Investigating the Effect(s) of Technology Integration on Teaching Practices that May Lead to the Development of a Community of Learners

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Introduction

Educators today have access to computer technology and are beginning to recognize it as a powerful tool in the teaching and learning process. Jonassen & Wilson (1999) refer to computers as mind tools stressing the importance of remembering that ìlearners are intelligent, tools by themselves are notî (p. 153).

With the introduction of computers, schools concentrated on teaching computer skills in isolation, like another subject area to cover. The emphasis has since progressed to having students gain knowledge from the computer, using it as a valuable information tool. In todayís schools, the shift is for students to learn with technology. It is believed that computer skills can be acquired in context while the students are learning curriculum content in a meaningful, relevant manner. With this realization, the focus has now shifted to advancing and enhancing the curriculum with the integration of technology.

Technology is rapidly changing many aspects of society. Schools, as they exist today, need to closely examine the educational needs and goals of our students and how we can best meet these needs and goals. It is believed that students of today need many different skills to be able to learn, work and adapt in our ever-changing world. As Riel (1996) noted:

> ìWe send children to school to give them the opportunity to move beyond the

> constraints of family and friends to open to them a vast range of possible futures. However the classroom in todayís society, by its very nature, is constraining. It isolates both students and teachers from many experiences that will help them to understand the past, develop skills for building a future, and to prepare their role as citizensÖIf it once took the whole village to raise a child, then can we expect a succession of isolated teachers to give students all the skills they need to [be] productive members of society? (as cited in Jonassen & Wilson, 1999, p. 120)
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> Jonassen (2000) reflects: The purpose of schools should be to educate, to "educe," which means to evoke, extract, or elicit something that is latent, that is, to draw out what learners know. That means that you cannot tell students what they should know; instead, your role should be to help them articulate what they know and come to know it better. (p. 277)

With this knowledge, how do teaching practices need to change and what instructional approaches will promote this environment? As educators, we have to realize that our past and present teaching styles and methods aren't necessarily incorrect but need to adapt and grow. Why is it so difficult to make these changes? Why do we seem so content to continue teaching as we were taught? As Ayers (2001) states, ìEven though we long for community - for places of common vision, shared purpose, cooperative effort, and personal fulfillment within a collective commitment - we most often settle for institutionsî (p. 62).

In the technological society of today, is it possible that the integration of technology will influence educators to open the door to change? Will the introduction of computers as a learning tool better prepare our students for their future?

Literature in this review will investigate the effect(s) of technology integration on teaching practices that may lead to the development of a community of learners. Several themes are prevalent in the current literature. These themes explore the thinking that technology integration may affect the learning environment, student roles, teacher roles, teacher beliefs and practices and ultimately the teaching and learning process.

Community of Learners

Researchers are studying technology as a possible catalyst influencing change from a traditional classroom to an environment sometimes referred to as a ìcommunity of learnersî (Rogoff, 1994, p. 209). Within this model of teaching and learning, students and teachers work together as resources for one another. Students collaborate and participate; teachers support and provide leadership. Gunter and Shwab (1999) describe a classroom with this environment as ìa social context in which everyone benefits if each member of the group feels a personal responsibility for accomplishing shared goalsî (p. 355).

Much of the growing interest in a community of learner's philosophy has been inspired by the earlier work of John Dewey and Lev Vygotsky (Rogoff, Turkanis and Bartlett, 2001). John Deweyís analysis of schooling suggested almost a century ago that education should begin with and remain closely tied to

the actual experience and concerns of students. Yet any change seems to be slow or non-existent in many classrooms. Dewey (as cited in Rogoff et al., 2001) observed that "the teacher's suggestion is not a mold for a cast-iron result but is a starting point to be developed into a plan through contributions from the experience of all engaged in the learning process" (p. 7). Vygotsky's work highlights the importance of others in the learning process. His position is that "learning awakens a variety of internal processes that operate only when the child is interacting with others in his environment and in cooperation with his peers (as cited in Peterson, 1992, p. 3).

Jonassen & Wilson (1999) believe ìtechnology plays a key role in knowledge-building communities by providing a medium for storing, organizing, and reformulating the ideas that are contributed by each community memberî (p. 118).

