

Generation Gap Between Students' Needs and Teachers' Use of Technology in Classrooms

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Abstract

In the 21st century, technology is a pervasive presence in the classroom. Unintended consequences of a technologically rich classroom learning environment emerge due to the dichotomy between 21st-century learners' and teachers' perceptions of the need to use technology. Several factors affecting the generation gap between teachers and students in classrooms are shared such as characteristics of 21st-century learners, teacher's perceptions of technology, student's ability to use technology independently, teacher training and the need to reshape pedagogy based on national education standards focused on technology use. The EMSCI Model provides teachers with a process to teach students how to use technology independently and suggests a pedagogical paradigm shift towards constructivist teaching to offset the generation gap.

Key Words: Technology, pedagogy, generation gap, constructivist, 21st-century learners

The increase in availability and access to technology in the last 20 years has highlighted the gap between students' needs and teachers' use of technology in classrooms. By 2006, two-thirds of all PK-12th grade students had a computer in their home and half of those had the Internet (Calvert, Rideout, Woolard, Barr & Strouse, 2005; DeBell & Chapman, 2003; Gutnick, Robb, Takeuchi & Kotler, 2011). In 2011, children between 5-9 years of age used the Internet about 28 minutes a day increasing to 46 minutes between the ages of 8-10 years. This is double the amount of time similarly aged children spent on the Internet in 2006 (Gutnick, et.al, p. 16). The prevalence of technology used by the youngest in our population speaks to why teachers need to include technology in their pedagogy.

Current PK-12 students are considered to be Digital Natives. Prensky coined the term Digital Native to define "native speakers of technology, fluent in the digital language of computers, video games, and the Internet" (2005-06, p. 9). Prensky described teachers as Digital Immigrants since most teachers were born before widespread use and availability of technology (Prensky, 2005-06). A synonym used interchangeably in education for Digital Natives is 21st Century Learners. These two terms represent students who are currently experiencing "...a profound gap between the knowledge and skills most students learn in school and the knowledge and skills they will need in typical 21st-century communities and workplaces" (Gura & Percy, 2005, p.32).

Twenty-first-century learners want to use technology in authentic ways. They expect to be technically competent in basic, application-specific tasks, such as creating a PowerPoint presentation, but also expect to be able to use technology for critique and analysis independently. Twenty-first-century learners use technology such as video games, social media, email, text

messaging, the Internet, digital music players, cell phones, computers and tablets in their daily lives. Prensky (2005-06, p. 13) claims "...students, who are empowered in so many ways outside their schools today, have no meaningful voice at all in their own education...." regarding technology use in their classroom. A student-centered classroom in the 21st century is one in which students are engaged in using technological tools to assist them in constructing a deeper understanding of concepts. While students' welcome technology as a familiar learning tool, too many teachers use technology as "electronic worksheets" (Wilhelm, 2004, p. 45). In some classrooms, technology is a reward for on-task behavior rather than an everyday tool to provide meaningful and engaging teaching and learning.

...the billions schools have spent on computers have had little effect on how teachers and students learn...The reason for this disappointing result is that the way schools have employed computers has been perfectly predictable, perfectly logical—and perfectly wrong...Using computers this way will never allow schools to migrate to a student-centric classroom" (Christensen, Horn & Johnson, 2008, p. 72-73).

Becker (2000) shared that children commonly use computers for information gathering or word processing. However, utilizing technology in such a static manner denies the interactive and engaging element embedded in most technological tools. Teachers know that it is this interactive and engaging element in technology that attracts students to technological tools and assists them in constructing a better understanding of their thinking through their experiences. Twenty-first-century learners need a pedagogical shift in classrooms, so technology is offered for use to construct their knowledge of academic content.

Some unintended consequences of technology creating a generation gap between teachers' use and students' need for technology are 21st-century learner characteristics, teachers' perception of using technology and the way technology reshapes pedagogy. A few additional factors affecting the generation gap between teachers' use and students' needs to use technology in a classroom will be discussed such as the Digital Divide, the ability of students to be able to use technology independently, professional development training and technological integration using national education standards. All of these factors provide a broad view of how technology has unintentionally created a generation gap between teachers and students in classrooms. Lastly, recommendations for reimagining the classroom to decrease the generation gap between students and teachers is shared.

