On Learning to Subvert Signs: Literacy, Technology and the TPACK Framework

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ABSTRACT

This paper discusses new literacy practices that can be enabled through the creative repurposing of digital technologies. We frame the discussion within the Technological Pedagogical Content Knowledge (TPACK) framework. TPACK is a form of knowledge that teachers need to have in order to successfully integrate technology in their teaching. TPACK argues for the idea of teachers as designers of curriculum, who repurpose existing technical tools for pedagogical purposes. Finally we offer a set of implications of this approach for teacher preparation programs.

Key Words: Technology; TPACK, Literacy Curriculum

Michael Hughes (http://mhughes5.blogspot.com/) then a sixth grade teacher in Jakarta, Indonesia, had his students do a "word list." But his approach was different from what is done in elementary and middle schools across the country (and the world) where children are instructed to memorize the spelling and definition of a set of words relevant to that week's curricular goals. Michael, wanted to use technology to facilitate complexity and deep understanding beyond rote spelling memorization. First, students in the class constructed the list by contributing words they had encountered in their own reading. Then they looked up their meanings and finally went online looking for photographs that could visually represent these words. These images were then posted on their personal blogs and shared with all the other students in the class, allowing students to compare and contrast different images that others had chosen (for the same words) driving home to them the nuances in meaning that specific words can convey.

Sean Nash (http://nashworld.org/) is a high school biology teacher who maintains a multi-year social network for his classroom. One day he linked to a series of websites (one blog was maintained by at 10 year old girl) where people were writing poetry about science or mathematics. This form of poetry (called Math-Po or Sci-Po) lies at the unlikely (in traditional domain specific thinking) junction between mathematical and scientific truth and fact, and poetic expression through grammatical subversion. Sean challenged his students to write poems about current ideas and topics they were learning about. His students took to the task with gusto and soon their website had a series of poems about difficult scientific ideas. Sean has written about how this act of translation (from a textbook or scientific article to a poem) requires deep understanding of the content. His students were also now connected to a larger community of sci-po and math-po writers and their work has been read my many people across the world. Sean also talks about how the process of constructing something (the act of design) can be as important, maybe more so, than the actual produce that emerges.
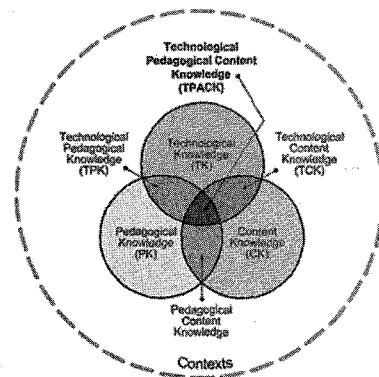
Both stories may seem simple and straightforward however each is wrought with complexity and sophistication. First, for both the up-dated word lists and the Math and Sci-po, students must truly understand the word or concept to be able to represent it in a new graphical, or grammatical way. Second, both examples foster rich understanding that takes place when engaged in interdisciplinary learning rather than learning a single discipline in artificial isolation. Third, both examples allow students to transform an idea or concept into something concrete (an image, a poem) that allows them the autonomy to manipulate the idea or concept and forces them to justify their choice of representation. And fourth, after creating these representations students are able to share their work with others and receive vital feedback.

These examples also carry with them important implications and requirements for teachers who are ultimately responsible for orchestrating and facilitating learning exercises. First, they require teachers' knowledge not of a specific technology but rather knowledge of the affordances and constraints of technology and how to use technology to facilitate deep, comprehensive learning. A new level of technical competency and literacy is needed by teachers to use technology in ways that enhance student learning. Classroom technology has advanced beyond using technology to simply deliver instruction (textbooks, projectors, whiteboards) and now holds the potential to transform content and pedagogy. Second, technology is not educational by default, it must be used and *repurposed* by a competent and capable teacher, one who is skilled and confident in their technical literacy. Teachers must embrace the role of becoming designers of curriculum, choosing technology that is appropriate for the content to be covered and their pedagogical approach. This is key for making these innovations work for their specific classrooms and learning needs. Third, technical literacy, subverting signs and repurposing

technology is possible through melioration, the process of taking ideas from one field and applying them to another.