Rogoff et al. (2001) explored ideas about learning as they conducted research in an innovative school. They found the principles of a community of learners were associated with specific instructional approaches such as "cooperative learning, multi-age classrooms, integrated curriculum, authentic learning, assessment in the context of instruction, and so on" (p. 12). This study clarified that simply adding new approaches to a classroom will not lead to the development of a community of learner's philosophy. Having a collaborative structure using a variety of instructional approaches throughout the day was critical. Cremin (as cited in Rogoff et al, 2001) voiced the same concern, "piecemeal changes do not create an integrated and coherent new philosophy of learning" (p. 13). It appears that we must understand the big picture of what a community of learners is in order to ensure that a fragmented approach does not occur.

The classroom of the future may be a community of learners and research is suggesting that technology will be an important part of that environment. However, we are cautioned to understand that:

> Developing a community of learners cannot simply involve applying a recipe of techniques to a new collection of people. It requires the participation of the people involved in inventing and adapting customs and traditions, who learn from their efforts to develop the principles and practices for themselves. (Rogoff et al, 2001, p. 10)

In gaining a better understanding of the needs of our students and how we best learn, will teachers expand their repertoire of instructional strategies to include more approaches in line with constructivist beliefs? Will these changes direct teachers to adopt a community of learners model of teaching and learning? How will the learning environment be affected with the integration of technology?

Learning Environment

Constructivist theorists, Adams & Burns (1999) state, ìwe learn in a variety of ways and the more opportunities we have, the richer our understanding becomesî (p. 1). Jonassen & Wilson (1999) describe constructivist environments as being ìenvironments in which students can do something meaningful and useful. The technologies afford students the tools to explore, experiment, construct, converse, and reflect on what they are doing, so that they learn from their experiencesî (p.194). He provides a metaphor to help us better understand the relationship between the learner and the computer.

"Carpenters use their tools to build things: the tools do not control the carpenter. Similarly, computers should be used as tools for helping learners build knowledge rather than controlling the learner" (p.4).

Jonassen (2000) stresses the importance of having a few computers in the classroom as these tools are best used collaboratively. He (2000) states "computer labs are one of the major impediments to meaningful integration of technology in schools" (p. 278). He has found that when computers are in a lab situation, "computers become the object of instruction rather than tools for learning" (p. 278). Jonassen elaborates on his carpentry metaphor:

> Imagine teaching carpenters to build your house but allowing them to go to the carpentry lab where they can use saws and hammers for only one hour per week. The rest of the time they have to talk about building a house, listen to lectures, and take multiple-choice tests on home construction. (p. 278)

Boethel and Dimock (1999) state that as computers become an integral part of the classroom, changes occur. Teachers with a more traditional style find that a variety of approaches are needed when students use technology as a tool. Reidl (1995) shared her personal story as she began to integrate technology in her classroom and realized that her current learning structure did not work. She needed to move away from whole group instruction. Planning for small group and individual instruction, students worked cooperatively and were active participants in the learning process. She described her transformed classroom as a ìconversation-rich environment that is learner-centeredî (p. 10). Working on computer-based projects, students became active learners collaborating with peers and teacher. More project-based learning, group work and individual instruction were necessary. Riedl states that when educational technology is used appropriately, it will help both the teacher and the students to create a caring, creative community of learners.

> According to Sandholtz (1997):
>
> Technology is a catalyst for change in classroom processes because it provides a distinct departure, a change in context that suggests alternative ways of operating. It can drive a shift from a traditional instructional approach toward a more eclectic set of learning activities that include knowledge-building situations for students. (p.47)

In my own teaching experience, I struggled with meeting the diverse needs of my students as we began integrating technology into different areas of study. Direct instruction was holding us back; a shift was needed. I began planning more independent, cooperative and project-based learning opportunities, allowing students to be active rather than passive learners.

Other changes may also occur in the learning environment. Scheduling of classes is often based on short periods of time. Jonassen (2000) suggests that since computers require engagement and we encourage the students to be engaged learners, we need to recognize that "engagement cannot always reach fruition in 50-minute periods" (p. 277). Once students get involved in their learning, they need larger blocks of time to dig deeper, discuss, analyze and make meaning in their collaborative groups. Flexible timing, scheduling, timetabling are all issues in the development of a changed learning environment more in line

with constructivist philosophy.

