2012, p. 7).

This oracy is encouraged and developed by the experiences of the child in the many contexts in which he finds himself. Early beginnings include the arms of caregivers and loving adults and children. Language requires connections and is learned through communicative relationships. It is not established through television, tapes, or apps. Its roots are relational.

Children establish vocabulary through conversations and learn it incidentally through being spoken to and read to. Flash carding and repetitive practice are not among the best practices for language attainment. Best in the natural environment for typically developing children, language is learned in everyday situations.

While strolling the aisles of a grocery store, a new grandmother quietly and calmly described her surroundings and items to purchase to her near-newborn grandchild. This was an appropriate exchange and the child simply gazed and *listened* as Grandmother went about her routine.

Parents are both pleased and encouraged by the emotional response of the child when he first "talks" in coos and "communicates" in smiles and wiggles. This behavior, encouraged by loving and competent caregivers, builds the developing language in the child.

And the child learns to "read" long before he learns to read. The exposure to language and books establishes the sense of story within the child. Using repetitive and predictable texts encourages the child to "try on" reading and children can be heard repeating the text in subsequent readings.

Traveling recently on an airplane, a young child could be heard reciting the familiar and predictable text of the perennially popular Bill Martin, Jr. and Eric Carle text, *Brown Bear*, *Brown Bear* (1967). Lilting through the cabin, her young voice captivated the passengers as she recited, *Brown bear*, *brown bear*, *what do you see*? (with the accent going a few octaves higher on the "you"). She recited the book multiple times. Although the passengers did not break out in applause, they should have. The child was 2 years old, had memorized the words and intonations based on multiple readings by an adult and through the sharing and transacting with the child. She was basking in the throes of emergent literacy, and all of the passengers on a Boeing 737 witnessed this without realizing the monumental achievement.

This child was in the early reading stages, but was not reading as we think of it conventionally. She was resting confidently in her emergent literacy.

Roth, Paul, and Pierotti (2006) define emergent literacy in this way:

> Children start to learn language from the day they are born. As they grow and develop, their speech and language skills become increasingly more complex. They learn to understand and use language to express their ideas, thoughts, and feelings, and to communicate with others. During early speech and language development, children learn skills that are

> important to the development of literacy (reading and writing). This stage, known as emergent literacy, begins at birth and continues through the preschool years. Children see and interact with print (e.g., books, magazines, grocery lists) in everyday situations (e.g., home, in preschool, and at daycare) well before they start elementary school. Parents can see their child's growing appreciation and enjoyment of print as he or she begins to recognize words that rhyme, scribble with crayons, point out logos and street signs, and name some letters of the alphabet. Gradually, children combine what they know about speaking and listening with what they know about print and become ready to learn to read and write. (para. 1)

Emergent literacy is a precursor which can be supported in multiple ways without escalating conventional reading to an earlier age.

The push for early reading and other forms of literacy, however, is disconcerting. Again, the National Association for the Education of Young Children (NAEYC) and the International Reading Association (IRA) (2009) implores us:

> Teaching practices must be appropriate and effective for *young* children, not just adaptations of what may work in the later grades. These practices must respond to young children's changing developmental characteristics as well as to their culture, language, and individual learning needs. (p. 1)

Again, they recommend the following in relation to literacy development:

From Infancy Through Third Grade: Phases in Children's Development of Reading and Writing

Phase 1: Awareness and exploration (infancy through preschool)
Phase 2: Experimental reading and writing (kindergarten)
Phase 3: Early reading and writing (grade 1)
Phase 4: Transitional reading and writing (grade 2)
Phase 5: Independent and productive reading and writing (grade 3)

Note: Grade levels are approximate. Many children function at higher or lower developmental levels than their grade would predict, requiring that early childhood programs be prepared to differentiate and individualize instruction. (p. 2)

This is also a reminder that must also examine the important relationship between listening, speaking, reading, and writing. Van Allen (date unknown) prompted us that what a child hears, he can say; what he can say, he can write down; what he can write down, he can read and others can read. This seeming obvious chain of events is an "aha" moment for children. It is at that point which many break the code of language, comprehending its importance and power. This is not to be confused with the process of decoding, a tool to help decipher and sound out the words of the language (phonics), but rather the means to understand the larger context. That is, children understand their place in the language cycle and their authority to make meaning!

Currently, we think of multiple literacies in relation to the education children. Many have their roots in conventional definitions of literacy (reading and writing), but others are based on that conventionalism (mathematical vocabulary and its comprehension and usage, geographical literacy, economic literacy, etc.)

NAEYC (2009) also reminds us:

- Children take their first critical steps toward learning to read and write very early in life.
- Children do not become literate automatically; careful planning and instruction are essential.
- Ongoing assessment of children's knowledge and skills helps teachers plan effective instruction.
- No one teaching method or approach is likely to be effective for all children, at all times.
- As children move from preschool into kindergarten and the primary grades, instruction focused on phonemic awareness, letter recognition, segmenting words into sounds, and decoding printed text will support later reading competence.
- Children who are learning English as a second language will become literate more easily if they have a strong foundation in their home language. (p. 1)

Professional Standards

It is noteworthy to discuss standards in regard to language and literacy in young children. Because language development begins in the early years, let us start with recommendations from the National Association for the Education of Young Children, the professional organization which defines early childhood as birth through age 8 (typically third grade).

First, NAEYC (2009) advocates for Developmentally Appropriate Practice (DAP). DAP follows the following tenets:

- Developmentally appropriate practice requires both meeting children where they are—which means that teachers must get to know them well—and enabling them to reach goals that are both challenging and achievable.
- All teaching practices should be appropriate to children's age and developmental status, attuned to them as unique individuals, and responsive to the social and cultural contexts in which they live.
- Developmentally appropriate practice does not mean making things easier for children. Rather, it means ensuring that goals and experiences are suited to their learning and development *and* challenging enough to promote their progress and interest.
- Best practice is based on knowledge—not on assumptions—of how children learn and develop. (p. 1)

DAP, then, meets children where they are in regard to their language learning while recognizing that child development is a complex endeavor and all children are not, and should not be, at the same place at the same time.

Table 5.1 Comprehension and collaboration

CCSS.ELA-Literacy.SL.K.1	Participate in collaborative conversations with diverse partners about *kindergarten topics and texts* with peers and adults in small and larger groups
• CCSS.ELA-Literacy.SL.K.1a	Follow agreed-upon rules for discussions (e.g., listening to others and taking turns speaking about the topics and texts under discussion)
• CCSS.ELA-Literacy.SL.K.1b	Continue a conversation through multiple exchanges
CCSS.ELA-Literacy.SL.K.2	Confirm understanding of a text read aloud or information presented orally or through other media by asking and answering questions about key details and requesting clarification if something is not understood
CCSS.ELA-Literacy.SL.K.3	Ask and answer questions in order to seek help, get information, or clarify something that is not understood

Table 5.2 Presentation of knowledge and ideas

CCSS.ELA-Literacy.SL.K.4	Describe familiar people, places, things, and events and, with prompting and support, provide additional detail
CCSS.ELA-Literacy.SL.K.5	Add drawings or other visual displays to descriptions as desired to provide additional detail
CCSS.ELA-Literacy.SL.K.6	Speak audibly and express thoughts, feelings, and ideas clearly

Additionally, the International Reading Association (IRA) and NAEYC authored a joint position statement (2009) which advocates:

> Learning to read and write is critical to a child's success in school and later in life. The National Association for the Education of Young Children (NAEYC) is committed not only to helping young children become literate but also to fostering their motivation to read and write for enjoyment, information, and communication. To reach these outcomes, teaching practices must be appropriate and effective for *young* children, not just adaptations of what may work in the later grades. These practices must respond to young children's changing developmental characteristics as well as to their culture, language, and individual learning needs. (p. 1)

The National Council of Teachers of English (NCTE) and the International Reading Association (IRA) recognize:

- These standards assume that literacy growth begins before children enter school as they experience and experiment with literacy activities—reading and writing, and associating spoken words with their graphic representations.
- They encourage the development of curriculum and instruction that make productive use of the emerging literacy abilities that children bring to school.

Finally, the early years of language and literacy development are foundational to the acquisition of later skills. The Common Core Standards for English Language Arts (ELA) begin in kindergarten, but they have their roots long before. Below, the Common Core Kindergarten ELA standards are noted (Tables 5.1 and 5.2):

In relation to the other standards, one can see interrelationships between NAEYC, NCTE, and IRA in Table 5.3. For example:

Table 5.3 Interrelationships across standards

CCSS.ELA-Literacy. SL.K.1	Participate in collaborative conversations with diverse partners about *kindergarten topics and texts* with peers and adults in small and larger groups
NAEYC	All teaching practices should be appropriate to children's age and developmental status, attuned to them as unique individuals, and responsive to the social and cultural contexts in which they live
NCTE	These standards assume that literacy growth begins before children enter school as they experience and experiment with literacy activities—reading and writing, and associating spoken words with their graphic representations. They encourage the development of curriculum and instruction that make productive use of the emerging literacy abilities that children bring to school
NAEYC/IRA	To reach these outcomes, teaching practices must be appropriate and effective for *young* children, not just adaptations of what may work in the later grades. These practices must respond to young children's changing developmental characteristics as well as to their culture, language, and individual learning needs. (p. 1)

Strategies

Language, like development in the other domains, is variable in its acquisition. We can, however, encourage its development in multiple ways.

The American Academy of Pediatrics (n.d.) does not recommend "screen time" (televisions and various other electronic media) before the age of two. Stating, "television and other entertainment media should be avoided for infants and children under age 2. A child's brain develops rapidly during these first years, and young children learn best by interacting with people, not screens," (para. 6) this position has often been generalized to include early childhood populations at large and beyond the age of two. However, the mention of interactiveness in regard to relationships with children and adults is crucial when discussing language development. "Children's active participation in social interaction is also vital to developing complex forms of language" (Martin & Fabes, 2006, p. 196). And "understanding the role of digital technologies in the processes of young children's literacy development is crucial to ensure that all children have equal access to opportunities to learn in schools today" (Wolfe & Flewitt, 2010, p. 397).

So, rich language development may be dependent on the abounding interactions with language that can be provided with, again, adults, older siblings, and other caregivers. A static, one-dimensional television screen does not develop language. However, the discussion of the topic and age-appropriate television program discussed with and viewed by the caregiver and the 4-year-old has the potential to enhance language.

Tools

Take, for example, the Public Broadcasting System (PBS) which brought us Sesame Street®, Mister Rogers®, and Barney®. These programs, when viewed together, tackled important concepts and demonstrated language in multiple ways. Today's children have far more sophisticated programming. However, it is still best viewed together, where interactions can occur between the viewers (adult and child), questions can be answered, language can be expanded, and misinterpretations corrected. PBS was and is a leader in technological display and means for learning. Along with their exceptional television programming, their Web site now offers multiple educational games and videos to be enjoyed by adults and children together.

There are multiple means today though, which can assist in the development of language and literacy. In addition to the pleasure of the feel, the smell, the texture of the "low-tech" traditional book, there are other ways to enjoy them. For example, Tumblebooks® offers e-books for purchase, though often, these books may be "borrowed" from cyber-libraries around the country. Downloaded to a tablet, phone, or computer, these stories can be enjoyed by adult and child. Like other tablet/computer options, illustrations often come "alive." The text can be read by the computer or read aloud by a caregiver. Interactive books are available by multiple vendors.

We know of the multiple benefits of shared book reading, but the tablet offers the option of many books on one device. In cars, planes, and trains, the tablet containing many books takes the place of hauling multiple books. The reader and listener can still enjoy the book in its original form, though the form is now flat and page-turning becomes a swipe. Concepts about print (CAP) can still be noted and learned, the colors are just as vibrant on the device, print size can be diminished or escalated, and books can be purchased, often, at bargain prices.

Applications on tablets and other devices are also available. Take sight discrimination as an important feature when learning to decode. Understanding the shapes of the letters and their combinations assists in later decoding and may be strengthened by exercises which involve looking for certain pictures, letters, icons. The popularity of the *Where's Waldo* (Hanford 1997) books and *I Spy* (Marzollo) had their precursor in the popular "hidden pictures" feature of *Highlights* magazine. Many baby boomers may remember seeking and circling the hidden pictures with a parent or older sibling. Such apps are readily available at low cost or now cost for download to phones or tablets. Highlights® even has such an application.

Another handy literacy tool, and relatively low tech which has gone high tech, is the song. Singing with young children can boost vocabulary through incidental learning when paired with the expertise of an adult.

Mrs. Brown was a master at this in her second grade classroom of the 1960s. Each afternoon, she brought out her autoharp and strummed chords while teaching her charges the words to American folk songs. She painstakingly, and with great pleasure, explained the meaning of the lyrics as young voices lifted songs, centuries old, into the classroom. Joyful, sad, and silly songs were learned adding to vocabulary and building memory capacity in children who thought the songs were just for fun.

Today, Mrs, Brown might use a computerized autoharp with the lyrics being transmitted on a Smartboard®.

Song apps, CDs, and videos can be added to the repertoire of parents, teachers, and caregivers as another means to build language and literacy. Lyrics of songs online and/or printed provide yet another way to expose children to print. Learning the songs, repeating the singing multiple times, and pairing them with the printed materials adds to the power of the literacy interaction between child and adult. This does not even take into account the applications which highlight the words in stories and songs as the words are spoken or sung. Caution is urged, however, so that these functions do not serve as a deterrent to learners by distracting them. Apps are plentiful and easily downloadable.

Although it is tempting for parents to let children simply learn the apps and games on their own, it is better to work with the child. Although a matching game may be easy to decipher, and beneficial to the child, expanding on the game through use of vocabulary and asking probing questions can be of more lasting benefit. For example, when using I-Tunes *Vocal Zoo*®, Sweeny (2011) suggests "this app could be used to build vocabulary by asking your child to find a particular animal, or more advanced auditory comprehension (and complex sentence modeling) were you to use descriptive attributes in exploring this app with your child: 'I see an animal that swims AND has a beak. Do you?'" (para. 3).

Language development, as previously noted, is the key to later literacy development that has traditionally encompassed reading and writing. Reading and writing are complementary processes which reinforce one another. Just as reading behaviors emerge, so do writing behaviors. This concurrent development can be capitalized on through the use of various technologies. From the pretend tapping on a keyboard or "writing" through a program in which the child uses his finger as a writing implement, literacy is being grown.

Consider the following: children's first attempts at writing may simply be squiggly lines. But these same lines are often then "read back" to adults. The child is demonstrating his understanding of print, that print carries meaning. Again, this demonstrates the growing understanding and emerging literacy within the child. The astute adult will use all means to encourage this "writing" knowing that it will reinforce his reading both in the exploratory and emergent sense.

Applications are bountiful in regard to language development, memory boosting, decoding, traditional reading, singing, phonemic awareness, etc. The applications are continuously created and upgraded. The adult, however, is vital to choosing that which is developmentally appropriate and which provides suitable scaffolds for young learners. Technology and the promotion, scaffolding, and reinforcement of literacy learning are still in early stages. More research is needed to determine the benefits and possible detriments of the practice (Table 5.4).

Wolfe and Flewitt (2010) remind us:

> Central to this field of research using multiple, visual media for data collection and analysis is the development of robust frameworks for the analysis and representation of multimodal activity, and formats for presenting data which facilitate the reconstruction and interpretation of sequences of non-verbal and verbal interaction that are often intricately interwoven and overlapping. (p. 397)

Table 5.4 Examples of tools applied to standards

NAEYC	All teaching practices should be appropriate to children's age and developmental status, attuned to them as unique individuals, and responsive to the social and cultural contexts in which they live.	Application: Technological applications should be appropriate for the age. Interaction with adults is vital to the development of language.
NCTE	These standards assume that literacy growth begins before children enter school as they experience and experiment with literacy activities—reading and writing, and associating spoken words with their graphic representations. They encourage the development of curriculum and instruction that make productive use of the emerging literacy abilities that children bring to school.	Application: Children are developing in the areas of language and emergent literacy from infancy. Care and intentionality is important in choosing ways to best foster the growth of this emerging literacy.
NAEYC/IRA	To reach these outcomes, teaching practices must be appropriate and effective for *young* children, not just adaptations of what may work in the later grades. These practices must respond to young children's changing developmental characteristics as well as to their culture, language, and individual learning needs. (p. 1)	Application: The escalation of curriculum, concepts, skills through technological means is cautioned.

We must also consider, "early childhood education professionals may be 'missing the boat' if the wide array of twenty-first century developmentally appropriate technologies are not integrated into today's classrooms" (Parette et al., 2013, p. 171).

Productivity and Creativity Tools

Applications and programs which assist in the development of language and literacy flourish in today's society. From art tools which can be used on a iPad, smart board, or pad cam, tools which permit children to produce items related to literacy are available and often, inexpensive.

Using a Language Experience Approach, teachers of young children can elicit words, phrases, and stories from young children. These stories placed in a word processing program, such as Word®, can then be printed into personalized books which young readers can read based on their own lived experiences which provide extra cues for the young reader. Illustrations can be added using similar programs, such as Kids Paint HD®, in which children can draw or paint.

Likewise, there are also apps which create book. Book Creator® for the iPad provides the opportunities for fledging authors to create their personalized books.

Communication and Collaboration Tools

Using the iPad and other such tablets for communication have gained favor in the autism community as well as for others who may have communication difficulties. This assistive technology may have other applications for children who have delayed speech, thus offering some relief from the frustration of trying to communicate without the use of speech.

Other Tools

Applications exist also for practice. These skill building activities do not offer the creativity and the ability to collaborate or communicate. Usually in the form of games, they offer the gamer the opportunity to rotely apply knowledge. Akin to worksheets on a tablet or phone, many do permit the player to enjoy the practice while advancing in levels or difficulty. Also, they do provide rapid feedback to the player to reinforce or remediate.

Conclusions

The use of technology to encourage and nurture early language development and literacy is still in its early stages. There may be many untapped applications of technology to assist young children as they grasp the complexities of language. It is clear that some parents see technology as beneficial, tentative, and cautionary. As Pasnik and Llorente (2012) report in their *2012 Study of Preschool Parents and Caregivers Use of Technology* and *PBS KIDS Transmedia Resources*:

Parents believe that technology is a powerful support for learning, see technology skills as a necessary part of their child's twenty-first-century education, and support use of technology in the classroom with certain limits.

- Although television and computers are the most commonly used technologies, many children have access to a variety of digital devices within their homes.
- Parents tend to associate specific media platforms with learning, often pairing a device's form with its potential to be educational.
- Despite generally positive attitudes towards technology and its ability to support learning, parents express concern that too much technology can keep children from other healthy experiences and they limit its use.
- Although many parents choose to set limits on their children's media use, these limits vary by family and by the age of the child.
- Parents gravitate toward television programs, Web sites, and digital games designed specifically for children by PBS, Nickelodeon, and Disney.

- Although families move fluidly through a great many programs and digital activities, the promise of learning undergirds many of the decisions parents make.
- Home technology-infused routines can be social, as digital play is an occasion for children to watch, explore, and play together with their parents and other family members.
- Parents engage in a wide variety of roles when it comes to media engagement, from technology provider to monitor to learning supporter.
- Parents look to the media, other adults, and their child's school for information when making decisions about children's technology use.
- Parents have a growing appetite for educational technological resources and would like to have more time to use them with their children. (p. 4)

We have only begun to tap this important resource. The many facets of technology and the assistance that technology may be able to offer should not be ignored.

Application Activities

Idea 1

Using a tablet, have the learner produce their writing individually. Export this writing into cyber-portfolios as examples and baselines for certain points during the year to document growth across time. This could involve both samples of handwriting, as well as examples of their samples of stories and nonfiction items.

Idea 2

Use a tablet for sharing stories with a small group of young children or an individual. Teach the children how to turn pages by modeling on the tablet. Let children explore the tablet and learn to read stories on the tablet or retell stories using the tablet.

Idea 3

Create a list of current apps for parents to promote language and literacy development.

Idea 4

Locate apps and Web sites which have familiar children's songs. Display them to children on a Smartboard or pad cam. Sing along! Provide lyrics in a "songbook" which children can illustrate and use in subsequent sing-alongs.

Idea 5

Conduct a current scan of apps and programs. Determine which are developmentally appropriate for the learner with whom you work. Can some be used for enrichment? For remediation? Which allow for enhanced creativity and development? Can they be used to accommodate the needs of learners? What benefits and toes to standards do they demonstrate?

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Chapter 6
Reading and Writing

Michael R. Sampson

Key Questions

1. What is the relationship between reading and writing?
2. Has technology changed the way writers write?
3. Does the technology we use today to read text change the way we read?
4. What are some ways teachers can engage students in the reading and writing process using technology?

Language, Reading, and Writing: The Beginnings

What is reading? It's talk, or language, written down. Thus, we can't discuss reading without talking about the foundation of written language—oral language, and its connection to reading. Roach Van Allen (1999), the father of the Language Experience Approach (LEA), captured it best:

> What I can think about, I can talk about…
> What I talk about, I can write (or someone else can write for me)…
> What I can write, I can read…
> I can read what others write for me to read. (p. 41)

For beginning readers, creating a bridge between oral and written language is essential for success. To create a text that children can read, the teacher can write, on a chalkboard or an iPad, as the child talks. This written text then becomes the material for reading and writing instruction. Because the student wrote it, she or he can read it. And comprehend it as well, as the text is a reflection of the language and experience of the child. LEA is a concrete way to help students see that talk is a

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R. Papa (ed.), *Media Rich Instruction: Connecting Curriculum To All Learners*,
DOI 10.1007/978-3-319-00152-4_6, © Springer Science+Business Media New York 2015

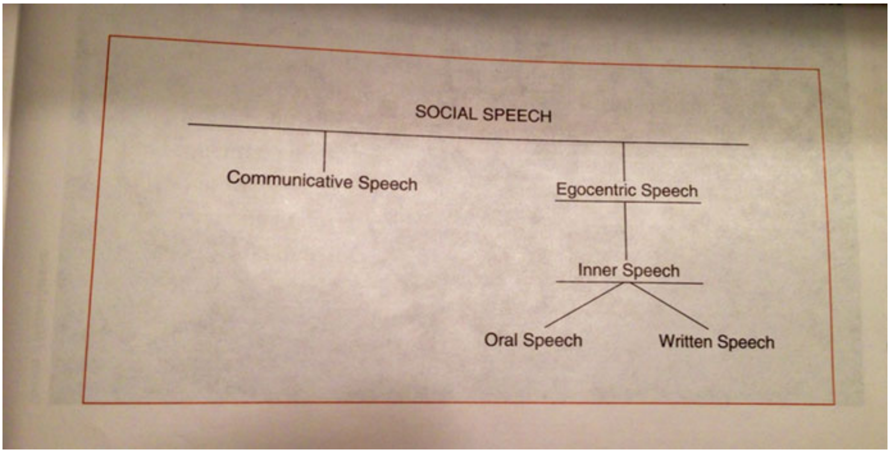

Fig. 6.1 From thought to communication

reflection of experiences and thought, writing is a reflection of talk, and reading is a way to unlock writing and understand the experiences and thoughts of the author.

As children move to independent reading of more sophisticated texts written by others, there is a need to deeper understand what that writing is refined and edited language.

Our definition about what writing is has been significantly influenced by the theories of the Russian linguist Lev Vygotsky. Like Allen, Vygotsky believed speaking and writing to be linked and that, in fact, oral language is the baseline for writing. Vygotsky noted that children's development of communication skills, including writing, developed and progressed from social speech (Vygotsky, 1962). Such speech includes what Vygotsky termed *communicative speech and egocentric speech*. Learners use communicative speech for telling their caregiver they are need to go to the bathroom, they want to play with an iPad, or asking if they can play outside. Egocentric speech is used as children solve problems and carry out activities, and helps students express, and perhaps overcome, difficulties: Three-year-old Michelle was overheard saying, as she became aggravated with a puzzle, "These pieces don't fit, I need some help!" She was clearly vocalizing her thoughts.

Vygotsky, (1962, 1978) considered egocentric speech to be the transition from vocal to inner speech. Inner speech is brief and transformed speech—explosions of thoughts and insights that are to pure meanings. These thoughts are what lead to written communication. Writing occurs through the translation of inner speech into the forms of scribbles, drawings, and words or phrases. Figure 6.1 shows the relationships that exist between inner speech and oral and written communications.

Writers often use inner speech to "think out loud" about what they want to express in their written communication. Ideas typically begin with images, but images soon become inner speech with voice. Writers must learn to listen to their inner voice, or their "stream of consciousness," as they learn to turn thoughts into print (Moffett, 1981).

Teachers must be careful not to interfere with the natural cycle of self-expression by demanding that children write before they are ready to write, or write about something they don't know about. Frank Smith (1993), states Vygotsky's concept clearly: "Anything the child can do with help today, the child will be able to do alone tomorrow. There is, therefore, no point in teaching anything a child does not immediately understand or find relevant" (p. 66).

The Writing Process: Developing Student Authors

Since reading is talk written down, there clearly is a relationship between language and writing. But good writing is more sophisticated and refined that simple speech. How may teachers help students refine their craft as writers? One way to build stronger writing skills is to engage student in the writing process by studying the writing of the authors they read, and using the writing styles of those authors in their personal writing. And when students view themselves as authors, they become more critical readers. Graves and Hansen (1983) break this process into three phases. *Replication* involves children becoming authors by writing their own books. As students struggle to capture their thoughts to text, they are doing what authors do. The second phase, *transition*, is marked by the growing awareness of students that they are writers, just like the authors who wrote the books on display in their classroom and in the school library. *Option-awareness*, the third phase, grows out of writing conferences among and between the teachers and other writers in the room as students question the organization and style of manuscripts written by classmates. The result is "at first an author is distant, then an author is self, finally the self-author questions all authors and assertive readers emerge" (Graves & Hansen, 1983, p. 181).

The teacher plays a critical role in developing writers as they model the writing process and serve as a mentor to student authors. Students must see that their teacher is a reader, and a writer. Graves (1986) puts it best—"It is the literate lives we lead, far more than methodology, that we bring to children: (p. 122). Teachers must show or model to students that reading, as well as writing, is both a pleasure and a tool in daily life.

We next turn our attention to how technology in a media rich environment can facilitate the writing process.

Technology and the Writing Process

The advancement of technology has fundamentally changed how many authors write. Just as e-books are pushing hard copy books off of bookshelves, the computer, iPad, and other electronic tools are replacing notebooks and writing pads in the writing process. In a recent study of best selling professional authors, Sampson and Leung (2008) reported that 80 % of the authors in their study exclusively compose their works on a computer. Sixteen percent use a combination of writing pads and a computer, while only 4 % write their stories on paper. In discussing his switch to electronic writing, Alan Brennert, author of many *Twilight Zone* and *The Outer Limits* television episodes and the novels *Time and Chance*, *Palisades Park*, and *Honolulu*, pointed out that the speed and readability of his handwriting was the issue: “Occasionally I might write a few paragraphs by hand, but there's a reason I mostly write on a computer. I nearly failed penmanship in school.” Young adult author Adrian Fogelin sometimes writes by hand “for variety.” She also uses voice recognition software in her work. She reports “I did it initially to save my hands, but I find that it makes the tone of my writing more natural.”

Students in schools are also making heavy use of technology, both in reading and in writing. Almost all (95 %) of teens use the Internet, and the percentage using smartphones to go online has reached 37 %, according to the Pew Research Center (Madden, Lenhart, Duggan, Cortesi, & Gasser, 2013). A 2012 Pew report found that teens send an average of 60 text messages a day. Clearly, students have shifted from writing on paper to writing on smartphone and computers.

Leaders from the National Governors Association Center for Best Practices (NGA Center) and the Council of Chief State School Officers (CCSSO) who created the Common Core State Standards, did not include the teaching of cursive writing in the standards. Their reason? Children in a digital age must master computer keyboarding; that skill is more important in the twenty-first century than is cursive writing. However, there has been a conservative backlash. One vocal opponent to dropping the teaching of cursive is Linden Bateman, a 72-year-old state representative from Idaho, who provides this strange logic: "The Constitution of the United States is written in cursive. Think about that" (Symthe, 2013). Seven states—California, Idaho, Indiana, Kansas, Massachusetts, North Carolina, and Utah—have forced their state departments of education to keep the cursive requirement. But the future is clear—there is no doubt that writing will increasing be done using electronic media tools.

E-Books and Reading Comprehension

The reading transition from paper to digital print is well underway among certain segments of our population. On a recent airline flight, the author observed that half the travelers were reading from smartphones, Kindles, or iPads and half from traditional novels. In elementary school libraries, budgets are being adjusted to add more and more e-books to the collection. Authors receive royalties from digital sales that are five times higher than print sales, and are pleased that their books never have to go out of print because of e-book options. But do students and adult readers read from E-Texts as effectively as they do paper text? And how do they feel about reading from digital as opposed to paper copies of books?

One would think that students of the twenty-first century, given their life span in the digital age (digital natives), would be more accustomed to and prefer e-books over hard copy text in books. But one study (Shaffer, 2012) suggests otherwise. His research shows that the students in his study strongly preferred paper over digital texts.

Another assumption is that the reader friendly features of digital text, including bookmarking, jumping to the Web for more in-depth information, and searching the text would lead to increased learning and comprehension. Some studies show this. However, other research studies indicate this is not the case.

In a study comparing students reading performance between digital text and paper text, Kerr and Symons (2006) found that children's reading rate and comprehension varied between the two formats. Reading speed was slower on the computer, but comprehension was higher. Comprehension was accessed using both recall and inference functions.

In a direct contradiction to these findings, Mangen, Walgermo, and Bronnick (2013) found that students who read texts in paper format scored significantly higher on reading comprehension and word recognition measures than students who read the texts digitally. Measures included pretests and posttests in reading comprehension, word reading, and vocabulary. Subjects were Norwegian 10th grade students. The students read non-interactive PDF files.

The bottom line is that the debate between comprehension levels between paper and digital texts that argues that students do better with traditional books is a mute one. There is no question that in the future virtually all texts will be digital and that reading comprehension and vocabulary knowledge will be enhanced (Abrams, 2013). Thus, as educators, we need to accept that fact and work on developing teaching strategies that enhance student success with digital texts. We will share several promising strategies in the application section at the end of this article.

Professional Standards: International Reading Association

In their new *Standards 2010* document, the International Reading Association (IRA) identifies what reading professionals should know and be able to accomplish with students. The IRA identifies the performance criteria recommended for assessing the competency of reading educators and provides templates on how to design programs to promote this competence.

New to the 2010 update are two new professional role categories: (1) the middle and high school content teacher and (2) the middle and high school reading classroom teacher. In addition, added attention has been given to the IRA diversity standard, and the urgent need for preparing reading teachers to teach students from diverse student populations.

Standards 2010 also provides matrixes that list each role with the corresponding elements of each standard; this helps teachers and program leaders to view a specific standard's element and its description across all roles.

Use a wide range of texts (e.g., narrative, expository, and poetry) from traditional print, digital, and online resources.	• Demonstrate knowledge of and a critical stance toward a wide variety of quality traditional print, digital, and online resources. • Support classroom teachers in building and using a quality, accessible classroom library and materials collection that meets the specific needs and abilities of all learners. [Reading specialists may provide support through modeling, coteaching, observing, planning, and providing resources.] • Lead collaborative school efforts to evaluate, select, and use a variety of instructional materials to meet the specific needs and abilities of all learners

Fig. 6.2 International reading association standard 2:3

The six standards are:

- Standard 1: Foundational Knowledge
- Standard 2: Curriculum and Instruction
- Standard 3: Assessment and Evaluation
- Standard 4: Diversity
- Standard 5: Literate Environment
- Standard 6: Professional Learning and Leadership

The reading of non-paper sources is specifically addressed in Standard 2: Curriculum and Instruction. The standard calls for teachers to use a wide range of texts, to include digital and online resources (see Fig. 6.2).

New Literacies Strategies: Vignettes

Interactive Writing

Jon Tyler is a 4th grade teacher who knows how to unleash the power of the Internet in his teaching. Jon uses the concepts advocated by McCarrier, Pinnell, and Fountas (2000) in their Interactive Writing strategy termed "Share the Pen." But he has morphed it into a shared online text that the class contributes to on evenings and weekends. During school days, the class review the latest contributions and are encouraged to ask the author contributor of a new paragraph their thinking process and to see if they wish to make edits after the class discussion. Each month, the class completes an exciting new **YA novel** that has been co-written on line. The new novel is "published" by the class and includes cover art with the PDF publication.

Fig. 6.3 A five-year-old playing Gold Rush! Permission from Ms. Michelle Ivanna Sampson, age 5, was granted

Gold Rush!

Michael Kharchenko, a game designer by trade, is a parent volunteer in his son's kindergarten class. Michael comes by the class twice a week during center time and leads a group of eight 5-year-olds in their quest to discover gold in California. The interactive computer "game" Gold Rush! serves as the platform for the adventure. The game features the excitement of the California Gold Rush. Actually an interactive novel, the children live the role of Jerrod, a young man living in Brooklyn when the story begins. Players are asked to sell their house, pack their bags, and choose among three routes to California from New York. Expedition one takes you by ship to Panama, where you have to cross by through foot through the rainforest and jungles of Central America to the Pacific. Expedition two crosses the heartland of the North America by steamer, stagecoach, and wagon train; Expedition three takes the long, perilous journey from New York around the tip of Cape Horn before sailing northward to California. The game is historically and geographically accurate. Thus, children learn history and geography as they play. But most of all they learn about the relationship between oral and written language as the teacher aide types in the commands children give him and talks out loud about the story as it progresses. At the end of the 12-week adventure that included three all three expeditions, the children were very disappointed to see the story end. It was definitely the children's favorite center. Figure 6.3 contains a screen shot from the game.

Fig. 6.4 Cover of a Web Book created by ten-year-old Josephine. Permission from Ms. Josephine Rosemary Papa-Shorts, age 10, was granted. This RealeBook was created and sent using our RealeWriter ("Really Writer") software

Web Books

Josephine Papa-Shorts, age 10, became excited about Web Books after discovering them on the Web. She chose to do a book on her school, Foundation Montessori, in the Chicago area. This simple picture book produced by Josephine on a computer and required only a digital camera or smartphone and Internet access. Josephine published to a site that contained not only her book but also books from other children around the world (Condon and McGuffee 2001). This, both the writing process and the reading process was enhanced using this digital technology (Fig. 6.4).

Conclusions

This chapter informed the reader on the relationship between reading and writing, especially to identify the changes to the relationship that technology brings. Language acquisition and self-expression have rapidly moved from paper to digital print and social media expression. Using digital media, recognizing it is ubiquitous, must be matched with promising pedagogical e-strategies that engages students successfully.

Application Activities

Idea 1

In your university classroom, design a social media activity using Facebook, Twitter, Blog, Instagram, etc., to discuss the writing process and best practices in teaching school age students to write.

Idea 2

Visit the NCATE/CAEP Web site (www.ncate.org) and read the section on the International Reading Association SPA on Reading Education (http://ncate.org/Standards/ProgramStandardsandReportForms/tabid/676/Default.aspx#IRA_ Next, compare your reading program to these standards.

Idea 3

Visit with learners of different ages and discuss technology use, including how they use the technology for writing with them. Be sure to include a preschooler and note their proficient with tablets and smartphones.

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Chapter 7
Points of Intersection: Mathematics Teaching and Learning with and Through Education Technology

Vicki Ross, Jennifer Prior, and Shannon Guerrero

Key Questions

1. What are the mathematical practices?
2. Why are the mathematical practices important in mathematics education?
3. Why bring a focus on the mathematical practices when considering integrating mathematics education and technology?
4. How can the mathematical practices be integrated with technology?

What Are the Mathematical Practices?

This past decade has seen the introduction of a set of national standards for education in the USA known as the Common Core State Standards (CCSS). At present, there are two subject areas being introduced to classrooms in 47 states (although the number of states implementing these standards changes periodically): the English Language Arts (CCSS-ELA) and Mathematics (CCSS-M). In this chapter, because we are concerned with the effective integration of technology into mathematics teaching and learning, we focus on the mathematics standards. The CCSS-M are organized into

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R. Papa (ed.), *Media Rich Instruction: Connecting Curriculum To All Learners*,
DOI 10.1007/978-3-319-00152-4_7,

mathematical domains and mathematical practices. According to the published standards (which you can access at corestandards.org) the mathematical practices "describes varieties of expertise that mathematics educators at all levels should seek to develop in their students" (Common Core State Standards Initiative 2012). The mathematical practices are to be implemented at all grades throughout math instruction. They are overarching in nature, whereas the domains are more content specific. There are eight mathematical practices (MP) outlined in the CCSS (corestandards.org):

CCSS-MP 1: Make sense of problems and persevere in solving them.
CCSS-MP 2: Reason abstractly and quantitatively.
CCSS-MP 3: Construct viable arguments and critique the reasoning of others.
CCSS-MP 4: Model with mathematics.
CCSS-MP 5: Use appropriate tools strategically.
CCSS-MP 6: Attend to precision.
CCSS-MP 7: Look for and make use of structure.
CCSS-MP 8: Look for and express regularity in repeated reasoning.

As we move further into this chapter, we will look more closely at the CCSS-MPs to develop a richer understanding and description of what these standards might mean for classroom practice. To begin developing that understanding, we explore the importance of these standards to mathematics education.

Why Are the Mathematical Practices Important in Mathematics Education?

Since the 1980s, we have seen an increasing emphasis in mathematics teaching and learning on the processes involved in learning mathematics. Earlier mathematics instruction, like the Back to the Basics Movement of the 1970s and 1980s, tended to exclusively focus on facts and procedures. In response to this approach, the National Council of Teachers of Mathematics (NCTM) developed a series of publications (1980, 1991, 2000) in which the organization outlined the processes necessary for becoming mathematical thinkers. These "process standards" were descriptions of how learners should attain and apply mathematics content. In many ways the process standards foreshadowed the new mathematical practices. These overarching mathematical practices are important in mathematics education for several reasons:

1. They portray mathematics as an important way of making meaning of the world.
2. They focus on mathematical thinking processes, and thus they push mathematics instruction beyond "the what and how" and into "the why" of mathematics learning.
3. They involve students in problem solving and higher order, critical, thinking skills.
4. They invite a flexibility in thinking about problem situations and move away from the notion of a one and only "correct" approach or entry point to a problem.

In short, the Standards of Mathematical Practice describe the "process and proficiencies" that students should possess in order to use and apply the content knowledge and skills developed through the Common Core State Standards for Mathematics. They incorporate, among other things, elemental facets of mathematical proficiency, problem solving, reasoning, and efficacy. These thinking skills and applications are specific to mathematics and lay the groundwork for lifelong learning and use of mathematics in our personal and professional lives.

Why Bring a Focus on the Mathematical Practices When Considering Integrating Mathematics Education and Technology?

For several decades there has been a commitment to the use of technology in mathematics instruction. In *Principles and Standards for Mathematics Education* (2000) NCTM's commitment and the underlying assumptions about technology's place in mathematics education were spelled out in the Technology Principle, which says "Technology is essential in teaching and learning mathematics; it influences the mathematics that is taught and enhances students' learning" (NCTM, p. 24). In a joint position statement, the National Association of Educators of Young Children (NAEYC), with NCTM, echoes this belief: Technology use requires "… thoughtful, informed decision-making in order for children's learning experiences to be rich and productive" (2002, p. 9). Experts in the field of Early Childhood Education note, however, that it is important to consider the kinds of technology programs that help in the development of conceptual knowledge, rather than focusing on skill and drill kinds of games (i.e., Shin, Sutherland, Norris, & Soloway 2012). Others (Samara & Clements 2002) argue that the computer programs that focus on mathematics learning tend toward the entertainment side of the spectrum and present more of a superficial treatment of mathematics. This concern is borne out in the literature in the field. While there exists a continuing commitment to utilizing the vast array of technological enhancements into mathematics teaching and learning, research seems, surprisingly, inconclusive about the overall gains in mathematics learning that are attributable to the use of technology. In a recent survey of research related to the effects of education technology, Condie and Munro (2007) summarize that the evidence related to achievement is "somewhat inconsistent" (p. 4) and calls for further research. In fact, research indicates that the effect on achievement is reliant on the ways in which technology is used to promote conceptual understandings versus computational procedures and memorization of basic facts. Notwithstanding the need for more study in this area, we feel that the linking of the mathematical practices with the new education technology standards is a powerful strategy. By teaming the mathematical practices with the National Education Technology Standards for Students (NETS*S), we shift from the more rote learning, routinized approaches to mathematics learning, to a more creative, problem-solving orientation. Bringing a focus on the mathematical practices to the integration of technology more effectively meets the International Society for Technology in Education (ISTE) standards, as well. The organization recently (2007) set out new expectations for student learning in their NETS*S.

International Society for Technology in Education NETS*S

NETS*S, Standard 1: Creativity and Innovation
NETS*S, Standard 2: Communication and Collaboration
NETS*S, Standard 3: Research and Information Fluency
NETS*S, Standard 4: Critical Thinking, Problem Solving, and Decision Making
NETS*S, Standard 5: Digital Citizenship
NETS*S, Standard 6: Technology Operations and Concepts

How Can the Mathematical Practices Be Integrated with Technology?

Finding the points of intersection between these two sets of standards is helpful as we consider ways of effectively using technology to enhance mathematics teaching and learning. We find this analysis even more useful when we include the substandards for each of the NETS*S in the exploration. Table 7.1 shows the relationship between these NETS*S and substandards and the CCSS-MPs. What we notice immediately is that there are four of the six NETS*S that have quite close connections with the MPs.

Table 7.1 Points of intersection between the NETS*S and the CCSS-MPs

NETS*S 1 *Creativity and Innovation* Students demonstrate creative thinking, construct knowledge, and develop innovative products and processes using technology.	Apply existing knowledge to generate new ideas, products, or processes Create original works as a means of personal or group expression Use models and simulations to explore complex systems and issues Identify trends and forecast possibilities	MP 4: Model with Mathematics MP 7: Look for and make use of structure MP 8: Look for and express regularity in repeated reasoning
NETS*S 2 *Communication and Collaboration* Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others.	Interact, collaborate, and publish with peers, experts, or others employing a variety of digital environments and media Communicate information and ideas effectively to multiple audiences using a variety of media and formats Develop cultural understanding and global awareness by engaging with learners of other culture Contribute to project teams to produce original works or solve problems	MP 3: Construct viable arguments and critique the reasoning of others MP 1: Make sense of problems and persevere in solving them MP 2: Reason abstractly and quantitatively MP 6: Attend to precision

(continued)

Table 7.1 (continued)

NETS*S 3 ***Research and Information Fluency*** Students apply digital tools to gather, evaluate, and use information.	Plan strategies to guide inquiry	MP 1: Make sense of problems and persevere in solving them
	Locate, organize, analyze, evaluate, synthesize, and ethically use information from a variety of sources and media	MP 3: Construct viable arguments and critique the reasoning of others MP 6: Attend to precision
	Evaluate and select information sources and digital tools based on the appropriateness to specific task	MP 5: Use appropriate tools strategically
	Process data and report results	MP 2: Reason abstractly and quantitatively MP 3: Construct viable arguments and critique the reasoning of others MP 4: Model with mathematics MP 6: Attend to precision MP 7: Look for and make use of structure MP 8: Look for and express regularity in repeated reasoning
NETS*S 4 ***Critical Thinking*** Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.	Identify and define authentic problems and significant questions for investigation	MP 1: Make sense of problems and persevere in solving them
	Plan and manage activities to develop a solution or complete a project	MP 1: Make sense of problems and persevere in solving them MP 4: Model with mathematics
	Collect and analyze data to identify solutions and/or make informed decisions	MP 2: Reason abstractly and quantitatively MP 4: Model with mathematics MP 5: Use appropriate tools strategically MP 6: Attend to precision MP 7: Look for and make use of structure MP 8: Look for and express regularity in repeated reasoning
	Use multiple processes and diverse perspectives to explore alternative solutions	MP 3: Construct viable arguments and critique the reasoning of others

(continued)

Table 7.1 (continued)

NETS*S 5 ***Digital Citizenship*** Students understand human, cultural, and societal issues related to technology and practice legal and ethical behavior.	Advocate and practice safe, legal, and responsible use of information and technology Exhibit a positive attitude toward using technology that supports collaboration, learning, and productivity Demonstrate personal responsibility for lifelong learning Exhibit leadership for digital citizenship	
NETS*S 6 ***Technology Operations and Concepts*** Students demonstrate a sound understanding of technology concepts, systems, and operations.	Understand and use technology systems Select and use applications effectively and productively Troubleshoot systems and applications Transfer current knowledge to learning of new technologies	MP 5: Use appropriate tools strategically

NETS*S 1: Creativity and Innovation

NETS*S 1 focuses on three interrelated areas: creative thinking, knowledge construction, and the development of innovative products and processes using technology. Other authors in this book have discussed, in their chapters, the notion of creativity and its importance in teaching and learning. Therefore, in this chapter on integrating technology into mathematics education, we feel it both pertinent and beneficial to bring to the fore the aspect of knowledge construction. In this first classroom vignette, we illustrate how this education technology standard can be interwoven with these three mathematical practices: MP 4, model with mathematics; MP 7, look for and make use of structure; and MP 8, look for and express regularity in repeated reasoning, as illustrated in this classroom vignette.

As Ms. Rodriguez encourages her fifth-grade students in exploring mathematics, she is helping them to be creative and innovative, and she is living out, what we see as, a belief that the construction of knowledge is fundamentally a creative act on the part of learners.

Of course, constructivist approaches to teaching mathematics have been recommended for decades, echoing an argument and call that harkens back to Dewey's *Pedagogic Creed* (1987, p. 77–80) written at the end of the nineteenth century. He argues that the learner is both an individual, with "capacities, interests, and habits" that, through the process of education need to be "translated into terms of their

Table 7.2 Classroom Example 1

Common Core State Standard Addressed:

5.OA.B.3 Generate two numerical patterns using two given rules. Identify apparent relationships between corresponding terms. Form ordered pairs consisting of corresponding terms from the two patterns, and graph the ordered pairs on a coordinate plane. *For example, given the rule "Add 3" and the starting number 0, and given the rule "Add 6" and the starting number 0, generate terms in the resulting sequences, and observe that the terms in one sequence are twice the corresponding terms in the other sequence. Explain informally why this is so.*

"I see that on the first day Pong Lo receives 1 grain of rice. Day 2, he gets 2 grains. So, they could be adding one grain of rice each day for the squares on the checkerboard. But, on the next square, we have 4 grains because it doubles every time." Ms. Rodriguez is nodding her head as she listens to Kevin summarize what he and his group are doing. She is circulating through her classroom, checking her students' progress on an exploration activity she has set in motion for her students this morning. It is still early in the investigation.

"It would be a good idea for you to continue with the work a bit longer. This idea of 'doubling' sounds interesting though. If we double a number, we multiply by 2, right? Is that what we're finding here? Are we multiplying the number of days by 2?" She pauses as the children look at their data. "I wonder how you might represent what you are seeing the number, and the relationship between those numbers, on your data sheet? What might a rule look like for your numbers to follow?" She pauses, and adds, "Maybe someone in your group could check back on the data from the story yesterday."

Ms. Rodriguez teaches fifth grade, and this week her students are exploring patterns and rules regarding relationships between numbers and terms. Additionally, she is preparing her students to use a coordinate plane to represent those numerical patterns and relationships. Yesterday, she read aloud the book, *A Grain of Rice*, by Helena Clare Pittman. This morning, in class, the fifth graders are investigating, in groups of three, the pattern that emerges in the story.

Through the process of constructing knowledge about relationships and numerical patterns, Ms. Rodriguez recognizes that this is a connecting point for her students regarding the NETS*S 1: Creativity and Innovation through the mathematical practices 4, model with mathematics; 7, look for and make use of structure; and 8, look for and express regularity in repeated reasoning. She structures the groups' investigations in ways that help her students engage in these thinking skills.

At workstations, Ms. Rodriguez has set out for each of the groups the following items: a set of directions/procedures, an iPad, one copy of the book, a chessboard, a cup of rice, and a team data sheet that looks like this:

# of Days/Squares	**# of Grains of Rice**
Day 1	
Day 2	
Day 3	
Day 4	
Day 10	

Once the group has completed the data sheet, students are to develop a set of ordered pairs based on the data. They will plot the pairs on a graph using a graphing tool on their computers. The tool that Ms. Rodriguez is using with her class is one they have used, in earlier investigations, to plot numerical patterns and relationships. (These earlier activities are ones that Ms. Rodriguez introduced and are available at nctm.illuminations/) http://nlvm.usu.edu/en/nav/frames_asid_109_g_2_t_2.html?open=activities&from=topic_t_2.html

A series of questions on the direction/procedure sheet for this activity asks the students to:

"Discuss with your teammates the pattern that you see from your data collection and graphing work. How did your group use modeling in your investigation, today? If you wanted to know how much rice Pong Lo had on Day 100, how could you figure that out? What kinds of underlying structure do see in this problem? What repeated reasoning were you asked to do? Be prepared, as a group, to present your thinking and justifications to your classmates tomorrow."

(continued)

Table 7.2 (continued)

As the class continues to work through the investigation, Ms. Rodriguez has been using guided questions to help each of the groups move through the exploration. She has now circled back to see how Kevin and his group have progressed. They are creating ordered pairs based on the data they collected. Lauren suggests, "I think we should have the number of days be the 'x' on our graph, so that the changes there are more like: 1, 2, 3. I don't think it works very well to have the big jumps run along the bottom line. Like this," she says, and begins a quick drawing of what she has in mind." The rest of the group is watching. They seem to be in agreement with Lauren.
"Lauren, that's an interesting thought you're sharing." To the rest of Lauren's group, she adds, "What do you think this idea has to do with the question about underlying structure in the problem? That's one of the reflection questions your group needs to take a look at. What are we doing about the graphing tool we're using today? Will that help us with this conversation? Let's pull out the iPad and take a look."

social equivalents" … that the child is both "a social individual and that society is an organic union of individual." Both aspects of the child must be attended to. "If we eliminate the social factor from the child we are left only with an abstraction; if we eliminate the individual factor from society, we are left only with an inert and lifeless mass." A student is not an empty shell to be filled with knowledge; they come to your classroom with prior knowledge that will need to be accessed and called on and which forms the basis of new knowledge that they construct in the interactions with their classmates and you, and all that, together, you do in the lived curriculum in your classroom.

