Dr. Nancy Stuewe Ed. D.
University of Calgary
Alberta Canada
nmstuewe@gmail.com

Bio: Dr. Nancy Stuewe's philosophy of teaching and learning is rooted within a constructivist framework that promotes technology as a pathway for understanding. A common element of constructivism for education is that meaningful learning with technology is an active experiential process of construction that teachers participate in. Nancy has recently retired for teaching and learning with the Calgary Board of Education. She has been an elementary classroom teacher; a learning leader to support 21st century learning, a teacher technologist and most recently enjoyed a learning commons role. She is also a graduate of the University of Calgary with an Ed. D in Educational Technology. Current ways of thinking about knowledge and work suggest that teachers are being challenged to entertain unfamiliar and innovative technology in their learning environments. As a researcher I am concerned with understanding how to support teachers in making sense of their experience with new technologies. I also see technology as a powerful partner in teaching and learning and an element of human life worthy of reflection. Underpinning all of this is my belief that people, not technology will guide us to a happier planet.

Defining Technology in a New Culture of Learning

Dr. Nancy Stuewe

Abstract: Governments have called for teachers to adopt a new role as *architects of learning* and use technology differently to support a constructivist approach to teaching and learning. Likewise schools are being challenged to harness exciting, yet unfamiliar information and communication technology. This paper is a segment of a literature review taken from, Unfamiliar Technology and the Architect of Learning: A Case Study (Stuewe, 2013b). It is intended to highlight the complex perspectives of how innovation is perceived and adopted in technology-enhanced learning environments such as the Learning Commons. This literature review contains a broad definition of technology followed by a brief exploration of three different traditions of education. It is important to note that there are many layers of traditions of education and many perspectives of technology all interconnected. This exploration focuses on the relationship between the role of the teacher, the beliefs in a teaching and learning environment, and how technology might be employed to support these beliefs.

Introduction

There is a new culture of learning (Calgary Board of Education, 2013; Thomas & Brown, 2011). Governments have called for teachers to adopt a new role as *architects of learning* and use technology differently to support a constructivist approach to teaching and learning (Government of Alberta, 2010). The *architect of learning* is a metaphor used to describe the role and context of teachers within a constructivist approach to teaching and learning. An architect designs the plans from which others will build (Shepherd, 2011; Stuewe, 2013a). The new learner depends heavily on technology to keep in touch, entertain, as well as obtain and share information. "Today's learners cannot imagine life without the Internet and supporting technology" (Calgary Board of Education, 2013, p. 2). Yet, "they need to be taught how these tools can be used in learning and critical thought" (Ontario School Library Association, 2010, p. 7). According to Sawyer (2006) studies of knowledge workers show that teachers apply their expertise in complex settings with a wide array of teaching tools from emerging technology to pencil and paper. Schrum, Shelly, and Miller (2008) reported that enormous funds have been devoted toward encouraging teachers to adopt new and emerging technology, yet not much has changed in spite of this expense and effort. Loertscher, Koechlin, and Zwaan (2008) also argue that in the New Learning Commons, teachers need to view technology as an extension of themselves and "not equipment or networks to battle" (p.46). This paper is intended to highlight these many complex perspectives of how technology is perceived and adopted in technology-enhanced learning environments such as

the Learning Commons. I begin this literature review with a broad definition of technology followed by a brief exploration of three different traditions of education. This exploration focuses on the relationship between the role of the teacher, the beliefs in a teaching and learning environment, and how technology might be employed to support these beliefs.

