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Leadership and Technology

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How Technology Can Support Learning and Teaching

Technology can support learning by making information more accessible and available to all stakeholders. It can also support higher order and “deeper” levels of learning that are essential for the future. To be a successful leader is to encourage a transformation of our cultural definition of learning and how learning occurs, and work toward change. This goal relates to the learning levels of McWhinney & Markos and transformative leadership and technology uses of Hughes and Puentedura as well as Senge’s systems thinking and Sharples, Taylor, & Vavoula’s Theory of Mobile Learning, all of which are discussed in this paper. When information is available to all stakeholders- students, teachers, and parents, a leader must push for what I will call Learning III (L3), or transformative learning. This type of learning goes beyond rote learning and reflection, toward a space where the learner is constantly and actively engaged with the world as a system. Technology enables this type of learning that is collaborative, reflective, and situated in content and context.

McWhinney & Markos distinguish three types of learning and define education as “a course of learning” (2003) (see Figure 1). The goal of education is that students graduate able to meet personal and societal needs, including the need to earn and living and function productively in society. This requires a “life-long learner”, and complicates the idea that a final destination in learning can be reached. Senge refers to this as personal mastery, the “discipline of continually clarifying and deepening our personal vision…It is not about dominance, but rather about calling…People with a high level of personal mastery live in continual learning move. They never ‘arrive’” (Smith, 2001). Learning is a process that is never complete.

A learned person has knowledge, but “education also conveys a sense of properness” which means the educated person “has been trained in some manner related to community expectations and traditions” (McWhinney & Markos, 2003). Here education becomes problematic for transformation and the needs of the future. If we train students with and in the context of today without the tools to look and work beyond what is presently accepted, transformation and learning stop. It is essential that for technology to support the type of learning needed (L3), our understanding of learning as a culture must change so that we can imagine that which is currently beyond us. This can be achieved by transformative leadership and transformative use of technology.

Figure 1

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| **Learning** | **Learning:** the acquisition of knowledge as well as of modes of organizing, questioning, making decisions, and exploring our own assumptions and constructions of reality. Takes place in events, not explicitly laid out along a path. A process, not a program.  |
| L3Triple loop | * Challenges the interpretation of experience, relations, and truth systems, leading to broad questions such as human life, world ecology, and relations to a higher power.
* Allows one to hold and work with contradictions and leads to the resolution of contraries in which personal identity mergers into all the processes of relationship in some vast ecology.
* People at this level tend to be sages or teachers of society. They induce L2, but disturb the normal course of community life and ask too many questions, demanding we pay too much attention to what they are revealing.
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| L2Double loop | * Comes from reflection, observing how we make choices, what assumptions are involved in learning by rote, and its extensions.
* Intent is to question the data (content) and conscious and unconscious assumptions used to conduct one’s life, adopt constructions of reality, life roles and moral obligations leading to different worldviews.
* People adopt new learning without recognition of the process by which they come to new worldviews. Without exploring the process, most people settle back into L1 assumptions.
* L2 is an event of change, a response to reflection and insight, a moment of instability that provides opportunities to take new paths.
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| L1Single loop | * Rote learning, adds to information and skill without contradicting the prior learning or raising questions as to the assumptions about what is being taught.
* Done by rote work.
* Can product changes. We learn languages, customs, and professions this way, without examining our goals, ethics, lifestyle, worldview
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Chart is created from McWhinney and Markos “Transformative Education: Across the threshold” (2003).

When education is defined by community context and tradition, or the “here and now”, the resulting learner is not prepared for a future different from today. Wenig paraphrases Reich and Senge in his article noting that “In time of drastic change, the learners inherit the future. The learned find them equipped to live in a world that no longer exists (2004, p.62). This points to how technology must support teaching and learning for the needs of the future: by changing what the “community” or culture expects a learner to know by enabling learners to transfer and transform knowledge. Because we cannot predict what the future will hold, learning must aim to reach the L3 level.

The three types of learning identified by McWhinney & Markos correlate to the SAMR model of transformative use of technology (Figure 2) in that they both seek to get learners to a point where they are no longer confined by culture and accepted worldviews and are able to see the world as an ecology or system that they can shape or transform in innovative ways. Because technology offers the ability to move beyond current pedagogy and achieve “previously inconceivable” things, it is an essential part of learning and teaching that must be recognized and examined. The highest “level” in both models correlates to Senge’s Systems Thinking, a major “component technology” of innovative learning organizations (Smith, 2001). Systems thinking contributes to this discussion by offering a way to understand how reflection and transformative thinking can enable better use of technology to support learning. Senge’s approach to organizations can be applied to technology use and leadership in education by providing rationale and tools for reaching L3. Indeed, the description of systems thinking echoes that of L3: Systems theory has the ability to “comprehend and address the whole, and to examine the interrelationship between the parts” (Smith, 2001). According to Smith, Senge argues that a key problem with management of organizations is that “rather simplistic frameworks are applied to what are complex systems” (2001). This is a problem with current, lower level technology use for learning too; technology is used to replace or augment pedagogy rather than to solve larger problems when it might be used to enable transformative learning.

