Digital Storytelling: A Powerful Technology Tool for the 21st Century Classroom

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Digital storytelling has emerged over the last few years as a powerful teaching and learning tool that engages both teachers and their students. However, until recently, little attention has been paid to a theoretical framework that could be employed to increase the effectiveness of technology as a tool in a classroom environment. A discussion of the history of digital storytelling and how it is being used educationally is presented in this article. The theoretical framework, technological pedagogical content knowledge (TPCK), is described, along with a discussion of how this model might be used with digital storytelling.

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IN MARCH OF 2007, THE U.S. Department of Education reported to Congress the findings of a major study that focused on the impact of computer software on academic achievement by elementary, middle, and high school students in Reading and Mathematics (U.S. Department of Education, 2007). The report concluded that "Test scores were not significantly higher in classrooms using the reading and mathematics software products than those in control classrooms," and there were "no significant differences in student achievement between the classrooms that used the technology products and classrooms that did not" (p. 1). These results appeared on the front page of major newspapers across the country and to the casual reader, this was just another one of the many indicators that our students are falling behind and the huge public investment to put computers in schools has been a waste of time and money.

However, numerous educators, researchers, and technology advocates would respectfully dis-

agree with both the findings of the report and the way that the study was conducted to begin with. In an article ("ED study slams software efficacy," 2007, May) in *eSchool News*, several well-known technology advocates responded to the report to Congress. Keith Krueger, chief executive officer of the Consortium for School Networking, stated, "This study failed to address several key pieces that other research and educators strongly agree are critical to the success of any efforts to transform teaching and learning" (p. 26). Mary Ann Wolf, executive director of the State Educational Technology Directors Association, added, "Strong leadership is needed to encourage the correct use of technology, provide support throughout, and systemically integrate the use of technology for instruction. Integrating technology is much, much more than putting a piece of software into a classroom" (p. 26). As the study purports, it addressed a very narrow piece of educational technology; but more important, the study did not include critical components known to be essential for the successful integration of technology—or any other reform effort in transforming education.

Noted neuroscientist Michael Merzenich (2007), a professor at the University of California at San Francisco's Keck Center for Integrative Neurosciences, went on to say that simply adding computers to conventional teaching strategies is an unsophisticated approach that, it is not surprising, adds very little to students' experiences in the classroom. He stated, "In a world run by computers, where almost every kid in that class will have some sort of a computer in their pocket and on their desk in their future life and job, wouldn't it make sense to measure the impacts of serious computer-based training on our school children's reactions to, and their facile uses of computers?" (p. 1).

The reality is that advocates of instructional technologies in schools have, for many years, been urging educational administrators and policymakers to change the focus from the technology itself to ways that technology can be used to bring out the very best in how teachers teach and how students learn.

How and Why Students and Teachers are Engaged by New Technologies

As the debate over the effectiveness of computer technologies in schools rages on, young people continue to use emerging technologies in their personal lives, even if a large number of educators have not yet found ways to meaningfully integrate them in the classroom. Ask just about any young person about the technologies that they regularly use and you will find that they are not just limited to the widely publicized Web sites such as MySpace and YouTube. The list also includes blogs, wikipedias, podcasts, and social bookmarking tools. Some, if not most, of these resources are unfamiliar to teachers (and parents), but today's students are using them at an ever-increasing pace and in ways that are helping to define a new generation of not just information-gathering, but information-creating as well.

What makes these tools so compelling is the nature of what has come to be known as *user contributed content, social media,* and *Web 2.0*. Roush (2006) wrote that these technologies are part of a transformation from "one-to-many communication on the Web" to "many-to-many communication, and that traffic and conversation naturally cluster around content, such as videos, photos, blog posts, and bookmarks" (p. 1). Borland (2007) explained this technological evolution in the following way:

> Web 1.0 refers to the first generation of the commercial Internet, dominated by content that was only marginally interactive. Web 2.0, characterized by features such as tagging, social networks, and user-created taxonomies of content called *folksonomies*, added a new layer of interactivity, represented by sites such as Flickr, Del.icio.us, and Wikipedia. (p. 1)