This creative act of constructing knowledge is part of all education, not just in the area of mathematics teaching and learning. However, it is important to acknowledge that initiatives promoting the use of constructivist approaches in mathematics education reached new levels in recent decades with the release of *National Council of Teachers of Mathematics Principles and Standards* (2000). Likewise, we see the same emphasis on construction of knowledge in the joint position from the NCTM/NAETC. The joint position from the National Association for Young Children and the NCTM (2002) makes recommendations for early childhood math programs. These include:

- Focusing on children's natural interest in math in the world around them
- Building on children's experience
- Basing math curriculum on children's development
- Focusing on children's problem-solving and reasoning processes
- Providing a coherent curriculum
- Providing deep interaction with mathematical concepts
- Integrating math throughout the curriculum
- Encouraging play and exploration
- Using appropriate experiences for exploring math concepts
- Continually assessing children's mathematical development

According to these recommendations, young children (as well as the fifth graders in our classroom vignette above) need the opportunity to try out their understanding of mathematical concepts in fun, interesting, interactive ways. They need the opportunity to develop at their own pace and not be forced to understand math concepts in the same way as older children. Exploration should be encouraged. The focus should be on development rather than on right answers. Piaget's work (1964) on the development of children's thinking continually highlights the concepts of *assimilation* and *accommodation* that address children's need to make sense of their world through comparisons between what they know and what they do not yet understand. Piaget emphasizes the need for children to manipulate materials and engage in problem solving, rather than in the repetition of abstract processes that often do not make sense to them. In addition to this, Vygotsky's theory (1981) emphasizes the importance of social interaction in the acquisition of mental functions. Children need to construct their own meaning, as stressed by constructivists, but involvement in social activities plays a strong role in the learning process. These ideas are also highlighted by Piaget and Indelder (1969) and Dewey (1966). These arguments, posited in the constructivist learning tradition, are found in the CCSS-MPs as well. So, it is an important point of intersection to find this constructivist approach prominent within the NETS*S as well.

An underlying reliance on constructivist learning principles in the teaching of mathematics touches each of the three facets of creativity and innovation outlined in this NETS*S, particularly so when we examine the substandards for NETS*S Creativity and Innovation. ***NETS*S 1. A***: Apply existing knowledge to generate new ideas, products, or processes and ***NETS*S 1. B***: Create original works as a means of personal or group expression are fundamental to a constructivist approach to learning mathematics. The first acknowledges the role of existing knowledge in the construction of new knowledge. In mathematics education this goes hand in hand with the idea of allowing students to develop their algorithms and solutions to problems that are meaningful to them. Ms. Rodriguez helps her class apply their existing knowledge as they collect data and create a graphic representation of the structure and pattern they discover. Through the use of reflective questions and ensuing class discussion time for construction of knowledge and justification of argument, Ms. Rodriguez embraces these substandards. NETS*S 1. A—apply existing knowledge to generate new ideas, products, or processes—and NETS*S 1. B—create original works as a means of personal or group expression—in the subject area of mathematics equate to the ability "to generate new ideas, products, or processes" (International Society for Technology in Education (ISTE) 2007). The second alludes to the idea of individual and group collaboration. In mathematics education this substandard might be developed through small group problem-solving activities. Ms. Rodriguez's fifth graders worked through the activity of creating a group data sheet and graph of the function structuring the pattern they discovered. Thus, while the first two substandards do not necessarily map directly onto the

CCSS-MPs, they are necessary for and compatible with a constructivist approach to teaching mathematics. The remaining two NETS*S 1 Creativity and Innovation substandards are more aligned to the CCSS-MPs.

*NETS*S 1. C*

Use models and simulations to explore complex systems and issues is mirrored in the mathematical practices 4, model with mathematics. As explained in the CCSS-MP document, in mathematics, students, when using models, are expected to "identify important quantities in a practical situation and map their relationships." The mathematical "tools" that are suggested in this standard include "diagrams, two-way tables, graphs, flowcharts, and formulas." To the extent that technology can be used to support students in the development of skills and knowledge related to these tools, these standards are completely interchangeable. Here is a great place to integrate technology into mathematics instruction. Tools found within the Xcel suite and other types of tools for graphing (as indicated in Ms. Rodriguez's choice of Web-based graphing tool) naturally fit with this type of modeling.

*NETS*S 1. D*

Identify trends and forecast possibilities relates in important ways to two CCSS-MPs: MP 7, look for and make sense of structure, and MP 8, look for and express regularity in repeated reasoning. Mathematical practice 7 expects students to look for and make use of structure, and as we look to the classroom example, Ms. Rodriguez asks her class to use the structure located with a children's literature selection, mapping that information onto a data sheet and, then, graphing the function to see possibilities and enable forecasting trends. Of course, there are many other ways that students can be engaged in these kinds of thinking skills. Understanding the underlying structures shaping a problem or an experience and the regularity in repeated reasoning are the foundations upon which predictions, whether weather forecasting or economic predictions, can be built. Types of technology integration that would be helpful here include the following.

Questions to Ponder

- At the beginning of the classroom story a set of standards was identified. Would you agree that these standards are addressed in the lesson?
- Think of an interesting way to include NETS*S 5. Explain.
- Think of an interesting way to include NETS*S 6. Explain.

NETS*S 2: Communication and Collaboration

Whereas in the discussion of previous NETS*S we located points of intersection among the various substandards and the CCSS-MPs, in the discussion of NETS*S 2: Communication and Collaboration, the intersection is a different aggregate of connections. As indicated in the above matrix NETS*2 and all of its substandards find a venue for implementation through MP 3, make viable arguments and critique the reasoning of others. We believe that, in the mathematics classroom, communication and collaboration are mainly directed at the creation of viable argument and at the critique of others' reasoning. In this story from Ms. Stewart's classroom, we show how these two sets of standards come together in the construction of mathematical argument.

Table 7.3 Classroom Example 2

Common Core State Standard Addressed: **3.G.A.1.** Understand that shapes in different categories (e.g., rhombuses, rectangles, and others) may share attributes (e.g., having four sides) and that the shared attributes can define a larger category (e.g., quadrilaterals). Recognize rhombuses, rectangles, and squares as examples of quadrilaterals, and draw examples of quadrilaterals that do not belong to any of these subcategories. Being able to use and create a hierarchical classification system is a thinking skill which spans across all subject areas, but in mathematics this week a third-grade class is exploring this concept with shapes. Ms. Stewart wants to help her students understand the concept of classification of objects into categories that can, then, be organized into larger categories. She is guiding her students' geometric investigations toward this goal. In addition to asking her students to explore attributes of shapes, and classify them into categories based on those attributes, Ms. Stewart is facilitating the next conceptual step of using subcategories. Her lesson integrates readily available technology tools to weave in threads from mathematical practices 3 and 6 and threads of NETS*S: Collaboration and Communication. She has incorporated the use of digital photography, Internet resources for research, and PowerPoint into her students' learning. As the final project, Ms. Stewart's third graders will compose and share a "book" with their first-grade reading buddies. This is an exciting day in Ms. Stewart's third-grade classroom. This morning, the students will begin composing their "books." Students are engaged in an investigative project related to geometry that spans several days. The project began on Monday. The class reviewed and charted all that they knew about geometric shapes. The next day, the class took advantage of the sunny, fall weather by taking a walk in the schoolyard and around the neighborhood. Ms. Stewart organized her class into teams of four, and each group was assigned a parent volunteer. She explained to the third graders what they should be attentive to during their outing. "I want you to watch for places where you see geometric shapes. Where do you think you might see geometric shapes as we walk around the schoolyard? Where do you think we might see shapes when we walk around the neighborhood?" She paused, allowing the children to think for a minute. "Share with your team what shapes you think we might see. Everyone takes a turn." The groups discussed the objects they might see for several moments. Then, Ms. Stewart described the parameters of the exercise. "I have listed some different shapes on this checklist. When your group has found one of these shapes and taken a photograph of it, please, put a check in the box beside it." She handed a checklist to each of the parent volunteers. "Now, before we leave," Ms. Stewart continued, "I would like your group to meet to discuss if there's a special topic you what to use to organize your presentation for your first-grade reading buddies. For example, I might want to look at the geometry of traffic signs. With that in mind, it would be important for me to pay special attention on our walk today to what? I want you to have a team idea of what we'd like to be looking for on our walk today."

(continued)

Table 7.3 (continued)

As the groups brainstormed book ideas, Ms. Stewart had a word with the parent volunteers. She specified that the adults were to carry the digital cameras, but the students should be allowed to take the photos. Each child would have two geometric shapes saved in the camera when they returned to school. However, the children were allowed to change their minds about the photographs they took along the way. Either during the trip or immediately after returning to the classroom, please, write out on the checklist the name of the student and which two pictures each student took for their project.

This morning, Ms. Stewart pulls the class together on the carpet for some discussion and instruction for the morning. She models for her students the process of creating their PowerPoint slides. She begins by showing the class the photographs she took. Using the photograph of the triangle, she demonstrates for the class how to add her photograph and her text to a PowerPoint slide. She takes their ideas about what would need to be included in a slide about triangles. Then, she asks the class into what topic this slide might fit. James suggests, “Different Kinds of Triangles,” and Shauna says, “Shapes in Building.” Ms. Stewart, then, talks to the class about the language mathematicians use for explaining triangles (three-sided polygon) and shows the class where they might go to find information related to their shapes. As Ms. Stewart instructs and engages the class in creating a slide together, the third graders direct Ms. Stewart as they create a slide for her second photograph of the tire.

She sends the class, by groups, to their workstations, and there each group finds instructions for creating PowerPoint slides for their “book.” Yesterday, after school, Ms. Stewart uploaded each group’s photographs and placed them into folders on the desktop of the computers the teams would be using. As the students begin to work, Ms. Stewart checks in with each group to track their progress and to help them with any difficulties they have with the technology tools and the mathematical concepts. Ms. Stewart circulates among the students, listening to their conversations and checking their progress.

Jasmine and Katherine are writing drafts of their text for their book. Jasmine says, “We should place this photo on a page for rectangles. It has two long sides that are equal and two short sides that are equal.”

Katherine responds, “Let me see the picture, please, because the two long sides need to face each other and the two short sides need to face each other so you could fold it like a taco and nothing would come over the edges for it to be a rectangle, otherwise it might be the picture of our parallelogram.”

Ms. Stewart comments to the students, “Those sound like some great attributes that you might want to include in your slide. Try to get all of those ideas written into your draft.” She moves to the next group.

“This shape is a quadrilateral. It has four straight sides and four angles, but I don’t think that anybody else noticed it,” says Jose. He and Hannah are researching information related to their two shapes.

“Our book is going to be called, *The Quad Family*. We wanted to make sure we got some quadrilaterals that have irregular shapes, too. Like, look at this flower garden, all the sides are pointing at the driveway. It looks like a big arrow.” Hannah says.

“That is an interesting picture. Great eye! If you were going to give this quadrilateral a name what would it be?” asked Mrs. Stewart.

As Ms. Stewart encourages her third-grade students in composing books to share, she is helping them to collaborate and communicate, and she lives out, what we see as, a belief that fundamentally mathematics is an act of creating and communicating viable argument.

Communication and collaboration are central to the creation of a viable argument. Students are expected to use assumptions, definitions, and results as a basis for their argument; from there, they make conjecture and explore the validity of their conjecture. All of these steps can be, and we argue probably are, an excellent use for collaboration. Students are expected to "justify their conclusions" (Common Core State Standards Initiative 2012) and "communicate them to others" (Common Core State Standards Initiative 2012). Both of these aspects of MP 3 call on communication skills. They are to "respond to the arguments of others" (Common Core State Standards Initiative 2012), which further involves communication and collaboration. "Students at all grades can listen or read the arguments of others, decide whether these arguments make sense, and ask useful questions to clarify or improve the arguments" (Common Core State Standards Initiative 2012). In the mathematics classroom, this focus on argument is central to discourse and dialogue and is the major point of intersection for the NETS*S Communication and Collaboration standard. In that technology supports communication, interaction, and collaboration among learners within a classroom setting and beyond, this standard and its supporting substandards are excellent areas for the integration of technology into mathematics teaching and learning.

In constructing the matrix above, we included MP 1, MP 2, and MP 6 with this standard of communication and collaboration. These mathematical practices are integral to the construction of viable argument and should be included with this standard. We recognize that although these MPs work more toward the service of constructing argument, they are not necessarily in the service of communication and collaboration. These mathematical practices have much more important roles to play in NETS*S 3 and 4 discussed below.

Questions to Ponder

- What other types of advanced preparations might be needed in order to ensure student success?
- What sorts of direction might be helpful to give to parents to make it more likely that the children will be the users of technology in this activity?
- What questions could you pose to students during this activity that would promote digital citizenship?

NET*S 3: Research and Information Fluency

This NETS*S involves students in research and information fluency, asking them to apply digital tools to gather, evaluate, and use information. This education technology standard meshes almost completely within the CCSS-MPs.

If approached from a constructivist learning philosophy, certainly, inquiry plays a role in the learning of mathematics as it pertains to this education technology standard.

Table 7.4 Classroom Example 3

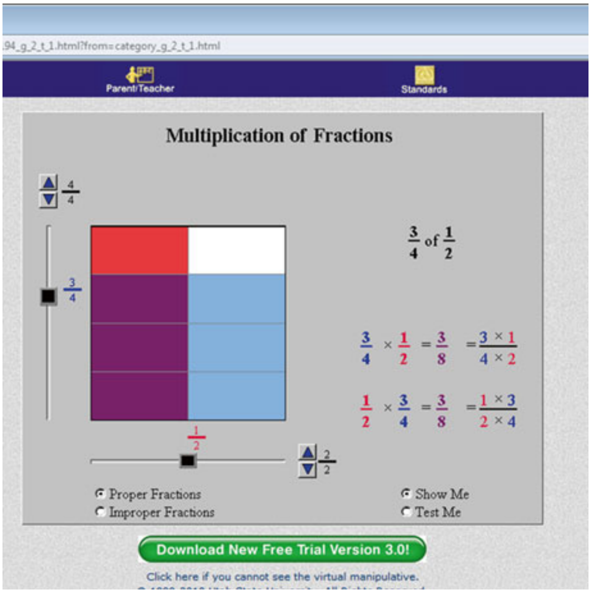
Common Core State Standard Addressed:

5.NF.4.b Apply and extend previous understandings of multiplication to multiply a fraction or a whole number by a fraction. Find the area of a rectangle with fractional side lengths by tiling it with unit squares of the appropriate unit fraction side lengths, and show that the area is the same as would be found by multiplying the side lengths. Multiply fractional side lengths to find areas of rectangles, and represent fraction products as rectangular areas.

Ms. Lahy wants to help students develop and understand the standard algorithm for multiplying fractions through an exploration of patterns applying an area model approach. Working in the computer lab, students use a National Library of Virtual Manipulatives (NLVM) applet for multiplication of fractions (http://nlvm.usu.edu/en/nav/frames_asid_194_g_2_t_1.html?from=category_g_2_t_1.html) to explore several examples of simple fraction times simple fraction. The applet allows students to change the value of a whole (e.g., 2/2, 3/3, 4/4) and use sliders to vary the fractional part of the whole for each factor in the product.

Ms. Lahy structures the activity so that all students have to do several similar problems before exploring the applet with multiplication problems they've created on their own. As they are working through each problem, students are asked to record their fractions, how each fraction is represented as the base or the height of a unit square, and the solution as determined by the double-colored area of the unit square. After the students have had time to perform several explorations using the applet, they are asked to begin drawing conclusions about how to multiply two simple fractions and how that product is connected to the area model.

Jack raises his hand and says that when he multiplied 3/4 by 1/2 he got 3/8. Ms. Lahy asks Jack to come to the instructor computer that projects to the front of the room and explain his thinking and his work. Once Jack recreates his problem, he shows the class how 3/4 by 1/2 created a square with 8 smaller squares and when he found the product, 3 of those 8 squares were colored in both vertically and horizontally. "So that means I can just multiply 3 x 1 to get the 3 in the numerator and 4 x 2 to get the 8 in the denominator!"



Ms. Lahy asks the class if this same approach worked for everyone else and asks another student to come forward and show her work. Maggie goes up to the front board and shows how she used the applet to multiply $2/5 \times 2/3$ to get 4/15. "I did what Jack did and got 4/15 since there are 15 total boxes and 3×5 is 15 and 4 boxes are double colored since 2 x 2 is 4!"

This glimpse into the classroom demonstrates the use of technology as an investigative tool that can be used to guide inquiry and gather, evaluate, and use information. NETS*S 3 promotes inquiry, the use and evaluation of information, and processing of data. Similarly, the corresponding mathematical practices associated with this NET*S center around problem solving, perseverance, modeling, precision, reasoning, and structure.

*NETS*S 3. A*

Ms. Lahy's use of an online applet (in this case she chose the NLVM multiplication of fractions applet, but there are several similar applets and apps available out there) allowed the students the freedom to plan their own investigative strategy for examining the patterns and relationships between two simple fractions, their product, and the area model representation of that area. Although she required students begin with the same set of problems, they were soon able to create, predict, investigate, and refine their own conjectures for an algorithm for the multiplication of two simple fractions. In MP 1, students are encouraged to "… make conjectures about the form and meaning of the solution and plan a solution pathway." Additionally, this activity allowed students to "… monitor and evaluate their progress and change course if necessary." The guided work with open exploration time allowed for student-generated investigation of not only the algorithm itself but a conceptual representation of an often misunderstood procedure.

*NETS*S 3. B*

At first blush, this technology standard may seem less clearly aligned with the mathematical practices than others in this cluster. However, upon further examination, clear connections can be drawn between this standard's use of informational organization, evaluation, and synthesis and the third and sixth mathematical practices of constructing and critiquing mathematical arguments and attention to precision, respectively. As was demonstrated by Ms. Lahy's use of an online applet to promote student-centered investigations, the development, evaluation, and synthesis of the procedural algorithm and the conceptual area model emphasized the need for clear definitions, selection of viable examples to support student-generated conclusions, and explanations that connected an abstract procedure with its concrete representation. The use of technology to promote investigation and present students' solutions required a certain amount of argumentation, critique, and precision. These skills and knowledge clearly connect to the technology standard's emphasis on research and information fluency and the skills associated with this substandard. As part of individual computer work and whole-class presentations and discussions, students are expected to "examine claims and make explicit use" of their findings in the analysis, evaluation, and synthesis of information related to multiplication of simple fractions.

*NET*S 3. C*

In the third substandard for NET*S 3 students are to evaluate and use information and tools appropriate to the task. Though Ms. Lahy selected the tool on the students' behalf, they were required to use the tool and the information generated from their investigation in authentic ways to draw mathematical conclusions. In a similar vein, the fifth mathematical practice wants students to learn to use appropriate tools strategically. Simply plugging in various numbers, without understanding the representation of the whole and the representation of each of the individual fraction factors, would not have been an appropriate use of the information presented on the applet or of the technology tools itself. Knowing how to represent the numbers via the technology tool was an instrumental part of this activity.

*NETS*S 3. D*

The fourth and final substandard for this NET*S requires that students process data and report their results. A fundamental part of Ms. Lahy's activity was having students share their work and explain their thinking via projection of their work on the instructor computer. While generating and processing data, it is clear that students will need to reason abstractly and quantitatively (MP 2), model with mathematics (MP 4), attend to precision (MP 6), look for and make use of structure (MP 7), and look for and express regularity in repeated reasoning (MP 7). By exploring the patterns and relationships between the fractions, the numerators and denominators, the product, and the concrete area representations students are looking for structure and examining regularity in repeated reasoning. By generalizing results based on observations, students are reasoning and modeling with an eye toward abstraction with precision. Each of these mathematical practices easily integrates with this education technology standard focusing on processing data through the application of technology as an investigative tool that requires students to develop and apply models, pattern-based reasoning, and connections between abstract algorithms and concrete representations. Finally, related to this NETS*S substandard, students are expected to report results. By communicating their findings, comparing their conclusions to those of their classmates, and synthesizing their own experiences with those of other students, students are engaged not only in reporting results but also in several related mathematical practices. Namely, presenting findings and listening to the mathematical ideas of others, students are constructing their own arguments while simultaneously synthesizing and critiquing the reason of others to determine if others' ideas align with their own conclusions (MP 3).

*A Broader Look at NETS*S 3*

As we move beyond Ms. Lahy's fifth-grade fraction lesson, we want to think about similar applications of technology at other grade levels and in other content domains. In the most general terms, this technology standard encourages the use of technology to explore mathematical concepts through gathering, evaluating, and using new information. In this context, technology allows students to perform dynamic investigations and explore authentic problem-solving applications. In short, this standard encourages children to explore, or "research," their worlds through mathematical investigations. Technology tools are very helpful in this regard.

A few sites that we recommend are the following: www.kidrex.org, www.safesearchkids.com, and www.kidtopia.info. Other useful tools include dynamic geometry software (like Geometer's Sketchpad) and dynamic statistical software (like Tinkerplots).

In lower grades, students could investigate the statement, "I saw the biggest spider ever!" by defining various definitions of what "biggest" could imply and researching various spider species online. Students could then record their information on poster paper or in a spreadsheet, convert their answers between inches and feet or centimeters and millimeters, and discuss the uses of various measurements and the necessity for precision in recording and reporting various measurements. As a final extension, students could apply scaling to create a life-size replica of the spider to hang in your classroom. The dynamic nature of the definition of "biggest" allows students to define biggest as longest, heaviest, largest body area, and so on. While the investigation of "biggest" and various spider species promotes modeling, reasoning, precision, and structure, the presentation of findings and defense of each group's definition of "biggest" obviously promotes mathematical practice 3, constructing viable arguments and critiquing the reasoning of others.

Questions to Ponder

- We indicated at the beginning of the classroom story a set of standards we felt might be addressed. Would you agree with the choice?
- Are there other standards that might also be addressed in this lesson? If so, which other standards do you feel would fit, and why?
- What would the pros and cons of teaching this concept with or without technology?

NETS*S 4: Critical Thinking, Problem Solving, and Decision Making

This NETS*S involves students using critical thinking and problem solving to plan research and make informed decisions. Like NETS*S 3, this education technology standard meshes almost completely within the CCSS-MPs. In fact, this technology standard, along with NETS*S 3: Research and Information Fluency, is the most productive point of intersection with the CCSS-MPs. The application of inquiry and problem solving in a mathematical context allows students to define authentic problems for investigation, plan and manage activities to develop a solution, collect and analyze data to arrive at an informed decision, and explore various perspectives and solutions. We believe that, in your classroom, when engaging your students in this technology standard, it is likely that the CCSS-MPs are being integrated as well.

Table 7.5 Classroom Example 4

Common Core State Standard Addressed:

8.F.4. Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of a situation it models and in terms of its graph or a table of values.

The students in Mr. Carmichael's class have just been given the charge to create a model that demonstrates the relationship between the number of rubber bands tied to a Barbie's feet versus how far she will fall. They have been told that once they've developed their model, they will have to predict and test the number of rubber bands needed to drop Barbie from a given height (taller than any height they can experiment with inside the classroom). Because Mr. Carmichael wants to assess how students tackle this problem, he is leaving the problem fairly wide open in terms of what model(s) students choose to apply and what tool(s) they use to create their model(s). To date, students have had some experience with spreadsheets and other online applets in creating and exploring tables and graphs based on tables.

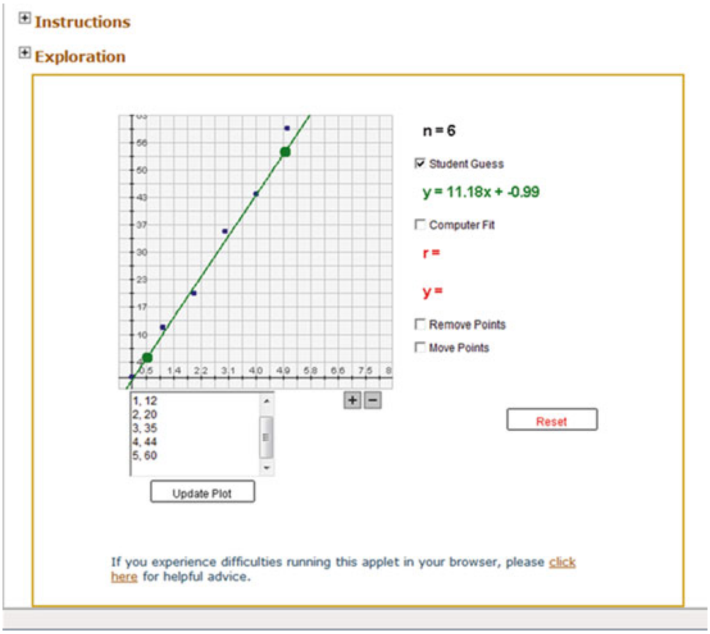
Mr. Carmichael holds a quick class discussion to make sure that everyone gets started on correctly and accurately gathering their data. He models for the class how to tie one rubber band around Barbie's feet so that they can then loop additional rubber bands around that anchor rubber band. The class decides that they should tie one rubber band on Barbie, see how far she falls, and then record their data. Then they will keep adding one additional rubber band around the extending loop of rubber bands to see how far she falls for 2, 3, 4, and 5 rubber bands. Students begin their data collection, and Mr. Carmichael makes a quick circuit of the room to make sure that students are measuring the distance fallen correctly and recording their data.

As he walks around the class, Mr. Carmichael stops in to hear the conversations and see the work of several groups. As he slows by his first group, he sees two students looping a second rubber band through the band already anchored around Barbie's feet. He sees Tommy sketching a table on his paper, with the labels "# rubber bands" and "distance falls" as column headers. When asked how the table will help them predict the number of rubber bands needed later on, Max says, "We think we can look at how much each rubber band adds to the distance she falls. Then we can just divide the height you give us by that number to get the number of rubber bands." Mr. Carmichael tells the group they are off to a good start but, before turning to check on another group, asks them how they know if the rate of change will be constant. After a moment's pause, Sylvia says, "We can graph it!" Mr. Carmichael nods and moves on.

At the next group, Mr. Carmichael sees Manuel working on one of the class' iPads. When asked why he is using a spreadsheet, Manuel responds that his group has decided to plot its data into a spreadsheet and then have the spreadsheet plot the points. They want to see if the relationship between the number of rubber bands and the distance Barbie falls is linear. When Mr. Carmichael asks the students how they will know if the graph is linear, Melissa says that they can just look at the points and see if they are in a straight line. Mr. Carmichael asks the group how a graph will help predict the number of rubber bands needed to tie onto Barbie for the unknown drop height. Lissa points to the graph on the iPad that Manuel has just created and says, "We can think of the line as going out that way forever and then go up the y-axis to the height you give us and see what the graph says x will be." After a pause, she asks, "Is that right?" Mr. Carmichael turns to the rest of the group and asks, "Is this right?" Mr Carmichael steps away smiling as the students begin talking about how the graph might help them determine the number of rubber bands they will need.

(continued)

Table 7.5 (continued)



As he ventures toward the third table, Jocelyn tells Mr. Carmichael, "We got a bunch of points. You know how we always use online applets to explore math? Could we look and see if there is one that lets us plot points and play around with the line that connects those points?" Mr. Carmichael lets Jocelyn and her group members use a computer in the back to search for an applet. Although it takes a few tries, Jocelyn's group finds Illumination's "Line of Best Fit" applet (http://illuminations.nctm.org/ActivityDetail.aspx?ID=146). They plug their points into the applet and then dynamically manipulate a line of best fit to represent their data. Mr. Carmichael tells this group that they are on the right track but encourages them to think about how this model will help them predict the number of rubber bands they will eventually need. After playing with the applet for a minute, Robert leans over and tells Jocelyn that they can use the equation of the graph to plug in the height of the drop as x. Before walking away, Mr. Carmichaels asks the whole group if x is distance or number of rubber bands and encourages them to further discuss how their equation will help them find the number of rubber bands.

On the following day, students will use their models to predict the number of rubber bands needed to drop Barbie from the school bleachers at a height of 15 feet 4 inches. They will then go test their predictions by actually dropping Barbie from the bleachers, with the intent of seeing which group is able to get Barbie the closest to the ground without actually hitting. The day after that, Mr. Carmichael will have each group share their data collection process, the models they chose, and how they used their models to make a prediction for the 15-foot drop.

This glimpse into the classroom demonstrates the use of technology, according to NET*S 4, as a problem-solving and critical thinking tool that can be used to conduct research, solve problems, and make informed decisions. Like NET*S 3, the corresponding mathematical practices associated with the NET*S 4 center around problem solving, perseverance, modeling, precision, reasoning, and structure.

*NETS*S 4. A. and 4. B*

The first and second critical thinking substandards include students' ability to identify and define an authentic problem and plan/manage activities to find a solution. Though Mr. Carmichael posed the bungee Barbie problem situation, students were left to their own devices in developing and implementing a data collection plan and modeling approach. Within the development of their data collection plan, students had to identify and resolve several subproblems for conducting an experiment while collecting data, for constructing a usable model that best represents their data, and for using of the model to predict the number of rubber bands needed to drop Barbie from an unknown height. This significant and engaging problem situation most certainly prompted students to apply the first mathematical practice by making sense of the problem situation and by initiating the lengthy process of persevering through a problem that is not easily solved.

*NETS*S 4. C*

The third substandard of this NET*S encourages students to collect and analyze data to solve a problem and make informed decisions. By the very nature of developing and conducting their own experiment, students applied a plethora of problem-solving, modeling, and reasoning skills to perform applied data collection, modeling, and data analysis. As such, there is a clearly explicit connection between this NETS*S substandard and six of the eight mathematical practices. The process of data collection forced students to determine and use appropriate tools strategically (MP 5) and attend to precision in their data collection efforts (MP 6). Organizing data and deciding upon a model (e.g., table, graph, line of best fit) that best represented their data (MP 4) are obviously closely connected to the abstract and quantitative reasoning (MP 2) involved in this problem situation. Analyzing the data and model in order to predict the number of rubber bands for the unknown height further connects to the mathematical practices for reasoning (MP 2), looking for and making use of structure (MP 7), and looking for and expressing regularity in repeated reasoning (MP 8).

*NETS*S 4. D*

The fourth substandard encourages students to use multiple processes and diverse perspectives to explore alternative solutions. This activity encouraged the development of diverse processes and perspectives by allowing students to develop their own experiments and data collection plans, by providing students the opportunity to compare rubber band predictions, by having students test their predications in an actual drop from the football bleachers, and by requiring students to share their process, model, and results in a classroom presentation at the end of the activity, after the final drop. With the opportunity to present problem-solving approaches, comparing and contrasting various groups' models and approaches, and reflecting upon the success of individual models, students are most certainly engaged in the construction of viable arguments and evaluation of the reasoning of others (MP 3).

*A Broader Look at NETS*S 4*

As we move beyond Ms. Carmichael's eighth-grade pre-algebra lesson, we want to think about similar applications of technology at other grade levels and in other content domains. In the most general terms, this technology standard encourages the use of technology to think critically and use data as part of problem solving and informed decision making. In this context, technology empowers students to structure, plan, implement, and analyze dynamic data-driven investigations and persevere in finding solutions. There are many technology tools for helping students solve problems that work in a similar way to the various technologies used by Mr. Carmichael's students. Similarly, there are many mathematical practices involved at various points along the way in solving a problem, thinking critically about an issue, and arriving at a decision. Constructing and implementing a data collection plan for gathering necessary information and working toward a solution through quantitative modeling, reasoning, and mathematical structure are all integral parts of this technology standard and authentic applications of several mathematical practices. These are important skills to develop, and students should be involved in these processes on a daily basis. These types of activities are great for integrating not just math and technology but also language arts, science, social studies, and the arts.

Technology tools for this aspect might include a flowchart application like thinking abstractly and quantitatively about a problem might involve students using calculators to organize and plot their data. Similarly, dynamic statistical software like Fathom allows students to plot and explore data in various ways. Excel spreadsheets can also be used to organize and represent data through various models. Students are encouraged to research information needed to solve the problem. They will, then, model and represent their process and conclusions. We suggest tools like PowerPoint or Prezi. These can be developed in collaboration through one of the Google tools.

In lower grades, students could conduct a classroom-level investigation by polling classmates on their favorite animal, color, food, or game. Allowing students to figure out how to collect and organize their data is an important part of the definition of the problem situation and management of the activity. Using a spreadsheet or Fathom to make a bar graph encourages the development of an appropriate model and analysis of results to find a solution. As a final extension, students could then present and discuss their question, their data collection process, the model they chose, and their results. The dynamic nature of students posing their own questions, presenting their work, and critiquing their own work and that of their classmates allows for student to develop, share, and critique the reasoning, problem solving, and modeling of others (MP 3).

Questions to Ponder

- Problem solving is fundamental to the technology aspects of this lesson, as well, as the mathematical practice component. What connections do you see between these sets of standards? Select a grade level, and develop a problem-solving lesson that incorporates both technology and mathematical practices.
- In what ways might this lesson also address NETS*S 1, 2, and 3?

NETS*S 5: Digital Citizenship and NETS*S 6: Technology Operations and Concepts

We believe that these are important education technology standards and that these standards involve students in life lessons. These are integrated through all aspects of classroom interactions. In this regard, we find a more tenuous point of one-to-one connection between the mathematical practices and these final NETS*S standards. That is, there is no single mathematical practice (or practices) that relates directly to digital citizenship, technology operations and concepts, or one of their substandards.

Digital citizenship reflects and applies all mathematical practices, and all mathematical practices are reflected in true digital citizenship. Through the regular use and application of technology in cognizant, authentic ways and through discussions centered around appropriate uses and applications of technology, teachers are planting the seed for digital citizenship within their students. By participating in mathematics inquiry that is supported through the use of learning and exploratory-based technology applications, students are developing their own positive attitudes toward technology, bearing the fruits of technology's capabilities to promote collaboration and learning, and demonstrating responsibility for their own learning.

Similarly, only through regular, streamlined, authentic use of technology (as opposed to one-time snapshots of cool activities with one technological tool) can students begin to understand technology systems, troubleshoot their use, select and use various technological applications effectively, and transfer their knowledge of current technology skills and applications to new technologies. For example, a student who is well versed in the use of spreadsheets, Tinkerplots, and applets for gathering, plotting, and exploring patterns in data can easily adapt and apply that knowledge to a new iPod app that applies similar skills, content, and knowledge.

Questions to Ponder

- We indicated at the beginning of the classroom story a set of standards we felt might be addressed. Would you agree with the choice?
- Are there other standards that might also be addressed in this lesson? If so, which other standards do you feel would fit, and why?
- Can you think of an interesting way to include NETS*S 6?
- We indicated at the beginning of the classroom story a set of standards we felt might be addressed. Would you agree with the choice?
- Are there other standards that might also be addressed in this lesson? If so, which other standards do you feel would fit, and why?
- Can you think of an interesting way to include NETS*S 5?

Conclusions

Through this chapter, we introduced two sets of standards, CCSS-MPs and NETS*S. We shared interesting, and beneficial, ways to create intersections between these standards and their classroom applications. The NETS*S help us think about the possibilities for technology integration, while the math practices help us think about conceptually driven mathematical tasks. Taken together, these intersections of the two sets of standards encourage to holistically integrate instruction in ways that promote authentic student engagement with technology and mathematics. They help us approach the teaching and learning of mathematics in creative and meaningful ways.

Application Activities

Idea 1

Apply your understandings of the NETS*S and CCSS-MPs. In considering Table 7.2 Classroom Example 1, which other standards do you feel are addressed in this lesson, and why?

Idea 2

Choose one of the technology standards, NETS*S, and create a follow-up lesson for the students in Ms. Stewart's class (refer to Table 7.3 Classroom Example 2).

Idea 3

Revisit Table 7.4 Classroom Example 3. This lesson demonstrates a powerful use of teaching a conceptual approach to fractional computation through a dynamic technology tool. However, being an effective teacher with technology involves when, if, and how to use technology. In what other ways might this concept be taught with or without technology?

Idea 4

Referring to Table 7.5 Classroom Example 4, explore the connections you could make between authentic implementation of NETS*S 4 and how that can promote digital citizenship.

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Chapter 8
Science: Learning Through Experimentation and Practice

Shadow Armfield and Cynthia A. Conn

Key Questions

1. How might you introduce, integrate, and sequence instruction aligned to Common Core and discipline content to build a student's digital toolbox?
2. How could you incorporate authentic learning and assessment into the design of the instruction?
3. How could you integrate instruction related to digital citizenship concepts and skills into content-based instruction?

Learning science is a hands-on activity that requires students to engage in the scientific processes through practice. The practice of science necessitates the use of technologies to experiment, assess, and evaluate ideas, theories, and laws. Technology in the science classroom has often aligned directly to the content of the class, microscopes, and X-ray devices for biology, balances, stopwatches, and other measuring tools for the physics classroom, etc. While there will always be a need for discipline-specific technologies, a number of technologies can be used across the disciplines. As the personal computer began to creep into the classroom, it became a much more universal tool for science education. In recent years the advent of mobile technologies has made it possible to access, analyze, and distribute understandings outside of the traditional "lab" environment. This chapter focuses on the tools that cut across the disciplines and how they can be used to support students in the K-12 environment in their growth as consumers and developers of scientific understandings.

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R. Papa (ed.), *Media Rich Instruction: Connecting Curriculum To All Learners*,
DOI 10.1007/978-3-319-00152-4_8, © Springer Science+Business Media New York 2015

Technologies: How Much Is This Going to Cost Me?

For many years, it has been argued that the best use of technology takes place in the classroom and not in an isolated lab (Davis & Shade, 1994; Salomon, 1990). The argument for making the technologies directly accessible to students ranges from time on task (time with access to the technologies) to the tool integration into learning activities. As technologies have become more prevalent in schools, a shift has taken place moving from teaching about the technologies to integrating the technologies into learning activities. Even with this shift, making technologies accessible in school has not been easy due to technology purchases, infrastructure, and other associated costs. The widespread use of mobile devices has made this movement more feasible, but it is still dependent on the funds available to purchase hardware and software/apps. As we write this, tablets (Android and IOS (iPad, iPod, iPhone)) have limitations to what they can do in comparison with a PC or a laptop. While this chapter gives some specific examples of how technologies might be used, you must consider what is available to you and how it can be used to best support and enhance your curriculum.

In this chapter we describe the integration of a number of technologies to support students as they engage in the learning and practice of science. The technologies will include the personal computer as well as mobile devices. You will read about programs, apps, and websites that are available for free and open-source use. We also discuss a few items that must be purchased to use. We understand the tight budgets that all teachers and schools face, but share these apps and programs to demonstrate the potential benefits that may be gained by using these technologies. As the availability of free and open-source tools is increasing all of the time, we encourage you to continually search for new programs and apps available for your systems.

Standards and the Language of Science

The discipline of science requires the integration of other disciplines in order for it to be fully understood by students. Science learning and instruction require that the students and the teachers work with a common language and set of standards. Developed in 2013, the Next Generation Science Standards (NGSS) were created to support teachers and students in the USA in successfully developing general understandings of science and scientific processes. The Common Core Standards for English Language Arts will be addressed for their support of "the particular challenges of reading, writing, speaking, listening, and language in" science education (Common Core Standards Initiative, 2012). Furthermore, the Common Core Standards for Mathematics will be used because science goes beyond the local language and "is written in the language of mathematics, and its characters are triangles, circles, and other geometric figures without which it is humanly impossible to understand a single word of it" (Galilei, 1957, p. 238). Finally, the National

Educational Technology Standards for Students (NETS*S) provide the framework for the chapter to show how technology can be integrated to promote personally meaningful learning based in research, collaboration, and higher order thinking. Selected standards from each of the other three are also discussed to demonstrate interconnections.

NETS*S, Standard 1: Creativity and Innovation

The idea of creativity is frequently oversimplified and generalized to mean one's ability to be successful in artistic endeavors. To the contrary, creativity spans across all disciplines and refers to the engagement in divergent processes, where the effort is both original and meaningful. As Best and Thomas (2007) state, creativity is "the process of finding and implementing new and appropriate ways of doing things" (p. 27). Innovation is the result of the creative work, whether in the form of processes, ideas, or products.

Engagement of students in innovation and creativity can be seen across the standards as students are asked to engage in open-ended problems that demand genuine creativity. This is in great contrast to traditional science activities that relied on problems that had fixed solutions. Throughout the NGSS (NGSS Lead States, 2013) students are encouraged to "plan and carry out investigations," construct explanations and models, and design solutions. These processes are supported by the Common Core Math Standards, which have the students at all levels, practicing math to make sense of problems, to work through the processes of solving them, to construct viable arguments, and to critique reasoning (NGSS Lead States, 2013, Grade Introductions). With the Common Core English Language Arts Standards students are learning to develop arguments with increasing complexity. At the early stages students are writing with the purpose of developing opinion and reasoning, which develops into the writing of arguments and explanatory texts supported by narrative at the middle level and high school levels.

Key Instructional Strategies: Simulation and Problem-Based Learning

Educational simulations are inclusive of a number of different activities that are engaged in both with and without technology. Educational simulations offer students the opportunity to engage in real-life experiences over shorter or longer periods of time, without the elements of danger, and are developed to include the learner as a listener, observer, and participant and address the students' developmental levels (Creativeteachingsite.com, 2011). As the students participate in the activities, they are working independently or collaboratively to nurture specific learning goals by developing multiple approaches and critical understandings to the problems presented (Aldrich, 2009). Educational simulations fit well in promoting creativity and innovation by scaffolding learners in the process. Students at emergent levels are led through activities that help them to experience the results of applying multiple approaches to one problem and seeing a probable outcome. Simulations prepare students for the divergent thinking necessary to develop solutions to problems that are abstract or which have no previous solution.

Problem-based learning (PBL), like educational simulations, is based upon real-world experiences. Whereas simulations encapsulate the entire learning activity, PBL activities allow for the learners to fully engage in the creative process by working with the teachers to define their level of control in developing the problem, the problem-solving process, and the solution (Ryberg, Koottatep, Pengchai, & Dirckinck-Holmfeld, 2006). As teachers work to develop PBL activities, Barrows (2003) states that they must remember that:

- The focus is on real problems that the learners (or the community) are facing or may encounter.
- Problems are ill structured with no clearly definable answers, allowing for unrestricted inquiry by students.
- Students are responsible for their own learning and for those with whom they are collaborating:
  - Determining what is needed to understand and solve the problem
  - Assessing self, peers, and process along the way
- The teacher is a mentor supporting the students through the process and promoting growth and independence.

Classrooms engaged in the PBL process require that the students engage beyond the standard curriculum and develop original works (processes, ideas, or products) that are unique and meaningful solution to real-world problems. For a more detailed explanation of PBLs, look to Chap. 15.

Digital Tools for Creativity and Innovation

Many tools are available for teachers and students as they delve into the incorporation of creativity and innovation in the learning environment. As teachers work with younger students to support their growth as divergent thinkers, they can scaffold by including branching stories, interactive spreadsheets, practiceware, virtual experience spaces, and real-time strategy games. Each of these tools supports the students in understanding the if/then situations that they will encounter as they answer open-ended question about the physical and biological world. Other technologies, like SMALLab (http://smallablearning.com/smallab), work at the intersection of reality and virtuality. SMALLab allows for younger students to develop an understanding of basic physics concepts, like motion and light, by allowing them to engage in an action that produces an immediate visual or audio response supporting their understandings of how the modification of environments develops differing outcomes.

As students advance developmentally, the technologies used to support their growth in creativity will change as well. The tools for the advanced learner of science will allow for much more open-ended activity. Students involved with real-world problems can use collaborative tools, like Google Communities, to synchronously and asynchronously share and develop ideas about research design, processes, and solutions and elicit feedback. These environments allow for the users to include not only text-based information but multimedia (audio, drawing, photographs, video, etc.) as well. Some students may find that their solution is actually the development of a new product. Computer-aided design (CAD) programs (and websites) give students the opportunity to create 3-dimensional designs of their products, and 3-dimensional printers allow for the possible creation of it. Given supportive learning situations and technologies, the creativity and innovation of our students are limitless.

NETS*S, Standard 2: Communication and Collaboration

Although grouped together for standard 2, communication and collaboration are actually two distinct phenomena. Communication is the act of transmitting information through verbal or written language (Merriam-Webster Dictionary, 2012) as well as multimedia. While collaboration will include communication, it is creative in nature, with those involved in the process actively working together to compose, develop, design, and solve solutions for problems that have been posed by teachers or determined by the learners themselves (Beers, Boshuizen, Kirschner, & Gijselaers, 2006). Neither of the two ideas is new to the field of education, and each has been used in learning environments with varying degrees of success.

Communication is included throughout NGSS with standards that have the learners sharing, providing evidence, and communicating hypotheses, understandings, and results. These standards also have the students engaged in collaborative activities through peer-review activities to strengthen arguments and by cooperatively designing and conducting investigations. The Common Core Standards for both English Language Arts and Mathematics demonstrate emphasis on communication and collaboration. In the early elementary writing standards, students are to "participate in shared research and writing projects" (Common Core Standards Initiative, Writing, Grade 1, 2012), while at the middle and secondary levels, these standards push for the use of technology "to produce and publish writing as well as to interact and collaborate with others" (Common Core Standards Initiative, Writing, Grade 6, 2012). In the area of mathematics, the Common Core Standards have an intense focus on communication that promote abstract and quantitative reasoning as well as using models and drawings to support the demonstration of understanding.

Key Instructional Strategies: Project-Based Learning and Cooperative Learning

Project-based learning (PjBL) is an individual or a group activity that has the students engaged in processes that result in the development of an artifact. Artifacts may be in the form of a presentation/demonstration, performance, and physical or virtual products. Although similar in name, it differs from PBL in that its focus is on developing projects to answer challenging questions or problems and not on defining and creating solutions for problems (Moursund, 2002). A summary of the key aspects of PjBL is as follows:

- Projects are the curriculum—students learn and understand the central ideas of the class through project development.
- PjBL questions and problems create difficulties in understandings that are to be resolved through the project creation process.
- Learners are involved in investigative processes which include inquiry, knowledge building, and resolution.
- Students are responsible for the decision making and project development.
- Projects are authentic and realistic (Thomas, 2000).

Students engaged in PjBL activities will have the guiding support of the teacher but will work as autonomously as possible to develop and share (individually or collaboratively) their own understandings and possible solutions for problems.

The term cooperative learning (CL) is often used in educational circles with vague reference to having students work together. While the idea of students working together is the base, it can more succinctly be defined as the requisite values and practices needed for students to work together to extend learning for themselves and their peers (Jacobs, Power, & Loh, 2002). To begin, teachers must demonstrate how to develop the norms of group work; these will include how to constructively acknowledge the contributions of others and to work democratically. This foundation leads the way for the students to engage one another in discussions, analysis, and problem solving. Group processing should also be included as an integral aspect of CL. Through group processing the students assess progress, group function, and steps to completion, promoting success as a group. CL is also about the individual, and students must be held accountable for their individual work and for the contributions they make to the group's progress and success. Through preparation and well-defined activities, CL can lead to better student learning, improve self-esteem, and make for a more inclusive learning environment (Gillies, 2007).

Digital Tools for Communication and Collaboration

Digital tools for communication are evident each time a web browser is opened. Students and teachers, alike, are bound to visit YouTube (http://www.youtube.com/), TeacherTube (http://www.teachertube.com/), Ted (http://www.ted.com/), Kahn Academy (https://www.khanacademy.org/), ScienceBlogs (http://scienceblogs.com/), and other websites to gather information as they work on classroom activities. This unidirectional communication is an excellent resource as students begin to learn about and conduct research for their science courses. On the other side of the equation is what the students do with their understandings and ideas. YouYube, TeacherTube, blogging, and the World Wide Web are malleable environments open to all. The projects that students create to demonstrate their understandings are not limited to writing papers or constructing bulletin boards; they now have access to environments where they can create and incorporate media. Students can blog (and receive feedback from teachers and peers) about their confusion, questions, and understandings. Using cell phones, tablets, digital cameras, or video cameras, students can record processes and demonstrate problem solving. They can create virtual bulletin boards (http://www.glogster.com/) that include text, images, audio, and video. These tools allow our students not only to collect information but also to be the creators and sources of information for others.

For many years now, the Web has been a space for individuals to develop and share their ideas and goals. For groups of individuals this meant communicating face to face or virtually (asynchronously or synchronously) and then designating an individual to share the work. Web 2.0 environments have changed this to allow for collaboration in the online environment. Students using Google Hangouts (http://www.google.com/+/learnmore/hangouts/) can draw, write papers, develop presentations, and videoconference together. Students using Mural.ly (https://mural.ly/) can collaboratively gather and share information in a visual display. These tools have made it possible for our students to use cooperative learning techniques both within and outside of traditional classrooms and engage in learning practices that can be engaging, creative, and deeply meaningful. For more on Web 2.0 tools see Chap. 13.

NETS*S, Standard 3: Research and Information Fluency

Research and information literacy are integral components of the Common Core English Language Arts Writing Standards (2010), NGSS Lead States (2013), and the NETS*S (2007). Research is defined as "the collecting of information about a particular subject" (Merriam-Webster Dictionary, 2012). However information literacy is the knowledge and skills related to recognizing "when information is needed and hav[ing] the ability to locate, evaluate, and use effectively the needed information" (American Library Association, 1989, p. 2). Inquiry learning is an instructional strategy that values the teaching of research and information literacy skills. Digital resources and tools are a key element to teaching students how to research as well as a venue for publishing their work.

Standards Connected to Research and Information Literacy

The Common Core English Language Arts Writing Standards (2010) integrate research as early as first grade, where students should gather information from sources to answer a question. In third grade, students are expected to conduct a short research project and gather information from digital sources. By sixth grade, students should engage in projects that ask them to collect facts from multiple print and digital sources, judge the credibility of each of the sources reviewed, and cite and reference these sources, so as to avoid plagiarism. In high school, students should be conducting both short and lengthy research projects, including projects where the research question is generated by the student. Students should be required to consider ways to expand or tighten the research question, practice various search techniques, and synthesize findings from multiple sources. The knowledge and skills described in the Common Core English Language Arts Writing Standards related to research and information literacy align directly with standards and objectives contained in the NGSS and the NETS*S.

Key Instructional Strategies: Inquiry and Deep Learning

Inquiry learning, as an instructional strategy, stems from science education (Coffman, 2012). It is a strategy that resonates with educators, schools, and districts that seek to instill in students the ability to "acquire the skills that will equip them to become independent learners able to seek answers to their own questions" (Kuhn, 2005, p. 39). This approach values teaching research and information literacy skills by asking students to formulate questions regarding topics of interest. This approach is learner centered. It encourages curiosity and ownership over the direction the learning takes. Rather than addressing topics at a surface level, this strategy focuses on exploring a question or a topic in depth. Questioning is an essential element of inquiry learning. It takes students beyond just "holding and finding information to being able to apply new knowledge in novel … ways" (Coffman, 2012, p. 1). Exploring a question or a topic in depth is central to inquiry learning.

Deep learning design attempts to help students gain a stronger understanding of concepts by sparking "… interest in the content of the task, [and focusing] on understanding the meaning of the learning material … There is an internal emphasis where the learner personalizes the task, making it meaningful to his or her own experience and to the real world" (Chin & Brown, 2000). Designing for deep learning allows teachers to create experiences that take students beyond acquiring and grasping knowledge to higher cognitive levels such as applying, assimilating, and adapting information (Anderson & Krathwohl, 2001; International Center for Leadership in Education, 2012).

Digital Tools for Researching and Publishing

A variety of digital tools assist and support learning related to research and information literacy. Some of these tools include:

- Search engines, in particular Google Scholar (see scholar.google.com)
- Citation makers such as Citation Machine (see http://citationmachine.net) or KnightCite (http://www.calvin.edu/library/knightcite/)
- Online note-taking tools such as Penzu (see https://penzu.com/)
- Online tutorials related to note taking and evaluating resources such as Fact Fragment Frenzy of Hints About Print (see http://www.readwritethink.org/classroom-resources/student-interactives/) or Oregon School Library Information System (see http://oslis.org/)

To support learning for younger students or students with special needs, it may be necessary to provide a list of websites that address the topic being studied and that have been reviewed in advance to ensure that the material is written at an appropriate level or includes audio or video clips regarding the topic. Additionally, a tool such as inFocus.cc (see http://infocus.cc/) can be used by teachers to highlight particular sections of a web page to focus student attention on the critical content.

