

# The Effective Integration of Technology Into Schools' Curriculum

Charlyque Joy Harris

## INTRODUCTION

Technology has become a fundamental part of our daily lives, being infused into entertainment, business, workforce, and educational environments. Technology is used throughout the world for gathering information, keeping records, creating proposals, constructing knowledge, performing simulations to develop skills, distance learning, and global collaboration for lifelong learning and work (Kimble, 1999). Today's educators are under great pressure to provide

21st century students with a quality education based on 21st century standards. Those standards include providing students with the technological and informational skills needed to compete in an ever-changing, technology-driven world.

According to Hamilton, technology should be integrated into curricula to enhance learning in content areas (2007). In order for technology integration to be effective, technology should be a fundamental part of the classroom, allowing students to be able to select technology resources to help them to "obtain information in a timely manner, analyze and synthesize information, and present it professionally" (Hamilton, 2007, p. 3).

Effective technology integration into schools' curricula has the ability to improve student learning outcomes (Hamilton, 2007). Students need technological and informational skills to compete in the 21st century. According to The Partnership for 21st Century Skills (2008) the four standards of 21st century skills are communication, collaboration, critical thinking, and creativity. Technology-enhanced learning experiences may also help student develop 21st century competencies such as information, technology and media literacies, critical thinking, communication and leadership skills, and innovativeness (Aslan, 2015). The International Society for Technology in Education was founded on the principle of preparing students to compete



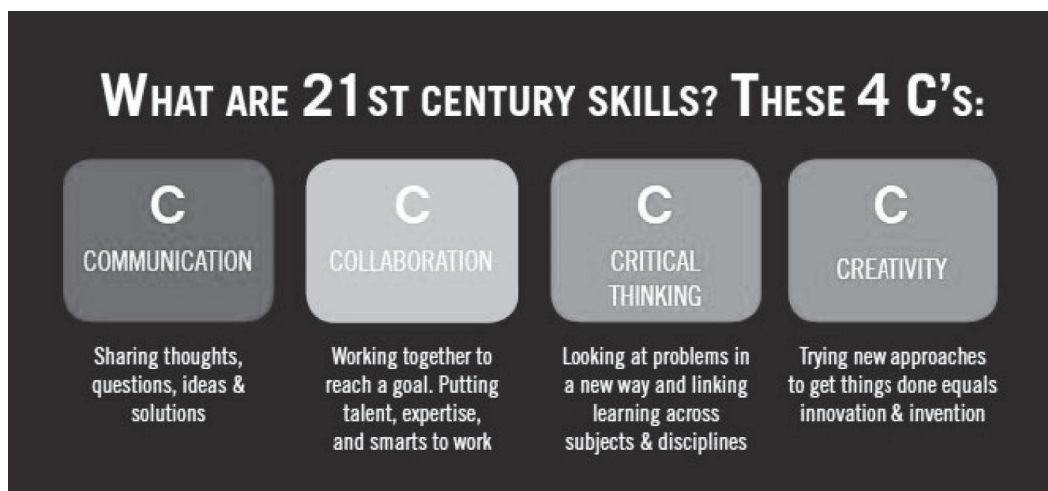


Figure 1. Description of the 4 Cs of 21st century skills.

in a technology-driven world by providing them with the skills to be technology literate.

### CONTROVERSY

The educational community has not completely bought into the idea of technology integration; in fact technology integration has caused a large amount of controversy. At the heart of this debate are Richard Clark and Robert Kozma. Clark (2012) describes media as “mere vehicles that deliver instruction but do not influence student achievement” (p. 2). Kozma counters Clark’s view by asking the question “what are the actual and potential relationships between media and learning?” (Kozma, 1994, p. 1). Clark asserts that learning outcomes are influenced by instructional design. Kozma counters that different media, under certain conditions produces positive learning outcomes. Although Clark initially expressed his views in 1983 and Kozma countered in 1991, the educational community continues to debate the issue with viewpoints being divided between those agreeing with Clark, those agreeing with Kozma, and those stuck somewhere between the

two. Kozma contested Clark’s conclusions by stating that “capabilities of a particular medium” in conjunction with teaching strategies, influence how learners process information in order to construct knowledge (Clark, 2012, p. 104). Kozma asserts that learning is an active and strategic process in which the learner combines information from his or her learning environment with prior knowledge. Kozma defines learning as an “active, constructive, cognitive, and social process by which the learner strategically manages available cognitive, physical, and social resources to create new knowledge by interacting with information in the environment and integrating it with information stored in memory” (Kozma, p. 1). Kozma adds that cognitive factors such as long- and short-term memory structure and content control the learning process (Clark, 2012).