Characteristics of 21st Century Learners

During the 1980s, classrooms in the United States held a ratio of one computer for every 125 students. By 1997, the availability of technology increased the number of computers changing the ratio dramatically to one computer for every ten students. By 2004, the ratio had changed to one computer for every five students (Clements, 1999; Coley, Cradler, & Engle, 1997, U.S. Department of Education, 2004).

As early as 2004, 99% of schools in the United States utilized an Internet connection (The United States Department of Education, 2004). As such, "Technology is ubiquitous, touching almost every part of our lives....Properly used; technology will help students acquire the skills they need to survive in a complex, highly technological knowledge-based economy (Edutopia, 2008, p.1)." Since students live in a world of engaging, interactive technology, it is important to include technology in schools for teaching and learning (Becker, 2000; Calvert et. al, 2005; Chiong & Shuler, 2010; ISTE, 2010; Lisenbee 2009; NAEYC, 2012). Due to the

expansive nature of technology since 2004, a generation gap has been recognized and explained as a digital divide between students and teachers.

The digital divide encompasses many factors beyond a generation gap between students' need to utilize technological tools for learning in their classroom and teachers' ability to incorporate technology into their pedagogy effectively. The definition of the digital divide is "gaps in access to and use of computers based on income, race, or parent education." (Calvert, et.al, 2005, p. 592). When viewing the generation gap between students and teachers, the expectations from technology by each cohort are drastically different. Students consider technology as a tool to communicate and interact with others including as a method to demonstrate their understanding through multimodal interactions. Teachers view technology as a tool to research and present information in a visual manner.

Many teachers are not comfortable allowing students to independently explore and construct their knowledge using multimodal interactions with technology when teachers, themselves, are not experts in a vast array of technological tools. This gap between students' expectations and teachers' use of technology in a classroom creates a disconnect between students and teachers. While teachers need to guide instruction for student learning, learning occurs best when students are actively involved in using technology, not watching a teacher use technology (Prensky, 2008; Grabe & Grabe, 2007). Therefore, teachers' perception of using technology in a classroom depends not only on their ability to use technology but being comfortable in offering students an opportunity to use technology in their classroom independently. A key factor which contributes to the generation gap between students and teachers is whether students can independently use technology.