Inquiry learning instructional units often ask students to create a final project to showcase the knowledge acquired. However, it is critical when addressing research and information literacy standards to also include formative assessments that look at the process students engage in related to formulating questions, utilizing search techniques, evaluating resources, note-taking skills, and citing and referencing sources. These skills are not necessarily apparent in final product unless students are specifically asked to address the steps they engaged in as well as notes or journal maintained through the process and early drafts.

NETS*S, Standard 4: Critical Thinking, Problem Solving, and Decision Making

Standards in the past have not necessarily focused on critical thinking. Many standards were fixated on remembering, understanding, and sometimes applying ideas. The NGSS and Common Core Standards, like the NETS*S, have been infused with language that encourages teachers to push students to higher levels of criticality. In fact, these sets of standards have a twofold emphasis: a traditional aim of conceptual understandings and a more critical aim termed practices or procedures. In the NGSS, in the area of Science and Engineering practices (included with each content standard), students analyze and interpret data and evaluate information for the purpose of designing solutions to the defined problems. The Common Core English Language Arts Standards include as their procedures, “anchor standards.” The anchor standards are addressed alongside the conceptual standards and have students analyze, assess, and evaluate what they are reading, writing, hearing, or viewing. Correspondingly, the Common Core Standards for mathematical practice propose that students reason abstractly, critique the reasoning of others, and evaluate processes as they learn the content. Each of these designs is in alignment with the literature on critical thinking which positions it as "a process whereby you evaluate ideas and information and the sources that provide them, arrange them in a coherent way according to their reasonableness and coherence, make connections to other ideas and information, consider alternative sources, and assess them for their implications" (Andolina, 2002, p. 4). Through the inclusion of critical thinking, problem solving, and decision making in the standards, students are encouraged to move from learners of the content to scholars, practitioners, and visionaries.

Key Instructional Strategies: Questioning and Design Thinking

A typical approach that teachers use in surveying their students' understandings of course content and their thinking about the content is to question the students. Armfield (2007) demonstrated that even in classrooms where teachers are intending to promote critical thinking among their students, the majority of questions asked can be at the lowest levels, where students give one "correct" answer. Questioning can be used to promote critical thinking by including methods that engage students in the analysis, synthesis, and evaluation of information and ideas. Instead of focusing on the repeated information, students work to define and solve problems (Hemming, 2000). As teachers apply questioning as a strategy in the classroom to promote critical thinking, they should limit the number of questions that have their students define, identify, and recite. Teachers must employ questions that have their students, at the least, analyze and synthesize and maximize the use of questions that ask students to apply, evaluate, and predict (See the Question Matrix: http://aaboori.mshdiau.ac.ir/FavouriteSubjects/QuestionMatrix.pdf).

Preparing students to engage in critical thinking requires that they consider problems on multiple levels. Design thinking (Scheer, Noweski, & Meinel, 2012) is an iterative process that goes through five phases which move learners from knowledge to practice and evaluation. The five phases are as follows:

- Understand and observe—At this level the learner is learning about the background of the problem and its context.
- Synthesis—Students define why the problem is a problem.
- Ideate—Students brainstorm possibilities for solving the problem.
- Prototype—Students develop paths to solve the problem.
- Test—Students solve the problem using the prototype and evaluate successes and concerns.

At each point, as students gain better understandings of the problem, they can go back to previous stages to adjust and then move forward again. Design thinking is very much in alignment with the scientific process (observe, hypothesize, experiment, report) but is more supportive of developing the metacognition students need to be critical thinkers.

Digital Tools for Critical Thinking, Problem Solving, and Decision Making

It is important to remember that the path to critical thinking, problem solving, and decision making is a process. Students need to have scaffolds in place to advance to subsequent levels. The following applications (Web based and apps for tablets) can support students in the process:

- Blogs (Kidblog, Blogger, Tumblr) and note taking (Word Processing, Evernote, OneNote, Google Keep) can be used in two ways to support this process.
  - Both can allow students time to think and reflect before answering questions of a higher order. This also allows for deeper feedback by the teacher and peers.
  - Both can be used as a science journal (independent or cooperative) as they move through the design thinking process.
- Resources (Science Buddies, National Archives):
  - Give students the opportunity to not only find information but also discuss their ideas with experts in the field.
- Concept Mapping (Kidspiration/Inspiration/Webspiration, Mindomo, mindmeister) allows for students to display their ideas in a visual way.
  - Some concept mapping tools export to word processors and presentation tools to make it easy to expand and share ideas.
- Timeline (Dipity, Timetoast) applications make it easy to track what the students have been doing and where they are going.
  - Students can integrate links, multimedia, and other resources.
- Presentations (http://cooltoolsforschools.wikispaces.com/):
  - Students can share what they have done, what they have learned from the process, what they would change, and what further work needs to be done.

By combining instructional strategies that focus on critical thinking with technologies that support the process, teachers can transform their classroom into an environment that meets NGSS, NETS*S, and the Common Core, pushes students to think beyond the classroom, and prepares them for life after the K-12 experience.

NETS*S, Standard 5: Digital Citizenship

With the ever-increasing digital applications, work expectations, and global connections, digital citizenship and safety is a key educational objective for youth. NETS*Students defines digital citizenship as "students understand[ing] human, cultural, and societal issues related to technology and practic[ing] legal and ethical behavior" (NETS*Students, 2007, p. 2). The elements of the standard address objectives such as practicing safe use of technology, following guidelines related to citing and referencing sources, positive participation in learning activities that displays active engagement in collaborative projects and utilization of technology, and demonstrating leadership that promotes digital citizenship (NETS*Students, 2007). Content standards and other standards like communication and collaboration or research are a natural fit for teaching about digital citizenship and actively engaging students in projects that require the demonstration of knowledge and skills related to digital citizenship.

Beginning in July 2012, new requirements related to teaching students about digital citizenship were enacted by the Federal Communications Commission (FCC) for schools receiving e-rate funding for telecommunications and Internet access. These new requirements were implemented to address compliance with the Children's Internet Protection Act and expanded efforts not just to ensure that schools are blocking inappropriate content from minors but also "to provide for educating minors about appropriate online behavior, including interacting with other individuals on social networking websites and in chat rooms and cyberbullying awareness and response" (FCC, 2011, p. 2).

Key Instructional Strategies: Authentic Learning and Assessment

Given the topic of digital citizenship, authentic learning and assessment techniques can be used as the foundational approach for developing instruction. "Authentic assessment is any type of assessment that requires students to demonstrate skills and competencies that realistically represent real-world problems and situations" (Moore, 2009, p. 291). Reeves, Herrington, and Oliver (2002) outline characteristics of authentic learning. Some of these characteristics include the following:

- Ill-defined and multiple possible outcomes
- Complex, sustained tasks
- Interdisciplinary perspectives encouraged
- Collaborative
- Authentically assessed
  (p. 2–3)

The value of authentic learning resides with the idea that this approach "get[s] students to deal with meaningful problems that provide worthwhile educational experiences" (Linn, Baker, & Dunbar, 1991, p. 20). Authentic learning is designed to be contextually rich in order "to engage student interest and thereby improve motivation" (Messick, 1994, p. 19).

In order to learn about and apply knowledge and skills related to safe, responsible use of technology such as not providing personal information via the Internet, role-playing appropriate responses and actions related to cyberbullying, avoiding plagiarism by accurately citing and referencing sources, and exhibiting leadership among peers regarding these and related topics, students need exposure to a variety of digital tools and realistic situations and interactions. These realistic situations and interactions can address real problems and involve electronic communication with a variety of individuals or experts, or instruction can be designed to simulate or require students to role-play a response to a scenario. Again, Common Core Standards and NGSS can easily be integrated with the NETS*Students Digital Citizenship objectives. For example, many of the NGSS include "Ask questions and obtain information …" (NGSS Lead States, 2013, p. 4) or "Ask questions to define a problem …" (p. 5) like the Kindergarten Weather objective that states, "Ask questions and obtain information on how forecasting of severe weather can help keep people safe" (p. 4). This objective also aligns with the Common Core English Language Arts Kindergarten objective of "Ask and answer questions in order to seek help, get information, or clarify something that is not understood" (Common Core ELA, SL.K.3.). These types of core content objectives provide appropriate topics and spur the use of digital tools for communication, collaboration, and research that will allow students the opportunity to authentically practice digital citizenship skills.

Digital Tools for Practicing Digital Citizenship

Common digital tools such as e-mail, online forms, blogging tools, word processing and presentation software, and search engines and information websites can be used to teach and practice digital citizenship concepts and skills. A variety of distributed learning platforms specifically intended for students that adhere to the Children's Online Privacy Protection Act are also available. Two such platforms that provide the option for teachers to set up online classrooms for their students to use to interact with each other and the teacher as well as to access learning materials are Edmodo (http://www.edmodo.com) and e-Pals (http://www.epals.com). E-Pals also offers an additional product called Global Communities which allows students and teachers "to safely connect … with classrooms in more than 200 countries and territories" (e-Pals, 2012, p. 1) on a variety of topics and collaborative projects. One specific e-Pals project centers around weather and engages students in exploring the conditions that make up weather and exchanging weather-related information with a class in another location. This is an authentic learning experience that also clearly incorporates tasks requiring the demonstration of digital citizenship concepts and skills.

NETS*S, Standard 6: Technology Operations and Concepts

The final NETS*Student Standard, technology operations and concepts, focuses on the selection, use, troubleshooting, and transfer of knowledge between applications and devices. These are truly lifelong skills that will serve students throughout the academic and professional careers. It encompasses the wide variety of applications discussed throughout this chapter. Two Science and Engineering Practices noted in the NGSS, "critique and communicate information or design ideas with others in oral and/or written forms using models, drawings, writing, or numbers" and "record observations, thoughts, and ideas" (2012, p. 4), align with the selection and use of technology applications. Common Core Math Standards related to measurement and data interpretation can be integrated with productivity applications such as spreadsheets or Web-based graphing tools. Additionally, Common Core English Language Arts strand of Production and Distribution of Writing that is threaded throughout all grade levels addresses the use of digital tools including keyboarding skills starting in second grade and in high school the use of the Internet to revise writing products including responding to feedback and incorporating links to relevant information, images, or resources (Common Core ELA, 2012).

Key Instructional Strategies: Active Learning and Repetition

Active learning or learning by doing (Dewey, 1923; Schank, Berman, & Macpherson, 1999) is a key instructional strategy for teaching students how to use, troubleshoot, and transfer knowledge between computer applications and devices. "Active learning places significant responsibility for learning in the hands of the learners themselves" and "involves putting … students in dynamic situations in which they read, view, listen, think deeply, and communicate" (Heide & Henderson, 2001, p. 1).

When designing instruction that incorporates active learning principles and integrates technology, it is important to consider when and how a tool or tools are introduced and can be utilized for subsequent assignments. It is helpful at a school or a grade level to determine what digital tools should be integrated in the curriculum. Consider what tools build upon skills taught in previous grades and curriculum objectives. Be thoughtful and strategic in helping students develop further expertise related to commonly used applications and adding new applications that foster creativity. Consider how special or elective courses can play a part in adding to a student's digital toolbox such as the inclusion of a digital photography unit in art, catalog searches in library, audio or videotaping of performances in music, or Xbox 360 active and interactive games in PE. Further, it is beneficial to analyze tools in terms of menu structures, features, and use. This analysis can be used to sequence the introduction and integration of applications allowing students to continually build up their digital toolbox. Repeated use of applications allows students to gain mastery and even become peer tutors for other students and teachers.

Digital Productivity Tools

Active learning applications of digital productivity tools can span from simple, daily journal writing exercises to complex, PBL approaches. A wide variety of productivity tools such as word processing, presentation, and spreadsheets; Web 2.0

tools such as concept mapping; story and timeline development tools; and mobile device applications would apply to the NETS*Students technology operations and concepts standard.

For a third-grade class studying animals in relation to ecosystem dynamics, social interaction and group behaviors, and adaptation, a Web-based application such as Animoto could be used to present information. Groups could be formed to research each topic or an aspect of each topic, and then presentations could be made or made available for viewing by the rest of the class. This design also incorporates a jigsaw strategy allowing an individual or a group to become the expert regarding a topic and then share that knowledge with others. Prior to using Animoto for an inquiry-based unit of instruction, it could be used to assess learning related to story problems in math where the concentration would be on learning the features of the tool and demonstration of student learning in relation to analyzing, illustrating, and successfully answering a story problem that employs grade-level math concepts.

Similarly, a fifth-grade science curriculum addressing gravity might utilize a word processing or an online poster application like Glogster (http://www.glogster.com/) to communicate information in narrative form as well as integrate models, drawings, or links to simulations. Before starting the science unit, the word processing or the online poster application could be introduced with a lesson related to digital citizenship that asks students to create a flyer or a poster describing online safety, cyberbullying, or how to avoid plagiarism. With this approach, the tool becomes more transparent when utilized later in a complex project, the learning moves away from the technology tool, and emphasis is placed on the content of the instruction.

Classroom Examples

Early Childhood

Science is sometimes overlooked for early learners due to the complexity of ideas. We can use these early childhood years to develop activities that will support students in gaining skills that will be needed as they begin to work with the complex ideas. In this activity, students will engage in the observation and organization/classification of items in their environment. As an example, as the students play on the playground have them each find three to five rocks that look and feel different. Either on the playground or back in the classroom have the students use Google Keep (accessible via the Web or by app on Android devices) to share the likenesses and differences between each of their samples. In Keep, the students can upload images of their samples, write about them, or using the app record their descriptions. Then as a class, the teacher can work with the students to color code each of the notes based on similarities and differences.

Tools/resources used: Tablets or computer (with app or web browser, a camera, and a microphone) and Google Keep (Evernote is a good alternative).

Standards addressed: NGSS, K.SPM, Structure and Properties of Matter; Common Core ELA Writing, Kindergarten 2, Participate in shared research; and NETS*S, Standard 2 Communication and Collaboration and Standard 4 Critical Thinking, Problem Solving, and Decision Making.

Early Elementary

To engage and excite second-grade students about the study of habitats, an inquiry learning unit can integrate science standards related to observing and comparing habitats. With a class set of iPads, a variety of animals and habitats can be observed daily through accessing live webcams. Daily access to mobile devices for the use of observing and exploring a variety of habitats can transform the teaching of these second-grade science standards to a deeper level of learning in relation to the content. The hands-on, independent exploration aspects of this unit can allow students to discover new information independently. To assess student's learning related to their observation and research regarding habitats, a report can be created that integrates writing standards and illustrations with the use of iPad apps such as Sundry Notes and neu.Kids Draw. Pixie, a computer software program, can also be used for assessment by modifying or creating a habitat-sorting activity.

Tools/resources used: iPads, web browser, Explore.org, NationalGeographic.com, BBC.co.uk/bitesize/ks2/science/, MBGnet.net, Pixie by Tech4Learning, Sundry Notes App, and neu.KidsDraw App.

Standards addressed: NGSS, 2-LS4 Biological Evolution: Unity and Diversity; Common Core ELA Writing, Research to Build and Present Knowledge and Production and Distribution of Writing; and NETS*S, Standard 1 Creativity and Innovation, Standard 3 Research and Information Fluency, and Standard 6 Technology Operations and Concepts.

Late Elementary

"What cutting edge technologies are being invented? How will they impact society? What problem or need does the technology address? What other related technologies or inventions might be needed?" (Conn, 2012, p. 34). These are the questions that frame an inquiry learning unit of instruction on Cutting Edge Inventions aligned to fifth-grade science, language arts, and technology standards. Time Magazine's annual issue describing the 50 best inventions for the year (see http://techland.time.com/2012/11/01/best-inventions-of-the-year-2012/slide/all/) can provide inspiration and be used as an initial source for students to begin investigating exciting inventions. A writing assignment can be used to assess learning. One such example comes from Thomas Elementary School in Flagstaff, Arizona, where students wrote and illustrated a fictional story based on their research titled *Zombies Out Teched* (see https://sites.google.com/a/fusd1.org/zombies-out-teched/) as well as a nonfiction collaborative report, *Researching Time Magazine's 50 Top Inventions*.

Tools/resources used: iPads, web browser, search engines, Time Magazine website, Google Docs and Sites, and Scanner.

Standards addressed: NGSS, 5-ESS3 Earth and Human Activity; Common Core ELA Reading: Informational Text, Key Ideas and Details and Range of Reading and Level of Text Complexity; Common Core ELA Writing, Research to Build and Present Knowledge and Production and Distribution of Writing; and NETS*S, Standard 1 Creativity and Innovation, Standard 2 Communication and Collaboration, Standard 3 Research and Information Fluency, and Standard 6 Technology Operations and Concepts.

Middle/Secondary Scenario

Throughout the USA many biomes have experienced the introduction of nonnative species (i.e., Alligator weed in the Southeast USA, zebra and quagga mussels throughout the USA, Africanized honeybees throughout the south and Southwest USA) (see http://www.invasivespeciesinfo.gov/ for more). Each area of the USA and throughout the world have or are experiencing some degree of nonnative species invasion. One of the standards in high school is interdependent relationships in ecosystems. By posing the following questions (and others), we can begin to get students to think about this standard. What are nonnative species? Why are nonnative species a problem? How can nonnative species be removed or terminated in an environment? How can an environment be repaired once an invasion has occurred? There are no clear answers to the questions (and each environment will be unique). Teachers can develop a PBL activity in which the students develop driving questions about nonnative species for which they will work to find a solution. Throughout this, the students will engage with professionals in the field, develop interview protocol (and conduct interviews), survey environments (create spreadsheets, maps, and reports), and define an answer for their question by developing a theory, a working method, or an artifact to solve the problem. Students will use technologies to connect to others, to demonstrate understandings, and to create their solutions (this can then be shared with the scientific community).

Tools/resources used: Computers, tablets, GPS, web browser, search engines, government, university and research websites, Google (Docs, Spreadsheets, and Maps and Hangouts (for interviews)), and other individually defined tools.

Standards addressed: NGSS, HS.LS-IRE Interdependent Relationships in Ecosystems; Common Core ELA Reading: Informational Text, Key Ideas and Details and Range of Reading and Level of Text Complexity; Common Core ELA Writing, Research to Build and Present Knowledge and Production and Distribution of Writing; Common Core Mathematics, Defining and Solving Problems, Constructing Arguments and Critiquing Others, and Quantitative Reasoning; and

NETS*S, Standard 1 Creativity and Innovation, Standard 2 Communication and Collaboration, Standard 3 Research and Information Fluency, Standard 4 Critical Thinking, Problem Solving, and Decision Making, Standard 5 Digital Citizenship, and Standard 6 Technology Operations and Concepts.

Conclusions

In this chapter each of the NETS*S has been defined and connected to select standards from the NGSS and the Common Core Language Arts and Mathematics standards. The chapter has also defined a number of instructional strategies and technologies to support success in meeting these standards. Over the years, the technologies available to teachers in the classroom will change. By beginning with the ideas that have been shared here, teachers and administrators will have a background that will allow them to transition with the technologies much more smoothly.

Application Activities

Idea 1

What NGSS and Common Core Standards could you integrate with instruction related to digital citizenship concepts and skills? How would you incorporate authentic learning and assessment into the design of the instruction? Outline the objectives, assessments, and learning activities.

Idea 2

Given the Common Core and content standards aligned to the grade level you teach, how might you introduce, integrate, and sequence instruction to build a student's digital toolbox? Propose a schedule based on your school's academic year and, if available, grade-level curriculum map.

Idea 3

Take a second look at the digital tools for critical thinking, problem solving, and decision making. Write a summary of a lesson plan in which you address Common Core and content standards. In the summary define how you can use two of the tools to engage your students in higher order thinking.

Idea 4

Develop a scenario in which you have your students meeting two or more NETS*S standards, a Common Core Standard, and an NGSS. Exchange the scenario with a colleague or a peer. Describe how each other's activities in the scenario align to the standards, and evaluate how the scenario enhances the student's learning and thinking.

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Chapter 9
Creative Connections: Technology and the Arts

Jennifer Prior and Pamela Powell

Key Questions

1. What are "the Arts"?
2. Why are the Arts important in the development of human beings?
3. What is Arts integration?
4. How can the Arts be integrated with the Common Core State Standards?
5. How can the Arts be integrated with technology?
6. What kinds of software and digital tools can be used to connect art and technology?

A group of first graders use finger painting to make colorful creations. A second-grade girl sits at an easel, using a brush and paint to depict a scene from a story read by the teacher. A class of third grade students examines the works of a children's book illustrator and uses the illustrator's medium to create their own original works of art. A group of sixth graders create a song and dance routine to display their feelings about an environmental issue. Kindergarteners use salt dough to fashion their favorite animals. After reading a story, a group of first graders create a dramatization of the plot. The arts in the classroom can be seen in many ways. As stated in *National Core Arts Standards: A Conceptual Framework for Arts Learning* by the National Coalition for Core Arts Standards (2013), "the arts are used by and have shaped every culture and individual on earth. They continue to infuse our lives on nearly all levels—generating a significant part of the creative and intellectual capital

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R. Papa (ed.), *Media Rich Instruction: Connecting Curriculum To All Learners*,
DOI 10.1007/978-3-319-00152-4_9,

that drives our economy. The arts inform our lives with meaning every time we experience the joy of a well-remembered song, experience the flash of inspiration that comes with immersing ourselves in an artist's sculpture, enjoying a sublime dance, learning from an exciting animation, or being moved by a captivating play" (p. 2). This same document identifies five philosophical foundations and lifelong goals as common values in arts education. They are as follows:

The Arts as Communication: Since art is a means of communication, they convey the experience of living life and should be used to express ideas and interpret the artistic communications of others.

The Arts as Creative Personal Realization: Creating and performing in the Arts leads to self-discovery and should be encouraged.

The Arts as Culture, History, and Connectors: Art communicates insights and understandings of different cultures and periods in history and the appreciation of different art forms leads to greater understanding of the connections between art and culture.

The Arts as Means to Well-being: The Arts enrich mental, physical, and emotional well-being and should be encouraged as a means of enjoyment and stimulation.

The Arts as Community Engagement: The Arts should be experienced and supported at the community level.

As long time teachers, we both became acquainted with the Arts in the classroom early in our teaching careers as we discovered the wonderful things we could do to use music for teaching reading and language arts, in general. We learned that songs were natural ways to teach children about rhyming words and that particular songs could be used to teach beginning letter sounds, parts of speech, or syllables. In each of our classrooms, we used music just for fun and encouraged students not only to sing but also to dance and even write their own songs. Music was a bright spot in the day and all children loved it. We also learned that the visual arts and the creation of art naturally fit into our curriculum. Music, dance, art, and drama were regular forms of creative expression in our classrooms. For example, a group of first-grade students read a book about the journey of a seed becoming a plant. In small groups, the children made their own recreations of the story in the form of puppet shows. Their ability to retell the story was impressive, but the detail of their props and settings and the things they had noticed in the book's illustrations that they included in their performances was also amazing. One year a group of third-grade students listened to different pieces of classical music to identify what they noticed about the mood created by the music. They identified happiness, sadness, anger, and other emotions they felt were being portrayed through the music and wrote about these moods with passion and depth. Another year, a group of sixth-grade students participated in a "wax museum" project while studying famous people throughout history. They researched such people as George Washington, Elvis Presley, and Harriet Tubman, created costumes to dress the part, and then became these characters as, in turn, each student came to life as the selected person and told his or her story. Each of these scenarios generated excitement and genuine interest in the subject matter, while allowing for creative expression.

The arts are more than the paint, the voices, and the dance. The arts teach children about life and through the arts, children can make meaning of their world. It opens them into their worlds in unique, expressive, and meaningful ways. Elliot Eisner (2005) expresses that the arts "are deeply engaged in the development of mind" (p. 9) and that leaving the arts out of education creates a diminished experience for students. He claims that three things are made possible by the arts:

> First, they develop the mind by giving it opportunities to learn to think in special ways. Second, they make communication possible on matters that will not take the impress of logically constructed language. Poetry, after all, was invented to say what prose can never say. Third, the arts are places and spaces where one can enrich one's life. Such outcomes are not educationally trivial. When taken seriously, the arts have much to teach educators; they could provide the models needed to create schools that genuinely educate (p. 9).

The arts are not fluff. In fact, it is through the arts that children can also process their emotions. They can sing their sorrow and process their pain. This was made evident after the 9/11 attack when second graders composed letters and pictures to first responders and to the city of New York. Rather than avoid the conversation regarding the tragedy, children were able to pen their thoughts, to paint their ache. Sharing these on the wall or in a group meeting helped them come to terms with the tragedy. Likewise, when the space shuttle crashed in 2002, a multiage class composed a tribute to the fallen astronauts. They went from room to room in the singing their song, which assisted in healing throughout the building.

Halverson (2013) summarizes the argument for art education in schools by saying, "Children are inherently creative, and the role of educators is to encourage young people to express themselves through art. To criticize this art is to criticize the children themselves" (pp. 121–122). In his book, Art as Experience (1934), John Dewey also writes of the importance of the Arts, expressing that they are an important part of our everyday lives as human beings and require us to be reflective, observant, in touch with our emotions, and connected to our present and past experiences. Maxine Greene (1995) also notes the importance of significant encounters with art and how the Arts have been neglected in the world of education. The omission of the Arts leads to a loss of spontaneity, inventiveness, and even problem solving.

The Arts and the Common Core State Standards

The adoption of the Common Core State Standards (Common Core Standards Initiative, 2012) by a majority of states has brought about discussion about how the standards will impact arts education. While the CCSS do not currently address a specific set of standards for the Arts, attention has been given to how the standards overlap with and include the Arts (Arts Education Partnership). The National Core Arts Standards conceptual framework document (2013) emphasizes the creative practices of imagination, investigation, construction, and reflection, which serve as an ideal foundation for learning environments for students. These areas were examined by the College Board for the National Coalition for Core Arts Standards (2012), focusing on overlap and connections with the Common Core State Standards. The study revealed well over a hundred connections between the common core standards and the four creative practices. Additionally, Coleman (2011) recommends the use of works of art to develop skills of observation and interpretation, which are emphasized in the common core standards.

For example, the first grade reading standards for literature lend themselves to the arts in many ways. Standard 2 involves retelling stories, which could be done in the form of creating a play, puppet show, or a visual art representation of the story. Standard 4 involves the identification of words or phrases that convey feeling. Students could find words in a piece of grade-appropriate literature, discuss the feeling the words add to the story and then write their own stories using feeling words. For grade 4, reading standard 5 for literature involves reflecting on the differences between poems, drama, or prose. Students might read the script of a play and then reenact it. They might also read, practice, and perform poems they read in class.

The reading standards for foundational skills also lend themselves to the integration of the arts. Standard 1 for kindergarten involves the identification and use of rhyming words, which can be experienced through the singing of rhyming songs. Then, as a class, the teacher could guide students through a group creation of their own song verses. The fluency standard (standard 4) could be used for all grade levels to encourage the fluid reading of grade-appropriate poetry and prose. Children might also work on fluency in the form of a reader's theater production of a story or chapter read in class.

While studying the desert in the southwest, children eagerly created an alphabet to post above the whiteboard using desert terms. Printed carefully, the Aa frame sported the word "Arizona" and a child beautifully illustrated it with an Arizona flag. Followed by Bb: Bobcat; Cc: Cactus, etc., soon a child-centered and created alphabet lined the top of the board. After learning more about the desert, expository texts were created and illustrated by children. When the monsoon rains ensued into September, the children danced the rain and then composed a song entitled "We are the Rainbow," which they performed for the entire school during a music program—choreographed, of course, by the children.

Many of the writing standards for all grade levels could be enhanced by having children use different mediums to produce accompanying artwork. The speaking and listening standards could also be used to allow students to express their thoughts and questions verbally about works of art by famous artists. The teacher could also model and encourage meaningful discussion between students about works of art, focusing on effective listening and speaking skills. Really, the sky is the limit with arts integration with the Common Core State Standards, so teachers are encouraged to look for and implement ways to enrich the standards with various forms of artistic expression.

While there are too many CCSS standards to list in a single chapter, the following chart highlights the third grade Reading Standards for Literature and some of the more obvious connections to the creative practices of the National Core Arts Standards. Note that standard 8 of the CCSS is omitted as this one does not relate to literature as stated by the Common Core State Standards document (Table 9.1).

Table 9.1 Third grade reading standards for literature as related to creative practices

	Imagination	Investigation	Construction	Reflection
1. Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers	√		√	√
2. Recount stories, including fables, folktales, and myths from diverse cultures; determine the central message, lesson, or moral; and explain how it is conveyed through key details in the text		√	√	√
3. Describe characters in a story (e.g., their traits, motivations, or feelings) and explain how their actions contribute to the sequence of events	√		√	
4. Determine the meaning of words and phrases as they are used in a text, distinguishing literal from nonliteral language		√	√	
5. Refer to parts of stories, dramas, and poems when writing or speaking about a text, using terms such as chapter, scene, and stanza; describe how each successive part builds on earlier sections	√		√	
6. Distinguish their own point of view from that of the narrator or those of the characters	√		√	√
7. Explain how specific aspects of a text's illustrations contribute to what is conveyed by the words in a story (e.g., create mood, emphasize aspects of a character or setting)			√	√
9. Compare and contrast the themes, settings, and plots of stories written by the same author about the same or similar characters (e.g., in books from a series)	√		√	√
10. By the end of the year, read and comprehend literature, including stories, dramas, and poetry, at the high end of the grades 2–3 text complexity band independently and proficiently				

While there are numerous ways that the Arts can relate to the creative practices, a few are identified on the above chart. Let's discuss these connections.

Standard 1: As students ask and answer questions about the text of a literature selection, they can be encouraged to use their imaginations. While they will draw from the text itself for their answers, they can imagine how the characters feel and why they do the things they do in the story. Students can also construct representations of the characters or settings and reflect on how their constructions convey the story's meaning.

Standard 2: Students are often asked to recount stories they read and communicate the main message of a story. Creatively, students can be encouraged to investigate the cultures from which stories come and then construct artwork or music, which reflects on these cultures.

Standard 3: When describing story characters, students can be encourage to use their imaginations to construct artwork of featured characters.

Standard 4: Students can use investigation to explore the meanings of words. As they identify the differences between literal and figurative language, they can create artwork that depicts the meanings in creative and even funny ways.

Standard 5: As students read stories, poems, or even plays, they can be encouraged to make their own dramatic representations of the text. Have them design sets and costumes that add to their productions.

Standard 6: Thinking about the narrator's point of view and comparing it to their own can involve imagination, construction, and reflection. Children can be encouraged to use creative word choice in their descriptions of their points of view and demonstrate their views through artwork.

Standard 7: This standard lends itself to deep reflection about the work of an illustrator. Draw students' attention to the artwork in the book. Ask them to reflect on how the illustrator communicates mood through the use of images and color. Then invite students to construct they own artwork that conveys mood.

Standard 9: As students compare different texts written by the same author, they engage in reflection and can be asked to create artwork reflecting the differences. They can also be encouraged to identify different kinds of music to accompany stories or creating dramatic representations. Then students can compare the differences between them.

Additionally, the Common Core State Standards emphasize the use of digital media as part of instruction. In particular, there are 16 references to the arts in the Speaking and Listening English Language Arts (ELA) standards, many of which focus on digital media and visual displays for the purpose of expression (College Board, 2012). The introduction to the ELA standards specifically mentions seven abilities for college readiness, one being that students are adept at using technology and digital media. This leads us to a discussion of the Arts and technology.

The Arts and Technology

Now that we have established a justification for the Arts, in general, for the integration of the Arts in education, and how the Arts fit well within the Common Core State Standards, we can look at the integration of technology with the Arts. With the widespread use of technology in our culture, comes an increased interest in the media arts, which are defined as "all forms of creative practice involving or referring to art that makes use of electronic equipment, computation, and new communication technologies" (Peppler, 2010, p. 2119). While the Arts in education have not been widely embraced in many areas of the country, it does seem that an appreciation for the inclusion of the media arts is gaining popularity. For example, as cited by Peppler (2010), the Los Angeles Unified School District Arts Branch makes recommendations for the use of media arts in schools. Infusion of technology with the Arts draws on children's natural interest in media arts and social media, regardless of age or ability level. Peppler and Warschauer (2010) describe the artistic renderings of an 8-year-old child with special needs. This child, who could read and write only at an emergent level, was able to create a piece that included a photo, moving clip art, a digital drawing, and background music to communicate a message. What might not have been possible for this child to do in a piece of physical art became a rather sophisticated representation of what she wanted to communicate. Digital technologies have changed what it means to create and to be innovative. Tillander (2011) states "the introduction of new media artworks often challenges educators about their assumptions of rule-based curriculum—that often focuses on drawing, painting, sculpture—and students about their assumptions of artistic means of expression" (p. 43). Likewise, McGuire (2012) states, "Media arts offer both student and teacher a new way of making meaning. The creativity of the arts can be enhanced using media as a tool to instill and communicate each discipline's creative aesthetics" (122). In short, the more we learn about the possibilities with using different forms of technology, the more we see the possibilities for using technology in artistic ways.

The International Society for Technology in Education (2007) developed the National Educational Technology Standards known as NETS. These standards include:

1. Creativity and Innovation.
2. Communication and Collaboration.
3. Research and Information Fluency.
4. Critical Thinking, Problem Solving, and Decision Making.
5. Digital Citizenship.
6. Technology Operations and Concepts.

A deeper look at the sub-standards for each area, reveal the natural integration of the Arts with technology. Standard 1, for example, is all about creativity and innovation. Students are encouraged to generate ideas and create original works. Standard 2 involves communication and collaboration, where children can work together to

Table 9.2 NETS standards as related to creative practices

	Creativity and innovation	Communication and collaboration	Research and information fluency	Critical thinking, problem solving, decision making	Digital citizenship	Technology operations and concepts
Imagination	√	√		√		√
Investigation	√	√	√	√		√
Construction	√	√		√	√	√
Reflection	√	√	√	√	√	

create artistic works using technology. Standard 3, involving research and information fluency could be implemented by having students use technology to locate works of art online or to find and listen to musical pieces. These are just a few of the ways the Arts and technology can be integrated that align with NETS, but as we proceed, it is important to note that some uses of technology can serve to stifle children's creativity. As noted by Haugland, Bailey, and Ruiz (2002), careful decisions about the use of developmentally appropriate software should be made in order to encourage creativity in children of all ages.

The following chart shows some of the connections between the six NETS standards and the creative practices identified in the National Core Arts Standards (Table 9.2).

The creative practices connect nicely to technology standards in many ways. The more obvious connections are featured in the chart above, so let's take a look at some of those connections.

Creativity and Innovation: This standard lends itself to all four creative practices. Students can be encouraged to imagine, investigate, construct, and reflect through the use of different technologies related to visual arts, music, and dance.

Communication and Collaboration: In the same way that students can be creative and innovative with art-related technology, they can also work together and collaborate with one another in their creations.

Research and Information Fluency: While there are likely many ways to connect this standard to the creative practices, more obvious connections are found with investigation as students can use technology to locate artistic works or musical productions. They can also be encouraged to reflect on the works of artists and musicians.

Critical Thinking, Problem Solving, Decision Making: All four creative practices can be utilized with this standard. Children can think critically about artwork and music found online. They can problem solve and make decisions about how to use technology and features of technology programs and online tools to create their own art.

Digital Citizenship: As students interact in online environments (with careful supervision from adults) they can be taught to consider issues of citizenship in digital environments. As students post their creative works to a class Web site or in other locations or interact with others in online venues, they should reflect on the perceptions of others and how to be respectful of others.

Technology Operations and Concepts: As students use technology tools to create or reflect on music, visual art, dance and dramatic productions, they learn more about how programs work and how to use them in creative ways.

As you can see, the connections between the Arts and the infusion of technology offer many possibilities, which leads to some suggested tools that will encourage students to participate in the Arts, not only for curriculum integration but simply for art's sake.

The Arts for Art's Sake

Numerous art-related technology tools exist today. Some are programs for the computer that must be purchased. Some are free or available for purchase for use on iPads or other tablet devices. Still others are available online. The programs featured below are a few examples of those that can be utilized in the classroom for students' creative work. Remember that, while the Arts can be integrated throughout the curriculum, it is also important to allow children to be creative just to be creative—just to express themselves for the purpose of self-expression and nothing more.

Painting and Drawing Programs: A program, such as Microsoft Paint provides digital paintbrushes, colors, and a variety of effects. Children can select different brush and pencil thicknesses and ready-made shapes to create visual arts. Many painting and drawing programs also allow the inclusion of text along with art.

Publishing Programs: While a program like Microsoft Publisher might not seem like an art program at first glance, it lends itself to the creative use of color, backgrounds, and clip art to accompany students' creative writings. Even basic word-processing programs often feature some art tools and clip art.

Music Production Programs: Programs such as Audacity or Garage Band can be used by students to create their own music. They can even record voices and then manipulate them in interesting ways.

Programs for Music Appreciation and Enjoyment: A program such as iTunes allows children to experience a variety of music. While most songs are available for purchase, iTunes and other similar programs also feature samples of songs at no charge. Amazon.com offers similar music samples of many of their featured products.

Movie-Making Programs: Programs, such as iMovie, allow students to capture their artistic work on camera. Students may want to record plays they have created or musical performances. They might even want to record the visual art of classmates. Most movie productions allow for creative editing and the use of background music.

The following section features more specific ways that Web sites and programs can be used for arts integration and for creative expression, in general.

Creativity Tools: Visual Art

The National Gallery of Art (www.nga.gov) has numerous resources for children to learn about famous artists and make their own artistic creations online. Simply access the site, click on the Education tab, and select NGAkids from the dropdown menu. Children can paint pictures with digital paintbrushes, create collages of artistic images, and create pixelated portraits using the online tools provided by the gallery. For art integration, children studying a jungle theme can use one of the NGAkids tools to create jungle landscapes, complete with animals of their choice. Children learning about the ocean can create seashore pictures with another tool that allows them to select images of both natural and manmade objects. For example, some of the images portray shapes made of leaves or wood. Others appear to be made of felt, plastic, string, or paper.

A program such as Print Explosion can be used to have students of all ages create greeting cards, posters, banners, and letterhead using colorful backgrounds and clip art. Children can use provided templates or create their own designs. This kind of artistic creation pairs well with a lesson about writing friendly letters and allows students to practice their writing skills with an artistic end product. In the same way, older children can be encouraged to design their own artistic layouts for letters or reports, adding clip art to enhance the themes of their writing or to create mood.

There are numerous iPad apps that can be used for artistic expression as well. An app such as Draw allows children to select different pencil colors to draw their own creations on the screen. An application such as Paper by FiftyThree allows students to make colorful sketches and diagrams, illustrations, and even notes all contained within a personalized notebook for future reference and viewing. Both of these apps allow for sharing creations through e-mail or via the Web. For arts integration, younger children might draw and compare characters or settings from a story they have heard or read. Older children could "take notes" about what they learn throughout a social studies unit by creating visual representations of their understandings of the concepts.

The Museum of Modern Art (www.moma.org) provides iPad applications and Web sites for children that allow them to experience the process of making and learning about modern art in digital format. Simply access the site, and select K-12 Teachers from the Learn tab to find the link to apps and Web sites. The iPad app can be purchased for a small fee through the App Stores, while access to the Web site (Destination Modern Art) is free. This Web site introduces students to famous artists, such as Picasso, Van Gogh, Frida Kahlo, and more. They can view the artists' works, learn facts about the artists, and have the opportunity to create their own modern art. For arts integration, both younger children and older children might use various forms of modern art to demonstrate their understanding of stories or concepts addressed in class.

There are many programs and computer applications that allow children to add creative effects to photography. A simple application such as Photo Booth allows them to take pictures of themselves as they sit in front of the computer. They can alter the photos to add sepia tone effects or stretch and bulge photos to achieve some fairly interesting appearances. Additionally, a program such as iPhoto or Photo Shop allows for even more variations to photos that are uploaded from digital cameras, including ways to crop photos and add borders and backgrounds. For curriculum integration, a group of second graders studying insects might use digital cameras to take pictures of insects they find on the playground. After uploading them to a photo enhancement tool, they could add creative effects to the insect photos. Fifth graders learning about resource conservation might take digital photos of all the items they throw in the trash during the course of a day and create a photo book for display.

Creativity Tools: Music

A program such as Garage Band can be used to create musical arrangements by recording instruments or voices. Interesting effects can be applied to the instruments and vocals for artistic expression. A Web site such as Sphinx Kids (www.sphinxkids.org) can also be used for learning about musicians and different genres of music as well as making musical productions. Children can hear the sounds made by particular instruments and then put together different combinations of instruments to hear how they sound together or even create their own rhythms. For arts integration, students can write and perform their own songs related to themes they are studying in school. For example, a group of sixth graders studying world governments might create a song to display their knowledge. A group of third graders learning about water conservation might create a musical presentation to encourage others to utilize water responsibly.

Creativity Tools: Dance and Drama

For children who love to dance, providing interesting music is sometimes all they need for inspiration. Many Web sites provide short clips of music. A Web site like Putamayo Kids (http://www.putumayo.com/kids/home), sells CDs of music from around the world. One added bonus, though, is that each CD they sell has a 60 s sample of each song, which is plenty of time for students to create their own short dances. Ask students to compare the music from different countries and determine whether the styles of music make them want to dance in different ways. For arts integration, develop a unit about a particular country and use music from that country as a point of reflection. In the same way that students can compare different forms of music, they can also compare music from different countries and reflect on what each form of music communicates about the people and their culture. Another playful Web site is Dash's Dance Party (www.pbskids.org). From the site, click on Search at the bottom of the screen and do a search for "dance party." Once there, you'll find an interactive dance game that younger children are sure to love.

For curricular integration, have younger children create dances where they pretend to be creatures in nature or move in a way that represents the sunrise. Have older students create dances expressing their opinions about issues addressed in class. Remember that not all students will feel comfortable with dance, so make it an option for those who choose to express themselves in this way.

Students will often enjoy creating plays or reader's theater productions and a program like iMovie gives them the opportunity to capture their productions for future presentations to parents or other classes in the school. Students can use the recording device on a camera phone or a digital video camera. Most video technology allows for editing so students can put together just the production they want. Video recording is also a great way to capture students' dance performances and clips can similarly be edited to create the desired outcome.

A more complex scriptwriting program, such as Adobe Story Free, allows for the creation of productions in a free online format. Students can use the program to develop characters, storylines, and write the detailed scripts for future performances. You can also do a Google search for free scriptwriting software as many are available online.

Children can also use recording software to perform radio shows of stories they create or recreate. Many smartphones have applications for voice recording. In addition, a simple search for iPad apps will reveal numerous free voice recording programs that can be easily used by children for their audio performances.

Productivity Tools: Art

Word-processing programs, such as Microsoft Word have a variety of tools that lend themselves nicely to the Arts. You will want to be sure to have the tools menus visible at the top of the page to access as many tools as the program has to offer. For example, Microsoft Word has a shapes menu with a variety of shapes that can be selected and placed in the document. The shapes can be shaded in different colors and given effects, such as 3D rotation, shadows, glowing, or mirror reflection. Students can also choose different themes for letters they type. The WordArt tool additionally allows them to get creative with the things they write, adding color, style, and effects to the written word.

Many word-processing programs have clip art galleries, which can be fun for children for creating collages or adding art to stories they write. Microsoft Word, for example, has a Clip Art Gallery under the Insert tab. A variety of photos are available in the gallery under different categories, such as animals, travel, weather, etc. Students can also create their own digital art or upload photos of physical arts they have created and use the Insert menu to add files to a word-processing document.

Conclusions

Participation in the Arts is important for all of us as human beings and integrating the Arts in various forms in educational environments serves to help children develop and grow, reflect and problem solve, and express themselves in ways that cannot happen in purely academic environments. In the words of Elliot Eisner (1998), "The arts inform as well as stimulate, they challenge as well as satisfy. Their location is not limited to galleries, concert halls and theatres. Their home can be found wherever humans choose to have attentive and vital intercourse with life itself" (p. 56). The use of technology for artistic expression offers a variety of ways for children to be creative and innovative within the context of learning or simply for the sake of art itself.

Application Activities

Apply your knowledge of utilizing the Arts and Arts integration with the following application activities:

Idea 1

Select a grade level of interest and then find an appropriate science or social studies topic for that grade level. How could you encourage children's visual artistic expression using technology? Experiment with a painting or drawing program on a computer, iPad, or online. Decide which program you would have your students use and how you would encourage them to apply their own creativity to the topic in an artistic way. Create a project of your own. Be sure to add notes to your own project to remind yourself of the technology you used, how it relates to the curricular topic you selected, and how you would encourage your students' artistic creativity.

Idea 2

Spend some time experimenting with music programs on the computer or use one of the music Web sites mentioned earlier in this chapter. You might also want to try a Google search of your own to locate Web sites for experiencing or creating music. Then select a grade level and a book that would be appropriate for children of that age to read. How could you have your students use music to enhance the book reading experience? Keep in mind that they could do a story retelling with music, add music to key points of the story, create a song reflecting the content or a scene from the book, or some other creative way to enhance the book with music.

Idea 3

Experiment with the Word Art feature of Microsoft Word or a similar feature using another word-processing program. See how many word styles, colors, backgrounds, etc. you can make with this tool. Now, think about how students might use a feature such as this to add emphasis and interest to stories or poems they know or write themselves. Think about how you would encourage students to use Word Art for emphasis as opposed to using it for all of the text.

Idea 4

Locate clip art online, through a word-processing program, or through a computer art or greeting card program. You might also do a Google search for clip art and click on Google images to see what you find. Spend time exploring the different kinds of clip art available. Then select a grade level and think of a way to involve students in creating a play or puppet show using enlarged clip art to creating props, settings, characters, etc. for their production.

Idea 5

Keep in mind that it is important to encourage all learners to use art just for the sake of art! Think about ways your students could use art technology in the form of visual art, music, dance, or drama simple for the sake of self-expression. What kinds of things could you do to encourage those children who may be reluctant to give the Arts a try? How will you allow them to share their completed works for others to see, hear, and enjoy?

Idea 6

Review the charts on pages 194 and 197. Some of the more obvious connections are identified through checkmarks. Review those sections of both charts that do not have checkmarks and brainstorm ways to form connections between the Arts and the Common Core State Standards as well as the connections between the Arts and the NETS Standards.

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Chapter 10
Social Studies Teaching for Learners Who Engage

Barbara Torre Veltri

Key Questions

1. How do teachers prepare children for their roles as citizens in a global community?
2. How do we teach primary source research, strengthen writing skills and engage students in the teaching of history topics, with relevance to the twenty-first century?
3. How do we teach "pot-holder" topics in the Social Studies and avoid a "pedagogy of silence?"

Introduction

In 1916, the National Education Association (NEA) established *social studies* as the name of the interdisciplinary content area that housed the social sciences.[1] The term *social studies* appears in the literature and the names of professional associations and organizations, academic institutions, curriculum centers, projects and international programs. Most social educators across the world accept the National Council for the Social Studies' definition of social studies as "the integrated study of the social sciences and humanities to promote civic competence" (NCSS, 1994, p. 3). The National Council for the Social Studies (NCSS) supports: "(1) meaningful, (2) integrative, (3) value-based, (4) challenging, and (5) active teaching (NCSS, 2008). But standards are broadly based!

[1] Anthropology, Archeology, Economics, Ethnography, Geography, Global Studies, History, Political Science, Psychology, and Sociology.

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R. Papa (ed.), *Media Rich Instruction: Connecting Curriculum To All Learners*,
DOI 10.1007/978-3-319-00152-4_10,

Perhaps that's why, for more than 85 years, Social Studies Curriculum has generally followed the model conceived by Dr. Paul Hanna, that was developed in the 1930s. The "Expanding Horizons or Near-to-Far-Approach" is still in use, in the twenty-first century, by schools in the USA and across the globe. And while a range of approaches espouse infusing social studies with literacy, global awareness, the arts, and traditional core content knowledge, *The Expanding Horizon* approach continues to find favor with both textbook and curriculum designers who appreciate the developmental progression that teaches children from Pre-Kindergarten through grade 6. Through a circular model focused in scope and application, overarching topics that correspond with particular grade/developmental levels operationalize as follows:

• Child/self	Pre-K-Kindergarten
• Family	1st
• Neighborhood	2nd
• Region/Environment	3rd
• State	4th
• Nation	5th
• World	6th

Hanna's approach organizes the curriculum in a way that's easily packaged and visualized. I actually draw what looks like the Solar System on the board, to illustrate a series of concentric circles, with Me at the center, surrounded by orbit-like spheres: family, neighborhood, region, state, and country, culminating with "the world." This linear progression is easy to replicate, but the downside is this: children may not be exposed to environments or cultures outside their own familiar circle, until adolescence, when most of their values, opinions, and norms are established.

The thematic approach to social studies curriculum is defined for each academic year across the elementary grades. And while the main tenet: start with the local, and branch out from what a child "knows," seems logical, this methodology assumes an egocentric (self-first, then others) approach to teaching the social sciences. To illustrate this point, I insert the word, "My" before each grade level category to remind my pre-service and in-service teachers of the explicit "Me" focus of formal adherence to this model, then I pose these questions: Is it acceptable for students to wait until the 6th grade before delving into a more global approach to their world? Are children interested in learning about the world outside their surroundings? The National Council for the Social Studies (1979) states, "The basic goal of social studies education is to prepare young people to be humane, rational, participating citizens in a world that is becoming increasingly interdependent" (p.262).

Teaching Social Studies: Challenges and Opportunities

How will *you* teach Social Studies within contextual frames when *your* students are influenced and impacted by new media, social issues, policies that impact children and families, environmental changes, diversity, globalization, cultural, economic and philosophical distinctions, shifting population demographics, and live within the throes of continual innovation? How will *you* embellish these strands, teach rigorous social science content, assess learners in the process, and consider the questions they bring forward to *you*?

Children can, indeed, delve deeply into rich social studies content. Some students instigate the study of abstract concepts and bring their questions and wonderment to the teacher. How many of us recall a time when our students or younger family members shared their own broad base of epistemologies, innate sophistication, and intuitive "ways of knowing," with us?

However, when faced with the realities of their professional teacher landscape, educators wonder how they can satisfy their students' curiosity when accountability requires particular ways of assessing academic achievement. Teachers report that external mandates, formal curriculum, and imposed frameworks that outline what and how they teach, limits student understanding of abstract concepts, and for many veteran educators, grade level curriculum, state, Common Core, and specialized professional association (NCSS) standards, pose additional "frame factors" that constrict time, resources, and physical space.

Another challenge faced by teachers in the Social Studies, is the ambiguity of the standards: Democracy, Freedom, Independence, Civil Rights, are only a sampling of the broad, abstract strands, that lack specificity, and require teachers to create their own thematic units and activities that support childhood learners' understanding of concepts.

While concerns appear widespread across schools in the USA and among international colleagues with curricula that mandates the teaching of geography, history, and even foreign language in grades K-8, these issues need not be considered problematic. These are exciting times!

Teachers can embellish their curriculum with supplemental activities, relevant content, enticing enrichment, and rich experiences that expose children to the world.

Jere Brophy and Janet Alleman, dedicated their lives to social studies research. The Michigan State University professors raise two important questions in a journal article: "(1) What content is most worth teaching in elementary social studies? And (2) what kind of lessons and activities are most useful for developing the proposed content?" (2006, p. 429).