Dexter (1999) conducted research involving several teachers from a variety of schools and states. They were investigating instructional philosophies, classroom computer use and changes in teacher practice as they began using the computers in their classrooms. The findings indicated that many teachers did experience changes but these changes appeared to not derive from any one source. Teachers made it clear that the computer did not automatically cause more constructivist practices. Several teachers moved towards the constructivist approach but stated it was because of teacher reflection, school-wide initiatives and not simply because of the computers in their classrooms. The researchers did note that beliefs seemed to be changing as teachers shared that their thinking and learning had changed. Many teachers began to believe that students should be active not passive learners and with deep thinking, the teachers were experiencing gradual knowledge construction resulting in a shift of a teacher role. The main recommendation from this study was to frame teachers as agents of change and to not focus on the computer as the catalyst for change.

Knapp and Glenn (1996) also state "the presence of new technologies will not change schools. But, technology, if integrated into effective teaching and learning practices, can help restructure the classroom" (p.13). Jonassen and Wilson (1999) express a similar view by saying ìtechnologies will not be the cause of the social change that is required for a renaissance in learning, but they can catalyze that change and support it if it comesî (p.219).

Teacher Roles

The literature reflects a shift in teacher role from the more teacher directed approach to one of being a guide, facilitator and co-learner. Means and Olsen (1999, as cited in Boethal and Dimock) believe that technology gives ìteachers additional impetus to take on a coaching and advisory role, perhaps because students learn to use the technology much faster than teachersî (p.17). Sandholtz (1997) believed that ìfunctioning as a facilitator with regard to technology can also lead to teachersí willingness to assume a facilitative role with regard to contentî (p. 43). It appears that as teachers and students share the teaching and learning process, it becomes evident that everyone has something to contribute to the group, thus working together as a community of learners.

Johnson, Schwab & Foa (1999) investigated technology as a change agent for the teaching process by studying more than 200 schools over a four-year time frame. They observed teachers who were adopting technology into their classroom transforming "the practice, art and meaning of teaching" (p.1). Teachers who were successfully incorporating technology into their teaching practice wanted the computers in their classroom for easy student access and not in a lab down the hall. With a small group of computers in their classrooms, these teachers soon discovered the need for dividing students into teams or collaborative groups for not only the computers but many other projects as well. Without even realizing it, they had moved away from whole class instruction and instead were having students work in small groups or learning centers. It was noted in this study that technology does increase the complexity that classroom teachers need to deal with but this complexity creates an environment where everyone takes responsibility to learn and teach.

In this study, it was found that many teachers felt more comfortable with the technology once they realized the students were competent experts and the teacher did not have to be the dispenser of knowledge. Technology offers the opportunity for teachers to become co-learners with their students: interacting, discovering, experimenting and discussing.

Knapp & Glenn (1996) believe that ìusing technology effectively can help teachers restructure their classrooms and move from a teacher-centered lecture approach to a more learner-centered inquiry approachî (p.218). As teachers see their students working collaboratively on the computers, it is perhaps more likely that they will try doing other project-based activities with their students. It appears that teachers trying different instructional approaches need to see the benefit to their students as they are then more willing to add new approaches that may lead to a community of learners. Means et al. (1993) observed:

> What they do need to know is how to help guide students through the meaning-making process: how to ask probing questions, how to connect students to relevant resources, how to organize students into cooperative learning groups, and how to give them tools to store, manipulate, and analyze information. (Ch. IV, Section 3, para. 4)

Teachers involved in the study conducted by Honey & Moeller (1990) claimed that integrating technology into their classrooms allowed them to make changes in their teaching. One group of teachers shared that their practices had changed over time, allowing them to teach differently as they were moved from a more teacher directed approach to an interactive approach involving the students. Instruction was more process-oriented rather than content-oriented and allowed more time to work with individual students. Honey and Moeller (1990) also noted that teachers who held strong traditional beliefs and practices had more difficulty integrating technology and were only able to do so if their teaching practices were able to change.

Reidl (1995) recalls her personal classroom experience as she realized her role as a teacher was changing. She explains, ì I am no longer at the top of the traditional pyramid-shaped power structure; instead, I am one part - and a very significant part - of a decentralized, working democracyî (p. 10). She also reflected that she had more time to ìaddress the needs of individual students and develop a community learning spiritî (p. 10). As she observed the students responding enthusiastically to this new environment, she was encouraged to continue her efforts to be more of a facilitator. Reidl (1995) found that each time a new technology was introduced, it had an effect on her classroom so she created the new 3 Rs of teaching: rethinking, retraining, and reflecting.