Defining Technology for Education

Amiel and Reeves (2008) noted a need for educators to become more philosophical about their view of technology and the value it holds to support learning. Ihde (2004) related that a conservative interpretation of technology is "simply as a human invention[s] which get used in good or bad ways" (p. 99). Ihde pointed out that a tool perspective of technology could take on a value-neutral or a value-laden role. Cuban (2001) suggested that policymakers as well as teachers expressed a value-neutral view of technology in his study. However his observations suggested something different. Cuban (2001) stated, "wiring schools, purchasing computers, networking machines, and using the machines themselves are hardly value-free behaviours" (p. 164). The using and choosing of technology for a purpose is a specific value choice in itself (Cunningham & Allen, 2010). Ihde (1993) described this dualistic view as utopia versus dystopia. A double-edged sword metaphor can be used to support this view. However technology is not just objects we handle and as Ihde remarked, dualism, "makes for great difficulty in a careful, balanced, and critical analysis" (p. 62).

A double-edged sword metaphor of technology limits our understanding to good or bad in how it functions or as skill we can master. Alternately, a ground-map metaphor may permit us to be open to more complexity and to pay particular attention to the process as well as the many activities, regions, resources, and boundaries of technology use (Cunningham & Allen, 2010). Ihde (2004) stated that John Dewey was concerned with "developing a primacy of praxis orientation to philosophy" (p. 96). Hickman (2002) in reviving Dewey's pragmatism described technology as a complex process that includes not only the device but also the thoughtful use of it with a goal to resolve issues. Amiel and Reeves (2008) have also stated, "technology is much more than hardware. It is a process that involves the complex interactions of human, social, and cultural factors as well as the technical aspects" (p. 31). This birds-eye perspective of technology allows us to expand the boundaries around its use and to see technology as a tool to engage in work and at the same time a skill that we can learn to master. However, Dewey (1938) might tell us skill involves experience; to polish a skill requires know-how that includes a process of teaching and learning. Amiel and Reeves (2008) have stated "Technology is not a product and instead is a process: tools are merely a product of a technological system" (p. 32). As a process, technology is not just a means to an end, but ends and means all bound up interactively in practice (Hickman, 1992). It may also be seen as a means through which we might relate, communicate, and participate with the world. Looking at technology as a means to an end, one might think of technology as a catalyst for higher student achievement. However with a process view, technology is part of the interaction of learning that, "generates new knowledge

that challenges, adds to, or deepens the learner's existing framework of knowledge" (Burns, 2013, p. 39). Technology in this light becomes an intellectual partner (Howland, Jonassen, & Marra, 2012).

Neither technology nor education is value free. Branch and Deissler (2008) have described education also as a process, a series of purposeful actions and operations. They have suggested the process of education can be supported with the use of technology. To expand the boundaries of technology's definition further, Internet-based learning management systems, such as Desire2Learn™ or Blackboard Learning System allow teachers to consider technology also as an environment, as a contained place to design, work, interact, and collaborate within. Feenberg (2002) suggested that a new metaphor for technology might be a house, not just a device but an "extremely rich and meaningful life environment" (p. xi). Within this complex view, people and not the device have volition. Teachers have the opportunity to use technology with knowledge, action, and to make connections with ideas and others. The Learning Commons might become an expanded physical and virtual learning place or experience. New information and communication technologies allow classrooms to connect with individual access and also with participatory knowledge-building capabilities (Cunningham & Allen, 2010). Wikis, blogs, Google Docs, and collaborative mind-mapping tools under the direction of an *Architect of learning*, allow participants to critique and potentially build on each other's ideas. Amiel and Reeves (2008) raises concern for teachers in that these new information and communication technologies greatly increase the complexity of the integration of technology into educational environments. Derry (2008) has cautioned, "even though recent work has concentrated on more detailed questions of learning and pedagogy, the question of knowledge has been neglected" (p. 509). Derry reminds us not to downplay the human dimension of the nature of knowledge while at the same time do not give into the glamour and hype of technology.