The questions above serve as the framework for this chapter and for any Social Studies educator. Yet permit me to insert one word integral to both the planning process and "teacher thinking" on practice: "*Why?" Why* is this activity most useful for developing the concept, topic, content, and theme? *Why* is this the time to teach about Native Peoples or Colonial America?

Teachers need to consider *why,* as much as *what*, and *when* during the planning process. In the social studies, effective teachers carefully select materials, props, costumes, artifacts, music, video clips, and culturally relevant texts. They consider time frame, audience, and where each lesson fits into the crescendo-building finale that is the culminating activity or performance that puts closure to a particular topical strand before a new one commences. That's what is so exciting about teaching our discipline! There's always a project, a guest speaker, an object to examine, a play, or a simulation to provide learners with opportunities to experience a world/culture/time period/environment/career/situation that is different from what they know. Experiences engage children with the content, and when they are engaged, they are thinking!

John Dewey (1916) noted the value of indirect, informal, incidental, and ancillary learning:

> [The Child] learns in consequence of his direct activities. The better methods of teaching a child, say, to read, follow the same road. They do not fix his attention upon the fact that he has to learn something… They engage his activities, and in the process of engagement, he learns." (p. 176).

While the Common Core standards' movement is embraced and debated in policy circles across the USA, and national curricula effects students in countries around the globe, neither presents as new phenomena. Scholars, theorists, and model citizens have forever engaged in discourse on the merits, purposes, and goals associated with becoming an educated person. The Ancient Greeks pondered the question, "What should an educated person know?" So did The Progressives, who at the turn of the Twentieth century faced the daunting task of educating the children of millions of immigrants who arrived on the shores of the USA from the European continent.

And while E. D. Hirsch (1987) suggests rigor in the core content areas, Peter Martorella (1985) suggests more enduring outcomes for Social Studies teaching: (1) transmission of the cultural heritage; (2) methods of inquiry; (3) reflective inquiry; (4) informed social criticism; and (5) personal development.

How does this occur within our schools? William Garrison, who retired after a career in education that culminated as director of assessment and evaluation for the Palo Alto Unified Schools believes in learner empowerment: "The educational process in a democratic society is grounded in basic freedoms. From a learner's perspective, the most important of these freedoms is the freedom to choose, to act on that choice, and to experience the results of those actions," (2008, p. 189).

Teaching rich content cannot occur in isolation. Understanding occurs when students engage in activities that reinforce assimilation of life skills. Learners recognize recurring themes in texts and realize that human characteristics are present in both antagonists and protagonists, leaders, heroes, and regular citizens. I encourage teacher candidates to offer their students the opportunity to develop life skills. Through practice, students (1) Make Decisions, (2) Take Risks, (3) Communicate Intentions, (4) Respect (or Disrespect) the Rights of Others, (5) Work Cooperatively, (6) Work Independently, (7) Take Responsibility, (8) Use (Available) Technologies, (9) Feel Free to Make Mistakes While Learning, (10) Rebound from Challenges, and (11) Solve Problems. Teachers recognize the "new realities" of teaching children in the twenty-first century. Few children are sheltered from or immune to the realities of their surroundings. They experience life (birth of a sibling), death (of a beloved pet or family member), and change (seasons, their body). Their lives are directly affected by the personal, professional, physical, cultural, and economic realities of adults, and they have become increasingly exposed to subject matter that is developmentally inappropriate (Carlsson-Paige, 2008). Our learners experience firsthand, personal upheaval associated with relocation, deployment, natural disasters, everyday choices, and yes, economic meltdowns. Moreover, questions that arise from our students' innate curiosities can be answered, immediately, through online searches with any electronic device, *during class*.

So why do kids need us? What value do teachers offer to children who can learn through YouTube, new media, iPads, virtual downloads, and other devices? While the sense of immediacy offers tangible sources of communication and information, the social studies consider deeper, philosophical questions that have perpetuated humanity's search for meaning since the beginning of time:

> Why am I here? What is my purpose?
> What do I have in common with historical heroes?
> How was electricity developed?
> Why did immigrants come to America? What is democracy?
> What is the purpose of war? What can't we end poverty?
> How can we all exist on the planet?
> How do people forgive after a dehumanizing injustice?
> What is divorce?
> Why do they do that? (rituals, traditions, celebrations).
> Why should I know about…? Why should I care?
> What's the meaning of that song lyric?
> You mean back then, they did ______?

Educators in today's changing world assume roles as facilitator, mediator, catalyst, discovery guide, and creator of environmental experiences. They reframe questions that learners consider, and support understanding. When children raise legitimate questions that deal with sensitive or controversial subject matter, subsumed within the Social Studies curricula, what should teachers do?

Teachers express concerns. Issue-oriented subjects appear across a wide-range of content areas in the Social Studies and English/Language Arts curriculum including, but not limited to: The Americas, Apartheid, Biographies, Careers, Civil War, Civil Rights, Colonialism, Culture, Current Events, Diversity, Families, Freedom, Gender Roles, Holidays, The Holocaust, Immigration, Patriotism, Politics, Religion, Race, Slavery, Traditions, Veterans, War, and the impacts of Westward Expansion on Native Americans.

I categorize the constructs above as "pot-holder topics," and define these as subjects that may be "too hot to handle." I actually display two, padded, cloth, potholders traditionally used in cooking, to illustrate how teachers, in our discipline, can get "burned." I caution, both novice and career teachers, to exercise care, consider cultural sensitivities, consult with the curriculum adopted by their school, and present balanced information, when teaching. The list of "pot-holder topics" has recently come to include, teaching about, the 44th President of the USA, Barack Obama, in some classrooms across the USA, as an effect of political polarization.

It is rare, in other disciplines, for teachers to face parent and district pressure, threat of job loss, or legal sanctions, because of curricular content, but when teaching topics within the social studies, these realities present regularly. A position paper issued by the National Council for the Social Studies (2007) outlines the importance of safe guarding *academic freedom* for both students and teachers. For these reasons, many teachers choose not to second-guess themselves and resort to operationalizing. They redirect questions posed by students that may be viewed as problematic.

Terrie Epstein and her doctoral students observed practices of social studies teachers and conducted interviews with 5th, 7th, and 11th grade public school students, parents, and teachers, based in Oakland, California. Epstein's multi-year findings note:

> Talking about racism historically and today is difficult, especially in multiracial classrooms or those in which the teacher and students have different identities or interpretive frameworks. But teachers who avoid race talk in history or humanities classrooms mis-educate all American youth, not just about their national historical legacy, but about their ability to change contemporary society (Epstein, 2009, p. 5).

Epstein's research focuses on race, identity, and social justice within the context of the social studies. Yet *the pedagogy of silence* practice occurs with regularity in K-12 settings and operationalizes as follows: (1) the learner's question is ignored by the teacher, who proceeds with teaching the lesson; (2) the learner raises his/her hand to ask a question, but is routinely ignored by the teacher who shifts the direction of the lesson; (3) the teacher ends the lesson ("close your books") or ("work on the assignment with your group"); (4) the teacher embellishes a strand of the lesson until the class period is formally concluded. Kids wonder why what they have to say doesn't matter. This practice is especially ritualized in the primary grades when children tend to comment freely and spontaneously, because the sanctions of *social censorship* are not fully understood or embedded in their consciousness.

These are not situational lapses, or failure to adequately allow for wait-time theory to gel. Teachers who are not confident in their abilities to open up a forum for student interaction with the Social Studies or English/LA content, or who feel compelled to micro-manage learner outcomes, by redirecting students' comments to a pre-determined set of particularized "acceptable" responses, delimit human agency in their classroom.

Over my 20-year career as a practitioner in K-12 school settings, I have experienced my share of *pot-holder* moments. Students actively interacted with the 4th grade Social Studies curriculum that started with Pre-Colonial America and culminated with Immigration from the European continent to the USA. The formal curriculum required the teaching of multiple *pot-holder* topics from Indentured Servants and Slavery, to Barbary Pirates and Forced Relocation of Native Americans. When current event topics, selected by students as an out-of-school assignment was added to the weekly mix, the list of controversial topics grew exponentially:

> AIDS, 9/11, Columbine, Challenger Explosion, three wars, (Near East) political upheavals, (Far East) tsunami and nuclear disasters; debates on Gun Control, Violence, marriage equality, and immigration reform.

These demonstrate that even primary grade learners do not live in a bubble. In fact, thanks to 24/7 global monitoring of world events, any person with access to a television or tablet can witness "live" coverage of events as they happen. I recall my experience in Delhi, India in January 2011. I was a presenter at the WE-ASC (World Education, Arts, Science and Culture) Conference. Delegates from around the world offered condolences to me, a US professor who hailed from Arizona, as we were tuned to CNN's live coverage of the memorial service to honor the victims of the Tucson, Arizona mass shooting. One conference participant from Estonia commented on the tragedy that took the life of a 5th grade student, Christina Taylor Greene, and other citizens who gathered on a Saturday morning at a local supermarket, to greet their Congresswoman, Gabrielle Giffords, who was seriously injured. As tears streamed down my face, I acknowledged her question, "Why do they kill children in Arizona?" and felt public humiliation that my home state of Arizona, and its people, were viewed by international colleagues through a media perpetrated stereotype. People made assumptions at the conference, based upon images and events portrayed in the media, and thus categorized Arizona, from two lenses: Tucson's gun violence or "illegal" immigration (Nunberg, 2006).

I was reminded that our perceptions of others are often filtered through a lens that is imposed upon us, and presents visuals of people, actions, geographic regions, occupations, and a host of other subjectivities, from a medium that may or many not offer primary source information, but is nonetheless, mediated by the commentary of others.

I remind both teacher candidates and practitioners alike, that our students are currently *growing into* their future roles as members of society. How will they assume their place in business, education, military and foreign service, the media, law enforcement, the judiciary, the arts, food production, design, sports, science, technology, and beyond, if they are not exposed to opportunities to make informed decisions? Moreover, our childhood learners are recipients of the same technology that both extends life (robotic surgeries, prosthetic devices, mechanical respirators for premature infants) and tragically shortens it, too.

Individual choices, decisions, and actions, when gifted with the freedom that personal autonomy permits, does not affect any of us in isolation, never has, and probably never will. The effects of one decision and one person's story ripples and impacts the rest of us, in some way. And, thankfully, as teachers in a democratic society, within the social sciences, our students are routinely enticed to examine, evaluate, and come up with their own answers, more often than they are required to come up with one, correct answer. Our goal is not to influence or sway learner's thinking or predetermine a situational outcome. Rather, social studies teachers are charged with providing students with a safe space from which to make decisions, share their perspectives, and experience learning.

Applications for Practice

So, what do we do? What should kids learn about people, places and environments? Why would they care about events and policies that exist outside their local community? How do teachers prepare children for their roles as citizens in a global

Table 10.1 C3 framework organization

Dimension 1
Developing questions and planning inquiries
Dimension 2
Applying disciplinary tools and concepts
Civics
Economics
Geography
History
Dimension 3
Evaluating sources and using evidence
Gathering and evaluating
Developing claims and using evidence
Dimension 4
Communicating and critiquing conclusions
Taking informed action

community? And how is it possible for teachers to cover broad strands within the guidelines set forth by the National Council for the Social Studies (NCSS) over the course of an academic year, a semester or within a thematic unit?

"The C3 Framework, like the Common Core State Standards, emphasizes the acquisition and application of knowledge to prepare students for college, career, and civic life. It intentionally envisions social studies instruction as an inquiry arc of interlocking and mutually reinforcing elements that speak to the intersection of ideas and learners. The Four Dimensions highlighted below center on the use of questions to spark curiosity, guide instruction, deepen investigations, acquire rigorous content, and apply knowledge and ideas in real world settings to become active and engaged citizens in the 21st century," (www.ncss.org/C3). Each of the Four Dimensions of the C3 Framework are strategically aligned to the Common Core State Standards for English Language Arts and Literacy in History/Social Studies which encourages content area integration (Table 10.1).

Social Studies Integration

Learners' questions challenge teachers to integrate content with other disciplines (Math, Literacy, Technology, and Science) Alanis (2007); Al-Hazza and Lucking (2007); Gunel (2008); Hanna (1965); Lark (2007); Norby (2003/2004); Osborne (1996); Peterson (2008); Rotner and Kelly (2009); Veltri (2009 Veltri (2012). Visit a library or an online bookseller and peruse titles such as: *Dinosaurs Divorce: A Guide For Changing Families* (1986), and *One World, Many Religions: The Ways We Worship* (1996), *While You Are Away* (2004), and *How Many Days to America?: A Thanksgiving Story* (1988). These are but a small sampling of titles that delve into topics within the social studies standards framework.

Thousands of trade books, literary selections, audio and videos are readily available in the public domain. These resources offer professional life lines for teachers, and learners who crave rich expository texts, realistic illustrations, visual images that support learner development, extend content applications, and provide tangible links for multimodal content delivery. These tools supplement the queries of learners who instigate, critically engage, and wonder, even as they observe political cartoons, culturally accurate illustrations and vivid photographs.

Don't underestimate the power of picture book classics to teach mid-level (grades 4–8) learners Economic principles of money management. *The Berenstain Bears Trouble with Money (1983) or The Berenstain Bears Get the Gimmies (1988)* offer examples of concrete teaching methods that help conceptualize basic economic strands of needs versus wants for all grade levels.

The True Story of the 3 Little Pigs! By A. Wolf (1989) integrates Social Studies with English/Language Arts skills that develop critical thinking, and point of view, while tapping the Common Core standards that require learner collaboration and problem solving. Articulating and debating a "defense" for A. Wolf that protects his rights, protected under the Bill of Rights for due process, offers upper grade learners the opportunity to examine the US Constitution and consider whether a wolf is entitled to a trial before a jury of his peers. (Does The Constitution offer rights to a "wolf"?)

While world events may have changed the names of countries on a world map, there has never been a time when my students have *not* pondered events, decisions, policies, laws, phenomena, inventions, structures (cultural, economic, political, and physical), weather disasters, or the environment, and considered the big questions:

> What would we do if we walked in their shoes?
>
> How did a child live…at a particular time period or location?
>
> Why did they decide, for better or worse, to take a risk, make that decision, work alone or with others, send a rich description of a battle in a journal, a letter to a spouse from the White House, or illustrate images in a sketchbook depicting the realities of boarding school, a policy imposed by the U.S. government upon American Indian youth.

One project that integrates primary source images, technology, literacy, and NCSS and Common Core Strands is the ***Book Back Drop Project***. Teacher candidates select one non-fiction or historical fiction book that addresses one or multiple NCSS standards: History, Economics, Geography, Global Connections, Diversity, or Environments, and create separate power point slides that identify: (1) objectives, (2) book summary, (3) affective and cognitive goals, (4) NCSS and Common Core Standards 5) Vocabulary, (6) bulleted content knowledge, (7) References and Resources and (8) a list of specific Assessments (performance, arts-based, authentic, and standard). Five to seven additional slides include one focused objective and lesson that teacher candidates create to enhance the topic for their elementary age students. Through the use of primary source visuals, embedded into the power point slides, specific performance tasks reinforce concepts, skills, and integrated content with research, written and oral communication, and technology.

For example, one teacher candidate (who is now teaching 5th graders currently) selected the book, ***The Navajo (Dine) Code Talkers.*** Her slides included; (1) a map of the area in Arizona and New Mexico that locates the Navajo Nation within the continental USA) for students to examine, research and discuss the environment, (2) a digital/visual story time line connected to the content information and the event studied, (3) content specific vocabulary with definitions located in context; (4) An Artifact examination station that class members requested from their grandparent or relative, (5) A narrative summation of a family interview (especially of veterans) and (6) Students' creation of their own code.

This teacher candidate culminating activity for my social studies course serves as a visual model for elementary age students who can replicate the activities over several in-class sessions. When informational and narrative texts that offer rich primary source visuals are available in classrooms, students' learning is stimulated, especially when one book focuses study on a particular time period, person, event, or challenge. Students' questions probe deeper into subject matter and results in an array of ancillary learning: research writing, inquiry, brainstorming, discussions, vocabulary acquisition, out-of-school excursions, interviews, visual displays, simulations and reenactments, international and national exchanges, adapted lyrics, political cartoons, 3-D artifacts, Web sites, designs, and expressive demonstrations.

One truism is certain: teaching social studies remains an adventure because of the unique interests and creations of my students. When an environment from which children can discover, is created, in and around the social studies, it should be an organic one, where teachers refrain from predetermining the lesson's outcome or trajectory of discovery. Predicting the direction of a project or discussion, or comparing the creative artifacts of one class with another, proves to be futile, because every year, the students change. And with the infusion of *student* creativity and intuitive sense of self, interaction with the content, based upon each child's "personal lens," makes the experience different for you, the teacher, every time you teach the topic.

Childhood and adolescents expression of self, is often correlated to their comfort level as well as what is prominent for them both personally and temporally. Through a project, instigated by my own elementary age students and replicated by teachers nationally and internationally, students illustrate constructs and terms related to the social studies, represented by a single letter of the alphabet, selected from a tub of cinnamon cookie letters. For example (E = Equality) *From A Kids' Point of View* opens possibilities for personal expression and what I term, the discourse of *"visual voices."* This teacher-as-researcher or action-research project, draws upon Michael Polanyi's (1967) research on tacit knowledge and offers childhood educators of students in grades 2–8 an assessment strategy whereby students, "show" through their original visual art, that they "know more than they can tell." These authentic assessments are telling, emotive, rich in content, not your average paper and pencil task, and demonstrate that when kids are motivated, their creativity demonstrates that their thinking and knowing is deeper than we can imagine. Social Studies must be integrated with the arts, music and drama. Images from the project can be viewed at www.fromakidspointofview.com.

How do we know that kids understand the content and concepts that teachers present? Do kids "translate" the information that they receive and make their own meaning? What matters to kids, why it matters and their point of view informs not only teacher practice but also public policies.

Four Theories Applicable to Elementary Social Studies

Theories abound in the social sciences. But for our purposes, let's keep it simple. Four theories work across all disciplines and are applicable to the teaching of K-8 social studies. Two theories relate to practice and were explained previously in this chapter:

(1) *Pot-holder Topic Theory (Dr. V's original)* and
(2) *The Pedagogy of Silence* (*Epstein,* 2009)

The next two theories are deeply embedded in the social sciences, and are heavily referenced within the research literature. During the first week of class I ask students to consider their own K-12 study of history, and then look at their family history, and consider the idea that *social order is reproduced with each generation.* I ask students to consider the rituals, celebrations, mores, values, routines, songs, games, foods, and cultural mainstays of their own culture. We then consider how expectations (social and economic) play into the cultural and economic "order" that reproduces one's role in society.

The final task requires students to list examples across historical or modern times that cite evidence of ***(3) Reproduction Theory***. We then share that the social order, over time, has always been reproduced. "If your father is a King, you are a prince. If your father is a tailor, you'll be a tailor." Take home message: socio-economic status was and remains, mostly predetermined. With education, hard work, luck, opportunity, a shot at immigrating to America, people had a chance to move up the social ladder. But for most inhabitants of the world, there is little or no opportunity to change one's social status.

(4) Revisionist Theory seeks to spin history according to whose version of the truth one wishes to acknowledge. This can be problematic when selecting texts and viewing the coverage of topics. Often one particular perspective on a topic, is viewed as more favorable, or becomes the "master narrative," as Francois Lyotard (1984) suggested; when the truth is minimized, a select few hold the dominant story for the masses.

Revisionist theories assert that The Civil Rights Movement didn't harm anyone, or that The Holocaust didn't happen and concentration camps weren't that bad. These comments, restated over and over in the public domain, are in fact, untrue, but targeted messages that are disseminated widely and with consistency, require counter-narratives from eyewitnesses to counter the mistruths. But many survivors of tragic events might not be available in person to present their accounts, yet their recorded testimonies, visual stories, interviews, journals, or original art, provide primary source data that helps to set the record straight for posterity.

Mr. Ernest Michel is one eyewitness who I have been privileged to know, and befriend. His story is an amazing triumph of hope. *Promises Kept* (2008) chronicles Ernie's youth in Mannheim, Germany, forced labor at three grueling Nazi death camps, diligent reporting as the lone Auschwitz survivor, by-line #104995 during The Nuremberg War Crimes Tribunals, community service as the Executive Director of the United Jewish Appeal in New York City, and retirement in Arizona, where he met the author and presented his "first person" accounts to hundreds of teachers, counselors, and administrators.

Conclusions

It is my hope that this chapter will ignite burning questions; energize both learner and instructor; deepen intellectual curiosity, spark self-actualization, and rouse the "voice" within, to inquire, inspire, and effect change. Student instigated projects, learner innovation, and inquiry that promotes discovery, entices solutions. You will find that children and adolescents do not view situations as problems; rather, they see possibilities, and that is a wonderful place to engage.

Application Activities

Idea 1

Culture Collage and Five Facts Shoe Research project: Go to www.afar.com and select back issues. Shoes from countries around the globe appear on a two-page full color spread in the first issue that identifies the country of origin underneath each shoe. Request the back issue, or the PDF. Excellent real-time images to overcome stereotypes and teach Global Connections NCSS standards.

Purchase current issues of AFAR magazine at Barnes & Noble booksellers and/or supermarkets. The magazine retails for under $5.00 and provides real-time cross cultural images, notes from reporters immersed in more countries than you can imagine. Great teaching tool for Social Studies topics: Production, Consumption, Distribution.

Idea 2 The Ripple Effect of Giving Up Your Story

Select one person to interview and include two key questions: Which historical event do you remember, and what effect did it have on you? Then go to www.youtube.com. Enter your interview subject's single historical event in the search area. Review two-minute video clips. Select one that captures the best portrayal of the primary source event. (e.g., John F. Kennedy's Inauguration Speech).

Idea 3 For the From A Kids' Point of View

The ABC's of Misunderstanding project: With a box of cookie letters as the concrete "prop" have students select one letter and have them consider one word/concept that relates to the Social Studies that begins with that letter. Students will illustrate what the word means to them (From A Kid's Point of View) and offer a short description. To see examples of this project, go to www.fromakidspointofview.com. Select the Gallery View tab to view a montage of student's "visual voices." Select the Case Studies tab to view kids' original art that depicts "immigration."

Idea 4

Go to http://www.moneymanagement.org/Budgeting-Tools/Credit-Lesson-Plans/The-Berenstain-Bears-Trouble-with-Money.aspx. There you will find a fully developed series of lesson plans that include materials, financial literacy vocabulary, outline of the big questions that instigate student thinking, and ways to engage group interaction with a project that is tied to key economic standards.

Definitions

Basic Human Needs: Essentials for survival Needs

1. Water
2. Food
3. Shelter
4. Temperature (warmth, but not excessive heat)
5. Rest

Basic Human Wants: Impact quality of life

1. Companionship
2. Comfort (warmer warmth/shelter
3. Freedom (Safe)
4. Self-determination
5. Peace (of mind, body, location

Culture: The way of life of a group of people.

It is important to note that while human beings are complex and individual, *needs maintain their constancy*, while wants are greatly impacted and even *altered* by:

Time:	When you live (era, period, century)
Place:	Where you live (Ancient Rome, Seattle, castle)
Circumstance:	An unseen situation (Do you have a flat tire?)
Condition:	One's state of being (Are you happy? Are you poor?)
Culture:	How you live

National Council for the Social Studies (NCSS)

Curriculum Standards for Social Studies

Standard

1. Culture
2. People, Places, and Environments
3. Time, Continuity, and Change
4. Individual Development and Identity
5. Individuals, Groups, and Institutions
6. Power, Authority, and Governance
7. Production, Distribution, and Consumption
8. Science, Technology, and Society
9. Global Connections
10. Civic Ideals and Practices

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Chapter 11
Comprehensive Assessment Planning: Developing and Managing Multiple Types of Assessments

Cynthia A. Conn

Key Questions

1. How has the InTASC Model Core Teaching Standards raised expectations in relation to assessment practices?
2. What are the benefits of comprehensive assessment planning that incorporates multiple and varied formative and summative assessments?
3. What technology-based assessment tools or applications are currently available to assist with the collection and reporting of assessment data?

Introduction

Assessment has always been a key element of teaching and learning, instructional design, and curriculum development processes. However, "the current education system treats assessment as a function largely separated from teaching" (Council of Chief State School Officers, 2011, p. 4). The standardized testing movement is one approach to systematically collecting and reporting student learning data, but concerns have continued to be raised that standardized tests "should not be the only measure of student performance" (Abrams, 2013, para 10).

In 2009, the American Recovery and Reinvestment Act was passed which includes a section on Education Jobs and Reform. This Act encouraged states to "aggressively pursue higher standards, quality assessments, robust data systems and teacher quality initiatives" (US Department of Education, 2009, para. 6) for K-12 students and schools. Following the passage of the American Recovery and

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R. Papa (ed.), *Media Rich Instruction: Connecting Curriculum To All Learners*,
DOI 10.1007/978-3-319-00152-4_11,

Reinvestment Act, the National Governors Association Center for Best Practices and the Council of Chief State School Officers published the Common Core Standards for Mathematics and English Language Arts (2010) to encourage higher learning standards for students that are focused on career and college readiness and emphasize performance. These standards have been adopted by “45 states, the District of Columbia, 4 territories, and the Department of Defense Education Activity” (National Governors Association Center for Best Practices, Council of Chief State School Officers, 2012, para. 1).

Additionally, in 2011, the Council of Chief State School Officers Interstate Teacher Assessment and Support Consortium (InTASC) updated the Model Core Teaching Standards which continues to include a standard devoted to Assessment (i.e., Standard 6) with detailed objectives. The revised InTASC Model Core Teaching Standards clearly recognizes the importance of assessment to the teaching and learning process and places a strong emphasis on knowledge and application of assessment practices. Standard 6 includes a section on critical dispositions and describes the commitment required by teachers to effectively engage in assessment work to ensure the greatest benefit for students. This focus on assessment is also reflected in Standard 2, Design and develop digital age learning experiences and assessments, of the National Education Technology Standards (NETS) for Teachers (International Society for Technology Education, 2008).

The revised Interstate Teacher Assessment and Support Consortium (InTASC) Model Core Teaching Standards (Council of Chief State School Officers) advocate for the real integration of “assessment, planning, and instructional strategies in coordinated and engaging ways” (Council of Chief State School Officers, 2011, p. 9). The consistent collection, review, and use of data from multiple types of assessments have often been difficult to manage. With the increase of cost-effective computing devices and applications that often include features for the collection and reporting of data, it is now becoming practical for teachers to truly integrate assessment practices in the comprehensive manner outlined in the InTASC Model Core Teaching Standards.

This chapter provides foundational content and strategies for use by teachers related to assessment practices and addresses the following questions:

- What approaches and technology applications can be used to develop and implement a comprehensive assessment plan?
- How can technology assist teachers in efficiently collecting and analyzing assessment data to benefit student learning?
- How might you use assessment data to differentiate instruction for students?

Getting Started: Assessment Planning

The first step in the assessment planning process is the writing or development of learning outcomes or identification of instructional objectives (Morrison, Ross, Kemp, & Kalman, 2013). An objective “tells what the learner will be able to do as a result of the learning experiences” (Mager, 1997, p. 23). Mager (1997) provides guidelines for writing objectives and recommends that objectives include three characteristics: "(1) Performance…states what a learner is expected to do and/or produce to be considered competent; (2) Conditions…describes the important conditions (if any) under which the performance is to occur; and (3) Criterion… describes the criteria of acceptable performance…[or] how well someone would have to perform to be considered competent" (pp. 46–47). In terms of identifying objectives, the Common Core Standards (2010), NETS for Students (2007), or Next Generation Science Standards (NGSS) (2013) provide comprehensive sets of outcomes that curricula can be aligned to. The Common Core and NGSS are delineated by grade level, whereas the NETS for Students are a broad set of outcomes that teachers, schools, or districts can determine when and how often to address each of the standards at the various grade levels. In many states, the NETS for Students have provided the foundation for developing state technology standards that are delineated by grade level and include instructional objectives. Each of these sets of learning outcomes should be reviewed and appropriately sequenced and arranged in relation to the adopted textbooks and instructional approach of the teacher. This curriculum mapping (Jacobs, 2004) process provides the foundational content for the assessment plan. It documents when and where particular learning goals are introduced, reiterated, and assessed.

Curriculum Mapping

For K-12 schools, Jacobs (1997) recommends using a calendar as the framework for outlining or mapping how each learning outcome is addressed. This is especially appropriate for early childhood and elementary settings. Secondary schools may also consider a course or a set of courses that students would typically take within a school department, such as Social Studies, Science, or Math, as the framework for mapping curriculum to standards. Information that should be included in the curriculum map includes:

- Outcome or instructional objective, including a reference to the standard, if appropriate
- Unit, lesson, and/or textbook chapter title
- Formative and summative assessments

Once these pieces of information are noted, it becomes evident how each learning outcome is being addressed, if gaps exist, and if any are addressed too many times. Although a table in a word document can be used, a spreadsheet or database is more useful due to the data sorting features available through these programs. See Figs. 11.1 and 11.2 for examples.

It is useful to map curriculum by grade level or within content areas so that teachers can analyze student learning throughout an entire elementary, middle, or high school academic program of study. To ensure that expectations and progression through curricula at similar school levels are comparable, curriculum maps are often created at the district level with teacher committees representing multiple

1	Standard/Instructional Objective						Month					Assessments	
2	ENG	MATH	SCI	SS	TECH	Etc.	AUG	IRA	SEPT	IRA	Etc.	Formative	Summative
3	[1]	[1]	[1]	[1]	[1]	[1]	[2]	[3]	[2]	[3]	[2]	[4]	[4]
4													

[Worksheet 1]
[1] List each code and/or description of national or state standards or locally developed instructional objective in a separate cell.
[2] List the name of the unit or lesson that addresses the standard/instructional objective in the month delivered.
[3] Note if the standard/instructional objective is being introduced (I), reiterated (R), or assessed (A).
[4] Note the name of the formative or summative assessment that explicitly assesses the standard/instructional objective and assign number (i.e., Assessment #1, Assessment #2, etc.).

Fig. 11.1 Example template for an early childhood or elementary curriculum map for a specific grade level

1	Standard/ Instructional Objective	Month					Assessments	
2	ENG	AUG	IRA	SEPT	IRA	Etc.	Formative	Summative
3	[1]	[2]	[3]	[2]	[3]	[2]	[4]	[4]
4								

[Worksheet 1]
[1] List each code and/or description of national or state standards or locally developed instructional objective in a separate cell.
[2] List the name of the course and unit or lesson that addresses the standard/instructional objective in the month delivered.
[3] Note if the standard/instructional objective is being introduced (I), reiterated (R), or assessed (A).
[4] Note the name of the formative or summative assessment that explicitly assesses the standard/instructional objective and assign number (i.e., Assessment #1, Assessment #2, etc.).

Fig. 11.2 Example template for a secondary education curriculum map for a specific grade level and content area

schools within the district. The management of large scale curriculum mapping initiatives is facilitated by sophisticated, collaborative software applications. A variety of products can be located through an Internet search for curriculum mapping software, and both open source and fee based products are available.

Identification and Development of Assessments

Once the initial curriculum map is developed, Wiggins and McTighe (2006) recommend a process called "backward design" (p. 13). This model encourages instructional designers and teachers to first locate or develop assessments explicitly intended to evaluate the identified learning outcomes. The InTASC Model Core Teaching Standards advocates the use of "multiple types of assessment processes to support, verify, and document learning" (p. 15). Standard 6 also notes the importance of a balance between formative and summative assessments. Formative assessment is the use of "various tools and strategies to determine what students know, identify gaps in understanding, and plan future instruction to improve learning" (Learning Point Associates, 2009, p. 2). Formative assessments often fall into one of three categories: spontaneous, intentional, or formally embedded in the curriculum

- Quiz or exam with multiple choice, fill-in the blank, and/or matching type questions
- Item analysis of worksheets or other assignments
- Writing prompts (short response and essays)
- Formative assessment techniques (e.g., Classroom Assessment Techniques, Angelo & Cross, 1993; 25 Quick Formative Assessments for a Differentiated Classroom, Dodge, 2009)
- Case studies and micro-scenarios
- Simulations
- Gaming or gamification
- Projects, products, and performances (e.g., creation of timeline, podcast, and participation in a debate)
- Observation of knowledge or skill (e.g., demonstration of steps to accomplish math problem, and presentation science concepts and lab results)
- Student self-assessment based on rubric or scoring guide
- Student thoughts related to learning based on responses to reflective questions

Fig. 11.3 Examples of types of assessments or assessment strategies that can be explicitly aligned to student learning outcomes or instructional objectives

or textbook (Learning Point Associates, 2009), whereas summative assessments provide comprehensive information necessary to determine if the instruction was in fact successful, and that the expectations set forth in the designated student learning outcomes have been achieved or to what degree they have been met.

Formative and summative assessments can and should take many different forms. The use of a broad collection of assessment types allows students with varying strengths and backgrounds to demonstrate their learning in relation to the stated instructional objectives. Assessments can range from traditional quizzes and exams to student self-report of learning through responses to reflective questions (see Fig. 11.3 for a listing of assessment types).

As noted in Figs 11.1 and 11.2, the formative and summative assessments should be listed in the curriculum map. Due to the time necessary to analyze, interpret, and use assessment data, careful attention and prioritization needs to be given to the quality and quantity of assessments to ensure an efficient assessment plan is adopted. Determining quality, implementing assessments, analyzing data, and using data to identify achievement and gaps in learning are discussed in more detail later in this chapter.

Integrating Technology-Based Assessment Tools

As discussed in the "Introduction" of this chapter, the increased access to computing devices and applications that include collaboration, viewing history, recordings, data collection, and reporting features is making it possible for districts, schools, and teachers to truly integrate assessment practices in the comprehensive manner outlined in the InTASC Model Core Teaching Standards. The Technological Pedagogical Content Knowledge (TPACK) framework (see http://www.tpack.org) provides one view of how to effectively integrate technology with content and pedagogy and is a useful resource in considering the connections between these three components when determining methods for integrating technology-based assessment tools (Koehler & Mishra, 2009).

Several categories of technology-based assessment tools exist including drill and practice, benchmarking tests, productivity tools, and learning management applications. One example of a drill and practice tool aligned to Common Core Math Standards is IXL(R) (see http://www.ixl.com). This product allows for the comprehensive practice of math concepts by grade level. It continually tracks student progress, and provides access to reports by student and class to identify learning achievement and gaps. Through an Internet search of K-12 software applications aligned to Common Core, additional math and reading products can be located. When reviewing products it is important to consider how the tool relates to the format of the Partnership for Assessment of Readiness for College and Careers (PARCC) and Smarter Balanced Assessment Consortium (Smarter Balanced) standardized tests aligned to the Common Core that are being adopted by states and that students will be asked to complete.

Benchmarking tools can provide useful information regarding student progress towards meeting a set of standards such as Common Core. Study Island(R) and several other products by Edmentum(TM) (see http://www.edmentum.com) provide a few examples. Again, an Internet search for benchmarking assessments aligned to Common Core Standards will generate additional sources. Also, as noted above, there are two consortiums developing common assessments being adopted by states that are aligned to the Common Core Standards, the PARCC (for more information, see http://www.parcconline.org) and Smarter Balanced (for more information, see http://www.smarterbalanced.org). In addition to the benchmarking tools being sold by private vendors, these consortiums are providing task prototypes and sample items (see http://www.parcconline.org/samples/item-task-prototypes) or practice tests (see http://www.smarterbalanced.org/pilot-test).

Productivity tools encompass a range of applications. Spreadsheet or database programs are included in this category and can be used to store, monitor, analyze, and report assessment data. Google Apps provide a variety of productivity software applications that include easy development of forms for administering tests, surveys, or self-assessments; creation of collaborative documents that allow for viewing history, development of presentations, Web pages or portfolios; and a Web conferencing tool with a recording feature that can be used for collaborating on projects, delivering presentations, or connecting with experts in the field.

Learning or assessment management applications such as Edmodo (see http://www.edmodo.com) or TaskStream (see http://www.taskstream.com) can include assignment instructions and quizzes/surveys or rubrics. These types of tools allow for the development of unique instruments and scoring guides while also providing an efficient method for collecting and reporting data from scored assignments. These tools also provide teachers a central location that is often password-protected to publish instructional materials, readings, assignment instructions, etc. for students to access. Since these tools include features for developing and implementing locally created assessments, teachers can explicitly align instruments to designated outcomes and if appropriate, incorporate academic language similar to the prompts students will encounter on standardized tests in order to better prepare students. This relates to an expectation listed as part of InTASC Standard 6(h) which states, "The teacher prepares all learners for the demands of particular assessment formats…" (Council of Chief State School Officers Interstate Teacher Assessment and Support Consortium, 2011, p. 15).

Developing Assessments

Not only have the InTASC Model Core Teaching Standards set high expectations in terms of the use of multiple types of assessments for documenting student learning, but the Common Core Standards have placed a strong emphasis on application of knowledge, presentation, higher order thinking skills, and problem solving. These types of knowledge represent the higher categories of "cognitive process dimension" (Anderson & Krathwohl, 2001, pp. 66–68) and are typically more easily demonstrated through performance based assessments. "Performance assessments ask students to demonstrate their skills rather than relate what they've learned through traditional tests" (Suskie, 2009, p. 26). A significant benefit of performance based assessments is that they "merge learning and assessment" (Suskie, 2009, p. 26). Performance assessments encompass project based learning, product development, and problem based learning. For more information, Part 2 Curriculum for eLearners and Chap. 15 Collaborative Learning provide detailed discussion and examples related to these instructional strategies.

Creating Scoring Guides

Performance based assessments are often used to foster high engagement with students. However, the effective use of performance assessments for monitoring student learning requires explicit alignment of objectives to the scoring guide or rubric criteria. A rubric is defined as "a scoring tool that lays out the specific expectations for an assignment. Rubrics divide an assignment into its component parts and provide a detailed description of what constitutes acceptable or unacceptable levels of performance for each of those parts" (Stevens & Levi, 2005, p. 3). Rubrics provide several benefits for students and teachers such as assisting with communicating assignment expectations and improving the quality and consistency of feedback. Additionally, once a quality rubric or rubric row is created, it can be adapted for use with other assignments (Stevens & Levi, 2005). This is particularly helpful since a variety of Common Core and NETS for Students outcomes are repeated or expanded upon throughout the grade levels.

With the end in mind, the performance or product that would appropriately demonstrate or measure student learning in relation to the designated objectives should be designed. The project or assignment instructions should include references to the appropriate standards or learning outcomes. Rubrics and scoring guides have tended to focus on the logistics of assignments (i.e., number of facts collected, number of pages written, participation with group members, etc.) rather than assessing the mastery of content. So it is critical that the criteria align to the designated instructional objectives so that the data collected provides an accurate representation of a student's achievement in relation to those objectives.

Given the audience level, it may be necessary to adapt or restate the language of the standards to ensure the student is able to comprehend the expectations. Once the standards or learning outcomes are determined, a rubric or scoring guide can be developed that contains each outcome as a separate criteria. Typically the criteria are listed in the left column, with a useful, detailed description of performance levels in the column or columns to the right of the criteria.

One approach to writing these descriptions is to write the best work you might expect, then the lowest level of work you might anticipate, and then the intermediate level or levels (Stevens & Levi, 2005). These criteria can be developed based on past student work on similar projects, observation of presentations or other work, student input, in cooperation with instructors teaching similar grade levels or courses, adaptation of other rubrics, or definitions provided through the selected standards. Although rubrics often need revised after an initial pilot, it is important to distribute the rubric to students since it provides another mechanism for communicating expectations and can be used by students to self-assess their work. After subsequent grading processes, the rubric should be revised or refined to clarify any items.

A good example of rubrics that are explicitly aligned to objectives and could serve as a valuable resource for schools are the Educational Technology Assessments that have been developed by the State of Washington Office of Superintendent of Public Instruction (OSPI). These Educational Technology Assessments are aligned both to the NETS for Students as well as integrate "science, math, health, English language arts, social studies and the arts" and related national standards (OSPI, 2013, para. 1). Multiple performance assessments that include detailed scoring guides for a variety of topics and grade levels are available through the OSPI's Web site: http://www.k12.wa.us/EdTech/Assessment/edtechassessments.aspx. The OSPI has licensed this work as a Creative Commons Attribution Non-Commercial Share Alike product and are encouraging the use, sharing, and adapting of these materials as per the following license code, http://creativecommons.org/licenses/by-nc-sa/3.0/

Rubric Creation Tools

For locally or teacher developed performance assessments, a variety of rubric creation tools are available online. As noted previously, many learning and assessment management applications provide rubric creation tools that are integrated within the product. Keeping the practical goal of collecting and using assessment data, including performance assessment data, several features are important:

- Ability to set up a class and provide student access to view and submit work
- Evaluate and store rubric scores
- Generate reports that lists data by rubric row for individual students as well as aggregated data for a class

Although products will have benefits and disadvantages, selecting a limited number of products for use within a school or district for locally developed traditional or performance assessments is helpful for managing comprehensive assessment plans. Selecting one or a limited number of products provides the opportunity for educators to become proficient in the use of the tool(s).

Validating Locally Developed Assessments

Beyond the practical barriers related to managing a comprehensive assessment plan with multiple types of assessments, there are recognized barriers to the creation of valid assessments. LaCelle-Peterson and Rigden (2012) note the importance of "includ[ing] evidence of the data's quality" (p. 4) when reporting evaluation results. In Pennsylvania, a law was passed in 2010 allowing "students to demonstrate competency on locally developed and independently-validated assessments" (Gotch & Perie, 2012, p. 6). Practical guidelines are emerging to facilitate work in framing a validity argument or inquiry for locally developed assessments.

Gotch and Perie (2012) describe an Argument Framework for Local Assessment Validation that incorporates three components: "Data, Warrant (Evidence to back claim and refute alternatives), and Claim" (2012, p. 7). Gotch and Perie's framework was developed to "evaluate the technical quality of high school end-of-course examinations that are intended to supplement or supplant state-level examinations" (2012, p. 2). Another model presented by Lai, Wei, Hall, and Fulkerson (2012) provides a "validity agenda" (p. 6) for performance assessments based on the Standards for Educational and Psychological Measurement (AERA, APA, & NCME, 1999). Conn and Pieper (2014) also provide guidelines for examining and documenting the validity of performance assessments using a qualitative, reflective practice approach. The Validity Inquiry Process (VIP) Model (Conn & Pieper, 2014) is aligned to eight validity criteria outlined in the literature (Linn, Baker, & Dunbar, 1991; Messick, 1994):

1. Domain Coverage
2. Content Quality
3. Cognitive Complexity
4. Meaningfulness
5. Generalizability

6. Consequences
7. Fairness
8. Cost and Efficiency

The model includes practical resources, including instruments designed for use by teachers and students to reflect upon and gather evidence to build a validity argument for locally developed performance assessments, the scoring guides developed to evaluate the performance assessments, as well as a broader review of the assessments that compose an assessment plan. A copy of the model and instruments are available online: https://sites.google.com/a/nau.edu/validity-inquiry-process-vip-model

Commitment to Assessment and Continuous Improvement

The Critical Disposition section of the InTASC Model Core Teaching Standard 6 describes the commitment necessary to effectively engage in assessment practices for the benefit of improving student educational experiences. Fisher, Frey, and Pumpian (2012) describe this commitment in relation to the importance of creating an explicit culture of achievement within schools. Sweet (2013) describes the role Professional Learning Communities and other stakeholders such as students and parents or guardians play in developing a school or district's culture of achievement. Culture of achievement can be defined as the intentional work of educators to meet the designated mission or learning goals. Comprehensive, valid assessment plans can provide data and documentation regarding student learning at a variety of levels including an individual student, class, grade, school, or district. Assessment results can provide teachers and administrators with evidence that the instruction that has been designed, developed, and implemented was successful or identifies where learning gaps exist.

As noted in InTASC Model Core Teaching Standard 6(c), teachers should work "independently and collaboratively to examine test and other performance data to understand each learner's progress and to guide planning" (p. 15). Professional Learning Communities can play a critical role in analyzing and using data to ensure students are meeting academic standards. Frequent, consistent review of data is needed to ensure students do not fall too far behind before intervention measures are implemented. Benchmarking or predictive tests related to standardized tests, as discussed earlier in this chapter, are one method for assessing student learning and can be helpful, but should be viewed as just one indicator. More frequent, varied, and formative assessment data is also critical to incorporate into an assessment plan to provide a comprehensive look at student learning that takes into consideration the various strengths and challenges of the student population. Without this commitment by teachers and administrators and support of stakeholders, it is difficult to reap the benefits that can be gained through purposeful assessment efforts.

Implementing, Analyzing, and Using Assessment Data

Part of the commitment needed to successfully implement a comprehensive assessment plan with multiple assessment types is the ongoing review of the plan. It is helpful to have a teacher or administrator take a lead role in ensuring the key assessments are implemented, and data from these assessments are retrieved promptly, analyzed and used to make individual student and whole class instructional decisions. Assessment plans often require revisions and need to be viewed as living documents rather than as a policy manual that is often only reviewed when issues arise.

Implementing Assessment Plans

When developing an assessment plan, selecting or developing quality, key assessments for evaluating student learning in relation to designated outcomes and prioritizing or limiting the number of assessments is critical for creating a manageable plan. Instruction often addresses a wide range of objectives; however, the assessment plan should only include the key formative and summative assessments that explicitly address designated outcomes. Guidelines to consider in choosing these key assessments include:

- Balance of assessment types (i.e., providing students with the opportunity to demonstrate and reflect upon instructional objectives)
- Feasible in terms of implementing, completing, evaluating, and analyzing results; this is especially important to consider when implementing performance assessments which can take more time to complete than traditional assessment methods
- Timing of assessment in relation to progression through the curriculum

In addition to seeking a balance of assessment types, it is important to have more than one measure of an outcome (while at the same time not including too many assessments causing the plan to be unmanageable). This is referred to as data triangulation and provides greater confidence in the data collected (Hendry, 1995). Additionally, given the demands on educators' time, efficiency must be a critical aspect of the assessment planning process. When deciding upon assessments, determine how outcomes should be reported and if possible, group similar outcomes or outcomes that should be analyzed together within the same assessment. Also, determine how the score levels should be interpreted; for example scores in the low range require intervention, whereas low to mid-range scores may only require detailed monitoring of student work. The actual cut scores for each of the levels should be determined in advance.

Once the assessments are selected and noted on the curriculum map, a data map should be created (see Fig. 11.4 for an example). The data map is essential for

Standard/ Instructional Objective	Assessments				Data Map
Code	Assessment #1	Assessment #2	Assessment #3	Etc.	Rubric Row(s)/Question(s)
[1]	[2]	[2]	[2]	[2]	[3]

[Worksheet 2]
[1] List each code and/or description of national or state standards or locally developed instructional objective in a separate cell in Column 1.
[2] Note the name of the formative or summative assessment that explicitly assesses the standard/instructional objective.
[3] Note the rubric row(s) or question(s) that explicitly align to and assess the stated standard or instructional objective.

Fig. 11.4 Example template for a data map

knowing where to locate data for a designated outcome (i.e., particular items from a traditional exam, specific rows from a scoring guide or rubric, or defined prompts from a self-reflection). It is needed for determining when data will be available for reporting purposes, and how to format reports so that data that is intended to measure the same outcomes from multiple assessments types can be presented together for analysis purposes.

Analyzing Assessment Data

The InTASC Model Core Teaching Standard 6(l) and 6(m) place significant emphasis on teachers knowing "how to analyze assessment data to understand patterns and gaps in learning, to guide planning and instruction, and to provide meaningful feedback to all learners" as well as knowing "when and how to engage learners in analyzing their own assessment results…" (Council of Chief State School Officers, 2011, p. 9). The underlying issue that often keeps assessment data from being analyzed and thus used is the lack of efficient methods or tools for generating reports. Increased sophistication of technology-based assessment tools and consistent access to computing or mobile devices can assist with this issue. Selecting a limited number of applications to meet the requirements of the various assessments will allow users to become proficient in the setup, management, and data retrieval processes. Additionally, as noted above, considering in advance the most beneficial grouping of outcomes for analysis purposes and to the greatest extent possible grouping the evaluation of these outcomes within the same assessment will speed up the process of compiling data reports.

Once assessment reports are generated, review the common elements between the multiple types of assessments explicitly aligned to a particular learning outcome or set of outcomes. It is helpful to review and report:

- Strengths in relation to predetermined cut scores
- Weaknesses in relation to predetermined cut scores
- Results that contradict each other (i.e., high score on one assessment and low score on another)
- Comparison of the teacher's or external observations or unsolicited comments regarding student learning outcomes in relation to the reported data

Before determining specific interventions based on low scores, Bannister and Reinhart (2013) suggests allowing students to review their individual results from the assessment and reflect on if they view the results as an accurate representation of their learning, knowledge, and/or skills. Strategically using the results of the assessment data along with student reflection, appropriate interventions or individual learning plans can be developed that encourage the student and if appropriate, parental or guardian participation, to further support student learning.

Using Assessment Data and Differentiating Instruction

The benefits of assessment work can only be realized if data is collected, analyzed, and used. Assessment planning and the use of results can provide a direct tie to differentiating instruction and even the development of individualized learning plans (Sweet, 2013). The idea of creating and managing individual learning plans might be an overwhelming prospect for teachers to consider. However, if the data is accessible through concise reports coming from technology-based applications and tools, and there are computing devices available for students to access these tools on a consistent basis, then using data to purposefully differentiate instruction or develop individual learning plans becomes a feasible process.

The drill and practice applications such as IXL(R) discussed earlier in this chapter and curricula-based products like Success Tracker which is an online feature of the enVisionMATH(R) (2012) textbook series developed by Pearson (see http://tinyurl.com/EnvisionMathDigitalSolutions) provide recommended lessons and tutorials to students based on achievement levels from quiz or test scores. With learning management systems such as Edmodo, teachers can create a variety of instructional materials and approaches to content that students can then be directed to. These instructional materials remained housed in the system so although they may require a considerable amount of time to develop initially, they can be developed incrementally and revised and remain accessible for future classes. Part Two of this text, New Knowledge for Curriculum, includes a wide collection of instructional strategies and examples for core and specialized content areas, and can serve as a resource for teachers in developing differentiated instructional materials.

When learning gaps are identified and intervention measures are implemented, it is important to reassess or re-test mastery of content. The same or similar version of the assessment tool can be used. If using a traditional quiz or exam approach, it is helpful to create a bank of questions in advance so equivalent but randomly selected questions can be presented for follow-up testing purposes. This feature is typically built into drill and practice products available from vendors. If performance assessments are used, then revisions to projects or products should be re-reviewed using the original scoring guide. Data from the initial and subsequent reviews should be kept to demonstrate growth and mastery of content.

Data reports, analysis, and instructional decisions based on assessment data should be documented and kept for future reference. Utilizing a secure, collaborative, Web-based application for reviewing, discussing, and storing reports, and recording decisions is beneficial for efficiently managing and later reference of related documentation. Programs like Google Apps, especially if licensed by the school or district, or other curriculum mapping, learning or file management systems can provide the necessary collaborative tools and storage needed to facilitate this work.

