Technology in the Classroom: The Impact of Teacher’s Technology Use and Constructivism

A Synthesis Paper

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Abstract

Technology applications of any kind, from the simplest to the most complicated, have changed the way we teach and the way we learn. In addition, there are many learning theories used to utilize and integrate these technologies more effectively. This paper will look at the importance of employing technology and appropriate learning theory to improve the outcome of the teaching and learning process. This synthesis paper will discuss (a) the reasons to use technology in the classroom (b) factors of teacher’s proficiency in using technology and (c) the advantages of constructivist learning theory in technology integration in the classroom. This paper will question whether technology by itself can make the education process more effective or if technology needs an appropriate instructional theory to effectuate its positive impact on the learner. The authors of this paper will present their thoughts and conclude with an answer to the stated problem.
Introduction

In the education system, almost everyone is aware of the importance and positive influences of using technology tools in the classroom. Fortunately, this has gone beyond the stage of thoughts and theories as today’s teachers attempt to integrate technology as a part of the educational system. Along with these changes in the classroom, the theories of learning that form the foundation of instructional design have also changed as educators attempt to develop new approaches to increase the learner outcomes.

However, this transition has not been easy, nor has it been without challenges that continue to slow the transition from traditional brick and mortar approaches to a more modern and technology-centered focus. While technology provides many new opportunities to address issues such as learning styles, student-centered instruction and promote higher-level thinking, the teacher’s attitudes and perceptions often prevent them from fully integrating technology into their course design (Teo, 2008). This hesitation leads to technology being used as a substitute for other tools in their traditional teaching styles instead of as a new approach to instruction (Judson, 2006). There are many reasons for this, but it is primarily a symptom of a teacher’s enthusiasm, comfort and interest in technology.

There are many factors that encourage a teacher to use technology in her classroom. These factors include computer self-efficacy, personal technology use, positive teacher attitudes towards technology and access to professional development in the technology realm. All of these are important in motivating a teacher to use technology tools. However, using technology in the classroom by itself is not effective unless you have a theory to model your instruction with. This paper will examine the factors that influence
teachers to use technology in their classroom and attempt to find a correlation between technology use and constructivist teaching practices.

**Reasons for Teacher’s Technology Use in the Classroom**

In the more than two decades since technology applications such as overhead projectors, VCRs, slides, smart boards, computers, software, internet, LMS, Web 2.0, etc. have been introduced to the education system, the resources for teaching have significantly changed. There are many advantages in using technology in educational settings. For example, it makes the learner more interested about the subject, it decreases learning time, and it provides opportunities to learn in non-traditional ways. Technology is transforming the way we learn. By transforming the process, it is also transforming the outcome (Fouts, 2000).

As an illustration, Swan (2005) and her colleagues wanted to find out if the use of mobile computing devices among elementary and junior high students would stimulate student motivation to learn, keep students engaged in learning activities, and sustain students’ learning methods. They found that the use of mobile computing devices in a classroom does indeed pose specific benefits. First, findings revealed that student motivation towards and concentration during learning activities - especially learning tasks that involved writing - increased when students used mobile computing devices to complete these assignments. Second, preliminary findings showed that the use of mobile computing devices could sustain student-learning methods. The devices were particularly helpful to students during writing assignments because the mobile devices used for this research project possessed writing capabilities because they had a full-size keyboard built into them. Third, findings suggested that the use of mobile computing devices could
decrease the division in conceptual comprehension abilities among the general student population and students with special needs. Fourth, teacher interviews affirmed that students showed advanced writing capabilities and used their work time more effectively due to the use of mobile computing devices.

Influences on Teacher Technology Use in the Classroom

Generally speaking, teachers that use technology in their classrooms have been influenced by a variety of factors either in their pre-service training, their personal lives, or during their teaching career that have influenced them to do so. One of the major factors that influences teacher technology use in the classroom is whether a teacher received technology training in their undergraduate coursework. If teachers are properly taught how to use technology before they enter a real classroom, their computer self-efficacy will increase, and their likeliness to use technology in the classroom will improve. Studies have shown that when pre-service teachers attend educational technology courses that emphasize technology use skills as part of the curriculum, the pre-service teachers' computer self-efficacy improves (Koh & Frick, 2009).

