

Integrating Technology: The Rewards Are Worth the Effort

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I wrote a first grade unit, as a project for this class, on the seasons and weather in which student success relies heavily on the teacher's ability to integrate technology into the unit. In one lesson, the students learn about the earth's rotation and its effect upon the seasons. I used three methods to demonstrate planetary rotation: a physical enactment of rotation by students; a static web picture; and a QuickTime movie of the earth rotating. Of the three methods, unquestionably the most effective was the QuickTime movie. The QuickTime movie provided the most realistic view of the objective allowing the students the opportunity to see the rotation of the earth. All of the students could describe and even demonstrate the rotation of the earth after viewing the movie. When asked why the movie helped them understand rotation, one student responded that when he saw the earth turning he "knew it was true". While it would be difficult to take a field trip into space, we can use technology to bring realistic information directly into the classroom. In many classrooms, teachers struggle with the integration of technology as a teaching tool. Some question the effectiveness of technology as a whole, while others question their ability to implement technology-infused lessons. Research shows that a student's use of technology is directly related to the teacher's skill with and preparation for technology use. This paper will explore reasons to support technology integration in schools and examine methods to instruct teachers in the integration of technology in order to enhance student achievement.

Support for technology integration in schools has grown in the past twenty years. In 1983, the National Commission on Excellence in Education published a report entitled A Nation at Risk. This report states that, "the educational foundations of our society are presently being

eroded by a rising tide of mediocrity that threatens our very future as a Nation and a people” (National Commission on Excellence in Education, 1983, p.1). Stating that the schools have not kept up with technological advances, the report recommends that new instructional materials incorporate the most current technology. In the past nineteen years many technological advances have been realized and the microcomputer has evolved into an interactive learning tool. While research during this time has not conclusively proven that technology has been a panacea for the educational system, technology has made a significant impact on both students and teachers.

A study by Apple Classrooms of Tomorrow points to increases in attendance, comprehension, motivation, and attitude as benefits of technology use in the classroom (National School Boards Association, 1995). In his article about science and the use of technology, Drake (2001) suggests that technology puts the “bang back into science”. Taking a look at five successful science teachers’ programs, he suggests many ways to incorporate technology into the science curriculum. WebQuests, multimedia research, collaborative projects with e-pals, handheld computers for data collection, project-based learning with web activities, and a virtual science lab are just a few of these teachers’ technology rich activities. (Drake, 2001). Technology allows “students to have plenty of opportunities to venture outside the traditional classroom and incorporate technology in hands-on activities that answer real-world questions”(Drake, 2001, p.55).

While I was unable to take my students outside the classroom, the use of multimedia technology took an abstract concept and made it a real-world experience for the students, and science is not the only curriculum area enhanced by the integration of technology. Studies show

student achievement in all content areas increases because of technology use. Reading comprehension increases when students use a computer; as the student is actively engaged in creating meaning, determining strategies, and expanding vocabulary (Singhal, 1998). A 1996 writing and technology study compares students in general writing development, sense of audience, purpose for writing, story quality, structure, logical flow, and the ability to share feelings. Their findings show an increase in motivation toward writing, writing skill, and the quantity of writing through the integration of technology and the writing curriculum (Owston & Wideman, 1996, p.14-16). A study of technology implementation and test scores for fourth and fifth grade students finds that math achievement increases when the level of technology use by the teacher increases. Technology rich environments afford the students multiple and varied opportunities for learning (Middleton & Murray, 1999, p.113).

Additional benefits of technology integration are cooperative, integrated learning, improved problem-solving skills, and the creation of global learners. By using technology, students can work in groups outside the classroom and can connect to learners around the state or around the world to share research and data on myriad topics (Whitehead, 2000, p.45-46). The Milken Foundation report on technology and achievement found that students with access to computer-assisted instruction and/or other forms of technology perform better on standardized, national, and researcher constructed tests. Studies indicating no effect or ineffective technology use also show a lack of clear learning objectives and integration of technology into the curriculum (Schacter, 1999).

Two important controlling factors become apparent from this research, the integration of technology into the curriculum and teacher training. Both factors are critical components for

growth in student achievement. Full technology integration has been lacking in most schools. Technology is often considered a stand alone activity rather than an integral part of the learning process. True integration of technology into the curriculum, “respects the interrelationships of the disciplines-language, mathematics, science- as natural and necessary to achieving the goal of becoming educated about a particular topic” (Davis & Shade, 1994, p.2). Technology becomes a seamless partner in the lesson. Technology should not be taught for technology’s sake, but for its use as another instructional tool like a book or map might be used in another lesson. Students who reap the benefits of technology integration learn that technology is a part of their world not something separate from the process of learning.