Conclusions

Meaningful AND manageable assessment plans are essential to ensuring implementation and actual use of assessment data. Intentionally creating a manageable assessment plan that utilizes technology-based assessment applications will provide efficient access to data reports for review. A variety of applications including drill and practice, benchmarking, productivity, and learning and assessment management tools provide features that can speed up the process of implementing and reporting assessment data. Evaluating applications to select the ones that best meet the assessment plan goals and when possible, limiting the number of applications selected for use by a school or district will allow educators to become proficient in the use of those applications.

The plan should be composed of meaningful assessments, and issues of validity and reliability of locally developed instruments should be examined to establish confidence in the data. Committing the time necessary to consistently review and discuss assessment data, to share data with students and their parents or guardians, and to use the data to determine appropriate interventions or effective differentiation strategies and celebrate successes is a vital aspect of the instructional process that supports student growth and achievement.

Application Activities

Idea 1

Within your own school or organization, find out what is occurring in relation to comprehensive assessment planning, such as:

What steps have been implemented or are planned for in relation to developing a comprehensive assessment plan that incorporates multiple and varied formative and summative assessments? What technology-based assessment tools or applications are currently available or are being used by teachers and administrators?

How are teachers, administrators, and professional learning communities participating in the assessment planning process?

Idea 2

Conduct an Internet search and create a list of free and fee-based assessment tools and applications, including tools explicitly aligned to selected standards. Look for tools that fall into the following categories: (a) drill and practice, (b) benchmarking, (c) productivity, including rubric creation tools, and/or (d) learning or assessment management systems. Evaluate one tool in each category and note the benefits and disadvantages of the tool in terms of practical use and implementation for your own professional practice or setting.

Idea 3

Select a lesson or instructional activity that you currently teach or plan to teach that would be appropriate or beneficial to assess via a performance or product.

Conduct an Internet search for free, Web-based rubric creation tools and select a tool.

Using (or determine) the designated standards or objectives for the instruction, develop a rubric that explicitly aligns the criteria (left column) to the objectives.

Evaluate the rubric you created using the Metarubric for Examining Performance Assessment Scoring Rubrics (Conn & Pieper, 2014; see https://sites.google.com/a/nau.edu/validity-inquiry-process-vip-model/).

- What do you see as the challenges of implementing assessment work within your school or district?
- In your own professional practice, how are you and/or how might you begin working towards meeting the expectations outlined in Standard 6 of the InTASC Model Core Teaching Standards?

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Part III
Dynamic e-Instructional Strategies

Chapter 12
Online Collaboration and Social Networking

Shadow Armfield, Dawn M. Armfield, and J. Michael Blocher

Key Questions

1. Think about a lesson or activity that you already do or have created. How would you use the applications in this chapter, or other online applications, to create an online collaborative environment for your classroom? What are the potential benefits for your students in using this mode of learning?
2. How does online collaboration differ from face-to-face collaboration? How can online collaboration add to what you're already doing in your classroom?
3. How would the type of collaboration discussed in this chapter, online collaborative environments, be difficult to implement in your situation? How could you overcome the difficulties within the constructs of your system?

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R. Papa (ed.), *Media Rich Instruction: Connecting Curriculum To All Learners*,
DOI 10.1007/978-3-319-00152-4_12, © Springer Science+Business Media New York 2015

Background

The incorporation of collaborative learning activities in the classroom can create challenges for both the teachers and the students. Teachers create the activities to engage the students in experiential learning, but collaborative activities are not always successful. Take for instance a ninth grader in a biology class who is informed that she will be working with a group of her peers to examine, observe, and experiment with pill bugs (Armadillidiidae). Each member of the group is asked to bring in five specimens. However, the next day she is the only one to bring in the specimen. The activities based on the specimen include recording, reflecting, and understanding the pill bugs within a traditional personal journal. This journal is only seen by the student and teacher, thereby removing the collaborative segment of learning. In addition, the lack of pill bug specimens limits the extent to which the group can engage in the course experiment, thereby negating the collaboration, and creates a disconnection between the student and the rest of her group.

Chances are that at some point in your educational career, as a teacher or a student, you have experienced a similar "collaborative learning" activity that was less than beneficial. Teachers purposefully create these activities to help students gain deeper insight into the task at hand by having disparate ideas defined, debated and developed into a collective meaning (Roschelle, 1992). Collaborative learning has long been used by teachers in both the face-to-face and online learning environments to varying degrees of success. The ISTE NETS*S, The Common Core, and many of the discipline specific standards are inclusive of collaborative student engagement. This chapter will define what collaborative learning is, how it differs from other types of learning, how it can benefit the learner, and how online environments can be used to support and enhance collaborative learning activities.

Theoretical Constructs of Collaborative Learning

Teachers employ many different strategies to ensure that their students are successful in learning the requisite content for their classes. These strategies include:

- Direct instruction (i.e., lecture and drill and practice)
- Indirect instruction (i.e., problem solving and concept mapping)
- Independent Study (i.e., research project and computer assisted instruction)
- Experiential learning (i.e., field trips and role playing)
- Interactive instruction (i.e., collaborative learning and problem-based learning) (Saskatoon Public Schools. n.d.).

All of these strategies have a place in the classroom and each benefit the students differently. Bransford, Derry, Berliner, Hammereness, and Becket (2005) argue that the best teachers come to the table with an extensive knowledge of instructional strategies and have a keen sense of when to employ these strategies in different situations. In this chapter we are not suggesting that collaborative learning is the only strategy to be employed in the classroom, but rather, that when it is used, it is used with a sense of purpose.

Dissemination vs. Collaboration

Traditionally schooling has been conducted through a dissemination model. Dewey (2007) states, "the subject matter of education consists of bodies of information and skills that have been worked out in the past; therefore, the chief business of schools is to transmit them to the new generation" (p. 17). When Dewey wrote Experience and Education in 1937, he understood that the traditional view was a limited one and that students needed much more than having predetermined information transmitted to them. He argued that students should have the opportunity to use the scientific method to explore concepts and engage in "the formation of ideas, acting upon ideas, observations of the conditions which result, and organization of the facts and ideas for future use" (p. 88). The need for such experience in education has been exacerbated by an exponential growth of accessible knowledge (Carroll, n.d.). Jim Carroll, a futurist, goes on to say that by no later than 2020, learning will focus on "just in time knowledge;" which is a modern notion of having all knowledge at our fingertips rather than memorizing information that was learned. What this means for education is that we must move from disseminating information to engaging with information through analytical processes.

This changing landscape of knowledge production supports the Bransford et al. (2005) argument for an array of classroom strategies. Collaboration, as an instructional strategy, gives students the opportunity to work with just-in-time knowledge and engage in the processes described by Dewey. Collaboration differs from dissemination in that the learner is actively working with the information to determine what it means, how it relates the individual and the community, and how it can be used in the future. Furthermore, collaboration gives learners the opportunity to share, receive and critique information with and from others, including knowledge that they arrive with, knowledge they create, and knowledge they can search for in that moment.

Connections

Collaboration, as an instructional strategy, is about building connections to individuals and content. Lev Vygotsky (1986) maintains that new understandings are rarely the result of individuals working by themselves but rather are developed as two or more individuals interact with one another and the content. He notes that learners are often in a "zone of proximal development" where there is a breach in what an individual knows or can do by herself and what is possible in collaboration. He argues that individuals can be blocked by their own views and that these blocks can be broken down through discussions and reflections with others.

Grouping

The ideas of Dewey and Vygotsky are widely known in the field of education, but their theory does not always lead to good practice (i.e., the example at the beginning of the chapter). Group work is at the core of collaborative learning and requires a great deal of forethought before being implemented. Cohen (1994) has defined guiding characteristics for successful group work. Within her extensive guidelines, she suggests that two of the most salient points in collaborative learning are:

1. Interdependence—Goal or Resource?
   (a) Goal interdependence: individual goals are dependent upon all other members achieving their goals
   (b) Resource interdependence: goals can only be accomplished with information provided by other group members (jigsawing)
2. Student Interactions and roles—Specific or open
   (a) Specific roles: best when the teacher has given a more structured group goal
   (b) Open: best for ill structured problems, allows for the group to create as they go

As teachers engage students in collaborative work, having a set of guidelines by which the activities will operate establishes more positive outcomes. This is true in both face-to-face and online learning environments.

Artifact Development

Collaboration is not only about the interactions among members of the group and the development of their ideas but also about the development of artifacts to demonstrate the growth of the group. In the introduction to Constructionism in Practice (Kafai & Resnick, 1996), the authors maintain that the act of developing artifacts creates a relationship between the designer(s) and the artifact, which in turn create deeper understandings of the overarching ideas. Furthermore, they suggest that through the collaborative creation of artifacts the collaborative community further develops itself. In a well-designed activity, students working together to create artifacts also build community.

Online Collaborative Environments

From the early 1900s, ideas and research about collaboration have been worked into school curriculum. In the last 20 years, technology has allowed for collaborative activities to move from a face-to-face environment to an online environment and in some cases a mash-up of face-to-face and online collaboration. Regardless of whether collaborative learning environments take place in face-to-face to online environments, the theoretical constructs remain the same. "The Web 2.0 learning environment is grounded in socio-cultural learning theory. The aim of a socio-cultural approach is to comprehend the developmental processes involved in rituals (activities), at the level of individuals (identities), social (interpersonal), and cultural (community) processes" (Tu, Blocher, & Roberts, 2008). As Tu et al. continue, this theory negotiates the ways learning is constructed. Learners develop stronger skills through generating content, reflection, review/modification, and making processes visible. Schmitt, Dayanim, and Matthias (2008) are paraphrased by Tu et al. as saying that "Web 2.0 environments allow learners to make their learning process (mental models) visible and to view others' learning process; furthermore, it empowers learners with multiple opportunities to take control of how they improve their thinking and refine their metacognitive strategies. It is the process of negotiating and managing how they would like to learn through self-reflection and assuming responsibilities." In online collaborative activities, students are able to negotiate and create new information.

The following sections will describe specific online tools and environments, how they can be used to support collaborative learning, and provide scenarios of what collaborative learning might look like when using the tools and environments. While we are naming specific collaborative environments, it is important to remember that environments will change. The ideas about how to use the environments to promote collaborative learning will remain the same as you and your students work in future environments.

This section has been separated into collaborative tools, social media, content management systems, and collaborative development environments. The categories are set up in this way to show the differences in online collaboration and how it can be implemented through standalone, completely integrated, or developmental sites. At the end of each of the categories, examples and/or scenarios will be discussed that demonstrate their use within collaborative learning activities.

Collaborative Tools

Collaborative tools are often stand-alone applications that are "cloud" applications, meaning that the content is backed up online. This implies that some sort of Internet connection must be maintained in order to participate with these applications. However, new innovations have made some of these tools available both online and offline, although when used offline they are not collaborative. The tools then become asynchronous (used by each user at different times) to be synced up to the original artifact once an Internet connection is reestablished. Most of the tools in this section are able to be used both online and offline and synced when back online.

Google Drive

Once called Google Docs, Google Drive now not only includes the standard document, spreadsheet, and presentation applications but also includes drawing and forms, as well as the ability to watch/create video, audio, and static visual artifacts (especially when used in conjunction with the Chrome browser and the Chrome Web Store where free plug-ins for Google Drive can expand the possibilities of Google Drive exponentially). Working in Google Drive allows both students and instructor the ability to chat while working on an artifact, watch changes being created by other members of the group, and interact with the artifact simultaneously. While Google Sites is not a part of Google Drive, the ability to link to artifacts within Drive and have them show up on a Google Sites Web site is invaluable. As you will see later, Google Drive also integrates well with the Google Plus system and can be used to create an entire collaborative learning environment. Google Drive is also available in mobile formats on most major mobile operating systems, thereby making the information available anytime and anywhere. This service is free.

Zoho

Zoho has applications for several demographics: business, productivity, and collaboration. The applications can be used across their designated demographics, and through a Zoho account, a user can create different artifacts with these tools. In the collaboration section, Zoho offers elements that are often seen in Learning Management Systems (LMS): chat, discussions, mail, and wiki. Zoho also offers document creation and project management applications. This service is free.

Microsoft Office

Microsoft Office Online presents a suite of applications that most learners and instructors are familiar with, while making them available in an online environment. The best function of the new Microsoft Office Online is the ability to collaborate with others in Word, Excel, or Powerpoint, as well as sharing files through SkyDrive, video chatting in Skype, capturing information in OneNote, conferencing with others in Lynx, and secure collaboration through Yammer. In addition, like Google Drive, Microsoft Office is now available in mobile format. This is a subscription-based service through the Office 365 subscription (Fig. 12.1).

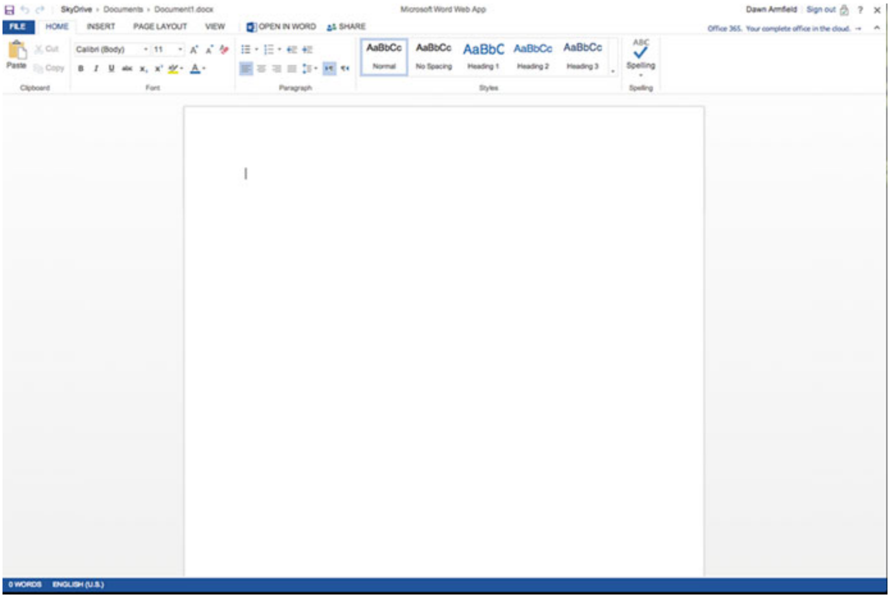

Fig. 12.1 Microsoft skydrive word document. Permission from Microsoft. http://www.microsoft.com/en-us/legal/intellectualproperty/Permissions/default.aspx

Adobe

Adobe has recently developed the Creative Cloud, in which all of the Adobe products, including Photoshop, Dreamweaver, InDesign are available. The majority of these applications are not considered "collaborative" in that multiple users can engage simultaneously, but Adobe has introduced a collaborative "other services." Within this section there is Story CC Plus, which is a collaborative screenwriting application, and Behance, which is a design community. Adobe offers its Touch line of tablet applications that are similar to the full versions of the most popular applications. This is a subscription-based service through Creative Cloud.

Social Media

Social media designates online social interactions through communities. Social media has been a part of the Internet since its early days (bulletin board systems ran in the 1980s and entire communities were built up around them), but really gained prominence in recent years with different sites like MySpace, Facebook, and Twitter.

Facebook

Facebook is probably the premiere social network site, but it also works well for online collaborative learning. Facebook allows each user to create a unique profile, have access to messaging, connect with different pages and groups within the site, and respond to discussions, polls, and interactive presentations. In addition, outside information can be easily linked for discussion, images and videos can be embedded in discussions, and interaction can be limited based on a user's privacy setup.

Blogs

Blogs began in the mid-1990s and are one of the longest running communication devices on the Internet. Used by individuals as well as businesses, blogs can be developed to produce daily information quickly or developed as content management systems. Blogs are typically recognized for their reverse chronological entries with the ability to comment on entries. The two most popular blogging platforms are Wordpress.com and Blogger because of their very large developer community (which contributes plug-ins, templates, and extensive functionality) and their ease of use.

MicroBlogs

Microblogs are similar to blogs in that they use reverse chronological order, but they can vary greatly from there. Typically, microblogs consist of condensed information. For instance, Twitter is considered a microblog. On Twitter, users have 140 characters per post to use. Links, videos, and photographs can be included in the post, but the links count against the 140 characters. Other users can comment, but it is often a part of the "stream" of information that updates on Twitter. Another popular microblogging site is Tumblr, which is very similar to Wordpress and Blogger, but is usually very specific in its content and audience appeal. While readers can leave comments, posts are more typically "favorited" or shared rather than used for direct engagement.

Social Bookmarking

Social bookmarking, popularized by Delicious, is a way to use folksonomy (shared knowledge that creates the tagging) to link like information and to share that information quickly with others who follow. A more popular social bookmarking site for those in academics is Diigo, which allows not only tagging but community building and interaction within the bookmarking site.

Mandalay/Academia

Sites like Mandalay and Academia are typically used by researchers to connect, organize, and share research, whether it is their own, collaborative information, or a general knowledge base situated around a specific topic.

Content Management Systems (CMS)

CMSs often consist of more than one section and are typically all-inclusive sites. For instance, a student could log in to her profile, see recent comments made to her, connect with others through the site, visit other pages within the site, and engage in different areas of the site. They can exist as a full learning environment. These systems are set up to be used in educational environments and in many cases have specialized tools to allow for students and teachers to work across the contents.

Ning

Ning was designed for users to create their own social networks. Used by educators, Ning becomes a useful environment as an add-on to other online courses or as a standalone course shell. Discussion boards, profiles, blogs, pages, and chat can be used within the Ning platform.

Drupal

Like Ning, Drupal can be used to create an individual social network. However, unlike Ning, it is not a pre-setup system. Some Internet Service Providers (ISPs) offer Drupal as an add-on within a site's setup. Drupal can be heavily modified to create the exact system that a teacher would want for her classroom. Examples of Drupal include http://whitehouse.gov and http://www.woodfordscience.com/

Moodle/Blackboard/etc.

Learning Management Systems are set up similarly to Content Management Systems, but with a focus on education. Each of these types of systems have discussion boards, grades, chat, assignments, quizzes, and e-mail built into the system. These systems are used at both institutional and individual levels by educators at all levels of instruction and are typically closed systems where users need to belong to the school and/or system implementing the course. They are not all created the same, however. While most of the systems are proprietary and owned by

Fig. 12.2 Moodle screenshot used in accordance with GNU general public license and Moode's trademark policy. Used in accordance with the GNU General Public License (http://docs.moodle.org/dev/License) and Moodle's Trademark Policy (http://moodle.com/trademarks)

corporations, Moodle is open source, and is developed and maintained by the community it serves. This is an example of an open Moodle system: http://moodlecommons.org/ (Fig. 12.2).

Collaborative Development Environments

Google+

Google+ has been set aside from the other systems because it is inclusive of many of the aspects of the collaborative tools, social networking, and CMSs. While on the surface it may seem more akin to Facebook, its strength is in the connections it has to all of the Google applications as well as the ability to set up separate communities within the environment that can have different levels of engagement and privacy. In addition, Google+ (or G+ to longtime users), incorporates visual tools like Photos, Hangouts, Hangouts on Air, and Events to engage users with both visual and textual information. Most notable in this collection are Hangouts and Hangouts on Air. Hangouts on Air is exactly the same as Hangouts, but with the addition of being recorded for later viewing. Hangouts allow for up to ten people to video chat and collaborate. Collaboration tools within Hangouts include Google Drive,

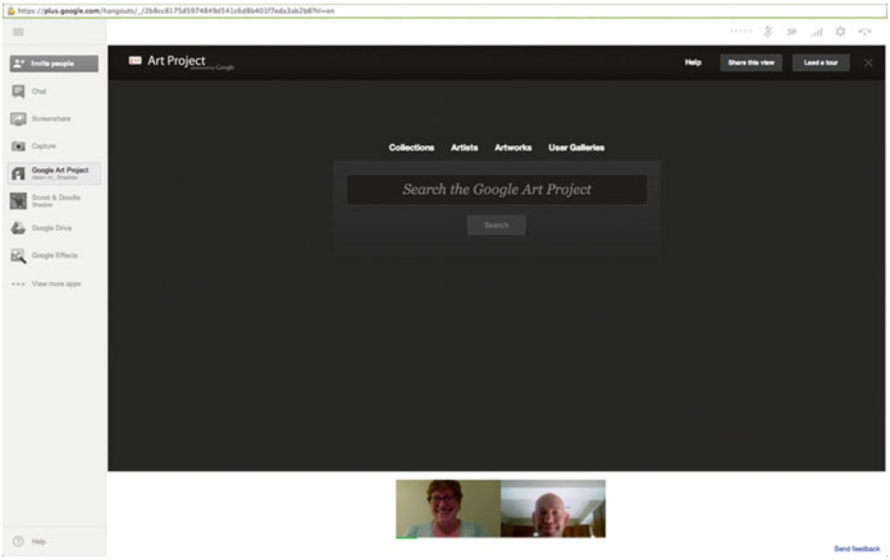

Fig. 12.3 Google art project. Image used in accordance with Google Product permissions (http://www.google.com/permissions/using-product-graphics.html). It should be noted that the authors of this chapter used G+ Hangouts with Google Drive to create this chapter

YouTube, Screenshare, Chat, A Story Before Bedtime (a collaborative book reading application), Google Art Project (which looks at works of art from various museums around the world), Cacoo for Hangouts (concept mapping), and Scoot & Doodle (drawing). While Google+ does not have grades, it would not be difficult to link to a secure grading application from within community to provide a free, full collaborative development environment (Fig. 12.3).

Conclusions

Collaborative activities provide learners with opportunities to expand their understandings of course content and the world around them. Learners who engage in collaborative activities retain the knowledge because it is instilled through knowledge sharing and building. Learners engage in the "just-in-time" knowledge, as well as creating knowledge in the collaborative unit. This enables them to construct stronger arguments and conclusions based on practical experience in the knowledge building.

Google+ and the other collaborative environments can be used across the curriculum. The applications and environments we have shown here are but a few of the thousands that can be found online. These are merely suggestions for what could be done in a classroom using tools that are widely available to most demographics. The tools in and of themselves are not important. It is the implementation and consistent development of the collaborative learning within the online environments that is important.

Application Activities

Idea 1 Collaborative Tools Scenario

In a Language Arts course, document applications are invaluable. Not only can students use them to write their documents (essays, letters, outlines, stories, etc.), but students can collaborate with others while doing so. In addition, one of the best areas of collaboration is peer review. When given access to a document, students and teachers can write comments, change the ways documents are presented, and chat within a document to develop more consistent writing styles. In most document applications a revision history can be accessed to see who made the changes and when. Changes can be reverted if any of the collaborators wish to change it back to any stage in the development. As Tu et al. (2008) stated, this type of interaction, the generation, review, reflection, and visible processes, make the learning more permanent. To practice collaborative writing in Google Drive, go to the following site: http://www.google.com/campaigns/gonegoogle/demos.html

Idea 2 Social Media Scenario

A social studies class is studying American history and is addressing westward expansion. The teacher wants the students to understand the difficulties faced by the pioneers as they moved west and has decided to focus on the Oregon trail. She has the students begin by playing the original Oregon Trail game at: http://www.virtualapple.org/oregontraildisk.html. After 15 min of play, in a full class format, the students are asked to describe what they experienced in their journey so far. After a number of students have described what happened to them in the game, the teacher informs them that they will continue their journey on the Oregon Trail by assuming the persona of an individual who travelled the trail (http://oregontrail101.com/). Students will create a blog that they will maintain and update throughout the unit. In this blog the students will describe their travels, post images of where they have been and what they have seen, and tell about the successes, and hardships they encounter. The teacher and their classmates can follow the blogs and ask questions to further engage the students in their character's experience. The students may also interact with others who are on the trail by following them on Twitter (i.e., https://twitter.com/RealOregonTrail). This activity allows the students to develop a mental model of what it was like to be on the trail as opposed to simply learning about the trail.

Idea 3 CMS Scenario

Using MathType (http://www.dessci.com) in combination with any number of CMS tools (including Drupal and Moodle), teachers can create activities that allow for students collaborate to better learn the concept. In the fifth grade Common Core Standards for Mathematical practice, students are responsible for solving "word problems involving addition and subtraction of fractions referring to the same whole, including cases of unlike denominators, e.g., by using visual fraction models or equations to represent the problem" (Common Core Standards Initiative, 2012). In the discussion board in the CMS, the students can be given word problems to work through. The students will use MathType to demonstrate their use of equations and use the drawing tools available in the CMS to create visual representations of the problem. After a student has worked through a problem, one or more of their classmates can be assigned to assess their work. The assessing students can give feedback about how the problem was solved and give alternative processes to support their feedback if needed. The teacher can look through and discuss these and assess both the original solving of the problem and the higher order thinking that is needed to give feedback on other problems. This process engages the students in the creation of visuals and the reflective feedback loop which further supports the students' understanding of complex and abstract ideas.

Idea 4 Google+ Scenario

At the beginning of the chapter a scenario was defined in which a science class was working with pill bugs (Armadillidiidae) to understand animal behavior as well as the animal itself. The activities included recording, reflecting, and understanding the pill bugs within a traditional personal journal. Using Google+ the teacher can both extend the ways in which the students collaborate and the level to which the students examine the animal and its behaviors. Beginning by creating a community for her class, the teacher creates a space for the students to work throughout the year. Within this community, the teacher can set up discussions, galleries, and presentations for the students to learn and share. Using Google Hangouts, the teacher can connect with a biologist who is an expert on animal behavior and have the class ask questions and gain insights about what to look for when assessing animal behavior. This Hangout can be recorded and included in the presentation section of the community for future reference.

(continued)

Idea 4 (continued)

From here the teacher can then engage the students in the experimental process. As the students record, reflect, and share their ideas about the pill bugs, they will use other tools. The students can not only observe and take notes in a shared Google Drive document but use a camera from their phone or a tablet to record the actions of the specimen, as well as draw the insects in their natural environments using Scoot & Doodle. The students can work on each of these collaboratively. cocreating the observation notes and the drawing and editing the video to along with the notes. All of these artifacts can be shared with the community for further input. The teacher and the students not only have the opportunity to see what each individual (or group) is working on but get a view of what the whole class is working on, which enables them to draw further conclusions across experiments. The class as a whole could then create a spreadsheet that can be used to demonstrate numerically and graphically behaviors of all of the pill bugs collected by the class. By using Google+, the teacher has given the students the opportunity to create individually, collaboratively, and developmentally to demonstrate understandings through various approaches.

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Chapter 13
Gamification for Learning

Chih-Hsiung Tu, Laura E. Sujo-Montes, and Cherng-Jyh Yen

Key Questions

1. What is gamification? How does it support learning and education?
2. How do game dynamics and game personalities relate to gamification design?
3. How is effective gamification created to support learning?

Gamification

Game-based learning (GBL) has been recognized to impact cognitive development, motivation, and decision making (Gee, 2003). Lazzaro (2004) contended that games trigger human emotions, such as excitement, amazement, sense of achievement, happiness, frustration, etc. Gamification has been applied to diverse fields, from education, learning, medicine, business, library, to military science, etc. Educators agree that gaming enhances the ability of learners to gain a new perspective through active engagements in collaborative decision making to solve problems (Gee, 2003; Huang, Yeh, Li, & Chang, 2010; Reese et al., 2011). Researchers have identified

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R. Papa (ed.), *Media Rich Instruction: Connecting Curriculum To All Learners*,
DOI 10.1007/978-3-319-00152-4_13,

that integrating gaming into learning has the potential to support attitude change (Hays, 2005), behavior change (Schoech, Boyas, Black, & Elias-Lambert, 2013), enhance learning motivation (Garris, Ahlers, & Driskell, 2002), encourage collaboration (Schafer et al., 2013), induce problem-based learning, activate communication, promote active engagement (Giannetto, Chao, & Fontana, 2013; Mitchell & Savill-Smith, 2005), peer-generated user content, motivated informed action (Lee, Ceyhan, Jordan-Cooley, & Sung, 2013), particularly when engaging underserved learners (De Freitas, 2008). In fact, when learners are empowered as game designers in participatory design strategy, the benefits are found to be more abundant and more effective (Dickey, 2005).

Gamification applies game mechanics, game dynamics, and frameworks to promote desired learning behaviors (Lee & Hammer, 2011). Wu (2011c) more specifically defined gamification as the use of game attributes to drive game-like player behavior in a non-game context. Game attributes refer to game mechanics, game dynamics, game design principles, gaming psychology, player journey, game play scripts and storytelling, and/or any other aspects of games. Game-like player behavior is specified as engagement, interaction, competition, collaboration, awareness, learning, and/or any other observed player behavior during game play. In fact, gamification does not turn an application into a game. Instead, it makes the learning process feel like a game. Gamification is not a game and is different from games played purely for entertainment, actually they are simulations of real-world events designed for solving problems to train or educate the contestants. Frequently, gamification becomes badge-based learning, or incentive-based learning to create more interest or competition in a class. Letter grades, test scores, cash bonuses, gifts, etc. are forms of incentive systems and frequently are considered as poorly designed gamification techniques (Sinha, 2012). Although rewards or incentives are a characteristic of gamification, such game mechanics, incentives, and rewards alone do not represent effective gamification design. In fact, simply applying an incentive system does not result in an effective learning engagement.

Game mechanics and game dynamics are the driving forces of gamification. Wu (2011a) argued game mechanics should be distinguished from game dynamics although many treat both synonymously and/or interchangeably. Game mechanics are principles, rules, and/or mechanisms that direct a desired behavior through a system of incentives, feedbacks, and rewards with reasonably predictable outcomes (Wu, 2011c). The examples of game mechanics are points, badges, ranks, levels, etc. To operate game mechanics, effective gaming dynamics should applied which are temporal in evolution and patterns of both the game and the learners that make the game (or any gamified activity) more engaging. While game mechanics regulate which incentives should be granted, game dynamics define "when and how" incentives should be presented. Therefore, game mechanics and game dynamics are intertwined to complement and enhance each other. Effective gamification designs frequently tout different game dynamics in conjoining game mechanics to constantly sustain engagement and enjoyment. For instance, while learners are leveling up with different ranks or unlock different badges in game mechanics, game dynamics would determine when it is the right time to allow learners to earn points, uplift ranks, or earn badges. When the right incentives (game mechanics) are granted at the right time (game dynamics), learners are able to move to the next stage with desired and sustainable behaviors. If incentives are granted at the wrong time or are not granted, learners may lose motivation because the process is too easy, to slow, to boring, or too complex.

Game Dynamics

Game dynamics, as an extrinsic force, play critical design strategies and stimuli to drive, to motivate, and to promote positive and desired learning behaviors. Game dynamics are reflected in the nature of the interactions between the learner and the major tasks in the activity and between the learners in the activity (Prensky, 2001). Learners are in control in the action to earn rewards or positive feedback to achieve the complexity of the decision sequence (Gredler, 1992). Game dynamics in gamification are based on social collaboration and competition among the players, reinforcement in the form of advancement in the game for decision-making, and actions governed by social and collaborative rules.

Schonfeld (2010) identified 47 game dynamics, such as Progression dynamic, Actualization, Status, Virtual Items, etc. to guide designers to plan their gamification activities. While game dynamics can serve as stimuli as events in the gamification environment that influence behavior, these 47 gaming dynamics can be categorized into six different stimuli: Discriminative, Eliciting, Emotional, Reinforcing, Nominal, Functional (see www.psychology.uiowa.edu). When aligning these six stimuli in gamification context, they can be redefined as: Deepen interactive engagement; Provoke desired behavior; Invoke collaborative socialization; Facilitate/sustain desired behavior; Encourage active exploration; and Charge meaningful emotion (see Fig. 13.1).

Discriminative stimuli support game dynamics and deepen interactive engagement. A discriminative stimulus influences the occurrence of an operant response because of the contingencies of schedules of reinforcement or paradigms of reinforcement or punishment that are or have been associated with that response. Discriminative stimuli can be divided into interval, ratio schedules, and extinction. Interval schedules require a minimum amount of time that must pass between successive reinforced responses while ratio schedule require a certain number of operant responses (e.g., ten responses) to produce the next reinforcement (Colle & Green, 1996). Tu, Yen, and Sujo-Montes (2012) reported that discriminative stimuli result in more engaging in providing: more frequent feedback/rewards; clearer expectations/game rule feedback; more variety feedback; and more unexpected feedback. Hsu, Chang, and Lee (2013) also concluded unpredictable time pressure is critical gamification potencies. Provoking desired behaviors can be supported by eliciting stimuli. Eliciting stimulus is a change in the environment that is highly correlated with the occurrence of a later response. It is a conditioned or unconditioned stimulus that causes a response. Effective integration on eliciting stimuli, the desired

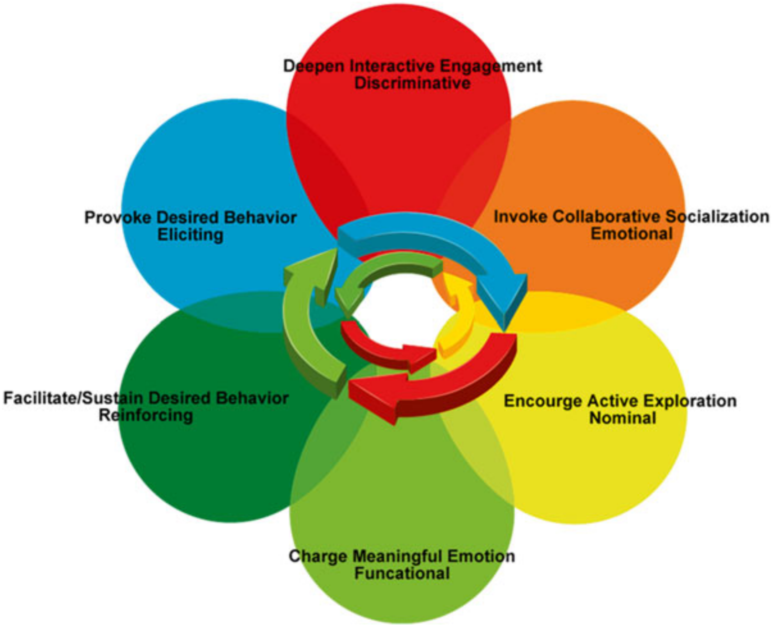

Fig. 13.1 Gamification potencies

behaviors can be initiated in gamified process and afterward. After provoked, reinforcing stimuli should be applied to facilitate and sustain desired behaviors.

Emotional stimulus is produced by some stimuli and may influence the occurrence of behavior and invoke collaborative socialization. These stimuli are designed to associate players' social interaction, social relationship, collaborative community senses, etc. To share rewards in network circles, groups work collaboratively to achieve communal goals and to earn collaborative rewards. With meaningful social learning context, the gamification process becomes richer in context-specific collaborative community ownership. It is more meaningful when learners are encouraged to participate actively to achieve individual and collaborative goals to earn individual and collaborative rewards.

A reinforcing stimulus is one that increases the occurrence of behaviors that it follows. These responses potentially lead players to be more engaging and more active participants. These rewards are designed in the series of challenges, tasks, or efforts in which players are engaged; therefore, these engaging interactions would lead to blissful productivity, communal discovery, loyalty, ownership, etc. Effective reinforcing design has potentials to facilitate, and sustain desired learning behaviors through effective step-by-step rewards, and the series of level up rewards, such as ranks, or leaderboard.

The unanalyzed stimulus as a whole refers to the nominal stimulus. Its strength is to engage and to encourage learners in active exploration. Although observed responses to the whole stimulus are readily seen; it may not be clear exactly which attributes of the stimulus are impacting the behavior. In nominal stimulus, exploring activities are critical to engage learners in discovering and exploring gamification activities that may bring with them unexpected surprise rewards.

Functional stimulus refers to the specific values and attributes that players attach to the stimulus and exert control over the organism's behavior. Learners are motivated by charging a meaningful emotion at the right time and at the right level. When players receive rewards, they may interpret them as motivating, challenging, enjoyable, additional values more than just grades, and motivating in using different technology devices etc. With effective functional stimulus, learners may feel more self-motivated toward learning instructions and their engagements are more enjoyable. Additionally, it could be more context-rich for learning if learners could access and earn their reward using their mobile devices.

Game Theories

Gamification in learning can be framed in the Self-Determination Theory (SDT) (Deci & Ryan, 2000) and the Fogg Behavior Model (FBM) (Fogg, 2011) (see Fig. 13.2). Motivation is a central concern in gamification, how to move

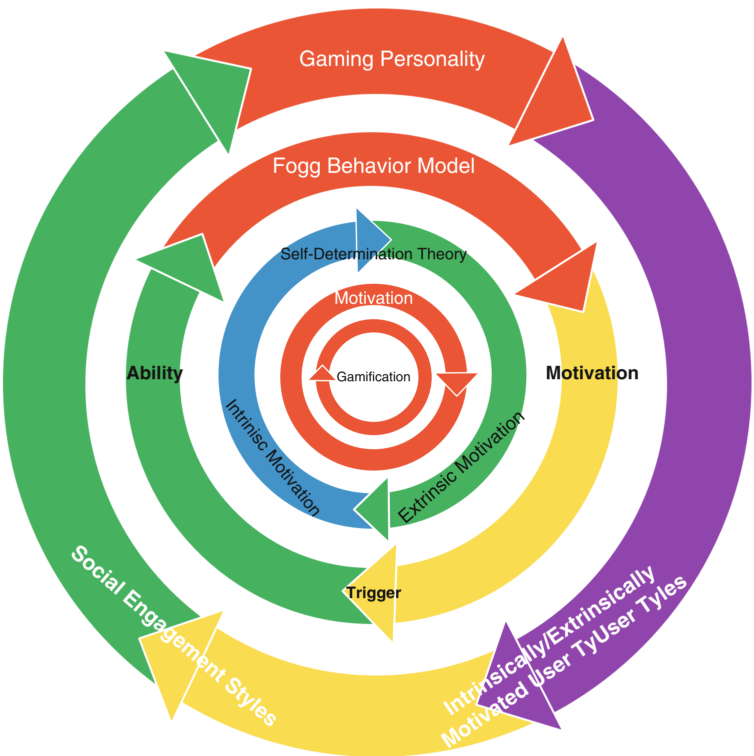

Fig. 13.2 Gamification concepts

learners to act. In gamification, motivation is portrayed as the initiation and sustainment of engagement in a particular task or behavior. Researchers argue that gamification could motivate and engage learners to reach desired learning behaviors, since motivation and engagement are major challenges for current learning systems (Bridgeland, Dilulio, & Morison, 2006). Game mechanics, badges, points, and levels are considered extrinsic motivation to engage learners more deeply, and to assist them in making better decisions. In fact, effective gamification may also motivate communities to work together toward shared learning outcomes. Self-Determination Theory (SDT) studies human motivation and personality. Based on SDT, learners are motivated from within, by interests, curiosity, care, or abiding values. These intrinsic motivations are not necessarily externally rewarded or supported, but nonetheless they can sustain passions, creativity, and efforts. The interplay between extrinsic forces and the intrinsic drives and needs are inherent in human nature. Designers can project game dynamics to enact conditions that support the individual's experience of autonomy, competence, and relatedness to foster the most volitional and high quality forms of motivation and engagement for activities, including enhanced performance, persistence, and creativity (Deci & Ryan, 2000). Leblanc (2004) affirmed that gamification provokes students to engage more deeply and potentially inspires them to change their self-concept as learners. Effective gamification employs the energy, motivation, and sheer potential of learners' game-play and directs it toward real-life learning. Corbett (2010) powerfully declared that gamification should go beyond classroom instructions to be integrated in universally in educational curricula, providing multiple routes to learning success and allowing learners to evaluate and set their own subgoals within the larger task.

While SDT explains the interplay of intrinsic and extrinsic motivations, "the Fogg Behavior Model (FBM) (Fogg, 2011)" attempts to understand how to balance what learners believe is boring to motivating activities associated with difficult to simple requirements. FBM is a multifactor model and facilitates analysis, construction, and deconstruction of game dynamics. It asserts that there are three required factors that underlie any human behavior: Motivation, Ability, and Trigger. Based on FBM, learners are required to reach an "activation threshold," a minimum level of ability and motivation to attain the ideal and target behavior to happen. How to balance motivation and ability to reach trigger point (activation threshold) is critical in gamification design. Wu (2011b) discussed two tactics to increase learners' actual or perceived ability through practice and training; therefore, learners' ability combined with motivation would reach the activation threshold to produce the ideal activity. The other method is to design a simpler target behavior; therefore, perceived ability is increased. Wu (2011b) described three ways to make the gamified tasks appear simpler: Divide and conquer, Cognitive rehearsal/guidance, and Cascading information. Divide and conquer suggests dividing more complex tasks into smaller or simpler ones, while cognitive rehearsal/guidance advocates demonstrating how the tasks are completed and how simple they are. Cascading information describes releasing instructions and information in minimal snippets to gain an appropriate level of understanding to guide learners through multistaged tasks.

Gaming Personality

Gamification invokes socialization, and charged emotions (Lee & Hammer, 2011); therefore, a gaming personality could predict how interactive and engaging gamification may be. The Bartle Test of Gamer Psychology (Bartle, (1996) is frequently applied by researchers to understand and categorize online game players into four gaming personalities based on their gaming preference: Socializer, Achiever, Explorer, and Killer (see Fig. 13.3). In a gamification context, Marczewski (2013) evolved Bartle's game personalities into Intrinsically Motivated User Types (Achiever, Free Spirit, Socializer, & Philanthropist) and Extrinsically Motivated User Types (Consumer, Exploiter, Networker, and Self-Seeker). The X-axis indicates preferences for interaction with other players (users) vs. exploring the world (content or system) while Y-axis denotes preference for interaction vs. unilateral action (Taylor, 2006). Different learners enjoy different types of enticements and motivations.

Achiever appreciates positive reinforcements in gaining and exploring points, levels, or badges. The process of becoming skilled at learning new things and improving themselves inspires them. They aspire challenges to overcome. To gamification designers, achievers are considered consumers who prefer rewards for their actions; therefore, they will perform activities to be rewarded with points or badges.

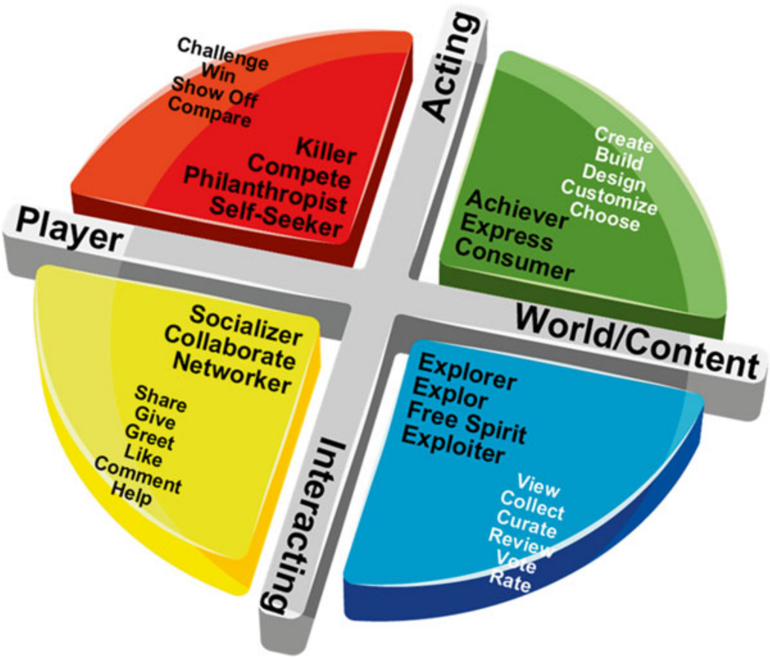

Fig. 13.3 Game personality and engagement styles

Table 13.1 Alignment of game personality, social engagement verbs, and intrinsically/extrinsically motivated user types

Game personality (Bartle, 1996)	Social engagement verbs (Kim, 2012)	Intrinsically motivated user types (Marczewski, 2013)	Extrinsically motivated user types (Marczewski, 2013)
Achiever	Express	Achiever	Consumer
Explorer	Explore	Free spirit	Exploiter
Socializer	Collaborate	Socializer	Networker
Killer	Compete	Philanthropist	Self-seeker

A explorer prefers to discover different activities and actions (also called Free Spirits) that are motivated by autonomy that inspires them to create, explore, and gain control of what they like to learn. Explorers to the gamification designers are seen as Exploiters who prefer to gain rewards from using the system by any means, even using loopholes in the rules to obtain rewards. Socializer participates in games for social purposes. They are motivated by relatedness through connecting with others and prefer to create the social connection that comes from communities (Marczewski, 2013). To designers, Socializers are Networkers who connect to others to manage and to increase their profile and rewards that may bring. Killer focuses on aggressive competition with others and prefers fighting them to gain success. A "Killer's" game personality may literally carry a negative meaning. Marczewski (2013) refined "Killers" as "Philanthropists" who are motivated by purpose in addition to competition. They believe that we need for our actions to have meaning; therefore, they are seen as altruistic, wanting to give back to others and enrich the lives of others in certain ways. Marczewski (2013b) indicated that the contributors of Wikipedia are the examples of Philanthropists who contribute their effort to make a better understanding of certain topics without asking anything in return. To designers, Killers are seen as Self-seekers who seek rewards for their actions with other players; therefore, they will respond to questions to get points, or badges and favor quantity over quality (Table 13.1).

These four gaming personalities have the potential to predict how to engage game instructions to help educators design effective gamification for online learning. A person's gaming personality is multidimensional rather than single. Based on the Bartle Test of Gamer Psychology's gaming personality scores, each person's would have four scores in each four gaming personality. Within four scores, one dimension may have higher scores than other three to represent gaming personality in general.

Gaming personality is also called engagement style. From a new perspective and inspired by game personality, Kim (2012) extended and related gaming personality to engagement styles and elaborated different engagement verbs for each gaming personality. Social Engagement Verbs capture the motivational patterns observed in modern social gaming and social media, particularly in gamification design. Social Engagement Verbs were created to help gamification designers to understand different game personalities and their preferred engagement styles; therefore, they can apply related engagement verbs to design effective gamification experiences that delight and engage learners by targeting relevant motivations.

Bartle's Achiever, engagement styles indicates players who enjoy self-expression motivated by a richer palette and greater abilities to showcase their creativity and find self-expression by performing the tasks: Create, Build, Design, Customize, Choose. Explore (Explorer) suggests that players enjoy exploring content, tools, people, network, community, and in their worlds can be full with rich and rewarding activities. Players are motivated by information, access, and knowledge; therefore, they view, collect, curate, review, vote, and rate relevant information. Collaborator (Socializer) focuses on collaboration and collective action. Players enjoy collaborating with others and to be part of group or community. Players enjoy sharing, giving, greeting, liking, commenting, and helping. Compete (Killer) pays attention to the competition that drives social gameplay and self-improvement (competing with themselves to improve their own metrics). Players enjoy competition and assume that others like competition as well by challenging, wining, showing off, comparing.

A Model for Constructing Gamification

A Model for Constructing Gamification (see Fig. 13.4) is proposed to assist educators to design effective gamification to support their existing instructions. The model consists of four dimensions: Goal setting; Player engagement; Progressive design, and

Fig. 13.4 A model for constructing gamification

Environment building. Under each dimension, three related strategies are suggested to achieve each dimension. Refer to content presented earlier in this chapter before applying these dimensions and strategies to guide your gamification instructions.

Goal Setting

- Set meaningful learning goals for gamification: Since the gamification process itself lacks any meaning of learning, it is vital to set meaningful goals for gaming instructions, such as becoming a competent by earning a Global Digital Citizen Passport (Tu et al., 2012).
- Identify appropriate behavior: Clearly identify what ideal behaviors that game instructions should initiate, invoke, facilitate, and sustain.
- Select effective infrastructure: Evaluate and select relevant and effective gamification instructions from the obvious ones, e-mailing rewards, to more complicated systems, such as Mozilla's Open Badge system, or Purdue University's Passport system, or to commercial systems.

Player Engagement

- Characterize ideal game personalities: Informing learners to participate in The Bartle Test of Gamer Psychology (Bartle, 1996) prior to beginning the gamified instructions. Understand learners' game personalities and integrate and guide the gamification.
- Distinguish intrinsic motivation and extrinsic motivation: Apply Intrinsically and Extrinsically Motivated User Types (Marczewski, 2013) for the design. Inform learners of their Intrinsically and Extrinsically Motivated User Types to help them understand their gaming preferences.
- Ascertain Social Engagement Styles: Based upon learners' social engagement styles, integrate social engagement verbs into gamified instructions and encourage learners to perform their related social engagement verb action and performances.

Progressive Designing

- Integrate interactive PERMA: Develop PERMA (Positive Emotions Relationships Meaning Accomplishment) (Seligman, 2004) gamified instructions into core engagement loop (Kim, 2011), from Positive Emotion, (social) Call to Action, Player (re:) Engagement, to Visible Progress. In other words, it is an engagement loop in the cycle of Motivation, Action, and Feedback.

- Implement vibrant game dynamics: Apply different game dynamics and game mechanics to support learners with power, autonomy and belonging.
- Evolve progressive challenge and complexity: It is critical to ensure the gamification process is easy to learn, but a challenge to master. It is particularly important to start with a simple gamification system then evolve into a more complicated one. Schenke, Tran, and Hickey (2013) determined eleven design principles for motivating learning with digital badges.

Environment Building

- Connect social collaboration: Although gamification instruction may appear more personalized, it is critical to engage learners as a group, or a collaborative accomplishment for awards. By awarding badges at the group level, learner motivation to collaborate and complete tasks is thought to allow learners to relate more to others and perceive the task differently than without the element of collaboration (Schenke et al., 2013).
- Exhibit meaningful awards: Allowing learners to display their awarded objectives, such as badges, with choices in private, semi-public, or public, would increase each learner's sense of control to appear more autonomous. In fact, by connecting and displaying awards in an e-Portfolio could add another instructional engagement in self-reflecting learning.
- Engage comprehensive community: Although gamification may focus on a digital environment, it is critical to engage learners in both local physical and digital communities. Engagement in the community can be seen to promote students' motivation to continue on activities because learners are relating to others.

Issues

Gamification seems to possess a great potential to motivate and to engage learners in collaborative decision making in problem solving; however, it is also critical to understand what issues may rest in gamified instructions. The problems are not that gamification is ineffective or bad. The problems are not being aware of the potential weaknesses involved in an ineffective gamification design. Below is a list of potential issues that educators should be aware of.

- Fake gamification: Simply applying fun process, awarding points or badges for completing tasks doesn't constitute and ensure positive gamified experiences (Shane, 2013). This results from lacking a comprehensive understanding of gamification concepts, designs, developments, and infrastructure (Vrasidas & Solomou, 2013).
- Bad gamification: Bad gamification may be the result of poor gamification design and implementation. Shane (2013) discerned that focusing on points and extrinsic rewards instead of the intrinsic rewards and supporting learners are common pitfalls.