What further distinguishes these emerging technologies from earlier ones is that they are being customized and personalized in dynamic, and often unpredictable, ways by their users, and this personalization is having a profound impact on how people, especially young people, are conducting business, finding entertainment, and

participating in social relationships. However, when it comes to using these technologies in the classroom, many teachers still do not have a good grasp of how to use them in their teaching. Judge, Puckett, and Cabuk (2004) sum up the situation this way:

> Teacher familiarity, confidence, and skill in choosing software and integrating technology into the curriculum are dependent on teacher training and time for self-directed exploration and learning. Due to the relative newness of computer technology, many teachers have not received adequate training to select appropriate technologies and lack support to use them. (pp. 386–387)

The Emergence of Digital Storytelling

Digital storytelling is a technology application that is well-positioned to take advantage of user-contributed content and to help teachers overcome some of the obstacles to productively using technology in their classrooms. At its core, digital storytelling allows computer users to become creative storytellers through the traditional processes of selecting a topic, conducting some research, writing a script, and developing an interesting story. This material is then combined with various types of multimedia, including computer-based graphics, recorded audio, computer-generated text, video clips, and music so that it can be played on a computer, uploaded on a web site, or burned on a DVD.

Despite the current emphasis on multimedia technology, digital storytelling is not a new idea. Joe Lambert and the late Dana Atchley helped create the digital storytelling movement in the late 1980s as cofounders of the Center for Digital Storytelling (CDS), a nonprofit, community arts organization in Berkeley, California. Since the early 1990s, the CDS has provided training and assistance to people interested in creating and sharing their personal narratives (Center for Digital Storytelling, 2005). The CDS is also known for developing and disseminating the Seven Elements of Digital Storytelling (as described in Table 1), which are often cited as a useful starting point to begin working with digital stories.

In the early days of digital storytelling, Lambert was impressed by how easily average people were able to "capture their story in a really powerful way in a relatively short amount of time for a relatively small amount of money" (Tucker, 2006, p. 54). Fast forward to today and one can see that what is new is that the tools needed for digital storytelling—computers, scanners, digital cameras, and high-quality digital audio capture devices—have become increasingly more affordable and accessible. Add to this mix a series of powerful, yet inexpensive software programs that allow even novice computer users to become digital media producers and editors on a scale that was hardly imagined when Atchley and Lambert were first beginning their work. We are currently witnessing dramatic growth in the educational use of digital storytelling, as a convergence of affordable technologies interacts with a contemporary agenda for today's classroom, as illustrated in Figure 1.

The combination of powerful, yet affordable, technology hardware and software meshes perfectly with the needs of many of today's classrooms, where the focus is on providing students with the skills they will need to "thrive in increasingly media-varied environments" (Riesland, 2005).

As an instructional tool, teachers have the option of showing previously-created digital stories to their students to introduce content and capture students' attention when presenting new ideas. Researchers such as Burmark (2004) have found that integrating visual images with written text both enhances and accelerates student comprehension, and digital storytelling is an especially good technology tool for collecting, creating, analyzing, and combining visual images with written text. Teachers who are able to create their own digital stories may find that they can be particularly helpful not only in engaging students in the content but also in facilitating discussion about the topics presented in a story and helping make abstract or conceptual content more understandable. A multimedia-rich digital story can serve as an anticipatory set or *hook* to capture the

Table 1
The Seven Elements of Digital Storytelling

Center for Digital Storytelling's Seven Elements of Digital Storytelling

1. Point of view	What is the main point of the story and what is the perspective of the author?
2. A dramatic question	A key question that keeps the viewer's attention and will be answered by the end of the story.
3. Emotional content	Serious issues that come alive in a personal and powerful way and connects the story to the audience.
4. The gift of your voice	A way to personalize the story to help the audience understand the context.
5. The power of the soundtrack	Music or other sounds that support and embellish the storyline.
6. Economy	Using just enough content to tell the story without overloading the viewer.
7. Pacing	The rhythm of the story and how slowly or quickly it progresses.