THE TPACK FRAMEWORK

Research and scholarship in the area of teacher knowledge has produced integrated framework for reasoning about how technology connects to content knowledge and knowledge of teaching, called the *Technological Pedagogical Content Knowledge* (TPACK) framework (American Association of Colleges of Teacher Education, 2008; Koehler & Mishra; 2008; Mishra & Koehler, 2006). This framework operates from a number of premises about the nature of teaching, including that: teaching is a highly complicated form of problem seeking and problem solving that derives from flexible and integrated bases of knowledge; teaching is dependent on flexible access to and application of highly organized systems of knowledge (Glaser, 1984; Putnam & Borko, 2000; Shulman, 1986, 1987); teaching must continually shift and evolve based on the contexts within which it is applied; and teachers practice in a highly complex, dynamic environment (Leinhardt & Greeno, 1986; Spiro, Coulson, Feltovich, & Anderson, 1988; Spiro, Feltovich, Jacobson & Coulson, 1991) that asks them to integrate knowledge of student thinking and learning, knowledge of the subject matter, and increasingly, knowledge of technology.

The TPACK framework (from http://tpack.org/)

Technological Pedagogical Knowledge (TPK) refers to the knowledge about how teaching and learning change when particular technologies are used. Teachers need to be equipped with knowledge about various technologies and be able to use them as pedagogical strategies in their classrooms.

This TPACK framework highlights three core knowledge components: Content, Pedagogy & Technology. *Content Knowledge (CK)* refers to the knowledge about the subject matter that is to be learned or taught, such as 8th grade mathematics, or 5th grade science. *Pedagogical Knowledge (PK)* refers to the knowledge about the processes and practices or methods of teaching. It includes knowledge about classroom management skills, teaching strategies, evaluation techniques, and the nature of target audience. *Technology Knowledge (TK)* refers to the knowledge about both the standard technologies and more advanced technologies. It enables teachers to understand information technology, apply it properly, identify useful technologies, and continually adapt to changes in technology (Mishra & Koehler, 2006; Koehler & Mishra, 2008).

Equally important within this framework are the interactions among these bodies of knowledge. *Pedagogical Content Knowledge (PCK)* derives from Shulman's idea of knowledge of pedagogy that is applicable to the teaching of specific content (Shulman, 1986). *Technological Content Knowledge (TCK)* refers to the knowledge about the manner in which technology and content influence and constrain one another. *Technological Pedagogical Knowledge (TPK)* refers to the knowledge about how teaching and learning change when particular technologies are used. Teachers need to be equipped with knowledge about various technologies and be able to use them as pedagogical strategies in their classrooms. Finally, *Technological Pedagogical Content Knowledge (TPACK)* refers to the knowledge that emerges from an understanding of an interaction of content, pedagogy, and technology knowledge. Quality teaching requires developing a nuanced understanding of the complex interplays between three key sources of knowledge: technology, pedagogy, and content and how they play out in specific contexts (Mishra & Koehler, 2006; Koehler & Mishra, 2008).

The TPACK framework has been helpful in thinking about the types of knowledge that teachers may need in order to successfully integrate technology into their classrooms, by emphasizing that technical knowledge, per se, is not enough. But rather, teachers also must understanding that technology has affordances and constraints for representing content ideas, and for affording and constraining the kinds of teaching approaches used to teach those ideas. This knowledge and understanding of affordances and constraints of technology is a new type of literacy, a new ability, the ability to consciously subvert signs.

TEACHERS KNOWLEDGE AND TECHNICAL LITERACY

The kinds of knowledge teachers need to develop can almost be seen as a new form of literacy - as a collection of skills, competencies and knowledge of how to use (multi-) disciplinary knowledge, pedagogical techniques, and technological tools in their classrooms. We build upon a definition of literacy suggested by Myers (1995) as "the ability to consciously subvert signs," implying that knowledge required for teaching is "more than just the ability to use sign systems to communicate some conventional meaning, because… literacy should be reserved for some state of agency in which one can control, even manipulate, how signs are used." (Myers, p. 582).

There are many reasons we support this new approach towards teacher knowledge. First, this definition emphasizes that teachers manipulate signs and symbols (of various kinds, language, equations, images, video, and so on). Second, this definition emphasizes the importance of teacher agency –the conscious manipulation of signs for educative or communicative purposes. Third, teachers are able to subvert these signs, implying that the sign-systems are not sacrosanct,

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but rather are human constructions that teachers can design and re-design for their particular context. Fourth, this definition emphasizes the value of teacher expertise, since subversion is not possible unless the teacher knows the rules of the game, and is fluent enough to know which rules to bend, which to break, and which to leave alone. Fifth, this definition emphasizes teacher creativity. As we know, the wicked problems (Rittel & Webber, 1973) of teaching with technology demand creative solutions. Most technological tools we use (Office software, Blogs, etc.) are not designed for teachers, and we have to re-purpose (subvert) them for their needs.