Teachers' Perception of Using Technology

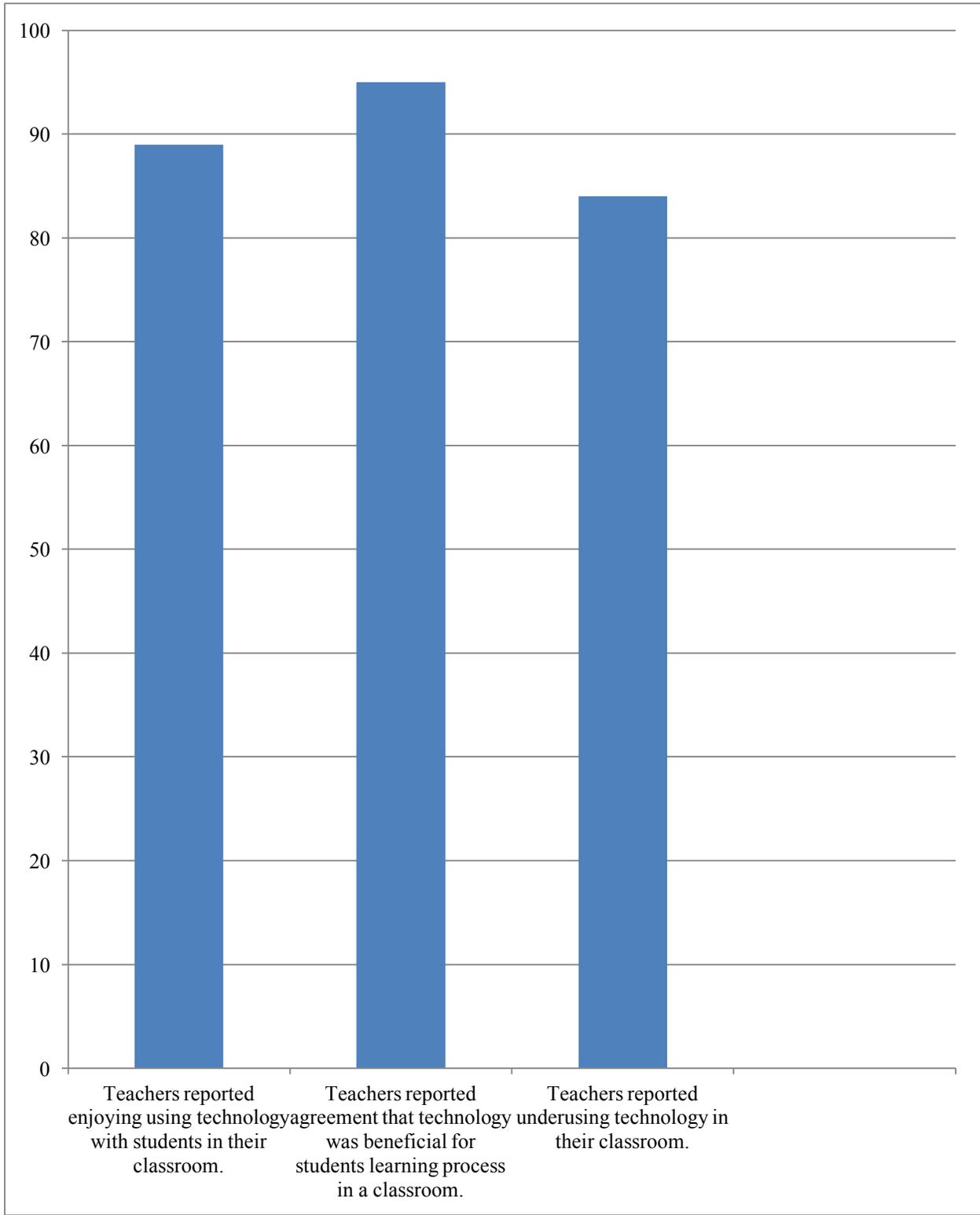
An issue contributing to the gap between teachers and students' use of technology in a classroom is the teacher's perception of technology. Research has shown that "...teachers hold a high agreement toward using computers" as an instructional practice, yet they did not "have strong beliefs about allowing children" to use technology in the classroom (Ihmeideh, 2010, p. 75). I found a similar trend when conducting a survey on teachers' perceptions of technology use for instruction with PK-5th grade elementary teachers.

A survey placed in 17 teachers' mailboxes at a public elementary school in an urban area of a Midwestern state along with a letter asked teachers to answer the questions and return the survey in one week. The methodology chosen for this survey was a selective sample. The teachers ranged in teaching experience from one year to 37 years with a mean of 13 years of teaching experience. This school housed a variety of programs including multi-disabled, developmentally disabled, deaf education, and served Pre-Kindergarten to 5th-grade students.

Thirteen out of 17 teachers in the elementary school returned the survey. The survey consisted of Likert questions, using a 1-4 scale, requesting information about teacher perceptions of using technology in their classrooms. The return rate for the surveys was 76%. Analysis of frequencies on the agreement with survey statements provide data on teachers' perceptions of technology use in classrooms. The results illuminate an understanding by teachers of the generation gap between teachers' use and students' needs in their use of technology in classrooms.

Table 1 and Table 2 offer a view of the quantitative results from this survey. Table illustrates teachers' perceptions of technology use in a classroom. Eighty-nine percent of the responding teachers reported enjoying the use of technology. Ninety-five percent of the