- Replacement and over-justification: Intrinsic desire may be extinguished by the introduction and subsequence removal of extrinsic rewards (Zichermann, 2011) when learners are intrinsically motivated toward to the desired behavior. To resolve the issue of over-justification, it is suggested that designers or instructors should prepare learners with skills and knowledge in contesting negative reinforcements so they obtain the emotional strength to overcome adversity.
- Wrong perception: To adult learners, gamification may be perceived as entertainment or too kindergarten (Tu et al., 2012). Gamification frequently is perceived for younger students, not for adults, even adult learners have engaging and positive gamification experiences. It is necessary for educators to explain the purposes of gamifying instructions and learners should be allowed to set their own individual goals within gamification. Another strategy is to encourage learners to participate in creating and planning gamification designs, examples would be having learners plan what kind of badge they earn and how they earn it is one way to encourage goal setting.
- Time consuming: Since gamification design and implementation are time consuming (Vrasidas & Solomou, 2013), educators should start with a simple and small-scale game. For example, starting a few rules with a few rewards. While learners progress, increase the challenges, and complexity of gamification designs. Learners are most engaged when they are in the flow of full involvement and enjoyment in the process of the gamified activities, such as not being bored, challenged just enough, but not so much to become frustrated and give up.

Conclusions

Gamification for learning and education frequently is perceived with negative impact on learning because of the misconceptions of gaming. It is undeniable that gaming engages players in interactions and possible changing behaviors. Educators should focus on the positive and effective digital gaming dynamics to support learning motivation, rather than using a game façade that relies on shooting enemies or aliens etc. Positive and effective gamification could enhance learning and engage learners in a more social and context-rich decision making for problem solving in learning tasks. Future research should focus on understanding learners' gaming personalities which would assist educators and gamification designers to design more effective gamified instructions and provide relevant support to different types of gaming personalities. Simply understanding gaming personalities is not enough to enhance gamified online discussions. Instructors should assist and support different types of gaming personalities by designing different gaming dynamics to engage them in online discussions to succeed in effective learning. It is important to notice that gaming personalities may not be a single dimension to each learner. Online learners may appear with a specific gaming personality; however, they may be associated with the other three personalities to a certain degree. Future studies should focus on the multidimensional gaming personalities to obtain deeper understanding of gaming dynamics; and how different gamification systems may relate to different gaming personalities. Schenke et al. (2013) suggest if the goal is to create an online content system, such as Wikipedia, one has to formulate in creating a system that approves the intrinsically motivated types because Philanthropists enjoy helping others and want to give back to others and enjoy enriching the lives of others.

Application Activities

Idea 1

Discuss five potential issues of gamification instructions that are not covered in this chapter.

Idea 2

Apply a model for constructing gamification to design a gamified instruction.

Idea 3

Discuss how gamification can be enhanced by mobile learning.

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Chapter 14
Gaming

J. Michael Blocher

Key Questions

1. What is “gaming?” And who are “gamers?”
2. What impact does the gaming culture have on learners?
3. How can educators take advantage of games and gaming by integrating them into their curriculum?

It was said that my great-grandfather purchased a car but never learned to drive. Apparently, he thought that it would was a good idea for his boys to learn to drive, but not his daughters. He didn’t believe that was something that self-respecting young women would ever do. I suppose his rationale was that he had his boys to drive him around when he needed to go places so he could take advantage of the benefits without having to deal with the trouble of learning to drive. As the story goes, while he saw the utility and benefit of having a car, he believed that he was too old to learn something that newfangled.

This story parallels my own thoughts about gaming. I’m probably as old as he was when cars and roads fit for driving were readily available in America. Similarly, video games have been in my home since my boys were young but they’re now in their 30s and moved on with their gaming consoles. As a technology educator teaching young folks, I’ve often thought that gaming is something that I should be familiar with and have stayed somewhat aware of the trends. I have tried playing and even shopped for a console, but I just can’t get hooked on becoming a gamer. I don’t think that the learning curve is too steep; rather it could be a generational thing or I don’t see the rewards for the effort. Regardless of the reason, I don’t care that I’m not gamer just as my great-grandfather probably didn’t care that he wasn’t a driver—he still got around.

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R. Papa (ed.), *Media Rich Instruction: Connecting Curriculum To All Learners*,
DOI 10.1007/978-3-319-00152-4_14,

While as educational leaders we may not care about being gamers ourselves, we can ill afford to ignore gaming and gamers. It is important to understand the impact that gaming is having on our culture, our learners, and our learning environments. Just as my great-grandfather took advantage of his understanding of the utility of the automobile without actually driving, I believe that we can take advantage of gaming by understanding the utility of gaming and the nature of gamers who are in our classrooms—as students, teachers, and probably administrators. The purpose of this chapter is to provide an overview of basic elements of gaming, types of games, the possible impact gaming has on learners and learning, as well as to provide some examples of integrating gaming within the classroom. Let's look at some gaming issues that are often cited as having an impact on our society.

First, there is the economic impact. Who these gamers and how much are they actually spending on games? According to *The Economist explains* (2013),

> Video games have never been more popular. The industry is worth around $80 billion worldwide, about the same as the global film industry, and the biggest titles comfortably outearn blockbuster movies. No longer is gaming a pastime for teenaged boys: the average gamer in America is 34, and around two-fifths of players are women. A generation who grew up with games have kept on playing; many now play video games (such as "Lego Star Wars") with their children. (para. 2.)

Next, there has been a great deal of interest on risk factors regarding video game play.

In a study of 7,069 gamers (94 % male), Grüsser, Thalemann, and Griffiths (2006) completed two questionnaires regarding their online game play investigating addiction and aggressive behavior. 840, nearly 12 %, of the participants met three or more of the criteria of study defined gaming addiction. This study looked primarily at male participants, for which they drew the conclusion that, "…the addictive potential of gaming should be taken into consideration especially in adolescents whose leisure activities comprise gaming to a large extent." (p. 291)

A more thorough and recent review of gaming addiction studies indicated that the tests for pathological game play were reliable, provided evidence for convergent validity and comorbidity, and showed correlations and comorbidity to other addictions. However, they also indicated that, while it is clear that some people, due to their addition, are and will continue to have life issues (i.e., disruptions in relationships, jobs, and/or finances), it is a complex issue. For example, like a gambling, a technology addiction may manifest in different ways, e.g., "…a person who has a problem gambling on horses may not have a problem gambling on slot machines, and vice versa." (p. 765). In a call for greater social responsibility for online gaming publishers, Yousafzai, Hussain, and Griffiths (2013) cited several studies indicating that 7–11 % of gamers have problems and reported playing 40—close to 90 h of gaming sessions. Interestingly, there are organizations and Web sites devoted to self-help support in identifying and recovery from online gaming addiction (Online Gamers Anonymous, 2013).

Another risk factor currently being investigated hopes to answer the question: Are violent video games responsible for violent behavior? Grüsser et al. (2006) found only weak evidence of excessive gaming being correlated to aggressive behavior. However, in conducting a thorough and well-cited meta-analysis on the topic, Anderson et al. (2010) stated;

> Concerning public policy, we believe that debates can and should finally move beyond the simple question of whether violent video game play is a causal risk factor for aggressive behavior; the scientific literature has effectively and clearly shown the answer to be *yes*. Instead, we believe the public policy debate should move to questions concerning how best to deal with this risk factor. (p. 171)

While investigating the link between violent video games and aggressive behavior Hasan, Bègue, and Bushman (2012) found compelling results and stated; "After playing a violent video game, people expect others to behave in an aggressive and hostile manner. These hostile expectations, in turn, increase the likelihood that players will behave in a hostile and aggressive manner themselves." (Sim, Gentile, Bricolo, Serpelloni, & Gulamoydeen, 2012, p. 956).

Gaming Elements

The gaming industry is quite complex and, for the uninitiated, it's easy to get confused with the variety of games, gaming consoles, and online services. To support readers who do not consider themselves gamers this section hopes to provide a solid foundation of the very basics of gaming.

Most gamers purchase a gaming console from Sony (i.e., PS2), or Microsoft (i.e., Xbox 360). More ambitious gamers build a PC designed specifically for gaming. There are thousands of gaming titles from which to choose. Making things perhaps a bit more confusing is that some game developers design their games to be played on a variety of manufacturers' consoles, including PCs, while others design their games to be proprietary and played only on a specific console (i.e., Xbox 360 Only). The end result is that a very popular game title will promote the sale of a specific gaming console. However, and not so surprising is that often times when a game title has done well but sales might be waning; it is then rereleased for other consoles. For example, Bethesda's Skyrim initially only available on the Microsoft Xbox 360, is now available for the Sony PS2 and PCs (Karmali, 2012).

To help them wade through the complexity, gamers have and do seem to utilize the plethora of online support provided by online blogs, and help Web sites devoted to gaming, game reviews, and general gaming news, i.e., Next-Gen Gaming Blog (Kitana Media Network, 2013) Additionally, these forums provide gamers with inside information on "cheats" or "hacks" to support and enhance their play. Most game developers also provide online support in the way of blogs and forums for their specific games, i.e., Bethesda Blog (ZeniMax Media Inc., 2013a). In addition there are other gaming-interested individuals that create social media sites for gamers to interact with others on a specific game. For example, The Skyrim Blog is a unique Web site devoted to folks who only want to discuss and interact on the topic of one game, Skyrim, and has close to 6,000 members. Their Welcome Page describes the site by stating; "The first thing you need to realise [sic] is that this is a social network site. It is more akin to something like Facebook, than a traditional forum or blog site. As such it relies on 'member content' rather than editors or writers." (ZeniMax Media Inc, 2013b, para. 3)

However, there are gaming elements that define the type of game and the level of interaction the player will experience, which are somewhat universal. In particular, games generally have a scenario that provides an environment and setting for the players. In many of the more robust titles the environment and setting is really a simulation where you create or modify an avatar that acts in your place though movement, decision making decisions and interactions in ways that are parallel to what you might, or might not do (depending upon your mood or motivation) in a virtual and often times fantasy world. As the player moves his or her avatar through the gaming environment, they will see and most likely interact with other avatars. The other avatars may be game generated and operated, or in online multiplayer games the other avatars are created and operated by other players, who are often at distant locations—even international. In these cases, players utilize headsets with microphones to communicate with the other players during game play, and one must subscribe to an online gaming account, such as Xbox Live Gold (Microsoft, 2013). In addition, an account such as this provides streaming media (i.e., TV, movies, and even the NFL Network), not to mention social media apps, such as Skype. In other words, the gaming console is poised to deliver more than just interactive gaming.

Today's most current games utilize high-level multimedia. New gaming consoles continue to be developed, which provide high definition audio and video to the gamer's TV, most often a high definition flat panel. Some gamers who wish to have even more power and video resolution choose to build gaming PCs using the most powerful and recent computer parts that include very high end processors, enhanced memory video cards and high fidelity surround sound speaker systems. These "gaming pc builds" as they're called, can provide smooth, vivid high definition video along with theater quality audio for enhanced game play experience, and can cost many thousands of dollars.

Like all computers, gaming consoles or PC builds, need to have an input device to allow the player to interact with the game. This element of gaming is required and over the years the *controller*, as it is called, has become somewhat universal in design, in terms of function. Most gamers prefer wireless controllers allowing them to sit anywhere and not be tethered to the console. While the controller is manufactured to be used with a specific console, it functions pretty much the same regardless of the gaming console. While different games may have slightly different functions for the controller buttons, the controller works very similarly between games. In other words, once a player learns how to use a controller, he or she can play just about any game. This is an important concept as it allows players to concentrate and focus on interacting with the game rather than having to worry about the controller.

One of the newer elements of gaming is the move toward increased interactivity. While video gaming has been a behavior that, historically, has players sitting in front of a TV, new consoles have input devices that can track movement.

For example, Nintendo's Wii has a remote that players hold that sends a wireless signal to a sensor bar located near the TV. As the player moves his or her hand holding the remote the sensor picks up the movement and displays the corresponding movement on the TV. The Xbox 360 Kinect goes a bit further by having a sensor device that includes a camera, which is placed near the TV and detects movement quite accurately without the player needing a remote. The remote sensors of these gaming consoles permit the player to move around, thus changing the nature of the types of games that can be played on these consoles. Both have athletic and health related games, not to mention games that teach dance, yoga, and include interactive multiplayer sports, such as tennis and baseball.

Types of Games

There are thousands of video game titles, which include titles that could be classified as entertainment, educational, edutainment, phone, and/or tablet apps, not to mention Web sites and embedded games within social media applications. Citing a lack of overlap between two extensive reviews of educational research on gaming for instruction Tobias and Fletcher (2012) reemphasize "…the urgent need for an agreed-upon taxonomy of games to use in sorting out the effects of different types of games on different outcomes and students." (p. 235) Given the blurry gaming landscape I will try to describe game types and illustrate with an example or two to provide a foundation for future discussion. However, this is in no way an attempt to define the needed taxonomy of games.

In the very broadest sense, you might think about games as being designed for entertainment, education and some that fall into the middle—edutainment. However, entertainment games have been used for instruction, some educational games have been entertaining, and some edutainment fall short of doing either. In addition, while the mainstream media often has articles on the benefits and detriments of video gaming, academic research on video gaming suggests a complexity where results often depend upon video types, a player's interests, and the behaviors being investigated. "The extent to which playing video and online games' affects the brain and behavior is uncertain. It is likely that the specific beneficial or harmful effects are determined by the characteristics of both the individual and of the game." (Bavelier et al., 2011, p. 763) To better facilitate an understanding of the types of games in terms of how they might impact learners and learning, this section will focus on describing four general categories or types of video games as defined by the industry; action, role-playing, strategy, and simulations. Now having said that, it is important to know that many of the games do not fall only in one general category. Rather, games often have elements of several. For example, players often utilize strategies within a role-playing game, or that there are action elements in other games. Therefore, the examples below have been selected by their categorization within the industry, because the games engage the player *primarily* within the category in which they are described.

Action Games

Action video games are often founded on a scenario or story and immerse the player in a fast-paced setting where quick reflexes supported by visual acuity help the player be more successful in achieving the goals of the game. While action games may include actions besides the popular "shooter" games, this is the primary focus for this genre. Players in action games often kill or destroy virtual enemies or threats, where the main engagement is using quick eye hand coordination to destroy the opponent. Players can play either solo action or in multiplayer environments where players team up to play against other teams using a variety of weaponry to beat the other team, often by killing them or destroying their weapons. Collaboration and strategy may play a role in the game; however, action games are often founded on competition. One game that is a good example is Halo, currently in version 4, with version 5 in development. Players can play individually, but often play in teams to battle other teams. Each version out sold the previous versions first day records with Halo 4 selling $220 million in the first 24 h of release (Sliwinski, 2012). With the popularity of earlier versions developers designed private gaming areas for multiple players, where up to eight players can engage in an online private gaming environment rather than being in one large open environment. Here gamers, generally friends located at a distance, can talk about non-game topics and/or engage in the game.

There are also many online and tablet and smart phone *educational* action games available for free or small fees. Similar to timed worksheets, online math action games have players complete math problems in a specific amount of time, i.e., addition problems within 1 min. If the player is successful, they are given some kind of reward and often given a more difficult next level to achieve. The reward can be as simple as positive feedback, as in Mr. Nussbaum's Slalom (2013), where players achieve an Olympic style medal based upon their ability to navigate the slalom gates, (math problems) get the correct answers and are given a timed score with seconds subtracted for mistakes. Available through the Android Market Place or iTunes for iPads this particular application costs $1.00. However, there is also a lesson plan for teachers, which includes how the game addresses Common Core Standards and assessment activities.

Role-Playing Games

In role-playing games (RPGs) the story is paramount and players take on a role or actor within the story. Beginning as nonelectronic dungeons and dragons games, RPGs have progressed to very complex massively multiplayer online role-playing games (MMORPG). RPGs are similar to action games in that warfare, conflict, and competition are elements, but more emphasis is placed upon collaboration cooperation as players often become guild members working together to achieve the games goals. Earlier RPGs included the well-known Legend of Zelda, but more current titles are some of the most profitable in the gaming industry and have progressed to be supported by millions of players, worldwide. An example that perhaps many have heard of is World of Warcraft (Blizzard Entertainment, Inc., 2013), which "…is an online game where players from around the world assume the roles of heroic fantasy characters and explore a virtual world full of mystery, magic, and endless adventure." (para. 1). As a good example of a MMORPG, the World of Warcraft Web site provides guides, forums, community, and other support. A player must purchase the software for their PC or game console, and pay a monthly subscription.

While support for RPGs seems to be for the commercial market, there are several good educational role-playing games, including Peacemaker (2013) where players can choose to play either the Israeli Prime Minister or the Palestinian President. Darfur is Dying (MTVU, 2013) where players choose to play the role of a Darfurian who must forage for water and escape being captured by the rebels.

Perhaps one of the most innovative ways to fund independent creative projects including educational games is Kickstarter (2013). Magicians: A Language Learning RPG (Simons, 2012) is a good example of a successfully funded project. The primary purpose of Magicians is for the players to learn the Korean language. Starting as an afterschool activity while teaching in Korea, Simons submitted an application to Kickstarter and was funded to develop the game and create a blog that details the game and development process.

World of Classcraft is another example of a classroom teacher developing a game and requesting support from Kickstarter. World of Classcraft parallels World of Warcraft, quite closely, but players gain or lose points based upon classroom activities. However, they can "level up" to gain "powers" (using notes for tests, gaining extra time on exams, etc.). However, this proposal was unsuccessful in its Kickstarter funding proposal (Young, 2013).

Strategy Games

Strategy video games are an extension of traditional strategy games, such as chess, where players use strategy and/or tactics to outwit their opponents in single player, multiplayer, or massively multiplayer. Generally, a strategy video game includes a map or world view within a setting seen from a strategic position. Strategy games come in two categories, real-time continuous play or turn-based, where players take turns moving their avatars, armies, troops, and equipment. Some strategy games focus strictly on tactics where the player acts as a tactician to best utilize their combat troops in a specific battle. Some single player games, such as Shogun 2 Total War AI, provide a computer artificial intelligent (AI) supported opponent. In his online blog just prior to the release of Shogun 2, Crecente (2010) describes the AI features of the game.

> We're told that the AI now can be much more flexible in how it responds to enemies on the battlefield. The enemy AI is also impacted by the sights and sounds of battle, responding, for instance to the sight of a mammoth forcing approaching them. It's worth watching through this whole video not just for the eye candy, but a chance to check out some of the tactics you'll be coming up against once you pick up the game for the computer next year. (para. 1)

Certainly America's Army, (Department of Defense, 2013a) could be considered an action game, especially since it is a multiplayer first-person shooter style game. However, the game also has a heavy focus on tactics and strategies, providing the player with a virtual combat experience helping them learn to be a good soldier and fighter. According to America's Army PC Game Fact Sheet, "America's Army presents a virtual world in which players explore Soldiering in the U.S. Army by learning how Soldiers train and employ teamwork and leadership to accomplish the mission." (Department of Defense, 2013b).

Simulation Games

Simulation video games have been available for a bit more than a decade and engage the player in some simulation. There are many types of simulation, which can take many forms and engage the player in a variety of settings. Some simulation games focus on specific skills. For example, the player operates a vehicle, aircraft, or even spacecraft to explore, practice, or enhance the requisite flying or driving skills. Other simulations engage players in real life situations where the focus might be on observational skills and decision making. For example, in some simulation games the player simulates being a surgeon in a medical trauma unit, where they make life and death decisions. Some simulation games of this type are more mundane, such as a dating simulation, where the player simulates social situations, while others are designed to give the player the opportunity to construct or build cities, communities, or environments. Most are probably familiar with SimCity, which has been around since 1985 has gone through many versions and generations where players build simulated cities and communities. The current versions include online multiplayer options, including a global market. Facebook, the popular social media site has collaborated with Zynga.com allowing users to add the simulation Farmville to their Facebook page. According to the company Web site; "Zynga Inc. is the world's leading provider of social game services with more than 240 million monthly active users playing its games…" (Zynga, 2013a, para. 1) They have raised more than $10 million for philanthropic endeavors, such as their work in Mirebalais, Haiti. As stated on their Web site, "We are focusing our main efforts on families and children in the Plateau Central Départment, which was significantly impacted by tens of thousands of refugees who survived the devastating earthquake in January 2010. Contributions from our players have been critical in building a kitchen to provide hot lunches to 200 school children, and in supporting children to attend school." (Zynga, 2013b, para. 2.)

Many nonprofit organizations, medical training and educational institutions, including many prestigious universities, have created Second Life (Linden Research Inc., 2013a) simulated environments for virtual meetings, courses and other educational and training activities. Second Life provides a simulated environment where the virtual venue where players create an avatar to move through the virtual space and interact with other members of that virtual world. For example, the USC Marshall

School of Business Second Life venue creates a virtual campus, using imagery from the actual campus, where students meet synchronously to practice running businesses, and managing rental properties (Linden Research, Inc. 2013a, 2013b).

StarLogo: The Next Generation (MIT STEP, 2013) is a 3D modeling and programing tool that allows learners to program simulations and 3D video games. Developed by Massachusetts Institute of Technology, originally as LOGO, StarLogo TNG is free for teachers to download and the Web site provides curriculum to provide teachers support in using StarLogo TNG to learn about science, physics, math and other disciplines by creating complex systems models and 3D games.

Impact of Gaming on Learning

The previous section provided commercial and educational examples of each of the four types of games described in this chapter. This section will provide an overview of the impact games and gaming might have on learning. To begin, however, let me provide a philosophical foundation for educational gaming.

As educators we want to take advantage of what video games might bring to the learning environment, in terms of providing the learner with an educational experience that motivates, engages, and yet appropriately supports our academic objectives. Dai and Wind (2011) argue that when using video and computer games for learning, the game must also have some element of entertainment. Resnick (2004) chooses a slightly different way to think about gaming for educational purposes and compares and contrasts the notion of entertainment and education vs. play and learning. "So I prefer to focus on "play" and "learning" (things that you do) rather than "entertainment" and "education" (things that others provide for you)." (p. 1) In terms of instructional strategies, the difference between "things that others provide for you" and "things that you do" could also be described as the difference between teacher directed and learner-centered. Designing and utilizing games for learning from this perspective provides the opportunity for the learner to take control and the responsibility to construct knowledge, a constructivist's perspective. Kirkley, Duffy, Kirkley, and Kremer (2011) argue for the constructivist perspective and discuss the importance of three key tenets of constructivism that enhance the design and use of gaming for learning.

1. "Understanding comes from our interactions with our environments.
2. Cognitive conflict or puzzlement is the stimulus for learning and determines the organization and nature of what is learned.
3. Knowledge evolves through social negotiation and through the evaluation of the viability of individual understandings." (p. 374)

There are, however, critics of the constructivist perspective for instruction (Kirschner, Sweller, & Clark, 2006; Klahr & Nigam, 2004; Mayer, 2004) supporting the notion that learners need more structure, guidance, direction, and/or scaffolding during instruction. Indeed, the discussion regarding instructional strategies that best support learning is not new. In this particular debate, both theorists' camps provide empirical evidence, supporting their position. However, literature on gaming research demonstrates even more controversy. For example, there are those who disagree on educational research itself, in terms of approach and direction (Tobias & Fletcher, 2012; Young, Slota, & Lai, 2012). Clearly, there are differences in how researchers view learning and the impact of gaming, even differences in the approach to research and questions one might investigate. However, most agree that we're still in the infancy of research on the impact gaming might have on education and learning.

Regardless of one's perspective I would argue that most educators and educational researchers would agree that there should be a purpose, rationale, and intentionality when integrating gaming into learning environments. To put it in the simplest terms, we should ask ourselves this question. What is it that I want my students to learn and what are the best instructional strategies of integrating the game to help them achieve that? For example, it seems clear that those who support a more structured direct instructional approach would agree with the importance of identifying instructional objectives, outcomes, or learning goals. Furthermore, those who support a more open-ended, learner-directed approach of exploration still have the three tenets listed above (Kirkley et al., 2011) that provides a foundational structure upon which to plan their integration of a game.

Therefore when thinking about how one might integration gaming for learning, one might want to consider the difference between formal and informal learning and thinking about what the students will be gaining. While a game might not have any specific formal learning application (i.e., math), the game may provide an opportunity for informal or tangential learning. For example, in a review of gaming for education literature Young et al. (2012) detailed findings that the use of video games, particularly massively multiplayer environments, for language learning. "Language allows players to negotiate meaning for action within the game context, and the power of video games for language learning is attributed to this grounded use of language in context." (p. 75) Furthermore, game play was even more effective for observers than the players, possibly because of the additional cognitive load required to play.

Benefits cited by researchers investigating action games, include enhanced vision and speed of cognitive processing. Yet there could also be negative effects with action game play.

> In terms of the possibility of video games potentially causing 'reduced attention', we have yet another concept that means different things to different people. If one means the ability to rapidly and efficiently filter visual distractors that are quickly presented (that is, visual attention), then clearly playing action games greatly enhances this ability. However, if one means the ability to sustain focus on a slowly evolving stream of information, such as paying attention in class, there is recent work that suggests that total screen time, and video game playing time in particular, may have negative effects (Bavelier et al., 2011, p. 764).

Action games are very popular and even some RPGs are feeling the pressure to include more action. Final Fantasy, with version 15 currently being developed is a good example. While previous versions were more traditional RPGs with combat sequences being controlled by game elements such as collaboration with other players, guilds, and acquired weaponry, version 15 is being designed to be more dynamic with more individual player action control provided. In other words, version 15 is more of an action role-playing game, somewhat of a hybrid between traditional RPGs and Action (Ta, 2013).

Conclusions

It is clear that there are many types of video games, which can be categorized, but often have elements that overlap. However, gamers often prefer one type of game over others. The stereotype of a young teenage boy hanging out playing video games till the wee hours of the morning is no longer valid. Video games have been around for several decades and gamers have not outgrown gaming, but rather have become more sophisticated and are willing to spend a great deal on gaming hardware and the games themselves.

The impact this has on learning and learners is unclear. The literature describes trends and possible effects, but is largely inconclusive, primarily because impact on learning would most likely be caused by the individual learner, the type of game, and how well it was integrated into the curriculum and lesson objectives.

Certainly, it could be argued that educators could take advantage of integrating gaming into their curriculum, but I would argue that it is tricky. First and foremost, one should be carefully identify the specific purpose and goal of doing so. Complicating things more is that there are many very different types of games, which might engage learners with very different interests and skills. With that in mind, the next section will focus on the strengths of the types of video games, as outlined in the research, and how those strengths might be best utilized to better support learning by providing specific activities or scenarios.

Application Activities

While using video games in the classroom includes some benefits and can motivate students it can also be a bit dicey as well. As discussed above, one should define goals/outcomes/objectives for a lesson and integrating a video game "off of the shelf," into your curriculum will require careful planning and preparation. In addition, one should be very judicious about the game titles chosen. For example, Heick (2013) provides some good examples for integrating off of the shelf games into the classroom. One title that he suggests is Skyrim (Karmali, 2012) to teach "problem solving," "resource management," and "various thinking strategies," to 8–12+ graders. However, the Skyrim startup screen has a ESRB Content Rating of Mature 17+ stating that it includes, "Blood and Gore," "Intense Violence," "Sexual Themes," and "Use of Alcohol." While some teachers may be able to integrate an off the shelf game such as Skyrim in their classroom, I would caution most. Therefore, the examples provided below focus on two approaches, (a) activities and examples that are better supported with curriculum and instructional materials, and (b) integrating off the shelf games with some ideas and cautions. In addition, there are a few resources listed to provide additional ideas.

Idea 1

The National Geographic Kids Web site has quite a few video games for various grade levels which could be integrated. The games are well done, utilizing good graphics, sound, interactivity, which may prove to be entertaining and motivating. For purposeful integration, however, the games should be supported with more detailed and specific content curriculum. Fortunately, the National Geographic Education site provides teacher resources that outline lessons and units to help provide more ancillary instructional materials (i.e., lesson plans, graphics, video, and worksheets) that support the integration of their games into curriculum. For example, Wildest Weather is described as an adventure game where players design probes to gather weather data on various planets and could be used for Grades 2–5. Players must answer weather questions to retrieve probe parts, which are designed to work best on a specific planet. Teachers could have their students play the game, exploring some of the various weather elements, thus activating prior knowledge. Students would then view images provided and complete a weather worksheet. Students would then work in teams to create and present a multimedia slide show that reports the findings of their selected weather element.

Resources: http://kids.nationalgeographic.com/kids/games/; http://kids.nationalgeographic.com/kids/games/interactiveadventures/wildest-weather/; http://education.nationalgeographic.com/education/program/wildest-weather-solar-system

Idea 2

This activity integrates the 3D Modeling Programing tool, StarLogo TNG. While not an off the shelf game, StarLogo TNG can be downloaded for free and is available for PCs, Macs, Linux, and comes in several languages, including English and Spanish.

The StarLogo TNG folks at MIT also provide extensive curriculum and materials to help teachers integrate this program in several disciplines. This science lesson for middle school students uses the 3D modeling and programing tool, StarLogo TNG and can be found at the MIT StarLogo TNG middle school science curriculum Web site. Other middle school science curriculum provided include: Energy Flow in Food Webs, Evolution by Natural Selection, Heat Transfer, Motion, and a Gravity Game.

The Phases of the Moon StarLogo TNG lesson helps students overcome one of the most common science misconceptions; what causes the phases of the moon. Using StarLogo TNG, students visualize and build a model of the earth and moon enhancing their understanding of the phases of the moon. In addition to the detailed teacher guide Phases of the Moon includes: Student TNG

(continued)

Idea 2 (continued)

File and Solution File, Student Worksheet (b/w and color), Student Worksheet solutions, Teacher Guide, Assessment Item, and a Moon Walk Video.

Resources: http://education.mit.edu/projects/starlogo-tng; http://education.mit.edu/starlogo-tng/learn/middle-school-science-activities

Idea 3

Simulations and model building software can be used for a variety of age levels and disciplines. This activity integrates SimCityEDU, an online resource for teachers who want to enhance Science, Technology Engineering and Mathematics (STEM) instruction. At their Web site, teachers can find and share units using SimCity. This example, highlights the 5 lesson unit entitled, "If You Can't Experiment, Simulate: Simulations as Scientific Tools" designed for 5–6 grade science. In this unit students use SimCity to design and conduct a simulation experiment to examine dependent and independent variables and then present their results. The unit is supported with very detailed teacher materials and worksheets including; Proposal, Identifying Dependent and Independent Variables, MiniReport, and Presentation Rubric. Each lesson plan includes great detail on aspect of instruction.

Resources: http://www.simcityedu.org/browse/; http://www.simcityedu.org/unit-plans/if-you-cant-experiment-simulate-simulations-as-scientific-tools/?browse=1

Idea 4

A very popular world building off the shelf game is Minecraft by Mojang AB of Sweden. MinecraftEDU is a Wiki created by and for educators who wish to integrate the game within their classroom or school. In addition to providing information on how to install, and use the game, there is a section devoted strictly for teachers that include lessons, templates, and activities, information on game-based learning, real-world examples, and even information on parental involvement.

In this activity, students learn about the importance of tool and technology development for civilizations. Students must first investigate elements required for humans to survive, i.e., food, shelter, clothing, etc. Students are then given a choice to build a virtual world that includes examples of the required elements from the perspective of ancient man, OR present day man. Students then create a report and presentation that outlines the similarities and differences between ancient and present day man.

Resources: http://minecraftedu.com/wiki/index.php?title=Main_Page; http://minecraftedu.com/wiki/index.php?title=Teaching_with_MinecraftEdu;

Idea 5

This activity uses an off the shelf strategy game Civilization V to help students learn about historical civilizations, elements of civilizations that make them great and the consequences of strategic decisions. There are a couple of cautions in using Civilization V, however. First, be sure to understand the limitations of the game. History is embedded as context, not in historical linear events. For example, there are historical elements that may not be accurate, out of place, and or changed based upon strategic decisions that your students may make. Second, strategic games are not for everyone and you may find that some of your students may not engage to the level that you expected. Finally, the ESRB rating is for Everyone 10+, but does list "Drug References, Mild Language, Suggestive Themes and Violence" and Civilization V is a fairly complex and detailed game, so you will want to make sure that your students are at an appropriate grade level and cognitive ability.

To integrate Civilization V, one must first select a target civilization from the list of historically based civilizations. Group students in teams of three and assign roles for the tasks of leader, historian/scribe, and tactician. During play, the leader is responsible for decisions based upon the council he/she receives from the other two team members. The historian/scribe is responsible for gathering facts and taking notes, in particular, of how the game deviates from history. The tactician is responsible for providing tactical advice to the leader based upon historical events and/or strategies based upon predicted advantageous outcomes, such as relative location of resources, allies or foes. Once the game is completed, each team creates and presents a report that outlines the game play, in terms of alignment (or misalignment) to history, achievements their civilization gained or lost, and an examination and assessment of crucial decisions.

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Chapter 15
Collaborative Learning

Laura E. Sujo-Montes, Shadow Armfield, Cherng-Jyh Yen, and Chih-Hsiung Tu

Key Questions

1. What is the type of learning that is needed in the twenty-first century?
2. How can PBL help achieve that type of learning?
3. How can an ODI question foster metacognition?

Problem-based learning (PBL) is a strategy that focuses on inquiry-based learning and is grounded on the belief that students learn more effectively when they are actively involved and interested in the topic (Kwan, 2000). Although PBL has been used in medical schools as the preferred way of teaching and learning for a long time, it remains almost unused in the public K-16 education systems. Fortunately, PBL is gaining more acceptance and use among K-16 educators and students due to the many cognitive and "soft skills" that participants must learn and use. Bell (2010) explains that soft skills are needed to compete and succeed in a global society. The author describes soft skills as the social and personal skills that lead a person to become a self-reliant, effective communicator, team player, active listener, who is apt in negotiation skills and creative endeavors, among other desirable skills. According to Koh, Khoo, Wong, and Koh (2008), in a study conducted with medical

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R. Papa (ed.), *Media Rich Instruction: Connecting Curriculum To All Learners*,
DOI 10.1007/978-3-319-00152-4_15,

school students, PBL showed a concentrated positive effect on social and cognitive dimensions. In particular, PBL showed strong to moderate impact on coping with uncertainty, legal and ethical aspects of health care, communication skills, and self-directed continual learning. These skills are very important for a global society workforce where employers look not only for the "hard skills"—technical skills—but also for "soft skills" that define a well-rounded and qualified individual (Goles, Hawk, & Kaiser, 2008).

As mentioned before, regardless of the recognized advantages of using PBL, very few public K-12 schools and post-secondary institutions actually use it as a standard strategy of teaching and learning. Kwan (2000) discusses that the lack of pervasive use is due mainly to teachers' resistance to implement PBL in the classroom. Teachers are often cited as being fearful of "losing control" of the teaching process. While teachers act as the knowledge dispenser in the traditional, lecture-based classroom, PBL moves them to the role of a coach, facilitator, and consultant, that is, away from the center of the teaching and learning processes. Given that tapping into students' interests to generate messy, open-ended questions to problems is the core of PBL, it is difficult for teachers to come to class with a well-defined lesson plan. It is this incertitude that precludes many educators from adopting this form of teaching and learning. Then, it is important to stress that in order to design, implement, and assess an effective PBL activity, a fundamental shift in pedagogy is need and, as a consequence, the teacher must first be fluent in this new pedagogy (Dalrymple, Wuenschell, & Shuler, 2006; Hitchcock & Mylona, 2000). Constructivism, a learning theory that is based on the belief that the learner constructs knowledge by experience and through social interaction (Savery & Duffy, 2001), serves as a perfect-fitting framework for PBL. In constructivism, teachers do not require students to memorize isolated facts but to focus on holistic ideas; teachers place the responsibility of learning on the students by allowing them to follow their own interests, make their own discoveries and connections, reformulate new ideas, and arrive to their own conclusions. More importantly, constructivist teachers acknowledge that learning and assessment are messy activities that cannot be neatly planned and executed (Brooks & Brooks, 1999).

Design, Implementation, and Assessment of a PBL Activity

The core of a PBL activity design is to tap into students' interests as a means of instruction. This does not mean that the teacher or facilitator will come to class with nothing prepared. On the contrary, PBL requires extensive preparation of materials and scaffolds; it also requires that teachers model and coach students. While there are two main ways of designing PBL curriculum, one that uses the students' interests and the other that is designed by the teacher with the aim of teaching certain standards and objectives, the former is favored in a true PBL sense—with some caveats. For instance, how the activity is designed depends a lot on the students' age and maturity, and whether the students are proficient in the use of inquiry-based activities. In other words, students need to be taught how to learn using PBL and

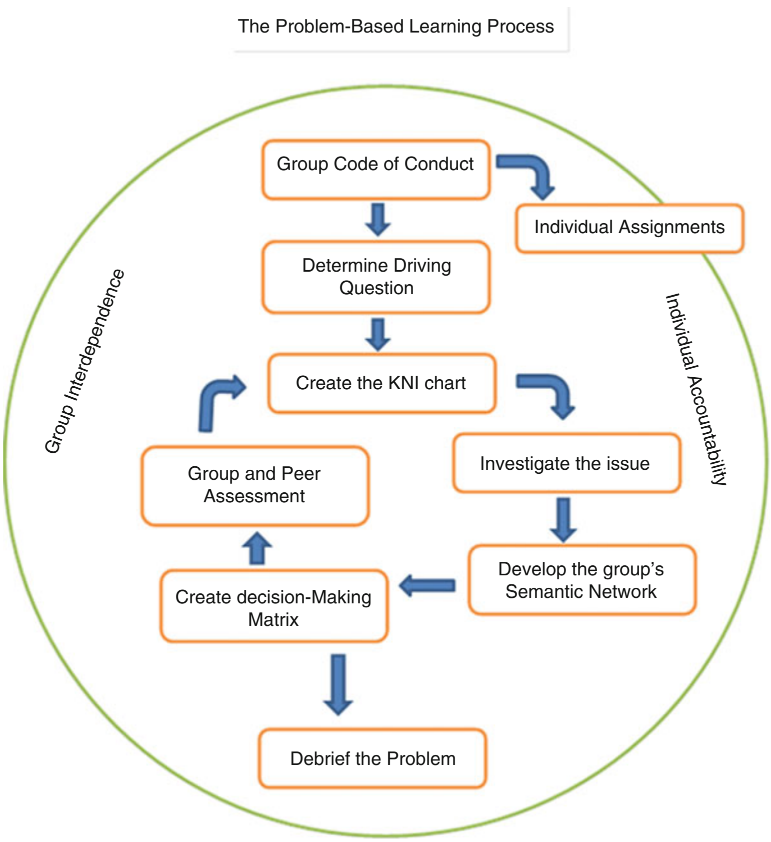

Fig. 15.1 Problem-based process

that is the main reason why the first foray into PBL activity needs to be designed by the teacher. Above all, a PBL activity is reiterative because in finding a solution to the problem, students go over the same cycle many times: they ask questions, search for information, assess the information, write about, and create a product (Torp & Sage, 2002). Figure 15.1 presents a graphic representation of the PBL process.

Designing a PBL Activity

Before discussing how to begin the design of a PBL activity, it is necessary to understand that this type of inquiry relies heavily on cooperative learning and working in groups. Although there have been discussions as to when to call group work "cooperative" and when to call it "collaborative" (Johnson & Johnson, 2004; Sharan, 2010) the two words will be used as synonyms for the purpose of this chapter and will be used interchangeably. Sharan (2010) warns that group work may come as a challenge for some cultures (i.e., boys and girls not sitting together, learning is highly structured in the specific culture, culture has low toleration to chaos, etc.). With this in mind, it is imperative that the educator teaches students how to work in such settings before embarking in a PBL activity. Johnson and Johnson (2004) state that cooperative learning is the use of small group of students that (a) work towards accomplishing a common goal; (b) maximize their own and each other's learning; and (c) work within parameters of positive interdependence, and individual and group accountability. It is also important to have heterogeneous, balanced groups in terms of abilities, majors, or other characteristics. However, keep in mind that how students will be grouped sometimes depends on the local culture, and that it should always be at the teacher's forefront not to group disenfranchised students by themselves or there will be a greater risk of team members ignoring the student's contributions. To help establish true cooperating groups, each team is invited to name the group and to create a group "Code of Conduct." The Code of Conduct is a manifesto that comes as a result of readings, discussions, and interactions among team members to identify what behaviors are desirable and undesirable in a cooperative group. Once the behaviors are identified and agreed upon by all team members, they become the contract that will direct the group's interactions. Along with the Code of Conduct, team members need to determine team roles; the most common roles in a team are leader, presenter, and recorder. The names of the roles are not as important as the role's activity descriptions and responsibilities are. The teacher must carefully design roles that cover all the duties and require interdependence among the students to be effective in the PBL.

These same activities can successfully be accomplished in a virtual classroom. It is important that the course facilitator provides a specific area for the group to interact. If working within a Course Management System (CMS), a private posting area, chat room, and ability to conduct synchronous online meetings with or without video are very important to foster group interaction. If the course does not use a CMS, there are a multitude of Web 2.0 tools that can accomplish the same goals. For instance, a free wiki can be set for the group (or let the group set it for themselves), a free video conferencing system can be used to conduct group meetings using video and/or audio, and finally, a private group in one of the social network tools can be used for instant communication among group members.

In a teacher-designed PBL activity, it is important that the instructor finds or creates a good problem with clear learning goals (Allen, Donham, & Bernhardt, 2011) through which key concepts are introduced and learned. Duch (2001) argues that a good PBL activity has several characteristics including a problem that: (a) is engaging and drives the students to look for deeper understandings; (b) requires students make decisions based on facts, information, and rationalization; (c) is complex enough that students realize that they can not only assign separate tasks to separate team members but need to work together to reach a solution; (d) connects new learning to previous concepts and, if possible, to concepts in other courses. A problem with these characteristics provokes questions that tap into higher order thinking skills in the form of analysis, evaluation, and application of learned concepts through the creation of a tangible product. Once the problem is identified, credible materials that frame the problem in context are presented to the students with some background information to understand the problem that is faced and the goals to be attained by the team. For instance, the team of students may receive "a letter from the town mayor" assigning them to a specific taskforce to investigate the impact that opening a big chain store would have on the local economy. In such a letter, background information is provided to frame the problem in a specific context with specific goals (learning objectives) delineated to be accomplished by the student in whatever role is assigned. On the contrary, if the group has experienced PBL before, then specific readings can be provided to the group to spark conversations and ideas about local and global problems. The idea is that the group comes together to select a problem of common interest and formulate a strategy about how to provide solutions. Understandably, setting the strategy can be accomplished via bulletin boards and synchronous and asynchronous meetings.

The Driving Question

When scientists work together, they formulate questions that serve as the focus of the investigation; the same is true of a PBL activity. The central question in PBL is called "the driving question" because it drives the investigation. A good driving question needs to be ODI: *Open* ended, *Deep*, and *Interesting*.

Open Ended

A good driving question does not have a one-word, one-paragraph, or even a one-page response. In fact, a good question does not have one single correct solution but several ones that bring advantages and disadvantages depending on the context in which the solution is applied (Jonnasen, 1997). An open-ended question is worth researching for an extended period of time, it has connections to different areas of knowledge, and it is situated in the real world.

Deep

A deep question is one that requires students to combine information from multiple sources to create a possible solution; it allows students to create new knowledge rather than regurgitating what they hear or read; it provides opportunities for students to revisit previous assumptions, make new connections, and come with new understandings of a topic.

Interesting

A question that is relevant to students will keep them interested throughout the investigation.

It is always a good idea to provide students with an example of a good driving question. Once the question is identified as being ODI, then students can practice changing closed questions to open-ended ones; this usually works well in teams and then the team presenter shares their new ODI questions with the rest of the class for feedback. Another strategy is to present "false problems" to students so they learn to determine whether there is an actual problem. Jonnasen (1997) presented some examples in which a problem is not a real problem. For instance, if the problem is that public transportation users complain of waiting for too long to take the bus, a solution may be to find ways to distract the patrons or to make them more comfortable at the bus stop so they take their minds off of the time that takes the bus to pick them up. Remember that ill-structured problems may have many possible solutions depending on the context in which the solution will be applied.

For an online PBL activity, this stage in the activity can be carried out by the use of a wiki or a chat room. In such a case, students individually create ODI questions to solve the problem. Then students can rate the questions in terms of which ones get to the heart of the investigation and are good, open-ended questions. Once the finalist questions are identified, students can meet as a group using a video-conferencing system or a chat room to decide on the final driving question. Many times, the final driving question is a combination of questions presented by different team members, or a question with several sub-questions. It is important that the driving question remains in a visible space so it guides the team in the inquiry process.

Using Metacognition: What Do We Already Know?

The next step in the process of a PBL activity is to come together to brainstorm about what each team member knows about the question. Jonnasen (1997) proposes that students ask themselves several questions, such as what do I know about the problem and the domain? What have I heard or read about the problem? What do I know to be true? What are my biases? The responses to these questions will be recorded in a three-column table called the KNI. The first column heading is *What I already **K**now*, the second column heading is *What I **N**eed to Know* to get closer to the solution, and the third column is *Where can I find this **I**nformation?* Besides promoting metacognitive skills, this type of activities allows the students to take ownership and responsibility of their own learning (Barrows, 2002). Depending on the maturity and experience of the students, the facilitator can request that students also brainstorm terms and keywords that later can help in conducting a more targeted search on the Web. For the online environment, a synchronous meeting with the team members is the most effective way to come up with the KNI chart.

Mindtools: Using Semantic Networks

Semantic networks, also known as concept maps and graphic organizers, are tangible representations of mind models. Semantic networks are important because they help the learner make connections between previous knowledge and new discovered knowledge, a requisite to solve problems. According to Jonassen (2003), problem representations are useful to guide the interpretation of a problem, understand the behavior of the system in which the problem is embedded, and establish connections that can trigger a procedure to find a solution. Semantic networks, matrices, and other external representations of thinking prevent students from having “a cognitive overload” because concept relationships are more evident. Furthermore, problem representations engage students in distributed cognition as each team member contributes to the development of the semantic network.

As part of the PBL process, students are asked to create a semantic network of the problem. The driving question is the center of the network and the spokes are what is already known and what needs to be investigated. As students find information about the problem, they are encouraged to add it to the semantic network; this expanding network becomes a graphic explanation of the elements that constitutes the problem. For the online classroom, there are many Web 2.0 tools that will allow students to create and add to the semantic network. Even the simplest tools for painting that are commonly part of computers in different operating systems can be used to create and modify the semantic network.

Decision Making Matrix

A matrix is another external representation of a problem and it is also based on the assumptions presented above. Torp and Sage (2002) use a matrix to make information and thinking evident to be able to arrive to a solution of the problem. The matrix is a table with four columns and as many rows as factors are found to influence the solution of the problem. The first column is Strategy and it explains a possible solution to the problem. As stated before, the matrix is created by adding a row for each solution presented. The second column is the *Pros* and the third is *Cons*. These two columns explain the perceived pluses and minuses of applying the proposed solution. Finally, the fourth column is *Consequences*. What will happen if the solution is implemented? Who and in what way others will be affected by the implemented solution? What is the impact on natural, human, animal, or other resources if the proposed solution is implemented?

The Decision-Making Matrix is one of the most important artifacts in the PBL activity because it helps students ponder the different proposed solutions. As such, it is of the utmost importance that all group members come together to fill and discuss the matrix. The result of these discussions will be the solution to the problem. However, it is entirely possible that team members realize they have not identified a good solution. In that case, the reiterative step is to go back to their KNI chart and to their semantic network to revisit previous work and to look for new connections. As with other activities, online teams can come together using a chat room or a videoconferencing system. A Web 2.0 videoconferencing tool is usually very useful for this assignment.

Debriefing of the Problem

This is the final stage in a PBL activity. At this point, teams create a product that incorporates what was learned in the process and the solution of the problem. Usually, teams present their results to other teams and they receive feedback through an evaluation rubric. It is common that the proposed solutions to the problems cannot be implemented in the real world for practical reasons. If that is the case, the teams can be assessed on the processes of the PBL activity instead of on the results of the proposed solution. For instance, Jonnasen (1997) proposes to ask questions to determine how many perspectives were included in the solution of the problem, whether the solution is viable and includes all stakeholders, and what evidence is presented of student development of deep understanding of the problem.

Assessment in PBL Activities

Alternative, formative, and continuous assessment is usually the way to evaluate students' concept understandings. In a PBL activity, the assessment usually does not come only directly from the teacher but also from peers. A simple rubric tailored to each activity can be used both by teachers and peers.

In order to maintain group interdependence and individual accountability, it is a good practice to assign both group and individual assignments during the PBL activity. For example, the semantic network can be a group assignment because its development depends on all team members contributing to it. On the other hand, it is possible to break up the decision-making matrix by the row or rows that each member contributed; this can be a group assignment that can also be used for individual assessment.

Other Activities in PBL

As discussed before, PBL activities can be designed to demonstrate specific standards and objectives. A way to do that is to assign individual assignments interspersed among the PBL steps discussed above. To illustrate, if one objective is to demonstrate certain mathematical skills, creating a spreadsheet is a good assignment. In the spreadsheet, students can compile numeric information on the components of the PBL; they can also create graphs with the data that would further help to understand the problem. Many times, essay writing is what is most practiced in a PBL activity. Students may be asked to create a newsletter with interesting data from the research of their problem. Besides grading the writing skills, students would be using technology to create the newsletter. Elements of graphic design, if applicable to the course, can be assessed this way.

PBL: An Example

The authors have extensive experience implementing PBL both online and in face-to-face environments. Online implementation is done through an online course that is part of a master's program in Educational Technology. What follows is an abbreviated form of the process presented to the students in preparation to start the PBL activity.

Problem-Based Learning Process

Get Prepared

Individually, download the software that you need to complete this project or identify the Web 2.0 tool. Since you will be creating a semantic network, you need to have a concept-map software program or Web 2.0 tool.

As a group, complete the following process,

Meet the Problem

Read the Memorandum (in PDF) that the City of Hibbert Mayor sent to you. If you are a little lost and do not know where to start, you can look at some resources that the Mayor has provided for you. They are titled Resources and you can find them in the PBL folder in Module Two.

Formulate a Driving Question

What is a "diving question"? How do you create one? Before you create your final driving question, learn what it is and practice creating other driving questions. Find the Driving Question page in the PBL folder in Module 2, read it, complete the assignments that ask you to change closed questions into ODI questions, formulate your final driving question, and post it to your group's discussion topic. **Your team leader will post the final driving question selected by the team to the class Driving Question discussion topic.**

Assess Your Knowledge

As with any problem, you need to stop and assess what information you have and what information you need to obtain. To make the process more straight-forward, use the What We Know, What We Need to Know, and Where we can I find the Information chart (KNI Chart). See a sample of a KNI chart in the PBL folder in Module 2. The technology aspect of this assignment is not as important or difficult as the content of the chart. **Groups, please take enough time to discuss this chart in your group's discussion topics**.

Semantic Network

In your group, place the driving question at the center of what will be a semantic network. Add the information that you already have from the KNI chart. As you and your group research the problem, add your findings to this semantic network.

Get the Numbers

The purpose of the spreadsheet activity is to integrate math into this project. Your group is free to select the products that they want to create. Remember that your group will need to create **at least** two of the following products: graphs, distribution tables, frequency tables, regressions, etc. Also, your team needs to create a Web page to display your team's results. Fianlly, your team needs to add a narrative to explain what the numbers and the graphs mean, the source of your data, i.e., the URL or the reference where you obtained the data. You will be assessed using the PBL Numeric Assignment Rubric.