Kozma agrees with Clark’s argument that some students will be able to learn regardless of the media; however, he feels that Clark’s position must be modified (Clark, 2012, p. 137). Kozma further encourages more research on the way learners process information presented by different forms of media. Additionally,

TEACHTHOUGHT

# 4 STAGES: THE INTEGRATION OF TECHNOLOGY IN LEARNING

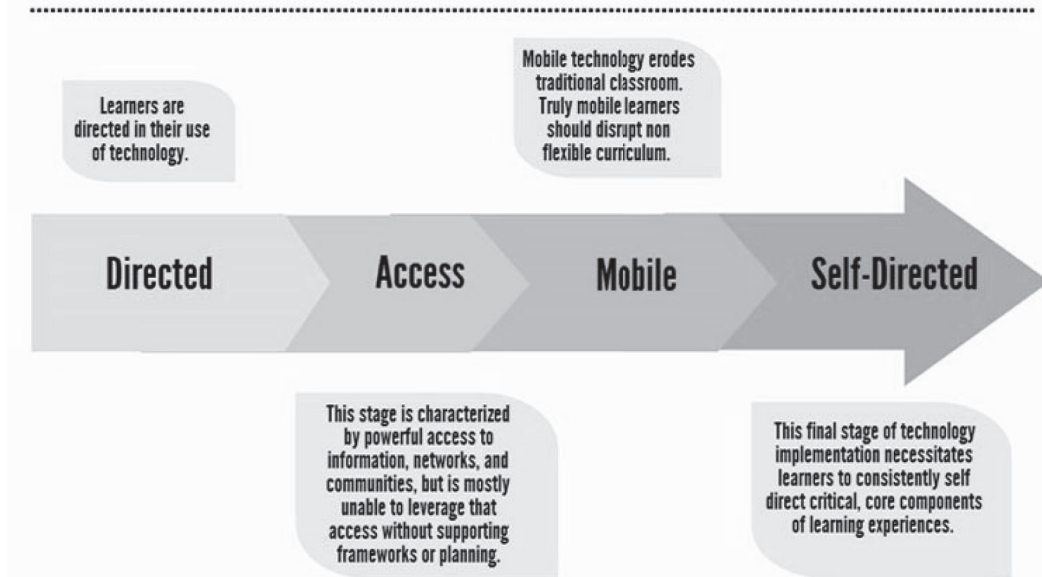


Figure 2. Demonstration of the flow to achieve effective technology integration.

Kozma points out that learner perceptions of a “particular medium and the purposes they have for viewing” can influence the amount of effort they put into the processing of the information (Clark, 2012, p. 118).

Kozma opposes Clark’s stance that media and instructional strategies are separate components. He asserts that media and instructional strategies have an “integral relationship, as both are part of instructional design” (Clark, 2012, p. 138).

While there is evidence to support Clark’s stance, the needs of 21st century learners, as addressed by Kozma, have caused educators to rethink instructional best practices.

### 21ST CENTURY LEARNERS’ NEEDS

Classroom technology integration is more challenging than it was in the past due the

increase of technology use for recreational purposes that has altered the “learning styles, strengths, and preferences” of 21st century students (Dede, 2007, p. 11). Additionally, according to Hodges and McTigue (2014), preparing middle school students for the demands of an evolving 21st century technology-driven world “while attending to adolescents’ rapidly changing cognitive, psychological, and social needs presents teachers with an even more dynamic challenge” (p. 2). According to Lawrence and O’Brien (2012), a study of an urban middle school concluded that the No Child Left Behind (NCLB) Act caused a decline of instructional time in social studies and science content area courses, causing the use of digital tools to be more critical for middle school teachers. Middle school teachers must learn ways to effectively utilize online social media, such

"blogs, wikis, RSS tagging and social bookmarking, music-photo-video sharing, mashups, podcasts, digital storytelling, virtual communities, social network services, virtual environments, and video blogs" (Rheingold, 2008, p. 100) Therefore, traditional approaches are less appealing to students (Chrisman & Harvey, 1998). Additionally, traditional approaches fail to adequately support students in acquiring the knowledge needed to thrive in a technology-driven society (Shane, 2009).