Traditions in Education

According to Sawyer (2006) much of society is unaware of important discoveries emerging from the learning sciences regarding how people learn and how technology can assist in the process in education. Sawyer has suggested that most parents and policy makers remember a focus on instruction and memorization of facts. Teachers also have either spent a career learning the skills to manage an instructionist classroom or have strong memories of being students in such classrooms. As schools move from teacher directed learning towards process and knowledge building we find many interconnected perspectives of knowledge exist in education. Teachers in general find themselves in the midst of many philosophical and ideological traditions (Barrow, 2010; Sawyer, 2006, 2008). Molenda (2008) noted that how and if a technology is considered at all will depend on the beliefs of teachers in a teaching and learning environment. Can the same be said for how a learning space is utilized? The following is a brief exploration of the relationship between the role of teachers, their beliefs in a teaching and learning environment, and how

technology is employed to support these beliefs in three different traditions in education; instructionist, humanist, and constructivist.

Instructionist

In an instructionist tradition of education, knowledge may be considered acquired, gained and measured in steps. Cunningham and Allen (2010) described unified standards by age, content, and performance. Accountability systems may be structured by a hierarchical approach for improving achievement in teaching and learning. The role of the teacher may be seen as a *knowledge authority* to prioritize the standards and find a way to measure progress. "The route to better learning must be the improvement of instruction" (Papert, 1993, p. 139). The decisions teachers make are data driven. The teacher looks for objective evidence of what is working or not in order to make appropriate adjustments (McNeil, 2009). Educational research is utilized to assist teachers in achieving the curriculum objectives not in participating in its creation (Sawyer, 2006). It stands to reason that a learning space would also be organized and accessed to serve these beliefs.

According to Duffy and Cunningham (1996) technology is adopted by instructionist teachers as a teaching or delivery tool to "provide more effective and efficient delivery of instruction and hence more effective and efficient learning" (p. 18). McNeil (2009) also noted that technology is regarded as an instructional intervention in this systemic curriculum. Technology becomes an efficient way to achieve knowledge acquisition and proof of conceptual understanding (p. 161). The tool of choice for the teacher with these objectives might be one that will help students add to their knowledge store, such as word processing, CD-ROMs, PowerPoint, and drill and practice websites.

Humanist

In contrast to instructionist McNeil (2009) sees, a humanistic teaching and learning tradition as concerned with self-understanding while fostering emotional and physical growth. The goal of a humanist tradition might be to promote intellectual skills necessary for independent judgement. Its purpose is to provide the learner with intrinsic rewarding experiences that contribute to personal liberation. The role of the teacher is to provide a warm and trusting environment as well as to function as a facilitator while providing challenging learning opportunities. In a humanist tradition, the learning focus is on knowledge gained through personal concerns and self-expression. (Underhill, 1989) described humanist education as a process of life-long learning. The job of a teacher-facilitator is not to decide what the students should learn but rather to identify and create the ingredients of a climate that helps free them to learn and grow. Reflective discussion is a key ingredient for negotiation and choice in matters of authority and responsibility in the classroom. Autonomous and authoritative power is in continuous flux. Classroom decision-making continuously shifts back and forth. A learning space might reflect this by providing comfortable furnishings, plants and pleasant colours.

McNeil (2009) highlighted the idea that technology opens many possibilities of exploration in humanist education for teachers and students. However, its use focuses on learning and meeting the needs of people. In the

humanist tradition, technology assists in finding the answers to personal questions, connecting people to each other, and helping people to make decisions.

Constructivist

In a constructivist perspective, learning is a complex process that is primarily under the control of learners. It occurs under the teacher's guidance within the context of the teaching and learning environment (Duffy & Cunningham, 1996; Molenda, Rezabek, & Robinson, 2008). The focus is on a process for learners to make connections in a whole world of meaning. The role of the teacher is like an *architect of learning*, "one who plans, designs and oversees learning activities (Government of Alberta, 2010). Teachers "strive to create environments where learners actively participate in the environment in ways that are intended to help them construct their own knowledge" (Jonassen, 2009). Duffy and Cunningham (1996) stated that "learning is seen to occur when the learner's expectations are not met, and he or she must resolve the discrepancy between what was expected and what was actually encountered" (Duffy & Cunningham, 1996). Constructivists stress the importance of self-awareness of learning and knowing. Duffy and Cunningham preferred the term reflexivity. It is a process of construction in which conflict of understanding leads to puzzlement and questions. These questions, McKenzie (2000) has related, help us to make sense of the world. McKenzie also explained that in the constructivist tradition, questions might be our "most powerful tools when it comes to making decisions and solving problems, for inventing, changing and improving our lives" (p. 1).