Jonassen & Wilson (1999) summarize the importance of the changing role of the teacher. They believe that it is important for the students to construct their own meaning of the world rather than to understand the world as the teacher does. As teachers, we have become accustomed to being the one in control and may find it difficult to give up some of this control. Jonassen & Wilson (1999) recognize that in order to empower students to become more responsible for their own learning ìteachers must relinquish at least some of their authorityî (p.219). ìThe teacher is not the arbiter of knowledge but rather is a coach that helps students to engage in a larger community of scholarsî (Jonassen & Wilson, 1999, p.220). Jonassen (2000) states the "role as the teacher must change from purveyor of knowledge to instigator,

promoter, coach, helper, model, and guide of knowledge construction" (p.276). He also observed that teachers who already possessed a constructivist philosophy did not require any major change, as these teachers seemed to readily adopt the use of technology into their classrooms.

The world of children today has always included technology so they feel comfortable with it. For educators, technology has appeared during our lifetime and for many of us, during our teaching career. Many teachers are fearful, not only of technology and the changes that it may bring, but also because they do not have technology knowledge and skills. An interesting conclusion by Jonassen & Wilson (1999) was that teachers need to gain some technology skills but they will be most successful using technology as a learning tool for their students if they do *not* master the technology and therefore act as an expert.

Noddings (1992) suggests that as teachers, we must become more like parents who are engaged in the task of raising a huge heterogeneous family. She believes that if we change our way of thinking and look at each child as an individual member of our family, we would change the way we treat them. We would adjust programs to meet the needs of each child, recognizing that they are special in their own unique ways. ìLearning communities provide a means for learning within an atmosphere of trust, support, common goals, and respect for diversityî (Jonassen & Wilson, 1999, p.119). So does the integration of technology encourage more collaboration thus creating an environment of interaction and mutual respect? If so, what teaching practices best provide an opportunity for this collaboration?

Teacher Beliefs

It is believed that in order for teachers to fully accept and implement a change in their classroom learning environment and teaching style, beliefs must also be altered. ìLearning beliefs are personalized understandings that describe how you think and feel about learning, schooling, and educationî (Shambaugh & Magliaro, 1997, p. 4).

Peterson (1992) addressed the difficulty of changing teaching practices. He said it involves reworking our belief system that is so ingrained from such an early age. From the time many of us were first graders, we learned how to 'do school' very well and knew exactly what the teacher role and student role were. It may not be that we are content teaching the way we were taught but rather it has become a tradition that we may never have doubted or challenged before.

Knapp and Glenn (1996) state that, ìOur core teaching style, is based on the way we were taught, a strong belief in helping students learn, and by what is acceptable practice in the building" (p.218). They believe, î most teachers bring to the classroom a common set of beliefs about schooling, built upon years of participating in the traditional system as former students and then as teachersî (p. 217).

Jonassen & Wilson (1999) recognize difficulties that arise because ìteachers assume new roles with different beliefs than they have traditionally pursuedî (p.220). It has been my experience that many teachers teach the way that they were taught. In order to break free from the traditional style of teaching and move towards a more constructivist approach, it takes effort, training, support, and the belief that there is a better way for students to learn. Teachers need to step out of their comfort zones and take risks when learning to integrate technology into their classrooms.

Saye (1998) is a strong advocate of student-centered learning and believes that the impact of technology could create a more empowering classroom environment. Observing many different approaches to technology by a variety of teachers, a study was designed to understand the differences in how teachers use technology and to suggest a teacher typology to explain some of the observed differences among teachers. Saye (1998) summarized that the teacher is central to change. Teachers' personalities and beliefs were the influential factors in making the decision to adopt technology. This study suggested that technology did not create changes in instruction but provided a platform for teachers to step back and re-examine their own beliefs and practice.

Changing teacher beliefs may take many years but appears to be an important component of initiating change in todayís classrooms. ì Classes become communities by learning a step at a time. Granted, motivation is a key component to the success of learning communities, but striving toward learning communities is a key to motivationî (Jonassen & Wilson, 1999, p. 145).

Student Roles

Jonassen (2000) believes that students do not learn from computers or teachers but rather "students learn from thinking in meaningful ways" (p.4). He points out that students are learning with the computer when computers support knowledge construction, explorations, learning by doing and conversing. Jonassen (2000) describes computers as intellectual partners that support learning.

As teacher beliefs and roles change, student roles also experience a dramatic shift. According to Bagley and Hunter (1992), students learning in the community of learner's environment become empowered and are more active self-directed learners. However, just as teachers tend to teach the way they have been taught, students also learn the way they have been accustomed to learning. Jonassen (2000) states "most, if not all, of their learning careers have been directed by teachers, so making the transition to learner control and self-regulation will not be easy for them"(p. 274). This is an important factor to note when planning instruction and to adopting teaching practices that empower the students.