Table 1--Teachers' Perceptions of Technology



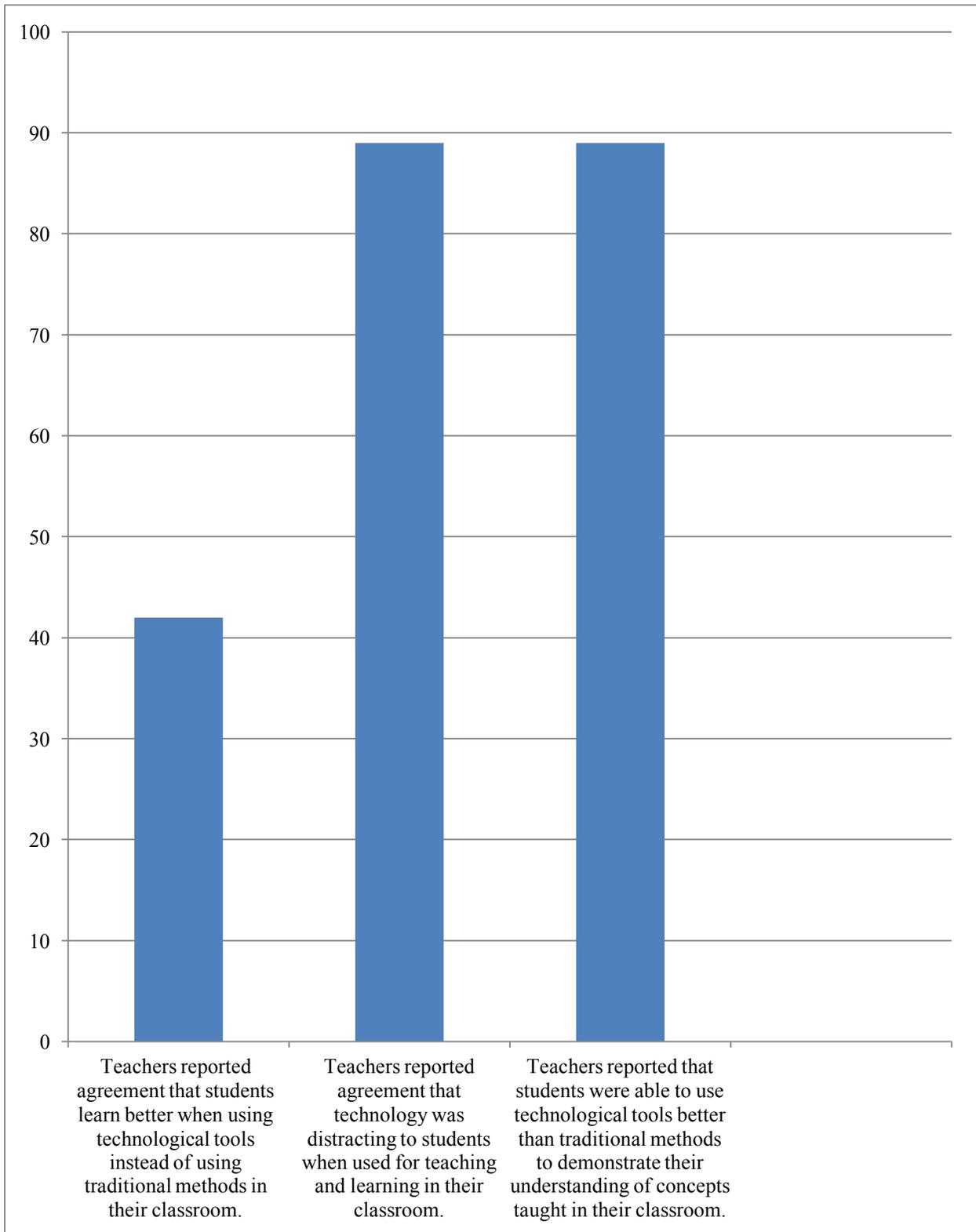
responding teachers said they felt technology was beneficial for students while 84% reported they underused technology in their classrooms.

Table 2 illustrates teachers' perceptions of student's independent use of technology in a classroom. Forty-two percent of the teachers felt students learned better when using technological methods of interaction and instruction and 89% of the teachers reported technological tools were more effective for students to demonstrate their understanding of concepts taught in a classroom. Yet, 89% of the teachers reported technology seemed to be distracting to students.

Overall, teachers' perception of technology use in the classroom was positive while their perception of students' independent use of technology in the classroom was inconsistent. The inconsistency is demonstrated by the dichotomy between the 89% of teachers designating technology was distracting for teaching and learning and the 95% of teachers agreeing student learning integrated with technology was beneficial. These results suggest that the generation gap is real. Teachers are not as comfortable letting students use technology in the classroom, but like using it to teach. Teachers understand how technology can motivate students to learn and demonstrate their understanding more efficiently using technology even though teachers don't offer independent use of technology consistently to students in their classroom.

Given the small number of teachers that participated in this survey, these findings are not generalizable to all teachers. It is important to note that this survey suggests teachers' perceptions do influence how they integrate technology in a classroom. Students cannot master independently using technology nor become productive members of the 21st century if teachers do not routinely include technology for teaching and learning in classrooms.