Publish or Perish: Disseminate the Results of Your Investigation

Your group will create a publication that explains all the different perspectives of the problem; that is, your publication is a way to make sense of all the research you have done to solve your problem, and as such, it needs to include citations and a reference page. The publication is a peer-edited product. That means that you will send your product to an assigned person in the class and you will receive somebody else's product. You will use a provided feedback sheet (a rubric) to evaluate your peer's essay and you will receive your product's peer evaluation using the same rubric.

You Are Getting There: Time to Make a Decision

The time has finally come when you and your team need to make a decision about your problem. To facilitate the process, use the Decision-Making Matrix to determine the best fit of proposed solutions. See a sample of a matrix in the PBL project in Module Two. This activity requires very simple technology skills. The important part of the matrix is the solutions that you present. To arrive to the solutions, your group is expected to meet in a chat room or to meet using a videoconferencing Web 2.0 tool to discuss the pros and cons of each one of the proposed solutions. As much as possible, this matrix needs to be constructed using synchronous communication. **Groups, please take as much time as necessary to present, discuss, and decide on a solution to the problem.**

How Are We Doing? Peer Review

At this point, you will need to create a product that will help you reflect on what you have learned about the problem. Above all, **your debriefing product needs to include your group's position on the investigated issue**. Try to be creative and do not limit yourself (or your group) to a presentation. Think "out of the box." You will peer-evaluate other group's debriefing of the problem. This evaluation needs to happen **before** the due date of the class' debriefing of the problems. Please use the provided Debriefing of the Problem Rubric to evaluate your and your peers' products. Your **final** debriefing of the problem will be the **average** of your instructor's evaluation and your peer group evaluation.

We Are Done! Or Are We?

As part of this PBL unit, you will also do the following **individual** assignments:

- Keep a journal about your investigation. You will need only three entries: one at the beginning of the investigation, one at the middle, and one at the end of the investigation. Follow this format for your entries:

  Entry 1: Expert problem solvers frequently examine their own thinking. One thing they want to keep checking on is their own bias. Bias is defined as a personal opinion, preference or prejudice.

  – Why is it important to know what biases you bring to the investigation of a problem?
  – What are your personal biases as you approach this problem?

  Entry 2: Expert problem solvers make sure the information they use is relevant and reliable.

  – "Relevant" means that the information directly applies to or answers your question(s). How did you decide if the information you discovered was relevant?
  – "Reliable" means that you can depend on the information to be true and without bias. How did you decide if it was reliable? What clues at a Web site or in printed sources can help you decide if the information was relevant and/or reliable?

Entry 3: Problem solving is challenging work. What have you noticed about yourself during this process regarding each of these characteristics? Rate yourself from 1 to 10, 1 being "not at all"; 10 being "very much" and explain your rating.

– Persistence: "I keep on trying to find the answers or the solutions, even when the questions are hard or confusing."
– Accuracy: "My work is careful, exact, and without errors."
– Open-mindedness (unbiased): "I am open to the opinions or ideas of others. My views can be changed when I learn more facts about an issue."

Entry questions were modified from the Environmental Education Outreach Program at Northern Arizona University (http://www4.nau.edu/eeop/).

- Design and maintain a database to keep your resources organized. Determine different sub-topics within your problem, if appropriate, and decide in your group what fields will be necessary so you and your team members will be able to search and sort your records in your database. Make sure to have **at least** the following fields in your database:

  – URL
  – Page title
  – What information is on the page
  – Why it is important to you

- Each group will construct a Web page that will be devoted to display the group's assignments. Your group needs to have at least the following the Web page:

  – Group Code of Conduct
  – Short bio of each of the team members
  – Links to each one of the PBL products.
  – A personal narrative that answers the following questions:

    - Talk about your experiences implementing PBL: is this the first time you implement it? If not, how many times have you implemented it before? Have you used technology with your previous PBL implementations? How?
    - Report on your students' experiences while you were implementing the PBL project; were your students' learning experiences different? If so, how? Did your **diverse** students (those with special needs, second language learners, or economically disadvantaged) react different to the problem? If so, how? Rate your students' response to the project from 1 to 10, one being "not engaged at all" and 10 being "very responsive." Explain your rating.
      Note: This bullet refers to the PBL that students in the course designed and implemented in a K-16 classroom where they were teachers.
    - Were there any factors that enabled or constrained the technology-enhanced PBL process? If so, identify the factors and explain how they constrained or enabled the process.

Assessment

You will be assessed in the following way:

Group Assignments

- KNI Chart: 20 pts.
- Group Semantic Network: 30 pts.
- Numeric Data Assignment: 30 pts.
- PBL Publication: 30 pts.
- Decision-Making Matrix: 20 pts.
- Debriefing of the Problem: 140 pts.
- Group Collaboration Rubric: 32 pts.

Individual Assignments

- PBL Journal Entries @ 20 pts. each: 60 pts.
- Resources Database: 30 pts.

Conclusions

Some researchers (Sendag & Odabasi, 2009; Dennis, 2003; Polyzois, Claffey & Mattheos, 2010) have found no difference in conceptual knowledge gains between lecture-based instruction and problem-based instruction; still, others have found significant gains (Hoffman, Hosokawa, Blake, Headrick, & Johnson, 2006; Strobel & van Barneveld, 2009; Nii & Chin, 1996). However, there is better consensus on the effectiveness of PBL to foster the development of critical thinking skills, life-long learning, profession-related skills, and team work (Sendag & Odabasi, 2009; Koh et al., 2008; Prince, Van Eijs, Boshuizen, Van Der Vleuten, & Scherpbier, 2005; Wood, 2003). As argued at the beginning of this chapter, a global workforce requires the specific skills of problem solving, communication, and self-directed learning. As we begin the second decade of the twenty-first century, information has become so ubiquitous that schools should not necessarily concentrate on knowledge acquisition but rather on the *skills* to work with, understand, and manipulate that knowledge. PBL can help students acquire the soft skills that are not overtly taught in the K-16 educational systems.

Application Activities

Idea 1

Change the following question to a good ODI spell this out question: Which country has the highest number of immigrants?

Idea 2

Although the PBL process is somewhat set in terms of the steps taken to select and arrive at a solution, the process itself can be modified to fit the facilitator's and students' needs. Under your current circumstances, provide an outline of the activities you would follow to provide solutions to the ODI question that you wrote in the previous activity.

Idea 3

Assessment is always a process that needs to be in the forefront of curriculum planning. Add the type of assessments you will use to evaluate the activities that you outlined in your previous activity.

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Chapter 16
Google Sites and Oral History Projects: Connecting School to Community

Christine K. Lemley and John Martin

Key Questions

1. Design: How can a high school–university partnership using new media technology situate an Oral History Project (OHP) assignment in a technology-rich realm to maximize student engagement?
2. Delivery: How can a high school–university partnership using new media technologies create and foster a social support environment between high school students and preservice teachers?
3. Assessment: How can a high school–university partnership using new media technology digitally track and assess student progress?

Introduction

> Sitting in my College of Education's faculty meeting at the end of a semester, an education technology colleague invited us all to consider how we could collaborate among and across departments. He encouraged us to create ways to connect our content areas to innovate research projects. I pondered this thought and remembered that I had recently agreed to partner with a local high school teacher on an oral history project. My university students and her high schools students would form groups and meet in an online space to (a) get to know one another and talk about high school/post high school plans, (b) discuss a common book they would all read and (c) share ideas about an oral history project in which they chose focus questions relating to the book to explore lived experiences of a community member through the stories they told. My technology skills were limited and I knew having another

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R. Papa (ed.), *Media Rich Instruction: Connecting Curriculum To All Learners*,
DOI 10.1007/978-3-319-00152-4_16,

> colleague to brainstorm ideas could enhance the project. He recommended I use Google Sites to foster interactions between university and high school students. I spoke with the high school teacher who recommended we be in contact with the school librarian and district office about such an endeavor. And so the project commenced (First author journal notes).

These opening journal notes described the beginning of a semester-long project in which two educators, a high school English teacher, Kathi, and a university teacher educator, Christine, negotiated literal and figurative ways to connect school to community in meaningful ways through an Oral History Project (OHP). Oral history is a qualitative research methodology that gathers information from individuals or groups about experiences and explores their causes and effects on the individual(s), community, and society at large (Charlton, Myers, & Sharpless, 2007).

At one level, the two educators connected university students to high school students through new media technology, to (a) encourage the high school students to consider post secondary education and to (b) offer a space for the university education students, soon to be teachers, to apply theory to practice in an online space with students. At another level, the two educators connected all students to community through OHPs that (a) had them determine what kinds of questions they'd like to ask, (b) go in the community to gather lived experiences through the stories people told in their responses, and (c) report findings to their respective classroom communities. The process was challenging (both educators were limitedly versed with Web 2.0 interfaces); and it was rewarding (the results students reported from online communication and face-to-face interviews were outstanding). The university instructor has continued to use Google Sites as an interface for communication between university and K-12 students.

The university–high school partnership highlighted the importance of sociocultural learning as a vehicle for learning. Gonzalez, Moll and Amanti (2005) define funds of knowledge "to refer to the historically accumulated and culturally developed bodies of knowledge and skills essential for household or individual functioning and well-being" (p. 133). When teachers give up their role as teacher and expert to take on a role as learner, they better understand that their students bring significant cultural and cognitive knowledge and skills to the classroom.

Drawing on preservice teacher and high school student funds of knowledge, Google Sites and its technology rich atmosphere, one that many youth connect with readily, was seen as a potential incentive for students to correspond with each other and become engaged with the project. The following question guided our analysis: *How can new media technologies, specifically Google Sites, enhance collaboration and expand learning in an OHP?* We build from the idea of participatory cultures (Jenkins, Clinton, Purushotma, Robison, & Weigel, 2006) to define new media as popular forms of media that allow for and encourage active participation in non-local communities and society at large.

In this paper, we first provide the theoretical framework that guided our study—sociocultural learning. We then present research participants, including educators and students from both university and high school settings. We discuss results according to the study's guiding question. Finally, we discuss the scholarly significance of this project and make recommendations for continued use of new media technologies.

Background Information

Theoretical Framework: Sociocultural Learning

This study draws on sociocultural learning (Brown & Duguid, 2000; Lave & Wenger, 1991; Vygotsky, 1978), which purports that social interaction is imperative in all culturally significant learning. As Vygotsky states,

> Every function in the child's cultural development appears twice: first, on the social level, and later, on the individual level…. This applies equally to voluntary attention, to logical memory, and to the formation of concepts. All the higher functions originate as actual relationships between individuals (p. 57).

Communities we socialize in, both physical spaces and group interactions, influence who we are and who we have the possibility to become (Vygotsky, 1978; Wertsch, 1991). People need to be valued and validated in the communities where they participate (McMillan & Chavis, 1986).

A second major theme in sociocultural learning is that the potential for learning depends on the "zone of proximal development" made possible through social interaction. As explained by Vygotsky, it is "the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers" (Vygotsky, 1978, p. 86). Learning from others through guidance and collaboration can afford knowledge gains that exceed what individuals typically attain on their own. Communities of practice (Lave & Wenger, 1991) provide spaces for group interactions and activities that shape construction of participants' identities.

New media technologies foster connections within interest groups, thereby fostering learning and the growth of communities of practice (DiMaggio, Hargittai, Neuman, & Robinson, 2001; Jenkins et al., 2006; Wesch, 2009). Factors driving this increase include new ways of inquiry and collaboration, and new opportunities for participation and publication of knowledge outcomes (Crook et al., 2008). Although the constantly shifting set of technologies that comprise new media allow for, to varying extents, connection, collaboration, and community building, it is the result of their use—the growth of participatory cultures (Jenkins et al., 2006)—that were more interesting in this study than the technologies themselves.

Design: Research Participants

Research participants and data for this paper includes: (a) a university teacher educator who provided recommended tasks for the OHP, (b) a university technology educator who provided guidance and reflections, (c) a high school teacher who provided interview anecdotes, (d) a library media specialist who provided reflections, (e) preservice teachers who provided OHP teaching tips on Google Sites, and (e) high school students whose Google Site interactions were analyzed.

The university teacher educator, Christine, had taught at a public state rural mid-sized southwestern university for 2 years. She is committed to issues regarding social justice, equity, voice, and sustainability. She had limited technology skills and was willing to try new media technologies. She often seeks ways to collaborate with school teachers, and hoped a project like this would interest a local teacher.

The university technology educator, Michael, had taught at the university level for 11 years. He primarily collaborated with faculty, and welcomed the possibility to engage in a project that took advantage of new media technologies. He spent less time than he thought he would need to with Christine and her class, and always offered to serve as a resource person.

The university preservice teachers, both graduate and undergraduate, were completing their final semester of coursework before student teaching. The students came from varied content disciplines (English, History, Music, Math, Science, and Physical Education/Health Sciences).

Kathi, the high school teacher, had taught English at the high school for 38 years. When Christine first approached her and suggested the idea of collaboration, Kathi accepted resources describing the pedagogy but declined the offer to immediately discuss further. Then a university resource faculty offered a workshop on OHPs and how she, as a former English teacher, had successfully implemented the methods in her classroom. Kathi and Christine both attended this workshop and talked about possibilities after the workshop, where Kathi agreed to pilot test an OHP the following semester with her students. The project was a total success to Kathi because her students impressed her with their ability to engage the project in meaningful ways. Kathi was ready to implement again, this time adding the university student connection. She hoped an added benefit would be that her high school students might ask university students about making decisions to go to university as well as engage the OHP.

Jean, the high school library media specialist, had taught at the high school for 10 years. She first served as a liaison to school district representatives, underscoring to Kathi, Michael, and Christine the need to connect through an online interface that could be monitored. Facebook, though an option, was not acceptable to the school board because the educators could not monitor it in closely. Google Sites, however, looked promising. The school district representatives had never had a high school faculty connect with a university faculty in this way, and Jean did not know Google Sites enough to answer the school district representatives' questions, so the project was put on hold until questions were researched and answered. Once the site was up and running, Jean served as the gatekeeper at the high school, allowing students to break through the high school firewall in order to access the sites. Jean wrote Christine about certain high school students not receiving messages to join sites. Christine visited Jean several times to work through challenges encountered.

The high school students were juniors in an English class. Few were familiar with Google Sites and recommended to Christine that they connect on Facebook instead. Christine explained liability issues with limited ability to monitor Facebook, which most students understood. The high school students learned with and through Jean how to operate and manage the site.

The partnership connected the high school students and university students in groups; each group created their own Google Site. In addition, each person was responsible to post an introduction page and respond to the posts on their group's site. Working together, the students drew on their own and others' funds of knowledge to create the project, Google Site and troubleshoot challenges as they arose.

Delivery: Community Oral History Project in Action

As a foundation of this project, both Kathi, the high school teacher, and Christine, the university teacher educator, implemented an OHP into their curriculum to connect school to community through personal interviews. The preservice teachers' OHP was to interview primary source informants about a topic/unit they planned to use in their classroom to demonstrate ways to maximize student engagement and connect school to community.

As an example, a music education student focused her interview around questions concerning how music played a role in the interviewees' everyday life. This education student planned to use information gained from interviews to demonstrate the importance of music in order to advocate for the continuation of music programs. In another example, a physical education/health sciences student focused questions around how technology has influenced physical movement. He wanted to underscore how video games and computer programs, while intellectually stimulating, have made youth less physically active, and therefore exacerbate occurrences of obesity. In a third example, an English education student also focused on technology, collecting information on how technology affords multiple forms of communication that connect people more readily. Additional information on these units is available from the authors upon request.

The high school students' curriculum for the OHP unit in which the students (a) read the book, *A Lesson Before Dying*, (b) discussed the book, (c) created an OHP based on the question, "What advice would you give youth today?" (d) went out in the community to interview community members 65 years or older, and (d) posted projects on Google Sites, and (e) analyzed and present OHP findings in class presentations. The university and high school students were responsible to post comments to their group member's postings. We agreed to post on Wednesdays and respond by Sundays for 8 weeks, which turned to 4 weeks because of lag on start time. The following conversation between the students demonstrated the high school students' challenges with starting the project and the university students' awareness of these challenges. We have marked "HS" for high school students and "US" for university students.

> **HS1:** 7:28 PM Mar 30, 2010
> Heyyyyyy my name is Trevor Leisek, I was one of the students that came to your class a few weeks ago. I play the trumpet and like sports, especially ultimate frisbee. But I'm the youngest of four in my family and all of us have gone to Flag High and my brother is actually a senior right now and i'm just the junior. Well that's basically the exciting me! Talk to you soon!

US1: 1:37 PM Mar 31, 2010
Hey Trevor. Good to hear from you. Are you in the marching band at school or just play for fun?

HS1: 10:27 AM April 1, 2010
I'm actually in the marching band, concert band, pep band and jazz band all for school.

US2: 9:00 AM Apr 5, 2010
Trevor, do you think that you migh be interested in pursuing music after high school?

HS2: 6:29 AM Apr 6, 2010
Hello my name is Adam Clawso, and you dont really know me that well because this is my first time being on here. Um I enjoy running alot, if there ever is a beautiful day, I am out running. I am the second oldest in my family, my sister is in her Freshman year at BYU so that's pretty exciting. Ya… sorry for taking so long. I'm bad when it cometo this stuff. Talk to ya later.

US1: 5:31 PM Apr 6, 2010
It's ok. There are plenty of people that have had issues with some of the sites. We have all had to reorganize a few things to make it easier for you guys to navigate the page.

More conversation ensued, with four high school students and four university students talking to one another, mostly about decisions after high school and challenges encountered by the high school students initiating connection on the Google Site. The high school students did not mention this in the text, but the educators knew they were going to their library and having Jean help them with the correspondences. The university students mainly relied on group members and other class members to troubleshoot.

Assessment: Collaboration at Multiple Levels

The educators analyzed data using the study's guiding questions: *How can new media technologies, specifically Google Sites, (a) enhance collaboration and (b) expand learning in an OHP?* Recognizing that cultural development is always possible (Vygotsky, 1978), the university educators (Christine and Michael) and high school teacher (Kathi) set up situations that attempted to make social learning interactions easier. To enhance the OHP, they structured social interaction by setting up groups so the students could learn from and with one another, drawing on each other's funds of knowledge, which enabled the instructors to identify progress and pitstops and also allowed for emergent communication through the site.

Collaboration occurred at multiple levels between and within the high school and university settings. Michael guided preservice teachers to create their team's Google Sites and was available to answer questions about it throughout the semester. As the point technology person at the high school, Jean assisted students and corresponded with Christine. Kathi and Christine collaborated on (a) how to use OHPs in their curriculum, (b) how to use the Google Site, (c) how to engage students to participate, and (d) how to frame assignments.

In order to combine diverse groups of content knowledge, courses experience, teaching experience and gender, Christine grouped preservice teachers of 3–4.

Each group included one graduate student, one student who self-identified as basic–expert computer skills on a novice–basic–expert range. Additionally, there were no more than two preservice teachers from any one discipline and at least one male when possible.

These groups worked together to build their team's Google Site and engage high school students in varying tasks for the OHP. Between the OHP itself, and the creation of, and interactions through the Google Sites, there were many opportunities for all participants to further develop knowledge and skills. Once individual OHPs were started and Google Sites were accessed, Kathi and Christine were impressed by students' engagement and ease in participation.

Oral History Project

Christine directed the preservice teachers to include the following for their OHP: (1) prepare in advance; (2) consider the complexity of interview relationship(s); (3) practice questioning and listening skills; and (4) determine how to present the interview. Christine had the preservice teachers complete their own OHP to (a) learn how to support their future students' work with such a project and (b) make a list of "teaching tips" for the high school students. The tasks, from preparation to presentation, demonstrated sociocultural learning that the preservice teachers completed through working individually and with each other. The following images/text show how some university students uploaded group and individual pictures with explanations to introduce themselves.

In response, preservice teachers drew on their own OHP experiences to make recommendations. Many answers emphasized preparation and questions, and gave specific tips for the following OHP processes: preparation, question creation, interviewing, archiving, and interview closure. The preservice teachers understood the importance of all of these tips after they had individually prepared, conducted, and considered how to present their own OHP to potential students. Learning through doing, they were prepared to offer practical and theoretical advice.

Create and Foster a Social Support Environment

Regarding teaching practices, culturally relevant pedagogy provides three tenets for effective teaching: academic achievement, cultural competence, and critical awareness (Ladson-Billings, 2009). Academic achievement, teaching students literacy, numeracy, technology, and other content knowledge skills through means that makes them succeed is necessary to build the student's confidence level to promote success. The OHP addressed academic achievement through teaching knowledge skills about interviewing effectively. Both university and high school students learned to plan, conduct, and present interviews.

Cultural competence, the second tenet of culturally relevant pedagogy, advocates for teachers to use students' background knowledge as a vehicle for learning. And, specifically, this meant learning about their own culture and at least one other. The OHP addressed this tenet by guiding the students to conduct an interview with a person of their choosing, always from various cultural identities, thereby facilitating students learning about multiple cultures. Critical awareness, the third tenet, identifies inequities that exist in society. University students used this tenet to critically look at school and society issues like privilege and power issues while interviewing.

In order to maximize cultural development access points (Vygotsky, 1978) and include cultural competence (Ladson-Billings, 2009) to draw on the students' knowledge as a vehicle for learning, Christine and Kathi included the OHP in their curriculum. Christine believed that culturally relevant pedagogy guided her students to critically engage their OHP in meaningful ways.

Drawing on Vygotsky's notions that social interaction is essential to cognitive development, Kathi supported forming groups and encouraged peer–peer, student–teacher and student–librarian dialogue. Christine created a survey/questionnaire for the high school students to complete. Kathi recounted the following about the OHP:

> They loved engaging with the college students. I didn't know that as the project was going on. I mean, I didn't hear them say "Oh, I am having so much fun engaging with my college buddy." But in their questionnaires they said that they really loved it. They especially loved the "About Me" section. That surprised me too because they would tell me "Well, I don't know what to say about myself." And some of them did comment, mostly boys, that it was hard to tell about themselves to an invisible audience… (Kathi, personal interview).

As noted before, the lack of ease to immediately access the site may have curbed interest and interaction. Gaining approval through the school district as well as getting the students connected took more time than originally expected. The invisible audience became visible when the students connected, and yet in the end the high school students commented that it would have been easier with a different interface.

One goal of the OHP was for the preservice teachers to innovatively introduce themselves to high school students. Christine, their university instructor, encouraged them to upload photos and other engaging media. Many took group pictures to upload on the home page of the text and then uploaded individual pictures on their own pages. Figure 16.1 below represents a group photo on the home page. From the side bar at the left on this home page, "The Original College Corner" high school students could click on this link to see an individual picture of a university student with a description, as illustrated in Fig. 16.2. Please note that the educators received permission through IRB from both the high school's parents and university students to use the sites and photos for presentations and written reports.

Some pages on the site included correspondence; these introductory pages surprisingly did not. The educators concluded that the high school students did not become as confident using the site as they had hoped; the students mainly reserved class time to create posts versus finding time outside of class. The educators concluded that the site itself, Google Site, was not as user friendly as the educators had imagined it could become after initiating contact.

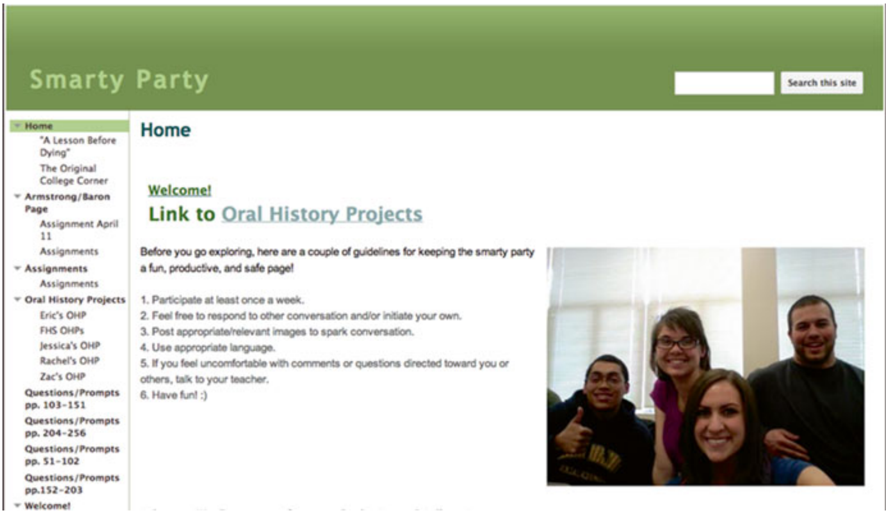

Fig. 16.1 Google Site group photo

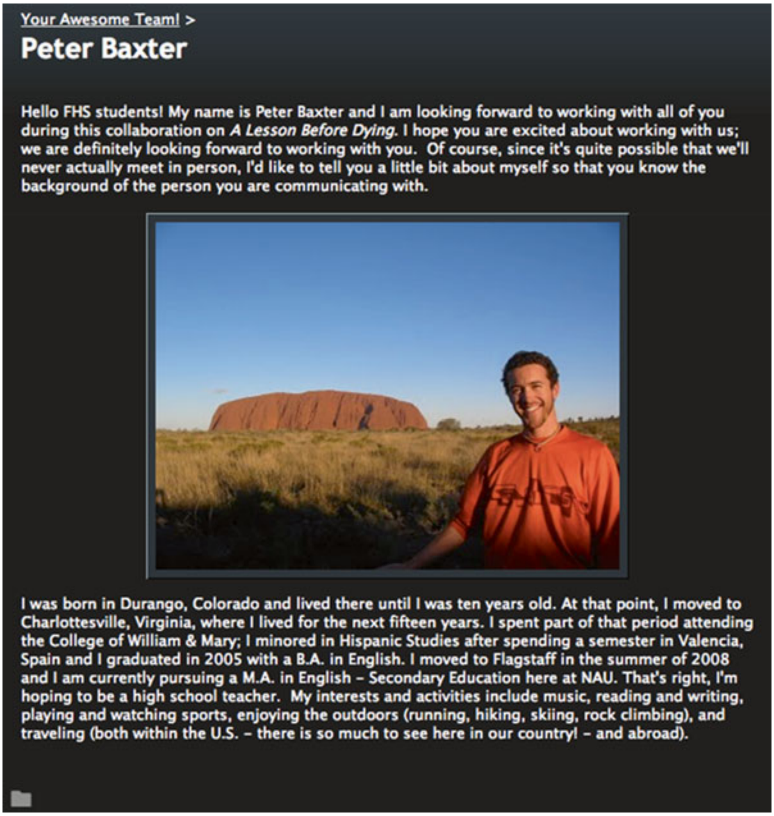

Fig. 16.2 Individual student introduction

Other preservice teachers uploaded songs. So, Kathi's interview excerpt above in which high school students said they were challenged to tell about themselves to an invisible audience surprised Christine, who thought the technology medium would have them ultra-engaged. She understood how Facebook-oriented they all were, yet the Google Sites, unfamiliar to most, was not embraced as much as she originally expected.

Jean, the librarian, focused on technology and talked about how important it is to know the level of student proficiency in the following reflective narrative:

> … Educators make assumptions about the technological savvy of digital natives, but I have discovered it is critical to assess students' technological knowledge initially. Perhaps a pre-assessment might be helpful to estimate how much time needs to be allocated to address students' needs before they begin the oral history project (Jean, reflection notes).

As instructors, we wondered if, as Jean notes above, the challenge was an issue of lack of knowledge or lack of appreciation for the chosen interface.

In addition, Jean commented that assisting high school students with the Google Site helped her to get to know the students and learn collaboratively with them. She explained how students sometimes determined and remedied challenges themselves, and other times needed her intervention. From a sociocultural perspective, Jean and the students engaged in peer-to-peer learning through the process as she writes about in the following reflective narrative:

> One of the biggest rewards for me was to collaborate with students as they figured out how to participate in this project successfully. They taught me some things, such as if you already have a Gmail account, you don't need to create a new Google Sites account … Also, trying to troubleshoot some of the problems together, I had an opportunity to talk with individual students and get to know them better … A couple of students were ready to give up almost right away, but with humor and gentle coaxing, I managed to encourage them to persist and continue to try to make either their email account or Google Site work successfully. In the end, they smiled, relaxed, and realized it pays to persevere despite the odds (Jean, reflection notes).

The OHP engaged students in relevant, meaningful and significant ways to connect school to community. Using Google Sites offered an authentic teaching/learning experience for preservice teachers to engage students, and for high school students to dialogue about course material and post secondary options.

Recalling recommendations made by preservice teachers, the students benefited from applying them in literal and figurative ways in their own interviews. They: (1) listened, (2) allowed tangents and still completed their interview, (3) wrote a thank you note, and most poignantly, (4) developed a relationship, in which a community member who was interviewed for an OHP called them "ambassadors" for their generation, and finally, (5) served as ambassadors to their classmates, showing each other how to form relationships through an interview. The following passage from Kathi's interview highlighted how the students and the research participant benefitted from the experience:

> …[two students] were [at the interview] for three hours. …they said that [the man they interviewed told them he] felt that they were ambassadors for their generation, that he

> didn't realize that children their age, students their age would be prepared to sit and listen. And be so interested in his war time stories and his past, and how he met his wife. They asked him that. He said it was the happiest day of his life. And you could see that they were glowing. They were proud of themselves. They were really pleased that they had taken the time to meet this man and to listen to him. …I saw a thank you note they had written him, and it seemed as if they had established a relationship that they wanted to continue. And they were my ambassadors too because they did me proud (Kathi, personal interview).

Addressing National Educational Technology Standards

Divided into six broad categories, the International Society for Teacher Education's National Educational Technology Standards (NETS) for students serve as a guide for teachers to address educational technology skills and dispositions. The educators focus on how the high school students' curriculum and activities met standards through this OHP. Teachers strive to have technology-rich curriculum to introduce, reinforce and master the standards within each category so that students achieve success in learning, communication and life skills. The six broad categories include: (1) Creativity and Innovation, (2) Communication and Collaboration, (3) Research and Information Fluency, (4) Critical Thinking, Problem Solving and Decision Making, (5) Digital Citizenship, and (6) Technology Operations and Concepts.

The *Creativity and Innovation* Standard was addressed through student-creation of a site within Google Sites. Starting from nothing, they had to design, build, organize, and maintain a system for organizing high school and college student interactions around the specific themes of Oral History and Earnest Gaines' *A Lesson Before Dying*. Once created, they added photos and digital media to introduce themselves to each other. Some included song lyrics and others put up videos of themselves. Figures 16.3 and 16.4 below represent two home pages from the Google Sites. The university students chose different ways to display the same information, and they all focused on the Gaines' book, introducing themselves, and OHPs, so the sidebars have links to information about these topics. Figure 16.4 additionally illustrates how the high school students used their technical proficiencies; the video link here includes two high school students acting out a scene from the book.

The *Communication and Collaboration* standard was also addressed through the design and maintenance of the sites. Communication and collaboration continued to develop throughout the sites' usage, as high school and college students dialogued with each other about interests, especially on post-high school plans and the university students' experiences choosing a college. All students drew on existing knowledge of technology and social media skills in order to engage each other.

Beyond the interactions on the site, the *Communication and Collaboration* standard was met through the goal of the OHP—to learn from community members, mainly through interviews and any artifacts the community members may have shared.

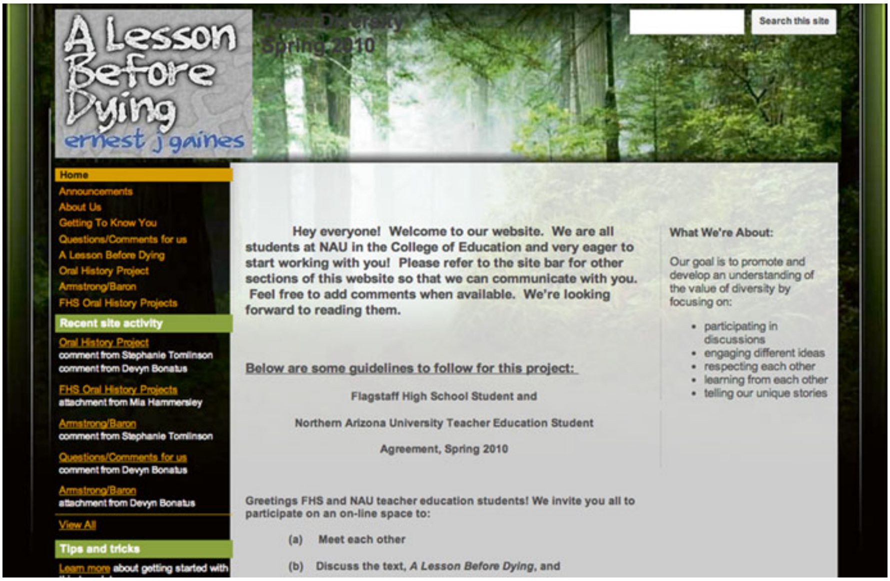

Fig. 16.3 Home page from Google Site

In practice, this meant that within group and individual work, students interviewed community members on a topic that the students knew the community member had knowledge about. Then the students took these interviews and posted them on Google Sites to share with one another and offer comments.

The *Research and Information Literacy* standard was addressed as high school students planned, scheduled, and conducted their own OHP interviews and determined the means to present them to their classmates, as well as ways to post them on the their Google Site. They identified themes from the interviews and highlighted how their questions and conversations illustrated these themes in significant ways. Some of them highlighted passages in text transcript form that they had typed up from their interviews. Others shared the actual audio because the tone of the voice as well as the words were important to them.

The *Critical Thinking, Problem Solving, and Decision Making* standard was addressed through the overarching question for the high school curriculum unit: “What advice would you give to the younger generation of today?” From this foundation, high school students imagined and selected additional questions to ask community members. They learned from a model interview of the teacher with another student, then critiqued that model on what went well and improvements to consider. Then they practiced asking questions and using the recording equipment (some used tape recorders, some used phone recorders, and others used camera recorders) in class with other students. Finally, individually or in partners, they ventured out into the community to conduct their own OHP interviews.

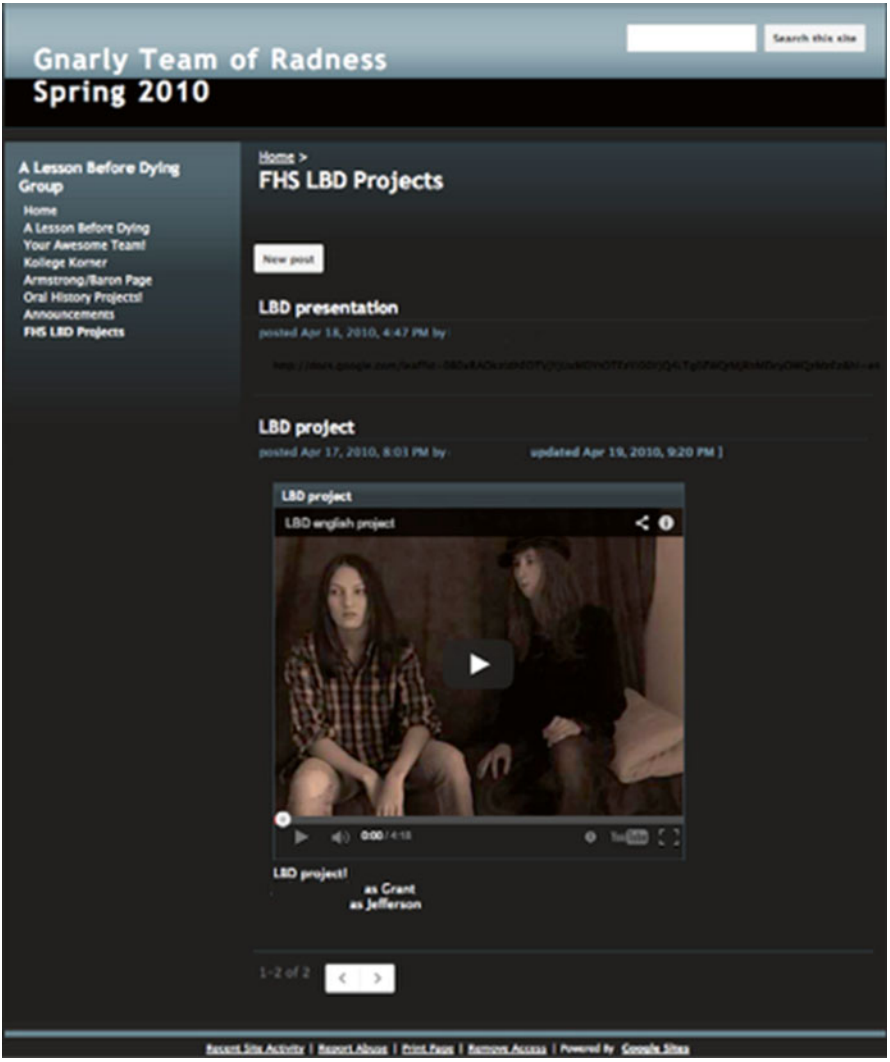

Fig. 16.4 Home page from Google Site

The *Digital Citizenship* standard was addressed in discussions and activities around interview etiquette and issues of consent. Christine and the university students created a consent form for the high school students to use with their OHP participants (Table 16.1).

In discussions and central Web site text, the university students explained the importance of this consent form, which enabled the high school students and their OHP participants to (a) understand the goals of the project, (b) consent (or not) to

Table 16.1 Sample consent form letter

High School Name
Address
Phone Number
E-mail Address

Informed Consent

Project Title: XXX

Dear Participant,

You are being asked to participate in a project conducted through XXX High School that involves research. We are excited to invite you to participate in this project because your knowledge base will greatly enhance the results. The researcher is required to receive your informed consent before you participate in this project.

________________________(student's name) will explain to you in detail: (1) the purpose of the project; (2) what you will be asked to do and how long your participation will last; (3) how your personal information, if collected, will be kept confidential; (4) potential benefits of participation; and (5) foreseeable risks.

Your participation in research is voluntary. If you refuse to participate, there are no penalties or loss of benefits or services that you are otherwise entitled. If you decide to participate and then withdraw or skip a question, there are also no penalties or loss of benefits or services. Whether or not you choose to participate in this project will have no effect on your relationship with XXX High School now or in the future. A basic explanation of the project is written below. Please read this explanation and discuss it with _________________(student's name). Feel free to ask questions to help you understand the project. After any questions you may have are answered and you decide to participate in the research, please sign on the last page of this form.

1. PROJECT PURPOSE:

- This project aims to gain information and stories from community members regarding their lived experience and life wisdom.

2. EXPLANATION OF PROCEDURES:

- For this project, I would like to invite you to participate by allowing me to interview you with specific questions about your lived experiences and what knowledge is important for youth to know.
- For the conversations during the interviews, you may choose to respond or decline response to any of the questions.
- With your permission, your interview will appear on a Web site that is secured for only people who have the exact URL to see.

3. CONFIDENTIALITY:

To guarantee confidentiality, the researcher will invite you to choose a name to use in any write up produced from this study. You may choose your name, a nickname, or another name.

4. BENEFITS:

The benefits for participating in this project are to gather a plethora of knowledge youth of today may use throughout their lives.

5. RISKS:

There are no foreseeable risks than otherwise encountered in everyday life through participation in the research.

(continued)

Table 16.1 (continued)

6. CONSENT: I have read the above information about the research project that is being conducted through Flagstaff High School and have been given an opportunity to ask questions. Please check the following that apply to your ability/interest in participating in this study. ___I agree to participate. Please use this name in any written report or public presentations: ____________________________________ ___I agree to be audio-recorded ___I agree to be video-recorded ___I agree to have this information posted on an Internet site where only people with the exact URL may see it. ____ Date _________________ **Signature of Participant (Parent/guardian if the participant is under 18 YO)** _________________________________ **Printed Name of Participant** If you have any questions, please contact ___________________________________ at the following phone number or e-mail address:

be interviewed, tape-recorded, video-recorded and have their interviews posted on the Google Site, and (d) be able to contact the student or the teacher with any follow-up questions or concerns. Kathi and Christine underscored the importance of respecting all of the choices that the research participants made.

The *Technology Operations and Concepts* were addressed through the interactions within the Google Sites platform, building off of students' use of computers and technology for communicating with each other. By exposing them to an interface that was not already something the high school students were familiar with, we encouraged them to troubleshoot collaboratively with each other and with the librarian as needed. The students drew upon their knowledge of other computer interfaces, especially Facebook, so some of that knowledge was transferrable, but they shared how much of the Google Sites functions were new.

Conclusions

For the conclusions, the educators consider design, delivery, and assessment of the project from the original questions posed at the beginning of this chapter.

Design: How can a high school–university partnership using new media technology situate an OHP assignment in a technology-rich realm to maximize student engagement?

Maximize Student Engagement: The OHP coupled with the new media technology enabled the educators to maximize engagement through (a) the online medium and (b) community engagement. Student engagement was maximized throughout the Google Site interface because they were motivated to participate in on-line environments. Some were challenged to learn a new interface, Google Site, which may have impeded participation, but most were able to locate resources that assisted them to participate. The community engagement component of the OHP, going out into the community to conduct interviews, underscored the importance of primary sources and highlighted that whereas texts and the Internet provide an abundance of information, people in our community hold an incredible depth and breadth of knowledge worthy of further exploration.

Delivery: How can a high school–university partnership using new media technologies create and foster a social support environment between high school students and preservice teachers?

Foster a social support environment between high school students and preservice teachers: A social support environment was fostered through considering (a) how the participants would interact through an online medium, (b) who was involved, high school and university students, and (c) the goals of the project, conducting an OHP. The Google Site interface encouraged preservice teachers to envision innovative and meaningful ways to engage their future students. Some students were rendered visible while others became invisible depending on initiative and know-how. Creating a space for similarly aged participants motivated participation. The students included pages that first had all participants introduce themselves through picture, video, and text. And then we created pages for the participants to engage the content of a text they were all reading. Finally, the students created pages in which the participants could share what they had completed for the OHP. Being able to see what other participants engaged fostered a social support environment in which viewers learned from and with one another.

Assessment: How can a high school–university partnership using new media technology digitally track and assess student progress?

Track and assess student progress: The Google Site enabled the educators to track and assess student progress through (a) noting completion of tasks and (b) assessing how the students were engaging each assignment. The Google Site interface encouraged creativity through text as well as images and video. Participants were able to express themselves individually and collectively through multiple mediums as well as learn from and with each other through seeing each other's products.

Application Activities

Peer-to-peer learning occurred at both the high school and university, as students and preservice teachers worked cooperatively in groups and listened to, affirmed, and learned from each other's interview processes. The following application activities made our OHP possible and serve to inform future OHP projects in technology-rich realms:

Idea 1

Design: Assemble Collaborative Teams

Application: Identify and assemble a team of supporters of innovative curriculum in your schools and communities. Identify people that are "risk-takers" and consider the scope and scale of risk they are willing to take. As you collaborate, you will probably need to scale back initial ideas to match the levels that your community will support, but finding a core team of supporters and partners is key. As you look for this team, consider the role of sociocultural learning and areas of expertise. What can individuals bring to the team to strengthen mentor and mentee roles? Consider specifically the skills, motivation, and interest of the students.

Activities:

Establish school–university partnership: The foundation of this project, a partnership, allowed high school students to engage in an innovative curriculum unit. This partnership additionally enabled preservice teachers' authentic opportunities to collaborate on a project as well as work with high school student (Zeichner, 2007). Establish the partnership prior to the actual project to identify how to support one another in meaningful, significant, and relevant ways.

Choose appropriate interface: As noted above, the educators chose Google Sites because they (a) understood K-12 school district liability issues and needed to be able to control public viewing and (b) wanted to have the ability to upload text, photos, audio, and video. Depending on context and from this experience of the students reluctantly engaging, some interfaces, like Facebook, could be literally and figuratively more accessible to youth.

Idea 2

Delivery: Identify Ways to Expand Knowledge Bases

Application: Identify activities and technologies based on learning goals that slightly exceed the comfort and levels of expertise of your participants. Recognize that participants all come in with different expectations and expertise in multiple areas. As you design activities, build from and in ways in which participants can both share their own areas of expertise and learn from working with others. Include varied opportunities for social interaction and trust building through communication. Recognize that teachers and students can benefit from authentic collaboration in which they learn from and with one other.

(continued)

Idea 2 (continued)

Activities:

Incorporate sociocultural learning: Building off the theory that social interaction is imperative in all culturally significant learning (Brown & Duguid, 2000; Lave & Wenger, 1991; Vygotsky, 1978), this OHP project centered around students interacting with each other through digital means, and drawing upon interpersonal skills as vehicles for learning (Ladson-Billings, 2009). Sociocultural learning was especially apparent in the influence and use of each other's islands of expertise (Crowley & Jacobs, 2002) through group interaction.

Be prepared to provide intervention: As noted above, the students were able to draw from their own funds of knowledge as well as the funds of knowledge from their peers. In addition, however, the librarian specifically noted a need to intervene in several instances. Support from instructors, as well as technology assistance, were important to the project's success.

Idea 3

Assessment: Set, Evaluate, and Reset Goals and Expectations

Application: Set realistic goals and expectations from the start. Reevaluate these goals and expectations continuously throughout the project in order to increase feasibility of progress. Understand that despite your best planning, there will be participants who cannot, for a number of reasons, participate as fully as others. Design alternate activities, or ways for all participants to contribute on teams. Determine ways that group members may evaluate self and each other to enable you to understand how to best support individual members and collective groups.

Activities:

Assess technology competencies: The educators initially assessed digital native vs. digital immigrant status (Prensky, 2001) with regard to technology competencies before making assumptions. When the educators realized how few high school students understood the Google Sites interface, they made sure the librarian and other technology experts at the high school could provide assistance with the project.

Provide community as well as in-class interviews: The OHP was completed easily by most. For some students who had problems to access community members, however, the educators needed to be ready to have community members come to the classroom. Understanding students' needs before, during, and after the project could best support their successful engagement and completion of a given project.

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Chapter 17
Mobile Learning and Mobile Social Interaction

Chih-Hsiung Tu and Laura E. Sujo-Montes

Key Questions

1. What is mobile learning? How is it different from other learning?
2. How does one design effective mobile learning? What are the guidelines?
3. What are the issues in mobile learning?

Mobile Learning

Mobile learning environments are human networks that afford learners the opportunity to participate in creative endeavors, social networking, organize and reorganize social contents, learner-created cognitive spaces (Cornelius & Marston, 2009), and manage social acts at anytime and anywhere through mobile technologies. Social acts that elicit identities, develop awareness (Kekwaletswe, 2007), cement relationships, ensure connections, and promote interactions between and among learners are necessary for interactive learning.

Mobile devices for schools are often seen as distractions from classroom learning. Rather than seeing students' mobile devices as a distraction, perhaps teachers can transform mobile devices into learning devices and learning tools. Why not creatively integrate them to support teaching and learning? Since we may not have resources to provide each student with a computer. Even if we could, computers are not personalized enough, and are not context specific enough, and are not easily mobilized to enhance learning in disruptive and innovative ways, when compared to mobile tech-

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R. Papa (ed.), *Media Rich Instruction: Connecting Curriculum To All Learners*,
DOI 10.1007/978-3-319-00152-4_17,

nology. Many students have their own mobile devices already, and mobile devices cost even less for schools. It is likely that all students could have access to these devices.

Social interaction with mobile technology is very different from Computer Mediated Communication (CMC) or Web 2.0 networking technologies. Researchers (Koole, McQuilkin, & Ally, 2010) are aware of mobile technology and that through human interaction on mobile technology both the user and the technology are shaping each other. Mobile technology connects learners virtually at anytime and anywhere. Mobile learners utilize mobile technology in fairly non-traditional ways to interact with each other (Kukulska-Hulme & Traxler, 2007) and with learning resources, such as location-based technology and Augmented Reality (AR) etc. Research has shown that mobile technology has impacted human social relationships (Jones & Issroff, 2007) and interaction both positively and negatively (Rau, Gao, & Wu, 2008). Mobile learning is more than just integrating mobile devices and mobile technologies. Mobile learning as an instruction tool should be integrated from four dimensions: Technology mobile, Learners mobile, Teachers mobile, and Instructions mobile.

Mobile social interaction should not just integrate mobile technologies to replicate digital social interaction on computers. Effective mobile interaction is more than a replication of desktop and laptop computing. It should be integrated in ways that exploit its capabilities. For example, it would not be productive to have students complete a written paper on their mobile devices. The integration of mobile learning should proceed from the unique features provided by mobile devices, technology and mobile apps, such as social sharing and collaborating, audio and video recording, and location-based technology. These features are not generally found on computers. Additionally, since mobile devices are universally transportable, students can access these devices and apps anytime and anywhere.

Effective mobile interaction focuses on social-context awareness by integrating location-based technology, which is unique to mobile technology and not easily found in other types of commuting. With the features of location-based technology or Global Position System (GPS), mobile learners are able to obtain and to enrich their learning context. For example, with these technologies, learners can access online information specifically related to their current location with mobile devices; learners can access their social network friends who are nearby to collaborate their learning tasks; or learners can record the data, such as photos, audio, video, environmental data etc., with an embedded geo-location data layer as their learning content and resources. Effective mobile learning design is able to fulfill learning in a more ubiquitous manner, with richer social awareness that is more personalized, and possesses more meaningful contexts.

Interaction and Mobile Learning

The concept of interaction is fundamental to the effectiveness of mobile learning. Interaction can be separated into four different categories Learner–Instructor, Learner–Content, Learner–Learner (Moore, 1989), and Learn–Interface (Hillman, Willis, & Gunawardena, 1994). Wheeler (2013) examined the interaction from intrapersonal interaction, peripersonal interaction, extrapersonal interaction, to interpersonal interaction by emphasizing learner–interface interaction (peripersonal) in mobile learning environment since it is grounded in human computer interaction and cognitive science. Mobile learning and mobile interaction should be substantiated in personalized learning and the concept of personal learning environments (PLEs) (see Fig. 17.1).

Learning interaction is initiated within mobile learners with self-dialogues (intrapersonal interaction). Utilizing mobile technology as a tool to build networks, mobile learners interact with mobile interface to engage in peripersonal interaction. Different mobile peripersonal interaction enables mobile learners to engage in extrapersonal interaction in social environments with different social networks (community, friends, professional, and community). Effective mobile extrapersonal interaction in social network environment allows mobile learners to reach interpersonal interaction thus supporting their social and cognitive learning. At the end of the cycle, interpersonal interactions encompass and loop back to intrapersonal interaction to reach what Vygotsky called "internalization." Wheeler (2013) argued the power of thinking (intrapersonal) is augmented across the social network simulating dialogues (interpersonal) while mobile learners interact with their mobile

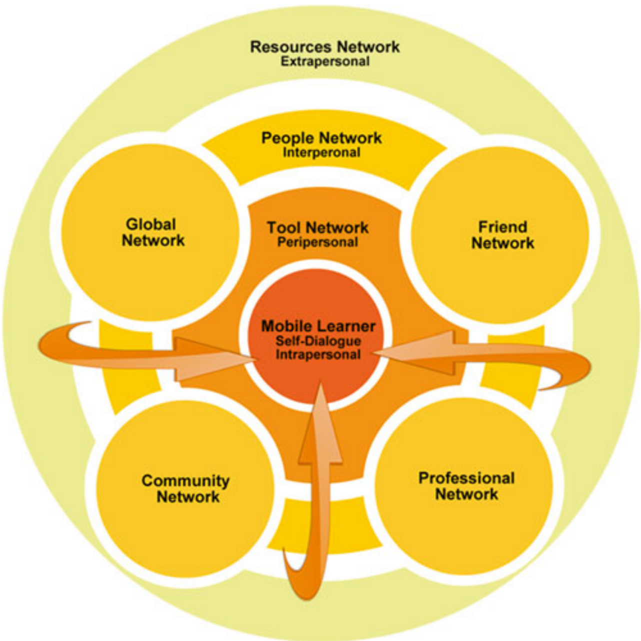

Fig. 17.1 Interaction and mobile learning

technologies and devices (peripersonal) environments (extrapersonal). More specifically, these interactions blend, entwine, and encompass one another simultaneously and uninterruptedly.