According to Koechlin, Rosenfeld and Loertscher (2011) the Learning Commons is student centred and looks like a multi-functional place that allows for creativity as well as reflect the communities learning needs. The Learning Commons approach emphasises individual and collective knowledge construction and contains a collaborative learning model for both students and teachers as learners (Koechlin, Rosenfeld, & Loertscher, 2010). This new culture of learning views learning as experimental, inquiry based, collaborative, social and technology rich (Calgary Board of Education, 2013, p. 3).

Within the constructivist tradition Howland, Jonassen, and Marra (2012) have used the term *meaningful learning* to describe a process of learning through inquiry. With its interrelated, interactive, and interdependent characteristics, meaningful learning, they say, is active, constructive, intentional, authentic, and collaborative. In this way Howland et al. have related that technology becomes a "partner in the learning process" (Howland et al., 2012). Meaningful learning happens *with* technology, not because of technology. They suggest technology can be thought of as an intellectual partner in the learning process. Derry (2008) also believes that the principle of design of technology-enhanced learning environments should have a learning-driven focus and not a technocentric one. Learning should drive the use of technology, not the other way around. In a constructivist tradition, technology can be viewed as a pathway for learning, not a delivery vehicle. Teachers do not need to become experts with technology to

support learners and learning; they only need a working knowledge and a willingness to try.

Technology becomes a complex notion of devices, process, and practice that also includes methods of fruitful questioning. The implications of learning with technology in a constructivist perspective are that teaching and learning becomes linked in a process. Instruction may spark curiosity and questions can motivate intelligent action that in turn may lead to an accumulation of experience. Together instruction, questions, and technology could mediate the teaching and learning process. Jonassen, Carr and Yueh (Jonassen, Carr, & Yueh, 1998) have used the term "mind tools" to describe the process in which learning with technology becomes an "intellectual partnership" (p. 31).

Conclusion

There is a need for educators to become more philosophical about their view of technology and the value it holds to support learning. The instructionist tradition of education suggests knowledge is scarce and reality is objective; technology then may be accessed as a neutral tool to support the efficient collection of data and improve delivery of instruction (McNeil, 2009). However in a constructivist tradition technology becomes a process or a networked activity. Teachers look for more pragmatic evidence of projects completed (Howland et al., 2012). Truth is socially negotiated (Crotty, 1998). Learning spaces would foster collaboration and the personal management of collective knowledge. With a process view, technology not only lends itself to the exploration of questions but also potentially could be used as a pathway to take learners *on* an exploration and perhaps a *place* of learning.

It is important to note that many layers of traditions and many perspectives of knowledge are interconnected. As architects of learning, teachers understand that what makes learning meaningful is a personal exploration of content, a focus on designing good tasks for exploration, and a willingness to gain enough awareness of technology to support the process as an intellectual partner. Technology will be used in the Learning Commons to serve user in the time and place in which they work. How teachers think of technology within the Learning Commons and how they create, use, and manage learning resources depends greatly on their beliefs about how people learn as well as the demands of their job (Molenda et al., 2008).

What has emerged from the literature is that technology is a complex notion of devices, process, and practice that also includes methods of fruitful questioning. The implications of learning with technology in a constructivist perspective are that teaching and learning becomes linked in a process. With a process view, technology may be viewed as a place in which we might relate, communicate, and participate with the world. This view of technology highlights a need to encourage teachers to develop an awareness of a relationship between learning and technology. The focus then becomes more on how do we support teachers to become more like architects and use technology support the human process of teaching and learning and less on technology as a means to an end and flashy technocentric thinking.

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