Table 2--Teachers' Perceptions of Student Use of Technology



Escobar and Cappella (2000) found similar results when they interviewed a small sample of students about their perception of using technology as a tool in a classroom. They found students expected to be able to use technology in a classroom. An eight-year-old shared that by using computers in a classroom students "...learn more things, and they'll be learning and having fun at the same time (Escobar & Cappella, 2000, p.187)." A 13-year-old student stated "...computers will be the future, so if you grow up with it, then you will know it (Escobar & Cappella, 2000, p.187)." These students' voices provide a perspective to understand 21st-century learners' expectations to use technology for teaching and learning in a classroom.

The burden is on teachers to bridge the generation gap by embracing the use of technology (Prensky, 2005; Buzhardt & Heitzman-Powell, 2005). Technology continuously advances in our society causing teachers' interest to be piqued, but many instructional innovations grounded in technology have been implemented and discontinued as fast as teachers have been trained to integrate them into their teaching. When schools began purchasing technological tools for classrooms, the predominant thought was to train the teachers how to use these new tools. Unfortunately, training was not the obvious fix that schools assumed it would be to get teachers to use technology for teaching and learning in their classrooms. This is due in part to how technology reshapes pedagogy. Teachers cannot just be trained to know how to use the technological tools while remaining unable to apply their understanding of how to teach or offer technology to students to independently use it in their classroom (Fryer, 2003). Training needs to focus on both teachers and students so student learning will benefit from this pedagogical shift towards integrating technology into classrooms.

Technology Reshaping Pedagogy

National education standards for students and teachers related to technology use in classrooms were developed by the International Society for Technology in Education (ISTE, 2010) to focus on encouraging active engagement, participation in groups, offering frequent interaction and connections to real world experiences. ISTE's standards are supported by performance-based standards for integrating technology into pedagogy from the Association for Childhood Education International (ACEI, 2007) and by a position statement on technology use in classrooms by the National Association for the Education of Young Children (NAEYC, 2012). As we move further into the 21st century, awareness of and responsiveness to emerging changes in classroom environments are necessary. Computers will become a powerful learning tool and resource which teachers may use to support collaborative learning in the classroom (Hyun, 2005, p. 88). Teachers are encouraged to offer technological tools as engaging, authentic, and collaborative modes of interaction among students in a classroom.

Many teachers believe that they have adopted technology simply by using electronic worksheets or projecting information on screens for students, which is not engaging or exploratory in nature. Teachers often utilize curriculum that promotes technology use in the form of teacher-driven activities, electronic worksheets, rote memorization of information, and use of computer labs to complete prescribed learning activities instead of student-led activities using multimodal interactions for students to construct their own knowledge. This outdated type of knowledge transmission is not responsive to the pedagogical changes incorporated in ISTE, ACEI or NAEYC Standards for 21st-century learners. Specific guidelines encourage the use of technology as a means to generate meaningful knowledge construction among students through engaging, authentic and collaborative modes of social and technological interaction.

Interviews conducted by Lisenbee (2009) on first-grade students regarding how it felt to use an interactive whiteboard to complete a re-telling of a story found themes of engagement, inspiration, and interaction. The students responded to interview questions with comments such as “nice to work together”, “very good”, “It felt fun”, “special”, “awesome” and “I liked just dragging it and making it falling down and making it small and getting them to go to new places” (Lisenbee, 2009, p. 68-72). Their voices expressed themes generated from utilizing technology. The comments reflected a classroom of students embracing a pedagogical shift to construct and demonstrate their understanding of academic content using technology.

As teachers infuse technology into their pedagogy through technological training and the integration of technological standards, classrooms are being reshaped to meet the needs of 21st-century learners. These types of classes are rich environments providing endless cycles of inquiry for students engaged in constructing knowledge during collaborative work. Schools are acquiring technological tools at the same pace as technology is increasing exponentially in availability and access. For example, schools purchased personal computers for classrooms to use in computer labs then began providing personal computers for individual students to use in classrooms. Interactive whiteboards, document cameras, mobile tablets and clickers were purchased by schools adding layers of available technological tools to use in classrooms. While students recognize that computers, laptops, cell phones, iPods, digital cameras, televisions, videos, interactive whiteboards and the Internet are technological tools to use in classrooms; teachers are slower to adopt new modes of technology.