There is a positive relationship between a teacher's computer self-efficacy and technology integration in the classroom (Koh & Frick, 2009). In a study conducted by Hernandez-Ramos (2005) he notes that since technology is frequently used by youth these days, sometimes student knowledge of technology can trump teacher knowledge. In these situations the roles of teacher (expert) and student (novice) can sometimes become interchanged and some teachers may feel embarrassed by this situation. For the most part, teachers want to feel in control in regards to technology in the classroom. Fifty-five percent of teachers surveyed strongly agreed with the statement "A teacher's proficiency
with computers will affect his or her willingness to integrate technology into the curriculum" (Hernandez-Ramos, 2005, p.47).

Secondly, research indicates that a teacher's personal computer use outside of school is the most consequential indicator of a teacher's technology use in the classroom (Wozney, et al. 2006). In the Hernandez- Ramos study (2005) teachers were asked how long they had owned a personal computer. The teachers were shown an assortment of eleven types of software applications and asked to rate their knowledge of each one. It was found that teachers who possessed high amounts of knowledge in regards to the eleven software applications let their students use computers one more day per week on average than teachers who were less proficient. Findings from this study (Hernandez-Ramos, 2005) revealed that if teachers were regularly using technology at home they would feel comfortable using it in the classroom.

There is a famous quote by Dr. Robert Anthony that says, “Forget about all the reasons why something may not work. You only need to find one good reason why it will.” This quote relates to how teachers attitudes towards technology affect their use or non-use of it in their classroom. The third area of focus concerns evidence to support the notion that when teachers have positive attitudes toward computers, technology will be effectively implemented into the classroom (Christensen, 2009). Some of these positive attitudes include the expectation that they will be able to implement the technology successfully and that implementing technology into the classroom is valuable to student learning (Wozney, et al. 2006).

Fourth, the U.S. government recognized the need to assistant teachers in effectively integrating technology into their K-12 classrooms. As a result, the No Child Left Behind
Technology in the Classroom: The Impact of Teacher’s Technology Use and Constructivism

Act / Enhancing Education Through Technology Program (NCLB-EETT) Funded Professional Development Program was developed to accomplish this purpose. Researchers wanted to see how beneficial this program was for the teachers involved. The researchers found that the government-funded courses did enhance participants' self-assurance and capability in integrating technology into their teaching (Overbaugh, 2008).

A similar study looked at the West Virginia K-12 RuralNet Project funded by the National Science Foundation. The purpose of this program was to teach educators how to integrate the Internet into their science and mathematics lessons. Researchers found that:

(a) The program improved teachers' self-efficacy towards Internet use. These levels of improved self-efficacy were still evident years after teachers had taken the classes. (b) The type of professional development program teachers are involved in makes a difference in improving their self-efficacy regarding technology. In this particular program a rigorous summer workshop was combined with extra online courses. (c) Specific environmental factors may impact teacher self-efficacy over time (Watson, 2006). In the final analysis, teachers that experience technology-rich professional development classes throughout their teaching careers are more likely to implement technology into their classrooms than teachers who do not have these opportunities.

**Teacher’s Use of Learning Theories Makes Technology Tools More Effective**

However, neither using technology nor a learning theory independently makes a productive class. Technology use should be embedded within a learning theory to support the methodology (Muniandy, Mohammad & Fong, 2007). In the majority of today’s classes the instruction is based on traditional learning theories where technology is being used only as a tool in replacement of traditional tools. For instance, teachers use Power
Point slides instead of textual handouts or writing on the blackboard. The question is: Does technology by itself make the classroom effective, or do you have to have a model or instructional theory to integrate technology in an effective way? Do we need to have an appropriate learning theory as a framework in which our educational outcome (learner) can be more creative and productive? (Rakes, Fields & Cox, 2006).

These research findings suggest that teachers cannot rely on technology tools or learning theory independently. These two variables must come together to make a productive classroom environment. Which learning theory works best with technology tools to accomplish this goal?

**The Benefits of Constructivism**

Education has three basic purposes: remembering knowledge, understanding knowledge, and applying knowledge and skills in actual contexts (Perkins, 1991). These are the first three steps of lower-order skills in Bloom’s taxonomy. Education has received positive influences in the past 20 years by technology developments and their wide impact on all aspects of modern life. The teaching and learning process has been improved through changes and impacts from technology integration. During this time, many theorists and instructional designers have tried to create a model that best fits with technology use in the curriculum and classrooms. Many observations and studies have shown that among all the theories and major schools of thought, constructivist theory is the most popular. However, what have constructivist perspectives brought to the table of education? The student-centered environment of constructivism empowers the teaching-learning process in order to improve the level of learning from basic to a higher-order of skills (Rakes, Fields & Cox, 2006).
Constructivism as a Framework for Educational Technology

According to the research reports in Judson’s (2006) article, there is a connection between teachers with constructivist instruction styles and their technology use in the classrooms. Evidence suggests that constructivist teachers are more likely to use technology in their classrooms in general and integrate technology into their lessons more often than teachers who follow other philosophies of learning. There is a positive correlation between teachers who have student-centered beliefs about instruction and how often they use technology as a way to enhance student learning. This relationship between technology use and constructivist teaching practices suggests that constructivist-minded teachers advocate technology as a worthwhile learning tool in their student-centered classrooms (Judson, 2006).