Figure 1. The convergence of digital storytelling in education.

attention of students and increase their interest in exploring new ideas. Teacher-created digital stories may also be used to enhance current lessons within a larger unit, as a way to facilitate discussion about the topics presented in a story and as a way to make abstract or conceptual content more understandable (Robin, 2008).

Perhaps the greatest benefit in the classroom may be found when students are given the task of creating their own digital stories, either individually or as members of a small group. This creative work provides students with a strong foundation in what many educators (Brown, Bryan, & Brown, 2005; Jakes, 2006; Partnership for 21st Century Skills, 2004) have begun calling *21st Century Literacy, Digital Age Literacies,* or *21st Century Skills*. Regardless of the specific term being used, these skills are being described as the combination of:

- Digital literacy—the ability to communicate with an ever-expanding community to discuss issues, gather information, and seek help;
- Global literacy—the capacity to read, interpret, respond, and contextualize messages from a global perspective
- Technology literacy—the ability to use computers and other technology to improve learning, productivity, and performance;
- Visual literacy—the ability to understand, produce, and communicate through visual images;
- Information literacy—the ability to find, evaluate, and synthesize information.

Digital storytelling can be a potent learning experience that encompasses much of what society hopes that students will know and be able to perform in the 21st century (Jakes & Brennan, 2005). The push for students to gain 21st century literacy skills by using the latest technology to communicate effectively is facilitated by students actively participating in the creation process of digital storytelling (Jakes & Brennan, 2005). As they do so, students develop enhanced communication skills as they learn to conduct research on a topic, ask questions, organize their ideas, express opinions, and construct meaningful narratives. Students who participate in the full

digital storytelling experience may also benefit from learning to critique their own work, as well as the work of others, facilitating social learning and emotional intelligence (Robin, 2008).

To practitioners of digital storytelling outside of education, this technology is most often used to create personal narratives that document important events in one's life. However, digital storytelling can also be a powerful tool in the classroom when used to produce historical documentaries, as well as instructional presentations that inform viewers about a particular concept or practice (Robin, 2008).

At the University of Houston, The Educational Uses of Digital Storytelling Web site has been established to provide information and examples of how this technology is being used by students and teachers in K–12 and higher education classrooms. The Web site, located at http://www.coe.uh.edu/digitalstorytelling/, also sorts example digital stories into the following three major categories: personal or narrative stories, stories that inform or instruct, and stories that re-tell historical events.

Personal Narratives

Perhaps the most popular type of digital story is one in which the author tells of personal experiences. These stories can revolve around significant events in life and can be emotionally charged and personally meaningful to both the author and the viewer. Many subcategories of personal digital stories have been described by Lambert (2003) and others and include stories that honor the memory of specific people and places, or deal with life's adventures, accomplishments, challenges, and recovery.

Stories That Inform or Instruct

This type of digital story is used primarily to convey instructional material in many different content areas. Teachers can use this type of digital story to present information to their students on subjects ranging from math and science, to art, technology, and medical

education. For example, digital stories have been created that demonstrate how to construct and use a pinhole camera (http://www. coe.uh.edu/digitalstorytelling/pinhole.htm), what can be done to increase someone's health during the aging process (http://www.coe.uh.edu/ digitalstorytelling/agingwell.htm), and how to help students understand principles of geometry through an examination of everyday objects (http://www.coe.uh.edu/digital-storytelling/ geo-story.htm). Although many personal narratives may include historical information as a backdrop to a digital story, digital stories may also be created by using combinations of these methods, such as autobiographical stories that use historical material as the backdrop of a personal narrative (http://www.coe.uh.edu/ digital-storytelling/computer-I.htm).

Stories That Examine Historical Events

A different type of story can be created by using digital media to recount events from history. In a classroom environment, students might use historical photographs, newspaper headlines, speeches, and other available materials to craft a story that adds depth and meaning to events from the past. A good example of this type of story is online at: http://www.coe.uh.edu/digital-storytelling/civilization.htm.