When exploring technological tools available in classrooms, “Students and teachers must become creators of information and ideas, not simply users of technology” (Burns, 2005-06, p. 51). “...we can explore ways to use technology effectively in the classroom, ways that add value

to traditional curricula and reach students who fail to respond to traditional approaches” (Shields & Behrman, 2000, p. 24). To support authentic learning experiences for students that focus on their needs, abilities, and interests, teachers need to provide students with opportunities for independent multimodal interactions. Authentic learning activities that incorporate independent use of technology in a classroom support students’ innate desire to investigate their environment. Authenticity in learning activities is an essential component of appropriate curriculum in classrooms (Branscombe, Castle, Dorsey, Surbeck & Taylor, 2003). Teachers should keep in mind that “effective technology integration must happen across the curriculum in ways that deepens and enhances the learning process” to successfully reshape pedagogy (Edutopia, 2008, p. 2). As such, choosing technology requires determining if it is the best tool for learning (Murphy, DePasquaie, & McNamara, 2003).

Recommendations for Teachers

By incorporating technology into a classroom, some teachers have begun to reshape their teaching and create appropriate classrooms for 21st-century learners. Balajhy’s (2000, p. 291) interview with teachers suggests they use software primarily because it is “‘interesting and motivational for students,’ rather than for ‘mastering skills and knowledge.’” Students want to learn through activities that “promote higher level thinking, collaboration, speed, and information evaluation—i.e., those competencies required for the 21st century” (Asselin, 2001, p. 50). Technology is the language and general mode of communication 21st-century learners use to interact with each other. Teachers reimagining their classrooms and reshaping their pedagogical knowledge and skills to include technology capitalizes on students’ motivation, interest and ability to independently use technology while focusing on offsetting the generation gap between students and teachers.

Reshaping Pedagogical Knowledge and Skills

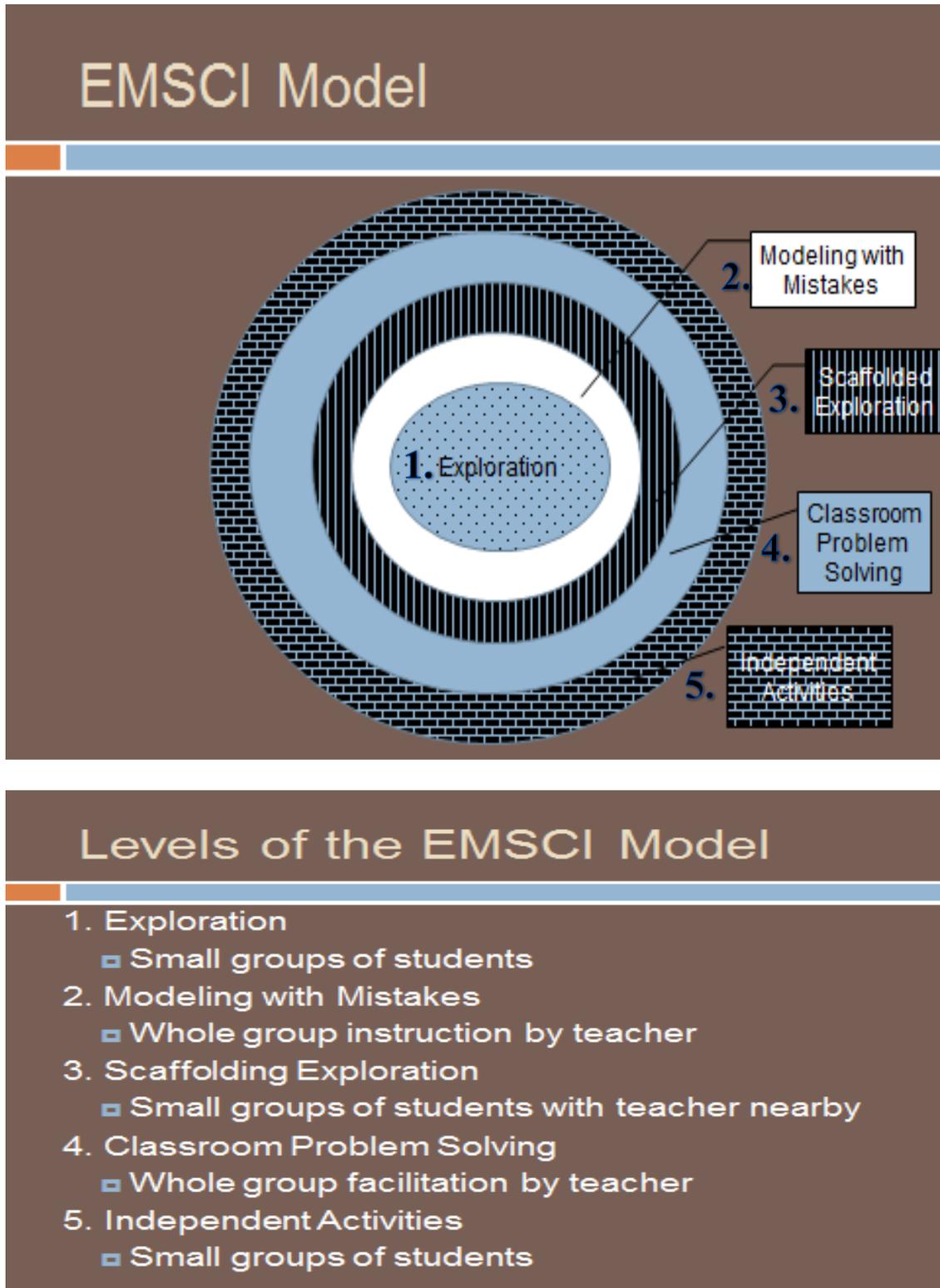
The connection between technology and student motivation is clear, but making changes in pedagogy to routinely offer students the ability to complete technologically integrated lessons is not happening regularly in classrooms. “Technology integration is a process, involving not only the physical acquisition of tools . . . , but also important changes in the ways educators think about their roles in the classroom and student roles” (Fryer, 2003, p. 4).