Mobile Social Interaction

Mobile social interaction differs from online social interaction and network social interaction from the aspects of control, context-awareness, multilayers, and location-free digital interactions (Tu, McIsaac, Sujo-Montes, & Armfield, 2012). Mobile social interaction is defined as the degree of enriching social context-awareness, managing location-based communications, personalizing multilayered interactivities, and optimizing digital and social identities to other intellectual beings through mobile technologies. Online social interaction is the degree of feeling, perception, and reaction of being connected by computer-mediated communication (CMC) to another intellectual entity through electronic media (Tu & McIsaac, 2002) and is explained from four dimensions, social context, online community, interactivity, and privacy. Network social interaction (Tu, Yen, Blocher, & Chan, 2012) is defined as the degree that network participants engage in creating, maintaining, sharing, connecting social contents, digital and social identities, network linkages, and collaborative communities.

Mobile technology affords wider and more diversified social interactions and empowers learners to take detailed control of their mobile social interactions. Learners are connected constantly and allowed to decide how, when and in what way they prefer to interact with others; therefore, mobile technology has a greater potential to empower learners to generate higher level of social interaction compared to online or network social interaction. Online social interactions and network social interactions are, in fact, more difficult to project when compared to mobile social interactions. Learners can interact with others using mobile technology to generate mobile social interactions in museums, fields, parks, outdoors, and anywhere away from their desktop or laptop computers. Additionally, mobile social interactions generate a richer type of context interactions and communications. Like online and network social interaction, mobile social interaction does not occur without strategic planning and designs. Simply providing learners with mobile devices does not result in an ideal level of mobile social interaction. In fact, inadequate integration of mobile technologies for learning may result in negative interactions and generate weak mobile social interactions.

How are mobile social interactions related to physical social interactions? Physical social interaction has always been considered paramount; therefore, in the past, educators replicated physical social interactions by enhancing virtual social interactions such as online and network social interactions. Physical and virtual social interactions become separately distinguished entities. In other words, virtual social interactions are always the second best to physical ones. With mobile technology's distinguished features, mobile social interaction might be a true entity to espouse and to fuse physical and virtual social interactions or even encompass both. Mobile social interaction truly advances and extends human's physical interaction because multiple context-awareness, location-based communication, multilayered interactivity, and dynamic digital social identities cannot be achieved by physical social interaction (Tu, McIsaac, et al., 2012). It should be noted that mobile social interaction is not necessarily higher, better, or more interactive than physical, online, or network social interactions; however, it holds great capacities and capabilities to empower mobile learners.

Early in the integration of mobile technologies, it was not uncommon for educators to use mobile technologies to replicate physical, online, or network social interactions to enrich mobile social interactions. Truly advancing human capabilities for interactive learning requires that educators go beyond mobile technologies rather than focusing on innovative and evolutional instructional strategies. Effective mobile learning does not come by default when using mobile technology.

Effective personal control and management is essential to prevent the production of negative results. It is not just the matter of which mobile technologies we have; it is about how we use and how we integrate them innovatively. We should design space and environment around learning rather than just instructions. Ideal innovation goes beyond more convenience, easier to use, faster in speed, or access more information. Innovative mobile interaction does not exclude how learners have been interacting with others. In fact, it is the innovative mobile social interaction that derives from and aggregates multiple dimensions and layers of social interactions to empower human learning. In other words, mobile interaction can be scaled from FTF communication, to email, to creating learning resources, and to multidimensional and layered communication. Effective and innovative mobile social interaction should focus on more immersive and authentic learning environments that afford interactions in simulations, e.g., visualization, haptic, augmented reality, and virtual worlds; therefore, mobile learning would be more engaging and motivating.

A Model for Mobile Social Interaction

A Model for building mobile social interaction (Tu, McIsaac et al., 2012) is proposed to assist educators to design effective mobile learning strategies to enhance mobile social interaction of learners and instructors. The model consists of four dimensions: enriching social context-awareness; managing location-based communication; personalizing multilayered interactivity; and optimizing digital and social identities.

Enriching Social Context-Awareness

Building Context-Rich Social Relationships

Mobile social interaction is no longer limited to a location where the computers or laptop computers are located. Constant monitoring of social interaction on mobile devices will increase the levels of awareness and connectedness in social relationships. Mobile learners can decide when, where, and how to interact with others to build context-rich social relationships. Therefore, the communication is more relevant, or context-specific. The mobile communicators can select a wider range of communication types, from e-mail, real-time chat, conferencing systems, to mobile phone calls and SMS. The communication formats are not limited to CMC anymore. The mobile communicators can apply a variety of formats, such as “Like,” “tweet,” updating their status, updating their digital profile, sharing any content to build context-rich social relationships from one-to-one, one-to-many, to many-to-many interactions. Formats of social interaction can range from as short as one word “Like” to video conferencing. The immediacy can range from instantaneous to asynchronous interaction. A competent mobile communicator should be able to maneuver different mobile devices, mobile communication tools, and mobile interaction formats to build and to enrich social interaction rather than using mobile devices simply for phone calls or to replicate CMC interactions.

Linking Instantaneous Social Connectedness

Using mobile devices for communication doesn’t mean that mobile learners should interact constantly. Mobile learners could use mobile devices to “stay on the alert” and “to monitor communication interaction” to increase social connectedness and social awareness, although it is not considered to be as high a level of mobile social interaction. However, it empowers mobile learners with flexibility to control their mobile communications rather than being obligated to communicate. Better social connection and social awareness in communication unfolds the perception behind “stay on the alert.” It enriches social context when ready to interact, they can have interactions with others via mobile devices. Mobile learners are empowered to manage and to control their interactivity based on their circumstance. Unlike CMC, learners may feel obligated to interact because they have made an extra effort to access desktop or laptop computers and, therefore, feel obligated to interact. Otherwise, they may not have a chance to do so.

Engaging in Mobile Etiquette

Using mobile communication etiquette is critical. Mobile etiquette is more than just virtual and digital communication etiquette since mobile technologies fuse FTF and digital communications. Both physical and visual social relationships are impacted rather than just visual interaction. Mobile social relationships could be engaging when correct expectations and effective control are exercised in mobile communication. When these devices are not utilized appropriately negative impacts and withdrawing effects could be created. For example, using mobile technology at FTF meetings could create the feeling by others that the mobile device user is withdrawing because people check and use their mobile technologies frequently during the meetings. This is called "cellular phone prayers" (Tu, McIsaac et al., 2012) because the users constantly look down and work on their mobile devices, creating a feeling of disrespect to other meeting attendees.

Managing Location-Based Communication

Establishing Appropriate Mobile Communication Expectations

Managing mobile communication is based on more than personal preferences. It is critical to communicate and to understand others' communication preferences and expectations. Mobile communicators may use the same mobile communication tools and formats; however, because they have different perceptions for what purposes these communication tools should be used. Knowing the expectations of other mobile users' communication perceptions and preferences is critical.

Dimensionalizing Location-Based Communication

Location-based technology or geo-location technology enables the enrichment of social interaction (Fitzgerald, 2012) by adding the physical location information to existing personal preferences, digital identities, digital networks, digital collaborations, and interactions. In other words, mobile social interaction no longer exists in a single dimension. Integrating location-based technology into existing mobile social interaction could lead to innovative location-based learning. For example, in a museum, mobile learners are able to access information about exhibitions and artwork with visual and social information from the museum visitors information sources to enhance social navigation and learning at the museum (Charitonos, Blake, Scanlon, & Jones, 2012).

Employing Wider and More Diversified Ranges of Social Interactions

Types of interactivity for mobile and network social interactions are more diverse than online social interaction. Mobile communications can apply diversified tools to communicate, such as multimedia channels, voice recognition features, and social networking interaction to communicate and to interact with others.

Personalizing Multilayers Interactivity

Creating and Sharing Social Content

Creating and sharing content on mobile devices in addition to text-based communication can enhance mobile social interaction. In fact, with audio, and video recording features on mobile devices, mobile users can create and share their multimedia content more efficiently than with computers. Once multimedia content has been created, they can be shared by posting to e-mail, SMS, blogs, Facebook, and Twitter. Mobile learners can apply multimedia-editing applications to touch and edit photos, audios, and videos. Additionally, the created and shared content can be tagged as an additional layer of information and activity to the communication.

Collaborating Ubiquitous Social Interaction

Creating mobile content can be advanced to the mobile collaboration level to reach ubiquitous interaction. Multiple layers of interactivity can be implemented from either a personal level or a collaborative level. For example, collaborators can utilize musical production applications, such as Garage Band, or presentation applications, such as Google Docs, or Prezi, to create presentation content collaboratively for the class presentation.

Bridging Spatial, Temporal, and Locale Interaction (Augmented Reality)

Augmented reality (AR) is a live, direct or indirect, view of a physical, real-world environment whose elements are augmented by computer-generated sensory input to recognize the mobile users' surroundings and to input such elements as sound, video, graphics, or global positioning system (GPS) data. This feature generally is not found in other computing equipment. When they are, they may not be portable enough to be used in the field. Mobile users will rely on cameras or device sensors as communication tools when AR capabilities are combined with different layers of information, content, and resources for any communication and learning purpose (De Lucia, Francese, Passero, & Tortora, 2012). Many mobile applications have an embedded AR feature while some applications specifically focus on AR features. For example, at a historical site, mobile learners can use mobile devices to aim at certain locations or structures to obtain multiple layers of information about the locations or structures, such as audio and video guides, historical photos showing the progression or evolution of the sites, locations, or structures (Griggs, 2011). Additionally, a rich AR interaction may even include a social layer of interaction, such as other mobile learners' shared contents, resources, thoughts, and reflections. Wikitude app and many museum AR applications are good examples of AR integration.

Optimizing Digital and Social Identities

Illustrated Digital Identities

Mobile learners should be encouraged to create, and update their profiles to maintain and manage their digital mobile identities (Ducate & Lomicka, 2008). Digital and social identities are the foundations of social relationships. Mobile learners should create and update their digital profiles with personal information, pictures, friend networks, etc. since digital personal information become digital identities.

Project Ideal Mobile Social Identities

Mobile learners communicate, create, and share their mobile communication and mobile content. These digital footprints become part of their digital social identities and are data that Goffman (1959) would call "self-presentation," projecting ideal self-images. Some mobile learners assume a more active approach by regulating and controlling information in mobile social interaction, such as posting and updating their current status on Facebook, Twitter, replying to the status of others, or blogging about their thoughts, etc. These social interactions become digital mobile footprints and are perceived as digital social identities.

Secure Self-Awareness Mobile Privacy

Mobile privacy does not come automatically unless learners actively manage it for their digital social identities and digital cognition footprints. Mobile learners likely enjoy the convenient and ubiquitous mobile interaction to create mobile digital and social identities. In fact, they also expressed their digital identities were more social because they have a stronger sense of social awareness and connectedness. All mobile contents and communications are transmitted wirelessly. Mobile privacy requires that learners have an accurate understanding of how wireless technology works.

Mobile Apps Selecting Guidelines

Mobile Linkage refers to using "mobile apps" to link to Web 2.0 tools on mobile devices. Mobile Linkage involves more than using an Internet browser to access online information. Specifically, by employing mobile apps, Mobile Linkage focuses on controlling social context-awareness, managing location-based communication, personalized multilayered interactivity, and optimized digital and social identities.

Mobile information and communication technologies are important enablers of the new social structure. The instructions built within Web 2.0 tools, such as iTunes U, Twitter, Delicious, Facebook, RSS, blogs, Google Apps etc. can be accessed by mobile apps on mobile devices. Mobile learning is able to achieve something that traditional desktop or laptop computers cannot achieve. Mobile Linkage becomes more powerful when mobile devices are equipped with recording, camera, and global positioning system (GPS) technologies.

Mobile apps' general features and designs allow mobile users to access the tools or Websites without using a browser. Generally, users can utilize mobile apps to perform whatever features or designs the tools or websites offer. More specific functions for each mobile app may vary, such as log in requirement, free or paid app functions. Tu (2014) suggests strategies to select mobile apps; to organize mobile apps; to share and to collaborate mobile apps; and to link tools.

To Evaluate Mobile Apps

Schrock (2013) advocates applying Bloom's Revised Taxonomy (Anderson, & Krathwohl, 2001) to evaluate mobile apps to assist educators in evaluating mobile apps for their instructions. From the lower to higher order thinking skills (Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating), educators can evaluate different apps based on their instructional goals. Some mobile apps are more complicated than others. Each individual mobile app may be capable of providing multiple levels of Bloom's Revised Taxonomy. With better understanding that potentials of lower/higher order skills that each mobile app may afford would assist educators in integrating more effective mobile instructions aligned with Bloom's Revised Taxonomy. Bloom's Revised Taxonomy can also be applied to guide educators to create their own mobile apps, if needed. Schrock (2013) utilizes the action verbs for each level to assist educators to evaluate mobile apps.

- Remembering: recognizing, listing, describing, identifying, retrieving, naming, locating, finding
- Understanding: interpreting, summarizing, inferring, paraphrasing, classifying, comparing, explaining, exemplifying
- Applying: implementing, carrying out, using, executing
- Analyzing: comparing, organizing, deconstructing, attributing, outlining, finding, structuring, integrating
- Evaluating: checking, hypothesizing, critiquing, experimenting, judging, testing, detecting, monitoring
- Creating: designing, constructing, planning, producing, inventing, devising, making

To Select Mobile Apps

There are many mobile apps available for different mobile operating systems (OS). Selecting the right apps to support your teaching is critical. Many apps are free, while others range from less than a dollar to relatively expensive. Here are a few guidelines to assist you in selecting apps for your teaching and learning.

For any given function, you may find multiple available apps. For example, there are many apps available for Twitter, Facebook, RSS, and To Do List. Try out some different apps to see which best meets your needs. This is especially recommended if the apps are free. You always can delete any unwanted items and add preferred apps.

Use “Review” information to assist you in selecting the correct app. All app stores have “Review” information. Generally, they are arranged in five-star review scales. Be sure to read other users’ review notes. This is particularly important when the apps are not free, although many apps are inexpensive.

Use “Top Charts” to help you screen for selection of the best apps: Generally, app stores list Top paid apps or Top free apps.

Additional features: Generally apps have the basic functions you need. Do not overlook the additional features in the apps, such as embedded location-based technology and social networking features for advanced collaboration.

Augmented Reality (AR): is a live, direct or indirect, view of a physical, real-world environment whose elements are augmented by computer-generated sensory input such as sound, video, graphics or GPS data. This is a feature you do not generally find in other computing equipment. Even when you do, they may not be portable enough to be used in the field. Many apps have an embedded AR feature, while some apps specifically focus on AR features.

Network with people informed about mobile apps to keep up with the best new apps.

Allow students to select their own mobile apps as long as their selected apps can be linked to the planned one and can accomplish the same required tasks. Generally, this can be determined through sharing their app activities via social network sites. By allowing students to select their favorite apps you provide them with another effective learning activity.

To Organize Mobile Apps

Since apps can be easily downloaded and many of them are free, they tend to accumulate. Therefore, strategically organizing your apps is necessary. Most mobile OS operation systems feature multiple pages and folders. You can organize your apps through the following methods:

- Page organization: Create different pages for apps with similar uses or functions.
- Folder organization: If you prefer less page navigation, apply a folder organization feature and organize apps with similar functions or uses into a folder, named with a title that is meaningful to you.

To Share and Collaborate with Mobile Apps

There two types of sharing and collaborating with mobile apps. Within apps, users can share and collaborate on learning activities, and they can also share their apps and collaborate about them.

Share and collaborate within apps: Many apps have embedded social networking features that allow you to share and collaborate your app activities with your friend networks. For example, within photo apps, you can share the photos on your mobile devices with your network friends by e-mailing them; or you can share the photos with other Web 2.0 tools, such as Facebook, Twitter, and Flickr. The sharing feature can be advanced to collaborative learning by encouraging student groups to share the data or information they gather on their mobile devices. Since many apps have embedded location-based technology, the collaborative data contains other layers of information. Some apps integrate location-based technology to deliver AR functions. Public Broadcasting Service's (PBS) AR mobile app, FETCH! Lunch Rush; overlay computer-generated graphics on top of the physical, real-world environment. It is a 3-D game, which helps children visualize the math problems they are trying to solve. The purpose of this AR mobile app is to use media to nurture children's natural curiosity and inspire them to explore the world around them. See: http://pbskids.org/mobile/fetch-lunch-rush.html

Sharing apps: There are many apps in app stores, and sharing our favorite apps with our network friends is a critical way to learn about the availability of new apps. On your iOS (Internetwork Operation System) device, you can share an app from the App Store directly with your network by finding and clicking on the application you want. Then select "Tell a Friend," which allows you to e-mail your friend with a link to the application. On an Android device, open the Android Market and select the app you would like to share, click "Share this Application" and either e-mail, text, or Facebook message. If you have multiple apps you would like to share, consider using "Applist.me" which allows you share a list of iOS apps with your network friends. It is a free application that you can download to both Mac and Windows computers.

To Link Tools

Effective mobile learning should use mobile apps that link to different mobile devices and tools. Rarely do mobile apps function alone. If you do use them alone, consider looking for the ability to link it to different devices or tools to make it more effective.

Same apps are available on multiple devices or mobile OS: If you use certain apps on certain mobile devices that you use, look for the same apps on your other mobile devices, or on a mobile OS. Most apps are available for different mobile devices and different mobile OS. On Mac computers, there is an App Store that regular computers can download. With the same apps on different devices and computers, you can access the same apps on most of your devices and computers.

Linking apps to another tool: When using certain apps, examine whether the apps have a sharing feature. If yes, you can share the app data with your network friends via E-Mail, Facebook, Twitter, or other popular social network sites. Apps data and information can also be shared and posted to other Web 2.0 tools. For example, you can post the app data to Facebook, Twitter, Flickr, or Delicious.

Linking to Location-based technology: Examine whether the apps have embedded location-based technology which could have the potential to apply AR to enhance learning in the more meaningful real-time, context-specific, location-specific methods. When opening an app, the app may ask whether you “Would like to use your current location.” If so, you know your app has embedded location-based technology. For AR apps, search the term “Augmented Reality” in any app store.

Safety

Mobile learning safety is very critical to younger learners. While planning effective mobile learning to promote higher mobile social interaction, educators should always consider mobile learning safety first. It is important to investigate school or school district’s policies for technologies, and mobile devices for learning. Dabbs (2012) suggested five building blocks to ensure the educators have appropriate mobile learning integration for teaching, learning, and connecting with students and parents: Notify parents; Develop a Responsible Use Policy; Establish Classroom Management Procedures; Plan activities with students: and Teach safety and etiquette.

Notifying the parents and involving parents are critical and effective. Mobile learning should involve both students and parents to create a ubiquitous learning community. This should include mobile learning ideas, design, and engagements, and how students and parents will use their mobile devices. Develop a responsible use policy process that engages both students and parents and solicit their inputs; therefore, the use policy would be more context specific and more relevant to each individual students and satisfying to their parents. Additionally, the policy should coordinate with the school’s or the school district’s policies, if any. Establishing classroom management procedures would ensure that the integration is smooth and safe. Since mobile devices are small, lightweight, and require different skills, it is necessary for educators to plan the management procedure before any mobile instructions start. It is highly encouraged that teachers invite both students and parents in planning the management procedures.

Planning instructional activities with students is another effective way to engage students in interactive mobile interaction. Students generally are excited about using mobile devices for learning purposes. Students frequently have creative ideas about using mobile devices. In fact, it could be effective to have one group of students to create mobile learning instructions for other student groups to learn with their teachers’ supervision.

Teaching mobile learning safety and etiquette should not be omitted. Knowing and practicing suitable mobile learning safety and etiquette is an essential learning skill.

It is more than just how to engage in and developing safe and appropriate mobile uses. Students should have knowledge and correct attitudes in handling when others are not exhibiting appropriate behaviors in mobile learning.

Future Research Directions

The future research directions should distinguish mobile social interaction from online and network social interactions. The research in mobile social interaction should focus on the aspects of personalized control, and location-free digital interaction and avoid replicating online and network social interactions to evaluate and to examine mobile social interaction. A model for mobile social interaction is suggested in this chapter. The future research could apply this model to establish a construct, a framework, or a theoretical framework for mobile social interaction rather than borrowing online or network social interaction to examine it.

Conclusions

Schools often see mobile devices as distractions from classroom learning. If you are unable to eliminate mobile devices from the classroom, then why not creatively integrate them to support teaching and learning? Many students have their own mobile devices already; and mobile devices cost even less for the schools. Therefore, it is likely that all students have access to these devices. Additionally, it is not necessary that all students have devices; a single device can be used by a group. Mobile learning does not just replicate traditional learning and should be used in ways that exploit their capabilities. It would not be effective to ask students to complete a written paper on their mobile devices. In such case, the emerging technology may well become inferior when comparing it to the traditional ones. Tu, McIsaac et al. (2012) argued that doing tasks faster, easier, or more conveniently is an "improvement" for learning. As educators face mobile technology as an emerging technology, we should aim toward "Innovative" and "Revolutionary" mobile learning integrations. We should dwell on what humans could do with mobile technology and what humans could not do without mobile technology.

Application Activities

Idea 1

Apply Bloom's Revised Taxonomy to evaluate six mobile apps for each taxonomy category. Design one instructional activity for each mobile app.

Idea 2

Discuss how mobile learning can be integrated to support PLE. Compare and contrast mobile PLE to online/network PLE.

Idea 3

Discuss what similarities and differences among physical social interaction, online social interaction, network interaction, and mobile social interaction. Discuss how they relate to one another. Draw a figure to represent the relationships.

Idea 4

Design a mobile app for an instruction, course, or organization. Use the Model of Mobile Social Interaction to guide your design. Additionally, please justify your design concept. You do not need to develop the mobile app. If necessary, apply any images or drawing to present your mobile app design.

Idea 5

Create a mobile learning activity that is able to: infuse virtual and physical environments to enhance learning and take advantage of the mobility aspect of the technology; and engage learners in social sharing and collaboration through mobile devices.

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Chapter 18
MOOCs

Chih-Hsiung Tu and Laura E. Sujo-Montes

Key Questions

1. How may MOOCs impact current education and learning?
2. What are the issues and trends surrounding MOOCs?
3. How to plan and design effective MOOCs?

MOOCs

MOOC stands for Massive Open Online Course, which has received a great deal of attention from higher educational institutions. This attention has been particularly popularized by mass media with comments from innovative, disruptive, Educational Evolution, Come the Revolution (Friedman, 2012), the campus tsunami (Brooks, 2012), Faducation (Barlow, 2013), False promise (Carlson & Blumenstyk, 2012), to hype, shallow, McDonaldization of global higher education (Lane & Kinser, 2012), etc. Hill (2012) indicated MOOC as a successor to online education receives controversial conversations on current higher education. While online education is still criticized with quality, MOOC is extolled publicly on the value and quality potential of online education by elite institutions with millions of dollars in investments (Hill, 2012). Furthermore, MOOC is frequently open for all to enroll with no cost. It is called free courses, free education, etc. Coursera, an MOOC platform offered by

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DOI 10.1007/978-3-319-00152-4_18,

Stanford University, now has more than 1.3 million students enrolling in more than 200 courses from 32 universities. Additionally, it starts granting verified certificates for students who complete the course requirements with a fee between 30 and 100 dollars (Midha, 2013).

The tensions, debates, arguments, and controversies about MOOC frequently originated from what is truly an "open" course. Therefore, educators ask what is open? It seems to be an increasingly difficult and limiting distinction between online and offline learning networks (Tschofen & Mackness, 2012).

Types of MOOCs

People have different ideas about what MOOC means (Stevens, 2012). Additionally, educators have different concepts and beliefs on teaching and learning; therefore, how MOOC should be delivered and taught could be very different. Currently, there are two main different types of MOOCs: xMOOCs and cMOOCs (Connectivist MOOCs). Despite their common name, they pertain to very different aims and methods (Hill, 2012).

Regardless the type of MOOC, MOOCs generally have three "essential" features: (1) the MOOC is "open" in that participants do not need to be formally enrolled in a school to "take" the MOOC and are not required to pay a fee to participate, (2) the course is designed to support a "massive" number of students, and (3) the course is online in that students can access pre-developed course materials, online assessments, discussion group tools, and materials developed during the course via the Internet (Bashears, 2013).

xMOOCs

xMOOCs are the ones with huge enrollments, commercial prospects, prestigious university professors, automated testing, and exposure in the popular press. The course content and instructions frequently are hosted on different platforms, such as EdX, Coursea, Udacity, Udemy, MOOC2Degree, from online learning, such as BlackBoard Learn, Moodle. Community is difficult but may be highly significant to the participants, or one can go it alone. Content acquisition is more important in these classes than either networking or task completion, and they tend to use instructivist pedagogy that focus on online lectures on multimedia formats. Traditional assessment, both formative and summative, may be emphasized. Mass participation seems to imply mass processing. Frequently, they are called content-based MOOCs (Lane, 2012), or Mechanical MOOCs (Lewin, 2012). For example, xMOOCs offered by MIT and Harvard (EdX), are free to anyone with Internet access, feature interactive technology, open admissions, and provide the ability to teach tens of thousands of students at once. The instructions are designed with advanced online technology, including online multimedia lectures, online interactive learning, automated assessment, and a credential of mastery for individuals successfully completing the courses. xMOOCs focus in promoting two areas: do-it-yourself labs and peer-to-peer exchanges (Oram, 2012). In other words, xMOOCs' instructions focus on one-way teacher–student lecturing, student–student interaction, and student–content interaction via self-organized online study groups. Student–Teacher interaction is very limited due to the large numbers of enrollees.

cMOOCs

cMOOCs, Connectivist MOOCs or Network-based MOOCs (Lane, 2012), are the original MOOCs, taught by Alec Couros, George Siemens, Stephen Downes, and Dave Cormier in 2008. The goal is not so much content and skills acquisition, but conversation, socially constructed knowledge, exposure to the milieu of learning on the open web using distributed means, and practiced, lived, and experienced knowledge (Downes, 2013). The pedagogy and framework of cMOOCs are based in Connectivist or Connectivism learning paradigm. Resources are provided, but exploration is more important than any particular content. The facilitator or the instructors encourages the participants to find their own pathways through the learning materials. cMOOCs strongly emphasize self-regulatory skills; Stevens (2012) argued that MOOC is best suited to a communicative and socially driven endeavor. Additionally, cMOOC participants need to be highly motivated self-starters who are driven to learn about a particular topic. Because of the open learning content, resources, and activities, cMOOCs are frequently described as chaotic learning that may lead to the heart of the learning experience (Siemens, 2011). Due to these natures, traditional assessment is challenging to implement.

Connectivism as a cMOOC Framework

Tschofen and Mackness (2012) argued that Connectivism and its principles are important factors to understand and to test cMOOCs instructions and learning. They indicated that Connectivism attempts to situate learning in the continual expansion and creation of knowledge and posits that information and knowledge growth in this digital age exceed our ability to cope. Siemens (2006) claimed that the quantity and complexity of information available is overwhelming. This is also an example of shifting from a content-centered model towards "socialization as information objects (Siemens, 2009)." This indicates the phenomena of chaos theory. More specifically, Tschofen and Mackness (2012) stated that cMOOCs related Connectivism based on Downes' (2010) four key principles: autonomy, connectedness, diversity, and openness.

Connectivism is based on the principle that all learning starts with a connection (Siemens, 2004). These connections occur on neural, conceptual, and social levels (Siemens, 2008), and in Connectivism, learning is thought to be "the ability to construct and traverse connections" (Downes, 2007). More specifically, learning in Connectivism is a network phenomenon, influenced, aided, and enhanced by socialization, technology, diversity, strength of ties, and context of occurrence. Connectivism values the need to derive and express meaning, and gain and share knowledge. This is promoted through externalization and the recognition and interpretation of patterns, which are shaped by complex networks (both internal neural networks and external social networks) (Siemens, 2004).

Open

One of key principles in cMOOCs is open that refers to open content, free content and knowledge sharing, and open curriculum. Open in the sense it is free and participants are expected to openly share their expertise, knowledge, understanding, and ideas, so that knowledge is not only freely distributed across the connected network, but also created within the connected network. cMOOCs are courses in that they provide a "loosely" structured curriculum around a given theme or topic, but learners are expected to be autonomous and manage their own learning by making their own social and conceptual connections to suit their own needs (Tschofen & Mackness, 2012) though building effective PLEs. cMOOC's instructions are perceived as guidance in a learning environment rather than a mechanical system. With the open design in cMOOCs, the learning activities and experiences could lead to chaotic learning. To cope with chaotic theory, open curriculum might be the response to cMOOC learning. Therefore, Self-organizing learning may be necessary. Reigeluth (2004) contended that systems require three characteristics: openness, self-reference, and freedom for people to make their own decisions about changes.

Task-Based MOOCs

Lane (2012) proposed a third type of MOOC between xMOOCs and cMOOCs based on instructional design. Task-based MOOCs emphasize skills in the sense that they ask the learner to complete certain types of work. The learning is distributed and the formats are varied. There are many options for completing each assignment, but a certain number and varieties of assignments are to be done to perform the skills. Frequently, the courses focus on different topics for each week or module, and skills are demonstrated through sections on design, audio, video, etc. in an effort to expose learners to many different formats and styles in online teaching.

Community is crucial, particularly for examples and assistance, but it is a secondary goal. Pedagogy of task-based MOOCs tends to be a mixture of Constructivism and Connectivism. Traditional assessment is challenging due to large enrollments.

xMOOCs vs. cMOOCs

How do xMOOCs relate to cMOOCs? Besides the common characteristics, as the name suggested, massive, open, online, and courses, there is little both relate them to each other. Particularly, from an aspect of instructional design and learning paradigm, cMOOCs applies Connectivism to frame its instructional paradigm while xMOOCs are not considered as Constructivism nor Connectivism paradigm. For example xMOOCs assign required textbooks, open for free or to purchase, or required readings while cMOOCs may oppose required textbooks and readings (deWaard et al., 2011). In fact, Downes (2012) argued strongly, for xMOOCs to be truly viable they inevitably will have to move in the direction of cMOOCs. He indicated Connectivism model would become the primary model. xMOOCs have to grow to become cMOOCs. xMOOCs will do that over time. Especially disturbing is that none of the major xMOOC providers have hired anyone trained in instructional design, the learning sciences, educational technology, course design, or other educational specialties to help with the design of their courses. They are hiring a lot of programmers (Holton, 2012).

Compare xMOOCs and cMOOCs

Table 18.1

Research in MOOCs

Research and literature addressing xMOOCs is lacking; however, when researchers should start examining cMOOCs from contemporary psychological theories, personality theory, self-determination theory, chaos theory, emergence theory, and complexity theory, to understand cMOOCs learning and learning phenomenon.

Personality Theory and Self-Determination Theory

Tschofen and Mackness (2012) examined cMOOCs from Connectivism paradigm in relation to personality theory and self-determination theory and suggest that together these two concepts offer a lens through which educators can explore dimensions of individual experience in Connectivism. They identified four principles to investigate the meaning of Autonomy, Connectedness, Diversity, and Openness.

Table 18.1 The comparison between xMOOCs and cMOOCs

	xMOOCs	cMOOCs
Institutions	Harvard, MIT, Stanford University, University of Pennsylvania, Princeton University, University of Michigan	Athabasca University, National Education Research Council (Canada), Indiana University, Brigham Young University
Platforms	LMS	Multi-tools platform
Technology	Coursera, edX, Udacity	Still underdeveloped
Cost	Free or low fee	Free or low fee
Subject areas	Various	Learning related areas
Offered by	edX: Instructors, courses Coursera: Institutions	Instructors, courses, institutions
# of students/ courses	Coursera: More than three million students/more than 329 courses	Vary
Content	Formal (traditional) course structure and flow Formal, structured teaching/content provision Learner expected to duplicate/master what they are taught	Content as a starting point, learners expected to create/extend and to share Content is fragmented (not confined to a course) Students are expected to identify additional learning content
Learning framework	Instructivist	Connectivist
Student–teacher relationship	Traditional relationship between teacher–learner (one-way teacher–student lecturing) Minimal student–teacher interaction	Learner control, personalize, management learning environments Student–teacher interaction is not main focus
Readings	Textbooks, open educational resources (online video, tutorials, articles)	Prefer open educational resources (online video, tutorials, articles) Students are expected to look for relevant readings
Instructional design	Instructor-lead instructions Online lectured-based instructions (heavily)	Lectures (not main focus) Distributed, chaotic, emergent Learner expected to create, grow, expand domain and share personal sense making through artifact-creation Knowledge is generative Coherence is learner-formed, instructor guided Distributed multi-spaces interactions Foster autonomous, self-regulated learners
Online discussions	Centralized discussion forum support	Distributed, often blog-based, learner-created forums and spaces Any Web 2.0 or social media discussion tools
Assessments	Complete some level of activity for formative and summative evaluation (quizzes, tests, assignments, papers, create artifacts) How: • Automated evaluations • Peer evaluations	Complete some level of activity for formative and summative evaluation (assignments, papers, create artifacts) How • Instructor/TA graded • Peer evaluations

(continued)

Table 18.1 (continued)

	xMOOCs	cMOOCs
Current research	Learning analytics Achievements Learning satisfaction	Learning analytics Self-regulated learning Personal Learning Environment (PLE) Open educational resources Gamification Personality theory and self-determination theory Chaos theory, emergence, and complexity theory
Award	Certificate of completion Earning credits (still under discussions) Badges None	Certificate of completion Earning credits (still under discussions; not main focus) Badges None
Strengths	• Easy to adept • Familiar formats • Personalized to certain degree	• New learning paradigm • Learners take active role in learning ownership • Interactive • Personalized
Weaknesses	• Traditional learning paradigm with minimal interaction integrated • Lack sound instructional design • Low completion rate • Require high motivation • Require high self-regulated learning skills and knowledge	• Not all learners use to the emergent learning paradigm • Require competent knowledge and skills in online technologies • Time consuming • Could be confusing • Low completion rate • Require high motivation • Require high self-regulated learning skills and knowledge

Autonomy

The concept of learner autonomy is clearly identified in educational literature with the concepts of choice, control and independence (Crome, Farrar, & O'Connor, 2011). The ability and capability to act independently and select levels of choice and control is not an element that has offered an easy path in Connectivist learning, where learners are expected to select among connections and information, and where deliberate attempts are made to reduce external control by minimizing traditional instructional processes and power structures. Downes, (2010) suggested wherever possible, learners should be guided, and able to guide themselves, according to their own needs, goals, purposes, objectives or values. It is recognition that, insofar as a person shares values with other members of a community, and associates with those members, it is a sharing freely undertaken, of their own volition, based on the evidence, reason, and beliefs they find appropriate. The parallels between these descriptions of autonomy suggest that both the network (or community) autonomy (Downes, 2010) and autonomy of the self or individual (Ryan & Deci, 2002) have room for equal focus within Connectivism.

Connectedness

Recent research into personal learning environments, a primary conduit for connectivist learning, has largely discussed connectedness in Connectivism in technology-based terms—a collection of hardware and software applications (Cormier, 2011). At the same time, the "sharing" emphasis in Connectivism (Kop, 2011) has been linked with a tacit or even explicit expectation of mutual obligation and support, as in Siemens (2010) contended about lurking.

Diversity

The concept of diversity in education is traditionally understood in the light of measurably obvious differences among learners, especially based on gender, race, culture, socioeconomic status and perhaps aptitudes such as Gardner's "intelligences" (Gardner, 1999). Additionally, Baym (2010) notes diversity in the degrees and kinds of interactivity offered by various modes of digital communication, a point relevant to MOOCs.

Openness

Connectivist environments to date have framed openness largely in the context of sharing resources, ideas and expertise, and communicating and creating new information and insights through networks. In contrast to the educational traditions of closed lectures, proprietary texts, and classroom-enclosed discussions, openness as sharing in networks offers a refreshing change in perspective and is an essential tenet of connective learning.

Chaos Theory, Emergence, and Complexity Theory

deWaard et al. (2011) evaluated the hypothesis that MOOCs and the innovative elements of mobile learning and social media can add to a new educational equilibrium based on an analysis incorporating chaos theory, emergence, and complexity theory. These theories lend themselves to guide researchers to examine MOOCs from a different lens to obtain better understanding of what MOOCs mean to human learning.

Chaos Theory

The format of an MOOC is open and online. In order to allow as many learners as possible to participate in the course, the learning resources are accessible online and should be open. Iannone (1995) argued that using a chaos theory framework, today's curriculum should be flexible, open, disruptive, uncertain, and unpredictable, but it must also accept tension, anxiety, and problem creating as the norm for the transformation process.

It is unclear whether linear structured instructions results in better learning outcomes than more chaotic meandering structure. deWaard et al. (2011) argued the experience of learning, making sense of that chaos, is the core of the learning experience, but if teachers make sense of that chaos and organize them for learners and gives them all the readings and sets the entire learning path in place for them then to a degree learners are eviscerating the learner's experience because now they have made sense of them and all they have told them is walk the path that the instructor has provided and formed.

Emergence

In cMOOCs, it is challenging to have instructors to participate, facilitate, and evaluate large amount of discussions, reflections, blog postings, and assignments weekly or regularly. deWaard et al. (2011) found the real potential in their cMOOCs, was the emergence of learning networks among participants in a many-to-many relationship, rather than the traditional one-to-many model of interactions between instructors and their students. Even this type of relationship can assume new forms, with significant changes in the role of instructors.

Complexity Theory

Davis and Sumara's (2010) explained "an education that is understood in complexity terms cannot be conceived in terms of preparation for the future. Rather, it must be construed in terms of participation in the creation of possible futures" (p. 43). MOOC format allows massive participation leading to the creation of possible educational futures. Learners to succeed in MOOCs are required to obtain complex learning skills and knowlege. deWaard et al. (2011) concluded the related required skills as a multifaceted set of abilities (Martin, 2006), including digital literacy, information literacy, and the ability to effectively use social software to build one's own learning environment (Pettenati, Cigognini, Mangione, & Guerin, 2009), called personal learning environments (PLEs). Social and relational aspects of the knowing knowledge attitude in the Connectivistic framework (Siemens, 2004, 2006) inevitably highlight that mastering technology is but one among many complex skills. In the complexity, deWaard et al. (2011) indicate learners should apply complex learning skills to meander their way through that path and getting the value of that learning experience and that sense-making process. Not all learners are well prepared with the complex MOOC. Clarebout and Elen (2006) carried out a meta-analysis of research about the use of different tools in computer-based learning.

Some studies in their review showed that students had difficulty making choices about which tools to use. Furthermore, they found several authors stressing the importance of metacognitive skills in making adequate decisions.

Researchers additionally are looking for the potential examinations on the areas of learning analytics, and gamification. deWaard (2012) suggested that researchers should investigate three important sets of learner analytics in MOOCs: the number-driven statistics, the social network analysis, and quality analysis. Whether MOOCs will offer formal credit hours for the learners, researchers also scrutinize the potential recognitions by integrating the concept of gamification.

Critical Thinking

Due to the natures of openness of MOOCs, MOOCs generate many controversial and debatable questions, which challenge educators to sort their ideas in role of higher education, accreditation, cost, instructions, and sustainable financial models.

Roles of Higher Education

What social roles should colleges play in higher education? MOOCs move education from an instruction paradigm to a learning paradigm where instead of colleges existing to provide instruction, colleges will have to exist as institutions that produce learning. Kolowich (2012) argued the result of MOOCs is based on a form of adult continuing education, lifelong learning, and formal/informal learning. The majority of students in both xMOOCs and cMOOCs, particularly in cMOOCs, were professionals in their current industries—hardly the target audience for those seeking a change in how we educate postsecondary students. The current MOOCs provide a nice proof-of-concept, but they do not solve significant educational problems (Hill, 2012). This question also leads to another question: what are higher educational institutions' social responsibilities? Should colleges provide inexpensive MOOCs to replace existing expensive college education? Should public colleges to offer MOOCs to other than their target students without cost? Based on the ideas of the neoliberal university, public colleges and universities emphasize that they support corporate competitiveness through their major role in the global, knowledge-based economy. They stress their role in training advanced students for professional positions close to the techno-science core of knowledge economies, in fostering research that creates high-tech products and processes for corporations, and in preparing undergraduate and community students to be malleable workers who will fit into (and be retained for) new information-based jobs and workplaces. In the process, the fundamental social roles of public higher education, including providing increased upward mobility for underserved populations, have been displaced by the economic role of serving corporations' global competitiveness.

Accreditation and Credits

Should MOOCs offer college-credit to all MOOCs learners? Should MOOCs be recognized by the accreditation agency? Coursera announced that they had begun formal conversations with the American Council on Education (ACE), the body responsible for accreditation of college-credit level courses.

Open

What is open in MOOCs? What is not a "true" MOOC, evidenced by debates surrounding what is truly an "open" course, for example, or the increasingly difficult and limiting distinction between online and offline networks. Should we allow MOOCs learners to create your own college degree by taking the best online courses from the best professors from around the world—some computing from Stanford, some entrepreneurship from Wharton, some ethics from Brandeis, some literature from Edinburgh—paying only the nominal fee for the certificates of completion. It will change teaching, learning and the pathway to employment. Can students build a curriculum based on MOOCs if prestigious universities recognize them? Is this what we mean by "open?" If open is the ultimate values of MOOCs, how open should we stretch? Is it the more open the better? How much open is necessary?

Low Cost Education

Are MOOCs a solution to low-cost education? U.S. government desires to provide lower-cost education options through flexible programs. The government, at both the federal and the state levels, is playing a large role. In a speech in November 2011, U.S. Secretary of Education Arne Duncan said of programs such as Western Governors University: "I want them to be the norm." DOE is looking to see competency-based education develop and flourish. According to Fain, Ochoa said the Obama administration supports quality competency-based approaches, "which can expand student access while trimming college costs and the amount of time it takes to earn a degree."

If MOOCs are the low-cost education or even no-cost education, questions arise that challenge the current situation. If students can access high-quality academic material for little or no cost, will higher education institutions be obliged to prove the value of their institutions' educational experience? If the content of university courses are freely available and a click-away, especially from institutions such as MIT or Harvard where individuals can learn from world-renowned scholars and scientists, what exactly are students paying for?

Instructional Design

How and where does instructional design fit in MOOCs? xMOOC may look like it is lacking sound instructional design while cMOOCs may look like they are chaotic. What are the sound and effective instructional designs for MOOCs to ensure learners' positive learning experiences? The institutions have learned that it is not effective to simply allow the student to create his or her own degree: a great deal of guidance is needed, perhaps from teachers. After all, very few 18-year-olds have the experience or breadth of knowledge to make the requisite decisions completely on their own. Online technology may be advanced. O'Connor (1997) argued: The Net Doesn't Free People: People Free People. Delivery models of xMOOCs may benefit many learners but it seems to lack the human touch. Learning is not mechanics.

Will peer evaluation ensure academic quality standards? or will it push down different cultural approaches to a new idea? Will massive collective intelligence tend to be un-informational? or will automated systems be able to detect talent? How do you mobilize a whole community to educate each other, while maintaining the value of expertise? How to assess higher thinking order in MOOCs?

Sustainable Financial Models

What are the market values of Stanford or Harvard degrees if everyone, everywhere and at every moment can take a course and repeatedly try again and again to succeed? What are the sustainable financial models? There are lots of experiments to be conducted on MOOCs.

A Model for MOOCs Design and Development

Although based on basic MOOCs concept, MOOCs should be in massive scale, open in access, applying online as delivery technology, and a format as course; Siemens (2012) argued MOOCs does not need to be in massive size. Fifteen or more participants can be an MOOC. An MOOC need not to be fully open. It can be open to certain degrees. Unquestionably, it would be available online. For the format, it does not need to be a course. It can be a professional development session, a training module, or a learning topic. There are a few critical questions to ask yourselves before starting designing and developing your MOOCs. By answer these questions would assist you to obtain better understanding the role of MOOCs to you, or your institution.

- Why do I need to deliver an MOOC?
- What is the need for an MOOC? What are the goals and the purposes to develop an MOOC?
- Do I have funding to sustain the MOOC?
- Who are the target audiences (students, professionals, anyone)?

- What is your ideal learning paradigm? Connectivism or traditional lecture-based learning?
- Am I able to secure a design team? Who are the team members in your MOOC design and development team? Instructors, instructional designers, technology specialists, technical support staff, administrators.
- Do you have an access to required technologies, and platform? What technology platform do you plan to integrate to deliver your MOOCs?

Siemens (2012) suggested a nine-step program to plan and to operate an MOOC:

1. Elect a topic or area, and determine the audience.
2. Secure an instructor to teach.
3. Determine Content.
4. Plan spaces of interaction.
5. Plan interactions (live, asynchronous).
6. Plan your continued presence.
7. Learner creation (activities).
8. Promote and share your MOOC.
9. Iterate and improve.

After answer all questions above, if you decide to design and develop an MOOC, below (Table 18.2 and Fig. 18.1) is a list of guidelines and a model that we recommend to plan and to design your MOOCs.

Based on the guidelines suggested in Table 18.2, a model for planning and designing MOOCs is proposed (see Fig. 18.1). In this model, it is critical to place Personal Learning Environment (PLE) in the center of MOOCs, regardless for

Table 18.2 Guidelines for planning and designing MOOCs

	Choices
Team	Form a plan and a design team: Instructors, teaching assistant, tutors, graders, instructional designers, technology specialists, technical support staff, and administrators
Host	Instructor, program, college, or institution
Platforms	Learning management system (Coursera, edX, Udacity, etc.) or multi-tools platform (web 2.0 and social media)
Cost	Free, or low fee
Subject areas	Determine a topic or an area
Course title	Determine a course title
Students	Students, professionals, or anyone on virtual world
Course size	How many students do you expect?
Course length	Length of course, session, or module
Course format	Self-paced, fixed beginning and ending dates
Content delivery	xMOOC: Formal (traditional) course structure and flow
	cMOOC: Content as a starting point, learners expected to create/extend and to share
Learning framework	xMOOC: Traditional lecture-based; instructivist
	cMOOC: Connectivist
Required technologies	Computers, laptop computers, and/or mobile devices with online access

(continued)

Table 18.2 (continued)

	Choices
Teacher–student relationship	xMOOC: Traditional relationship between teacher–learner, teacher–student interaction is limited
	cMOOC: Learner control, personalize, management learning environments, less focus on teacher–student interaction
Student–student interaction	xMOOC: Less focus on the student
	cMOOC: Highly promotes, encourage to learn from peers
Readings	xMOOC: Textbooks, open educational resources (online video, tutorials, articles)
	cMOOC: Prefer open educational resources (online video, tutorials, articles), students expected to identify relevant readings
Instructional design	xMOOC: Instructor-lead and lectured-based instructions
	cMOOC: Learner expected to create, grow, expand domain and share personal sense making through artifact-creation
	Use open article, multimedia resources (YouTube, others), conference recordings/proceedings, video, interactive presentations, texts, simulations, leave room for learners to create/share, guest speakers, video interviews (Siemens, 2012)
Online discussions	xMOOC: Centralized discussion forum support
	cMOOC: Distributed, often blog-based, learner-created forums and spaces. Web 2.0 or social media discussion tools
Preparation for students	Prepare students to obtain necessary self-regulated learning skills, and strategies
	How to prepare students to build their effective personal learning environments
	Build effective PLE
Assessments	xMOOC: Complete some level of activity for formative and summative evaluation (quizzes, tests, assignments, papers, create artifacts). Automated and peer evaluations
	cMOOC: Complete some level of activity for formative and summative evaluation (assignments, papers, create artifacts). Instructor/TA graded and peer evaluations
Improvements	Course evaluations
	Administrate surveys or questionnaire to understand students' learning experiences
	Solicit feedback from design and develop team
Potential research	xMOOC: Learning analytics, achievements
	cMOOC: Learning analytics, self-regulated learning, personal learning environment, open educational resources, gamification
Award	Completion of certificate, earning credits, badges

cMOOCs or xMOOCs. It is necessary that instructors, educators, and institutions plan and design MOOCs to allow students to build their PLEs to ensure their MOOCs learning more positive. PLE building is a new learning literacy for online learning. This model starts the process of setting up the vision for MOOCs, and move to planning, implementing, accessing, designing, and technology. These main processes are a constant flux. Educators and institutions should constantly update, revise to facilitate PLE building for all students. This constant flux will drive and steer the critical MOOCs entities, goals, students, cost, subjects, delivery, paradigm, interaction, research, tools, platforms, to facilitate effective PLE building. For the strategies in building effective PLE, see Chap. 3 in this book.

Fig. 18.1 A model for planning and designing MOOCs

Conclusions

Are MOOCs good or bad ideas for education? Educators continue arguing and debating. Our fear originates in whether it is sustainable. Hill (2012) foresees that there will be a lot of experiments in MOOCs, since MOOCs are in their experimental, visionary stage. He argued further that the potential of MOOCs would be based on further developing their techniques. The examples that attempt to tackle the four barriers of revenue, credentials, course-completion rates, and student authentication will likely determine the future generation of MOOCs.

For many schools, it is no longer acceptable to leave it to individual faculty members or departments to decide what, how, and when online courses and programs should be developed. Most educational institutions will need to determine how online education does or does not serve their specific mission and needs. Online education should now be a considered part of any institution's strategic planning process, even if the decision is to not offer online education.

When it comes to social responsibilities in education, "who" should have access to "what" at what "cost" at "where?"

- **Who**: Do MOOCs solve the education problems since many do not have access to online technology? If xMOOCs are right for us, what are teachers and schools supposed to do? What are the values of teachers and schools?
- **What**: Education, learning, content, instructions, teachers, or educational or learning facilities?
- **Cost**: Is free equal to "zero?" Does free solve all education/learning problems? Or is free priceless and infinite?
- **Where:** If cMOOCs do not impose any learning structures to learners, how are cMOOCs different from online interest groups?

Regardless of the types of MOOCs, perhaps the ideas of MOOCs are making its way through Everett Rogers' ideas, diffusion of innovations. An innovation is communicated through certain channels over time among the members of a social system. The innovation must be widely adopted in order to self-sustain. Individuals experience five stages of accepting a new innovation: knowledge, persuasion, decision, implementation, and confirmation.

Where are we now? And what is next?

Application Activities

Idea 1

Select one cMOOC and one xMOOC to analyze their strengths and weaknesses.

Idea 2

Discuss three critical issues of cMOOCs, xMOOCs, and/or MOOCs in general that are not covered in this chapter.

Idea 3

Apply the model for planning and designing MOOCs to plan a cMOOC or xMOOC.

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R. Papa (ed.), *Media Rich Instruction: Connecting Curriculum To All Learners*, DOI 10.1007/978-3-319-00152-4, © Springer Science+Business Media New York 2015

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