TEACHERS AS DESIGNERS

Repurposing these tools for educational purposes, however, is not a trivial problem. For educators to repurpose tools and integrate them into their teaching, they require the creative application of TPACK by developing habits of mind that encourage melioration, across disciplines, regarding new tools and developing new pedagogical strategies. Viewing teachers' use of technology as a new literacy emphasizes the role of the

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teacher as a producer (as designer), away from the traditional conceptualization of teachers as consumers (users) of technology.

Literacy is an active process in which individuals must switch between producing, creating and receiving content of any form. New literacies are about not only this give and take but also about agency and autonomy. The ability to subvert signs gives the producer freedom to create signs of "one's own." In terms of technological literacy, the ability to subvert means the ability to manipulate, change, adapt, and repurpose technology to fit specific educational purposes. The ability to subvert technology gives teachers the ability to redesign technology to reach or communicate in some way with students. Most technologies are not designed or intended specifically for education. This is not to say however that teachers cannot use any and all technologies for education, just that conscious and effective use of technology for education is required to transform technologies from the broad consumer market to effective use in the classroom.

REPURPOSING TECHNOLOGY AND SUBVERTING SIGNS

Why is acquired ability to consciously subvert signs a useful way of looking at literacy? Technology is in a rapid state of change, new technologies are emerging all the time. Many new technologies hold incredible potential for education, but keeping up with each and every technological breakthrough is nearly an impossible feat. Competencies in specific technologies and specific types of communication will serve little purpose in a world where not only technology but the way individuals communicate and express themselves takes many, very different forms. This is not to say that technological knowledge is not required for successful integration into education, rather flexible, creative, and adaptive technological knowledge is required. A sort of technological literacy, in which educators are able to control, manipulate, and utilize technology to fit their specific teaching needs. Who could have predicted the emergence of "text speak" that has taken text-messaging and a whole generation by storm. We are not advocating integrating "text speak" into curriculum, but rather than ignore this cultural phenomenon teachers need to have the technological literacy to adapt technology, that in many ways seems at odds with education, for educational purposes.

Signs are new symbols systems available through new media. Similar to mulitliteracies defined by the New London Group (1996), signs can and do take any and all forms. Signs can be the clothing we wear, the art we create, the music we surround ourselves with, virtually anything and everything that

we purposefully and consciously chose, represents "us." Simplistic representations of signs no longer account for a majority of representations. Not everything of symbolic purpose is spoken or written linearly, new signs are emerging and beginning to represent a large part of how we communicate, interact and learn. New technologies are affording new signs and we have yet to develop a way for talking about this, about the precipitates and effects, the complexity and the consequences.

To subvert technology for education teachers must be able to identify and acknowledge technology with specific pedagogical value. Unfortunately, teachers are rarely if ever trained to experiment and play with technology. It is only by understanding these new tools that teachers can learn to "subvert" them for pedagogical purposes. Such pedagogical subversion is a challenging task. It requires a new set of skills; it requires an emphasis on creativity and innovation, a willingness to suspend judgment about particular tools and technologies and a tolerance of ambiguity. It requires teachers to be able to think across domains and overcome functional fixedness to produce meaningful educational technology that fit their specific needs. Successful subversion requires melioration, competence to borrow a concept or idea from one field of study and apply it to fill a need or solve a problem in another field (Passig, 2007). These are not skills that are currently given much emphasis in the teacher education curriculum or in teacher professional development. Indeed, they are not valued by politicians and policy makers.

CONCLUSION

The TPACK framework emphasizes the role of teachers as decision makers who design their own educational technology environments as needed, in real time, without fear of becoming

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"outdated" or obsolete. In this approach, teachers do not attend to specific tools, but instead focus on approaches to teaching that endure through change in technologies, content or pedagogies. Teachers with flexibility of thought, tolerance of ambiguity and willingness to experiment can combine traits that perfectly design and tailor their own educational content, pedagogical, and technological environments. Remembering back to the two stories presented at the beginning of this paper, there are three implications and requirements embedded in the activities. First, teachers must gain broad technical knowledge, technical literacy or the ability to subvert signs. Second, teachers must be willing to experiment and put their technical literacy to work as deliberate designers of technology. And third, teachers' can design, repurpose technology and ultimately subvert signs through melioration. Both stories are great examples of how easy access to networked digital tools can

change and transform simple instructional assignments and lie at the heart of repurposing and interdisciplinary thinking.

Clearly an approach, that places TPACK at the center of teacher training, and offers opportunities for deep-play and creativity (Mishra, Koehler & Henriksen, in press) are the need of the hour. It is only then that teachers can help foster the kinds of multi-literacies so required in this technology saturated world.

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