One method to change teachers thinking about their roles and the roles of the 21st-century learners is to offer quality training on technological tools while implementing national teaching standards related to using technology in classrooms. Applying theory to practice is a much more efficient method for training teachers to use technological tools than lecturing them about including new technology in a classroom. Teachers' resistance to change and perceptions towards using technology directly affects their interest in training to use technology as an instructional tool in a classroom and their interest in letting students use technology in a classroom. These factors relating to perceptions and resistance to change significantly affect the generation gap. The ability of teachers and students to reimagine the independent use technology supports reshaping the teaching and learning process in classrooms.

Reimagining Independent Use of Technology

Teachers interest in reimagining and reshaping classrooms provide opportunities for students to learn to use technology independently. The EMSCI Model provides exploration, scaffolding, and practice for students to build the skills they need to use technological tools independently. The EMSCI Model was created to "provide a structure for teachers to follow in an effort to ensure better student learning of how to independently use technological tools. . . ." (Lisenbee, 2009, p. 123). Figure 1 provides a visual depiction of the EMSCI Model. The

Figure 1. Levels of EMSCI Model



beginning level, Exploration, provides the initial force creating the ripples in learning needed to proceed through the other four levels which end with the ability of students to independently complete activities using technology. The EMSCI Model provides teachers with traditional instructional strategies embedded within a five-level process for teaching students how to independently use technology: Exploration, Modeling with Mistakes, Scaffolded Instruction, Classroom Problem-Solving and Independent Activities.

The first level, Exploration, provides time for small groups of two to four students to explore technology without any instruction. Exploration offers intuitive and curious questions to be answered kinesthetically and collaboratively while students manipulate and interact with technology to determine what they know and want to know about this technological tool.

The second level offers time for teachers to make purposeful mistakes as they model how to use the technology. This level, Modeling with Mistakes, is a core component providing a space where students and the teacher feel more comfortable not being an expert on all modes of technology. Viewing the teacher remaining comfortable with the learning process during initial attempts to use technology while making mistakes takes some of the pressure off students trying to use the technology also. Teachers model with mistakes during whole group instruction for this level of the EMSCI model.