Figure 2

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| **Level of Use** | SAMR **Puentedura** | **Examples** |
| Redefinition | Tech allows for the creation of new tasks, previously inconceivable | Integrated with workgroup and content management software |
| Modification | Tech allows for significant task redesign | Integrated with email, spreadsheets, graphing, packages |
| Augmentation | Tech acts as direct tool substitute, with functional improvement | Basic functions (e.g., cut and paste,spellchecking) used |
| Substitution | Tech acts as direct tool substitute, with no functional change | Word processor used like a typewriter |

From <http://hippasus.com/resources/tte/part1.html>

McWhinney & Markos define this future “educated person” as a product of transformative learning. They explain that transformative learning “refers to those psychological, cognitive, and social processes of learning and education that follow from a variety of reflective and maturing experiences” (2003). This definition is reflected in the results of Hughes’ study of teacher professional development opportunities’ impact on technology-supported transformative practice as outlined in “The Role of Teacher Knowledge and Learning Experiences in Forming Technology-Integrated Pedagogy” (2005). Here Hughes concludes that not only is there a need for a strong content and pedagogical knowledge base to achieve transformative practice, but a need for “learning experiences grounded in content-based technology examples” (2005). This conclusion highlights process as a key factor in the ability of the learner to transfer knowledge and engage in transformative technology practice. This more focused, content-based approach to teaching is one way that technology can support learning.

Hughes also notes the use of this knowledge and the role of reflection. The power to use technology in a transformative way “lies in the teacher’s interpretation of the technology’s value for instruction and learning in the classroom” which is mediated by “past experience and accumulated knowledge” but, prior knowledge is challenged through reflection (2005). A learner must be aware of his own beliefs, be exposed to alternative belief systems, which in turn causes him to “question [his] knowledge based and change [his] actions” (2005). One of Hughes’ study participants, Nell, was able to use technology innovatively in her classroom though “experimentation, reflection, and time” (2005), a part of L3 and of system thinking. Reflecting on how technology is and can be used is a catalyst for thinking more deeply and achieves both transformative learning and transformative use of technology.

 Cradler & McNabb find similar results and write that “technology generally improves performance when application directly supports the curriculum standards being assessed” demonstrating that a strong alignment of content, learning goals and assessment is important for successful use of technology in education. Inspiring a realignment and more conscious connection between curriculum standards and technology is another way that technology can support learning by increasing accountability through reflection.

Cradler & McNabb also find that that high-order thinking and problem solving skills can result from technology use and “enable learners to apply their content knowledge in a variety of ways leading to innovation and deeper understanding of content domains” (2002). Technology can aid in teaching rote learning content, but also provide a vehicle for “deeper” levels of learning by providing a variety of applications and differentiation. Cradler & McNabb notice that technology plays a role in achieving transformation because “powerful technologies are now available to significantly augment the skills necessary to convert data into information and transform information into knowledge,” for example, by using interactive video programs to increase problem-solving. Research demonstrates that “students in classrooms who used the Jasper video programs were better able to complete complex problem-solving tasks” thus showing that technology can enhance existing skill and increase likelihood of transfer, leading to innovation.

Finally, Sharples et. al discuss mobile learning and find that “learning is an active process of building knowledge and skills through practice within a supportive community. It comprises not only a process of continual personal development and enrichment, but also the possibility of rapid and radical conceptual change” (2005). This conclusion lines up with what the other thinkers mentioned in this discussion find about the nature of learning: it is a process in context which is never complete with capabilities of transformative change and influenced by context. Because Sharples is talking about mobile technology, this is an example of another way that technology can support learning. They propose that in “the era of mobile technology, we may come to conceive of education as conversation in context, enabled by continual interaction through and with personal and mobile technology” (2005). Technology can support learning by making continual engagement with information and communities possible though increased mobility, leading to transformative learning, and enable L3 and systems thinking because technology is able to “preserve and organise digital records of [sic] learning over a lifetime” (2005).

In summary, in light of the context in which we learn and the goal of transformative learning, technology supports learning by building rote learning higher-order or “deeper” learning in a variety of ways. It is a vehicle for communication and collaboration as well as a tool for differentiation and organization and storage of knowledge. Technology can help learners to become systems thinkers and question assumptions about world-views and lead to innovation. With the support of technology, learning can reach new and “previously inconceivable” heights, and in doing so prepare learners for an unknown and rapidly changing future.

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