The combination of constructivist learning theory and the use of technology seems to produce the best applications of technology tools to facilitate course design. Instead of being limited as a part of the existing traditional approach, when used with constructivist theory technology seems to change every aspect of instruction, from course design to delivery methods and even evaluation (Rakes, Fields & Cox, 2006). This willingness to not only use technology in learning environments, but to allow the technology to change the instructional approach is not common among teachers today. Having a preference for constructivist teaching methods increases the likelihood that a teacher will also use and integrate technology in their instruction (Rakes, Fields & Cox, 2006).

The Hernandez-Ramos (2005) study conducted a research project that targeted teachers in the Silicon Valley in California to find out what factors mainly influenced their technology use in the classroom. Findings revealed that three major factors
Technology in the Classroom: The Impact of Teacher’s Technology Use and Constructivism

influenced teachers’ technology integration practices. 1) If teachers had been exposed to technology in their teacher training programs, technology was used more frequently by the teacher and students than in other classrooms, 2) Technology was used more frequently by the teacher and students in classrooms where teachers possessed an understanding of software applications, 3) If teachers held constructivist beliefs, technology was used more frequently by the teacher and students than in other classrooms.

Constructivist teachers pattern their instruction after the old Chinese saying: "Tell me and I will forget; show me, and I may remember; involve me and I will understand" (Hernandez-Ramos, 2005, p.47) which focuses on student engagement in the learning process. Constructivist teachers advocate for student use of technology to build their own understanding of information by incorporating authentic experiences into project-based learning situations. In a literature review produced by Boethel & Dimock (1999) they explain that when teachers blend technology into constructivist learning situations, student achievement is positively impacted (Hernandez-Ramos, 2005).

For his research design, Hernandez-Ramos (2005) had a constructivist beliefs scale created. This scale was used to compare groups of teachers who answered "yes" to the question "Have you ever created technology-based projects for students?" with those who answered "no". Teachers who indicated that they “Integrate technology into their lessons whenever possible” (p. 48) scored significantly higher on the constructivist belief scale than their colleagues who did not. Results indicated a positive relationship between teachers who used technology most often (4-5 days per week) in their classrooms and constructivist beliefs.
Conclusion

While technology use in the classroom is increasing every day, the use of these tools in a way that maximizes their benefits and uses their full potential is still difficult for many teachers to do. Simply adding a technology tool to a traditional teaching approach does not really produce more effective instruction, and sometimes make the process harder and more complex without providing much benefit. In order for technology to be used effectively in the classroom, a teacher has to make sure that they are using it as part of an approach that involves the student in the activity, like they would try to do in their class if the technology was not used. Constructivist approaches, with their focus on student centered learning, has long advocated student involvement in the process of gaining knowledge, and has sought ways for teachers to become advocates in the learning process, rather than as figures who only dictate information. This approach seems to be a good match for the technological applications being developed today. While being an advocate of constructivism isn’t a requirement for the use of technology, and while using technology will not necessarily convince someone to change from their traditional teaching approach, the two tend to enhance the other, and provide the best outcomes from both an application and a theoretical perspective.

By using technology in a constructivist approach, teachers can easily involve students in learning activities, they can structure the instruction to meet different learning levels and styles, and they can broaden the range of detail and resources that are available to the learner. This allows the technology to be more than just another way to present information; it becomes the system in which information is presented. Technology as part of a learning theory is more than a tool; it becomes the framework for the methodology.
At the same time, for those who are looking for ways to enhance their constructivist approach to instruction, technology provides the ability to support all of the central themes of this theory. Instructors are also less hesitant to use technology because they can see that it actually helps them design their instruction in such a way that supports their theoretical approach. Using the two together—technology and constructivist theory—provides a better utilization and integration of technology tools into the classroom in an appropriate and effective manner, while giving the instructor the tools necessary to effectively design an instructional model that meets the requirements of a student-centered focus.

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