Sandholtz recognized a major change in student roles in this new technology rich environment. The students often became the experts or mentors to their peers and teachers. Sandholtz (1997) believes that:

> Action becomes the domain of learners, whether teachers or students. Usually teachers are experts, but other sources of expertise are recognized, valued, and used - even when the source of expertise is children, a common state of affairs in classrooms with technology. (p. 13)

Bitter and Pierson (1999) believe that this shift is perhaps the most difficult one for teachers to accept and embrace. However, they found ìwhen teachers were able to move past that pervasive teacher-centered view of education, students and teachers, as communities of learners, were able to benefit from the range of individual areas of expertise represented by the entire groupî (p. 43).

> The underlying philosophy of this learning design is that when technology is properly used, it allows teachers to return to their students the ownership of their learning. The outcome is the blossoming of self-reliant thinkers who will

know how to learn throughout their lives. (Riedl, 1995, XVII)

Computers offer students the opportunity to explore areas of interest and express their work creatively. As teachers begin to adopt a more constructivist approach to teaching and learning, studentsí learning may become more relevant as individuals are allowed to build on their own knowledge. It appears as though technology may provide students with the opportunity to learn in a style that directly fit their own personal strengths and abilities. Heide & Henderson (1994) suggest that all students may have a higher chance of being successful in school because ìtoday, new technologies help teachers to respond to the different learning styles of students and to develop new attitudes toward learningî (p.6).

Perhaps one of the most powerful changes in beliefs that I experienced in my teaching practice was when I became a co-learner taking risks alongside my students. Empowering my students to share their expertise with teachers and peers allowed their self-esteem to soar and also allowed me to experience the dynamics of working as a community.

Noddings (1992) says that if she were to redesign education, we would see children studying, discussing, exploring matters, and doing things in their various centers of care. Teachers would work with all children on topics of general concern and with small groups of children on more specialized subjects. This was happening in my own classroom. We were all active learners, taking risks side by side, establishing a relationship through mutual respect and caring.

Benefits to Students

With the changing environment of the classroom and the shift of teacher and student roles, there appear to be many benefits for the students. The literature makes clear that technology alone does not produce learning but is only a tool that can be used in many ways. Means and Olsen (1997) state that when students are using technology, they are in an active role rather than passive. Students are actively making choices about how to obtain and process information. They interact with one another as they problem solve, discuss and analyze. Honey and Moeller (1990) found in their research that there was a widespread belief among teachers that using computers in the classroom could expand students' learning and make it more fun and meaningful at the same time.

Technology opens the real world to students where they can explore and construct knowledge. Knapp and Glenn (1996) strongly believe that ìsimulations offer students the opportunity to confront problems and make decisions in an imaginary environment that is realistic enough to provide meaningful issues and appropriate consequencesî (p.29). Providing real life experiences through the use of technology where studentsí learning is relevant, interesting and motivating appears to be beneficial to all students. One teacher that I worked with involved her primary class in an email project. She found that it helped her students to have a more global sense of the world and to look outside their small community, motivating them to learn beyond their classroom walls.

Sandholtz (1997) discovered that teachers noticed less advanced students were now feeling success, unpopular students were gaining approval from their peers, and students who were once unmotivated were now wanting to stay in at recess. In my own teaching practice, I was excited to discover these unanticipated benefits of technology integration. It seemed to be the spark for many children and it was

rewarding to observe students working together as a community, each feeling success regardless of individual learning interests, needs or abilities.

As teacher and student roles shift with the integration of technology, a closer relationship seems to develop between students and teachers. Reidl (1995) found that as she was soliciting student ideas and input, there was mutual respect and caring. Because of the small group and individual discussions with students, she felt she had a closer bond with each student. Being a co-learner with her students made her more approachable as they now viewed her as a fellow learner. My years of teaching using technology as a tool in a more constructivist environment, allowed me to build stronger relationships with my students. My role changed from a directed teaching approach to a facilitator, guide, coach and co-learner. This style of teaching allowed me a greater freedom to work with individuals and small groups creating a closer relationship between my students and myself.

Jonassen & Wilson (1999) summarize the importance of relationship building to the establishment of a community of learnersí environment. ìAt the core of learning communities is the cultivation of a certain quality of relationship among teachers and students. Learning communities are united by a common cause of mutual support and by shared values and experiencesî (p.119). They continue by saying, ìlearning communities provide a means for learning within an atmosphere of trust, support, common goals, and respect for diversityî (p.119).