The third level, Scaffolded Instruction, is completed in a small group of two to four students. Each group uses the technology while being observed by their teacher. The teacher provides scaffolding, if needed, to assist each small group in successfully navigating any issues using the technological tool. If the teacher is unable to provide scaffolding for an issue, the group of students is encouraged to continue using the technological tool while the teacher takes

notes to pitch to the whole group during the fourth level. Overall, the teacher attempts to remain a notetaker allowing each group of students to attempt to resolve issues with technology on their own. The "... teacher compiles a running list of issues that students have needed scaffolding with the most. This list will be used for the classroom problem-solving meetings." completed in the next level (Lisenbee, 2009, p. 129).

In the fourth level of the EMSCI Model, Classroom Problem Solving, the problems and solutions identified during the third level provide discussion points in a whole group setting. This level embodies collaboration, analysis, and problem-solving while discussing the struggles and successes encountered during the previous level. It provides peer-to-peer interaction and exchanges to identify students as experts at inquiry-based processes.

The final level of the EMSCI Model is Independent Activities. The teacher provides independent technological activities for each student to practice the strategies and skills learned during their participation in the EMSCI Model. This level provides time for the teacher to observe if all students can independently use technology or if some iteration of one or more levels of the EMSCI Model would provide additional practice for some students.

Teacher's knowledge about technology, comfort with technology, and perception of how to use technology as an instructional tool in classrooms provides an impetus of opportunities for student learning in a classroom. The EMSCI Model provides a new role for teachers as they gradually release responsibility of technology to students. The EMSCI Model offers a process to offset the generation gap between students and teachers by allowing and encouraging students to use technology independently.

Offsetting the Generation Gap

Constructivist teaching provides a necessary link teachers can use to counterbalance the generation gap in a classroom. Twenty-first-century learners expect to construct their knowledge using technology in a classroom. Constructivist teachers provide opportunities for students to participate in meaningful learning experiences which actively engage students in using technology to construct their knowledge. Student-centered classrooms focused on using technology in authentic ways create appropriate classroom environments for 21st-century learners. Forcing a pedagogical paradigm shift for teachers assists teachers in reshaping the way they teach which also reshapes the way students think and learn in classrooms. Therefore, a paradigm shift focused on constructivist teaching methods and technology use would provide a counterbalance for the generation gap between students and teachers.

Effective integration of technology must utilize research-based instructional methods which are known to enrich the learning process for students. Four key components of constructivist teaching which support and complement technology use in classrooms are: group participation, active engagement, connection to real-world experiences and frequent interaction including feedback. (Becker, 2000; Edutopia, 2008; ISTE, 2010).

Teachers using constructivist teaching methods have student-centered classrooms reflective of the needs of 21st-century learners. These classes provide learning experiences which are active, inquisitive, exploratory, collaborative and able to represent knowledge in authentic ways. Incorporating technology into the social environment of a classroom offers opportunities for students to construct knowledge through social interaction and play using technology (Berk & Winsler, 1995; Branscombe, et.al., 2003; Jacobs, 2010; Nanjappa & Grant, 2003; Piaget, 1954; Rakes, Flowers, Casey, & Santana, 1999; Vygotsky, 1986).

Teachers need to be certain that technology is reflected in their classroom environments because "...today's education system faces irrelevance unless we bridge the gap between how students live and how they learn" (Grabe & Grabe, 2007, p. 19). A student-centered classroom including technology would not only generate students' understanding of concepts but, iteratively generate new connections to real world events and experts. Use of technology in classrooms assists students in gaining skills needed to be productive citizens after graduation and support a shift in teachers' pedagogy (Gura & Percy, 2005; Grabe & Grabe, 2007).

Conclusion

In the 21st century, technology has become a pervasive presence for teachers and students in and out of the classroom causing a generation gap between the two cohorts in their expectations for using technology in classrooms. Teachers are encouraged in standards to engage students with technology to actively explore, participate in collaborative groups, interact with others and make connections to real world experiences. Additionally, teachers are encouraged to embrace and embed technology as another instructional method in classrooms so students can learn to use technology independently to construct knowledge. The EMSCI Model offers a process for both students and teachers to work towards independent use of technology in a collaborative manner. Changes brought about by teachers reimagining their classrooms and reshaping their pedagogy will fade the shadows of a generation gap due to the shining success of teachers and students independently using technology in classrooms.

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