### **WHAT IS TECHNOLOGY INTEGRATION?**

Before we can address the challenges associated with integrating technology into school curriculums, we must define what technology integration is. Hamilton (2007) defines technology integration as the use of any technology or device to support, teach, or assess student learning during an instructional period. Teachers must be skilled in technology integration by using it as a method of teaching, communication, and assessment (Howery, 2001). Overbaugh and Lu (2008) affirm that teachers must be able to use a wide array of technology to enhance their curriculum, if they are to be considered fully competent integrating technology.

### **TECHNOLOGY INTEGRATION LEVELS**

According to Kim and Baylor (2008), despite the efforts of schools to provide teachers with computers, educational software, and technology training, many teachers do not effectively integrate technology into their curriculum. Many teachers have not progressed beyond using technology for their own productivity and creating teaching materials. The evaluation of the *Enhancing Education Through Technology Program: Final Report* noted that only 15 states indicated that they are meeting their state's definition of full technology integration (Bakia, Means, Gallagher, Chen, &

Jones, 2009). Additionally, although there has been an increase in teacher use of technology to support teacher productivity, there was no evidence that the frequency of student technology use for learning increased.

### **GOVERNMENTAL TECHNOLOGY INTEGRATION FUNDING**

The 2006 21st Century No Child Left Behind, Enhancing Education Through Technology Title II D (NCLB II-D) Year 3 Review, reports that the U.S. Department of Education allotted \$700 million to help state school agencies in their efforts to provide students with technology-enhanced lessons (State Educational Technology Directors Association, 2006). The initiative had three goals

1. to improve student academic achievement through the use of technology in elementary and secondary schools;
2. to assist every student in crossing the digital divide by ensuring that every student is technology literate by the time the student finishes eighth grade, regardless of race, ethnicity, gender, family income, geographic location, and disability; and
3. to encourage the effective integration of technology resources and systems with teacher training and curriculum development to establish research-based instructional methods that can be widely implemented as best practices by state education agencies and local education agencies.

Although 14 states reported that prior to NCLB II-D funding their state did not have a source for funding technology, it is evident that funding is not the only factor that hinders a high level of technology integration. The report concluded that roughly 22% of state school agencies require that school improvement process include technology integration (State Edu-

Using Technology	Technology Integration
Technology usage is random, arbitrary & often an afterthought	Technology usage is planned & purposeful
Technology is rare or sporadically used in the classroom	Technology is a routine part of the classroom environment
Technology is used purely for the sake of using technology	Technology is used to support curricular goals & learning objectives
Technology is used to instruct students on content	Technology is used to engage students with content
Technology is mostly being used by the instructor(s)	Technology is mostly being used by the student(s)
Focus on simply using technologies	Focus on using technologies to create and develop new thinking processes
More instructional time is spent learning how to use the technology	More instructional time is spent using the technology to learn
Technology is used to complete lower-order thinking tasks	Technology is used to encourage higher-order thinking skills
Technology is used solely by individuals working alone	Technology is used to facilitate collaboration in & out of the classroom
Technology is used to facilitate activities that are feasible or easier without technology	Technology is used to facilitate activities that would otherwise be difficult or impossible
Technology is used to deliver information	Technology is used to construct & build knowledge
Technology is peripheral to the learning activity	Technology is essential to the learning activity

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Figure 3. Technology use versus technology integration.

ational Technology Directors Association, 2006).

The United States Department of Education established the Common Core State Standards in 2010 to establish consistent educational standards for all students across the country. The purpose was to help ensure that all U.S. students graduate

from high school “college and career ready,” possessing the skills to “earn a self-sustaining wage or participate in postsecondary education without remediation” (National Governors Association Center for Best Practices & Council of Chief State School Officers, 2010, p. 12). To achieve these skills, students need instruction and

practice in “(a) using digital tools and online resources; (b) engaging in argument, reasoning, and problem solving; and (c) collaborating on authentic tasks that require academic reading, writing, and research” (National Governors Association Center for Best Practices & Council of Chief State School Officers, 2010, p. 12).