Visitors to the Examples section of the Educational Uses of Digital Storytelling Web site (http://www.coe.uh.edu/digitalstorytelling/ examples.htm) will find many more examples of digital stories created by educators and students on topics that cover numerous content areas. In addition, educators who visit the Web site may also be interested in exploring the Digital Storytelling Ideas page (http://www.coe.uh.edu/ digitalstorytelling/educational-uses.html) where they will find resources aimed at teachers, instructors, and workshop facilitators who plan to use digital storytelling in the classroom.

Even though few research studies on the effectiveness of digital storytelling have been conducted, numerous findings have been reported on the benefits of multimedia projects in which students have shown an increase in research skills,

increased organizational skills, and a greater interest in the content being taught (Paull, 2002; Salpeter, 2005). Many educators involved in multimedia projects with students would agree that some of the most significant gains pertain to higher-order thinking and problem-solving skills, including synthesizing, analyzing, evaluating, and presenting information. When students use technology such as digital storytelling, they learn to "convert data into information and transform information into knowledge" (Cradler, McNabb, Freeman, & Burchett, 2002, p. 3).

The Need for a Better Theoretical Framework

Given what is known about how digital storytelling can be used in the classroom to engage and motivate both students and teachers, people must ask themselves if the U.S. Department of Education 2007 report to Congress that found "no significant differences in student achievement between the classrooms that used the technology products and classrooms that did not" (p. 1) might have shown vastly different outcomes if the technology use was different. It is worth asking what the findings might have been if digital storytelling had been used by teachers and students in the classrooms that were the focus of the research study instead of the mostly drill and practice reading and mathematics software that was used.

Part of the problem in this complex set of issues is that there is not yet a consensus in the field of instructional technology that serious educators and researchers agree upon with which to conduct productive and meaningful investigation. However, it is clear to many that content integration, supported by powerful computer technologies, is needed, and the impact that computer technology can have on students is much more meaningful when it involves an impact on higher order thinking skills, not just test scores.

In an editorial that discusses the effectiveness of technology use in schools, editors of five educational technology journals who are members of the National Technology Leadership Coalition

(Schrum et al., 2007) wrote "that different technologies do have unique pedagogical affordances and that the effects of these affordances can only be understood in the context of a specific content area (and related learning outcomes) and a specific pedagogy" (p. 3).

Technological Pedagogical Content Knowledge (TPCK): A Theory for Integrating Technology in the 21st Century Classroom

Pierson (2001), Mishra and Koehler (2006, 2007), and others have advocated that the use of a conceptually-based theoretical framework can improve how teachers are trained, how they teach when they arrive in the classroom, and even what research questions researchers explore in this area. The term *technological pedagogical content knowledge* (TPCK) is gaining a great deal of attention in the field of technology and teacher education as it focuses on the relationship between knowledge about content, pedagogy, and technology. TPCK can be traced back to the earlier work of Shulman (1986) who introduced the idea of pedagogical content knowledge, or PCK, and Pierson's investigation of the relationship between teaching abilities and what she labeled *technology-use abilities*. Pierson's framework utilized composite categories of teaching ability and technology-use, which helped lead to much deeper investigation of how technology is used by teachers, both during their preservice training and once they are practicing classroom teachers.

But it was Shulman's (1986) suggestion that content knowledge and knowledge of pedagogy no longer needed to be considered as separate, independent entities that changed much of the thinking about teacher education. Both Pierson's (2001) and Shulman's work has now evolved to an overlapping framework that highlights the interactions and connections between content (the subject being taught), pedagogy (the teaching process being used), and technology, whether it is pencils and blackboards or computers and other sophisticated digital devices.

Mishra and Koehler (2006) have written extensively about how TPCK can be used in the classroom and described its various components as follows:

> TPCK is the basis of good teaching with technology and requires an understanding of the representation of concepts using technologies; pedagogical techniques that use technologies in constructive ways to teach content; knowledge of what makes concepts difficult or easy to learn and how technology can help redress some of the problems that students face; knowledge of students' prior knowledge and theories of epistemology; and knowledge of how technologies can be used to build on existing knowledge and to develop new epistemologies or strengthen old ones. (p. 1029)

A graphical representation of how TPCK's components fit together is shown in Figure 2.