With much of the research focusing on teacher and student role shifts, many may question the studentsí personal thoughts and feelings about learning with technology in a more student-centered approach. As Knapp & Glenn (1996) found in their research:

> ìTeachers who have restructured successfully report that their students much prefer working in the new learning environment because it allows them more flexibility, more opportunities to be creative, pursue their own interests, think for themselves, work independently, or work with peers. Itís much more fun for them and students also report that they learn more when they have to get the information, think about it, and communicate it to others.î (p. 223)

Any change involves taking risks and many teachers may wonder if all the time and effort will be truly worth it. Jonassen & Wilson (1999) noted ìthe excitement and enthusiasm generated by students while they construct their own understanding using technology-based tools is more than sufficient reward for taking those risksî (p. 221). I wholeheartedly agree with these statements as I had a classroom full of keen, eager students who literally had to be persuaded to leave at the end of the day. They were so involved in their learning that many were disappointed when the school year came to an end.

Summary

I have explored current literature on the effect of technology integration on teaching practices that may lead to the development of a community of learners. Technology may be one catalyst that will move classrooms of today towards becoming classrooms of the future. Sandholtz expresses it by saying:

> Technology is not a panacea for educational reform, but it can be a significant

> catalyst for change. To those looking for a simple innovative solution, technology is not the answer. To those looking for a powerful tool to support collaborative learning environments, technology holds tremendous potential. (Sandholtz et al., 1997, p. 184)

There seems to be a common understanding that the integration of technology will have an impact on the classrooms of today. The shift of roles for both teachers and students is exciting and empowering and may be linked to the changes in the classroom environment with the introduction of technology. The literature, both in theory and practice, supports the idea that students learning in a community of learners environment using technology as a tool for learning, are able to build on prior knowledge, feel success and grow to their fullest potential. It seems evident that a constructivist-learning environment allows students to experience success with the integration of technology. However, researchers caution us to recognize that technology alone can not bring about all the needed changes in todayís classrooms.

As teachers integrate technology they may become aware of the need for a changed learning environment which offers all students a quality education; an education where each child is encouraged to pursue personal areas of interest, enabling them to use their own talents and skills, all within a caring, safe environment. Several authors suggest a variety of instructional approaches as being effective when using technology in a more constructivist approach but it was clear that individual or isolated strategies could not create a community of learners.

With the integration of technology in today's classrooms, we may begin to see transformation of the teaching and learning process. There appears to be a growing interest in using the communities of learners model to restructure schools and technology may be the catalyst for many changes to occur. It seems that if technology is used effectively as a tool for learning, students can be more creative, autonomous and collaborative than in classrooms where technology is not accessible to students.

It appears that the constructivist approach to teaching and learning may be an effective way to successfully integrate technology, allowing students to learn by doing, to work with others and to have authentic experiences making the learning relevant and motivating. Research is indicating that building a community of learners is perhaps more important to the learning than any one instructional method or strategy and it appears that technology plays a significant role in this creation.

There is one clear common thread throughout the literature and that is the need to accept technology as being a part of our students' lives and to respect the powerful learning tool that it can be. David Thornberg (as cited in Galas 1997-1998), a well-known futurist suggests, "we as teachers can truly provide students the real tools of technology to cross the bridge to their future instead of our past" (p.21). What changes in the teaching and learning process may be largely attributed to the integration of technology? How will educators in the field today cope and/or thrive with these changes? Will the introduction of classroom computers largely affect the teaching practices and if so, what practices and instructional approaches need to be implemented?

We need to prepare to make changes on an ongoing basis as we integrate technology into the classroom. Guhlin (1997) provides us with a picturesque metaphor to make us realize the importance of learning more in this area. "Technology integration is similar to a tidal wave, growing silently in strength, then

falling with an unstoppable roar upon those who paid no attention or showed little interest" (Guhlin, 1997, p. 26).

It appears that technology may serve as a pedagogical vehicle for shaping students' lives, changing the way they learn and work together. Future research should focus on instruction that uses technology in ways that support collaborative learning with complex, authentic tasks, resulting in the creation of a community of learners. This is indeed a rich area of research that needs to be pursued as a means to better understand, appreciate and adapt to living in our ever-changing, technological society of the 21st century so we can prepare our students for their future and not our past.

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