## **TECHNOLOGY INTEGRATION BARRIERS**

Overbaugh and Lu (2008) assert that there is a strong relationship between teachers’ educational beliefs and their instructional decisions and classroom practices. Teachers must consider technology to be personally meaningful before they can use it to enhance student learning. Additionally, teachers must believe that they can implement technology effectively, as well as possess the technological skills to do so. Without a sufficient level of self-efficacy for performing computer tasks, technology integration may not even be attempted (Oliver & Shapiro, 1993).

According to Bandura (1997) the first step toward developing the capacity to perform a particular skill is building self-efficacy. Self-efficacy is “a judgment of how well one can perform across a variety of situations” (Nel & Boshoff, 2016, p. 38). An individual’s perceived level of self-efficacy influences his or her “motivational state as it involves the individual’s beliefs regarding his or her abilities to perform and succeed at tasks” (Nel & Boshoff, 2016, p. 38). In regards to technology integration, self-efficacy refers to a teacher’s persistence with which he/she will try to create technology enriched lessons (Overbaugh & Lu, 2008). Hall and Martin (2008) concluded from a pilot study that instructors with high levels of technology self-efficacy tend to demonstrate more perseverance and creative techniques to incorporate technology into their curriculum. Hall and Martin state that factors such as “grade level taught, the content area, the experience

level of the teacher, and professional development” contribute to teachers’ levels of self-efficacy in regards to technology integration (2009, p. 5).

Bull et al. (2008) emphasize that there are several issues that act as constraints to effective technology integration.

1. School content must address specific learning objectives.
2. Many learning objectives are subject to time constraints.
3. Addition of technology can increase the complexity of classroom management.
4. Schools are heavily invested in print technologies and often constrain Internet access in ways that limit access to online media tools.
5. Teachers have limited models for effective integration of media in their teaching.
6. Only limited research is available to guide best practice.

The authors add that these factors explain why the global spread of technology usage for recreational purposes outside school has yet to be employed with equal effectiveness inside schools.

## **INEFFECTIVE TRAINING**

Research suggests the ill-preparedness of teachers is attributed to training that rarely goes beyond technical skills (Kim & Baylor, 2008), teacher training in the form of workshops (Gulamhussein, 2013) and lack of organizational support during the implementation phase of new technology (Ermeling, 2010). Gualamhussein’s (2013) report asserts that staff development must move beyond the traditional practice of supplying teachers with knowledge as a means to train them to integrate technology. Teachers will need additional training to turn their newly acquired knowledge into effective practice. Erikson and Shumway (2006) concluded that many tradi-



## Universality

Students are diverse and global, by successfully integrating technology into classrooms we can prepare them for life and future careers

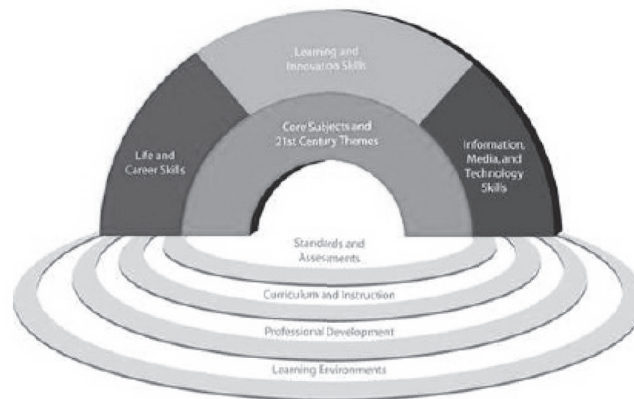


Figure 4. Twenty-first century learners need technology skills in order to compete in a technology-driven society.

tional classroom settings can remain very effective when combined with instructional technology.

As technology becomes more commonplace in classrooms, teachers should focus the use of technology to help 21st century students gain the knowledge and skills required to compete in technology-driven society (Kelley, 2013). Means (2010) concluded through research that effective training is directly related to the content area that the instructor teaches, delivered through multiple sessions over time, consists of follow-up activities, and engages participants at their current knowledge and skill levels. Additionally, evidence suggests that teachers consider professional development to be more beneficial when

they participate with other teachers from their work environment, because they have a support group that allows them to complete their professional development goals (Means, 2010). Studies show that teachers view technology professional development as useful mainly when it is related to their area of specialization and content taught.