Mishra and Koehler (2006) underscored that this framework is just a beginning and, like all frameworks, it is not perfect and needs additional testing, use, and modification. But as they noted, "no single framework can provide all the answers. The TPCK framework is no exception. However, we do believe that any framework, however impoverished, is better than no framework at all" (p. 1047).

How TPCK Can Be Used With Digital Storytelling

We have seen that multimedia projects in general, and digital storytelling specifically, can be used to engage and motivate both teachers and students. This technology, although powerful, is currently being used in K–12 and higher education classrooms with an emphasis on technical skills and without the greater level of thought and consideration to the subject matter, the teaching strategies, and the real world needs of today's classrooms. As Hicks (2006) suggested, this framework might be helpful in guiding teachers to apply their knowledge in the classroom by providing "the ability to think about and use technology in critical, creative, and responsible
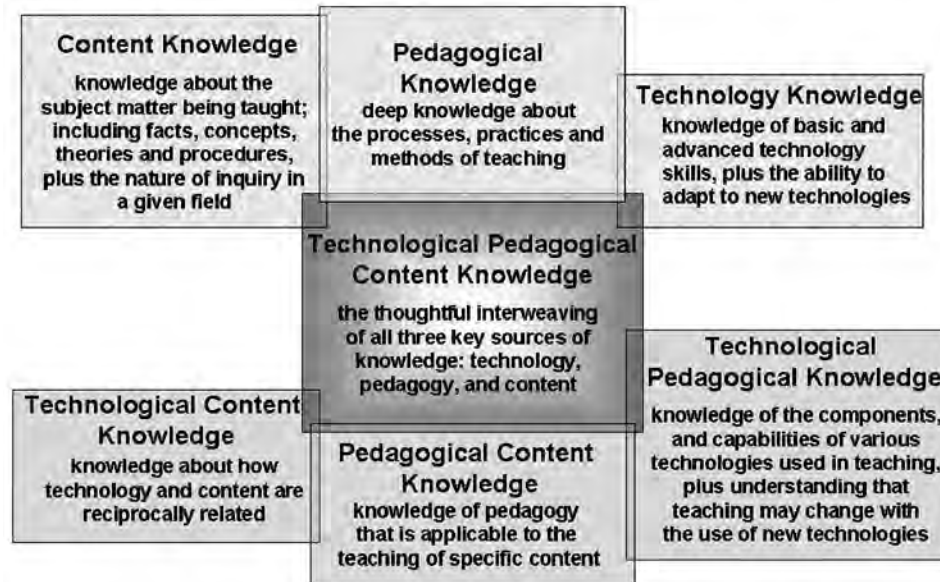
Figure 2.   Interactions of TPCK as described by Mishra and Koehler (2006).

ways—will then develop and enhance TPCK" (p. 50).

It is also important to consider how educators might conduct future research studies that can demonstrate the benefits of multimedia in general and digital storytelling in particular, and reduce the controversy generated by findings such as those from the 2007 U.S. Department of Education study discussed earlier. Most serious educators and policy makers would agree that motivation is a critical ingredient for learning, and research studies that demonstrate increases in motivation by students that participate in digital storytelling and similar technologies should be designed and conducted. It is also important that teachers learn effective ways to motivate their students to become more engaged in learning new content with the help of multimedia technologies. Muller, Eklund, and Sharma (2006) acknowledged that motivation can be "difficult to define, measure and control"; however, they believe that "studies must seek to identify the methods employed in various media that can demonstrably and repeatedly enhance motivation" (p. 8). Perhaps by combining the convergence of digital

storytelling in education as earlier described with the theoretical framework of TPCK, researchers will arrive at a deeper understanding of the different and more powerful roles that digital media can play in both teaching and learning.

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