Teachers are often not provided with effective technology integration models; and there is "limited research available to guide best practice" (Bull et al., 2008, p. 102). Teachers need teaching models that enable them to conceptualize how to use various programs to enhance teaching and learning. Effective modeling includes student technology use, technology utilized

in small and large group instruction, and content specific technology utilization. Additionally, teachers need opportunities to collaborate with other teachers using the same technology.

Research also suggests that school climate and support should be changed to foster effective technology integration. The climate for technology integration should allow for experimentation to help eliminate the fear of failure (Overbaugh & Lu, 2008). Support for technology integration is one of the areas that is often neglected by schools' technology training personnel. Technology support should be on-site, ongoing, expeditious to be effective.

Lee (2006) offers strategies for school administrators that can be used to support teachers in their efforts to integrate technology.

- plan professional development that provides a vision of how integrated technology can look in the classroom;
- model ways that technology can be used to support standards-based curriculum;
- create opportunities for teachers to share about how they use computers within schools and between schools;
- offer more training on how to integrate technology into curriculum;
- offer training on how to use computers to teach content in instructional areas, rather than how to use specific software programs;
- consider creative ways to increase the number of teachers who attend technology training sessions;
- for teachers who are hesitant to integrate technology, provide more training on classroom management and how to maximize the amount of computer time available; and
- incorporate funds for updating hardware and software in technology budgets any time new technology is acquired.

## **BENEFITS OF EFFECTIVE TRAINING**

Teachers who frequently integrate technology understand the value of technology to students' academic careers. Lee (2006) asserts that teachers that value technology understand that technology experience is necessary for students' future success, technology further enables them to meet students' various needs by addressing their learning styles and preferences, and technology can enhance the quality of student work.

In addition to preparing 21st century students to thrive in a technology-driven society, technology integration offers benefits. Teachers that are effectively integrating technology are more likely to cultivate classroom management practices that maximize technology usage time for students, use computers as a tool to produce quality student work, attend more technology training, take the initiative to develop technology activities for students, ask for help with integration issues, and share technology ideas with other teachers (Lee, 2006).

In a study of teachers who are considered to be expert technology users by their peers, Becker (2006) concluded that expert technology users "directly address curriculum goals by having students use a variety of computer software, including simulations, programming languages, spreadsheets, database programs, graphing programs, logic and problem-solving programs, writing tools, and electronic bulletin-board communications software" (p. 274).

The presence of certain characteristics increases the probability to develop into an exemplary technology innovator. The characteristics are:

- working in an environment with several other technology users;
- computer use for consequential activities such as writing and simulations;

- access to an on-site technology coordinator for support; and
- working in a resource-rich environment.

### TEACHERS AS DECISION MAKERS

In addition to improving technology training practices, providing support throughout the implementation phase, and creating a climate that encourages and rewards technology integration, school administrators can further increase technology integrations levels by including teachers in the technology decision-making process. Hamilton (2007) concludes that schools with high technology integration levels have an on-site, teacher-only technology committee. In addition to decision-making power, those committees are “empowered with a budget” (p. 28). Teachers in those environments are motivated to increase their use of technology because they feel included in the decision-making process, therefore feeling that their needs and wants were considered. In order for an innovation to be adopted by a social system, Rogers (1995) noted that it must be perceived to be advantageous and be compatible to current values. Teacher-only committees are “able to influence other individuals’ attitudes or overt behavior informally in a desired way with relative frequency” (p. 27). Peer opinion plays a large part in influencing decisions. Rogers states that individuals will value the opinions of their peers more than scientific research and decisions “made by relatively a few individuals in a system who possess power, status, or technical expertise” (p. 38).

### CONCLUSION

It is evident that more research is needed to discover best practices for technology integration. However, current research suggests guidelines that administrators can

follow to support effective technology integration in their schools. By following the guidelines mentioned above school administrators will be able to effectively support teachers in their technology integration efforts. A supportive environment will give teachers the confidence they need to effectively design technology enhanced instruction that “more directly and powerfully” influences student learning outcomes (Clark, 2012).

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