The teacher’s skill level and technology implementation in the curriculum increases with appropriate teacher training. The attitude toward technology and the implementation of technology within the classroom by a teacher is “inseparable” (Middleton, 1999). Teachers willing to switch from a teacher-centered to a student-centered classroom will reap many benefits from the use of technology. Some of these benefits are:

- increased emphasis on individualized instruction
- increased student performance
- increased interest in teaching
- increased administrator and teacher productivity
- increased planning and collaboration with colleagues
- increased communication with parents
- individualized assessment and skill development
- varied instructional methods using technology
- revised and reconstructed curriculum (Cradler, 1994, p.2-3)

While all of the benefits of technology integration are important to student achievement, the teacher will be more likely to use technology when the following factors are met:

- the teacher is aware of effective technology and it’s benefits to student

achievement

- the teacher has time to plan, learn about, and implement technology applications
- the teacher has a social network of technology-using teachers
- the teacher has mentors or peer support
- the teacher has access to technology while planning and learning
- the teacher has access to technology while teaching
- the teacher has administrative involvement and support
- the teacher has long-term professional development (Cradler, 1994, p.2-3)

State and federal programs must also provide the following elements in order to promote teacher's use of technology:

- incorporation of technology into existing education initiatives
- incorporation of technology applications into state curriculum frameworks and standards
- incorporation of funding for teacher training and support
- incorporation of funding for initial use and upgraded hardware and software
- incorporation of formative and summative assessments of all programs (Cradler, 1994, p.3)

The question shifts from why should a teacher use technology, to what methods should be used to train the teacher how to integrate technology into their curriculum.

There are two types of teacher training that need to be examined, the preservice and inservice teacher programs. Preservice technology integration classes are necessary to develop a preservice teacher's ability to use technology to its fullest. At the University of Texas, education students take classes that integrate technology directly into the core curriculum; there are no stand-alone technology implementation classes. At the University of Virginia, "students start with real problems and use technology tools as needed to solve those problems" (Salpeter, 2002). At Rutgers University, a teacher education course in literacy was taught using technology to model the effectiveness of technology integration. Preservice teachers participated in an online course involving online chats for discussion, interactive television for face-to-face

meetings, the use and evaluation of literacy software and PowerPoint, and most importantly, technology was required to be integrated into any project or activity created by the students. By forcing the preservice teachers to learn in a technology-rich environment, they in turn learn how to incorporate these technologies into their classrooms (Morrow, Barnhart, & Rooyakkers, 2002). Full integration of technology into the undergraduate education curriculum is the best way to bring new teachers into the classroom with a ready knowledge of technology integration, but it does not resolve the concerns of the inservice teacher.

Professional development for the inservice teacher is critical to technology integration. When creating professional development models, one must take into consideration the teachers and their concerns. Many of these teachers are considered master teachers, but when asked to integrate technology, these master teachers revert to preservice skill levels (Wepner & Tao, 2002, p.642). Staff developers must remember these teachers are “humbled by their lack of knowledge and proficiency” (Wepner & Tao, 2002, p.649). Their proven ability to teach must be acknowledged and celebrated while helping them adapt these new skills into their repertoire. To turn these teachers into technology integrators several things must take place. The teacher must have:

- the desire to use technology
- the technical skills necessary to use the technology
- the knowledge about technology to determine what is appropriate
- the management skills to work with groups of students
- the ability to turn learning over to the students
- the planning time to ensure proper integration (Wepner & Tao, 2002, p. 646-648)

Many school districts throughout the United States are creating professional development models to assist teachers with technology skill development and curriculum integration. The

Auburn (Washington) School District is developing a program that matches professional development to the skills of the teachers. Through Integrated Technology (IT) Teams, the teacher training starts with the district's productivity tools, then training moves to the integration of technology into the curriculum. By making the teachers technology competent before technology integration, they create a focused group of learners. The IT teams correlate teacher input to the school district's standards. The training takes place onsite with off site professional development offered after school and during the summer to keep skills sharp (Milone, 2000, p.58). In Middletown, Ohio, the district correlates team building with professional development. Using a "train the trainer" model, staff members train each other in needed skills and reviews skills as necessary. Review of previously taught material is an integral part of their process. Believing that review ensures mastery, teachers work until they can apply the content of the lessons (Milone, 2000, p.59-60).

In North Carolina, the ExplorNet Technology Program is a problem-based approach using a hands-on design to model effective use of technology for instruction in specific school situations. Instructors use a three-pronged approach to teach the teachers. Immersion is first prong, treating the teacher like a student in a classroom; the objective is to create an overview of the new technology. Prong two is teacher-to-teacher instruction, when the instructor and teacher work through the technology as a team to develop technology uses tailored to the teacher's specific needs. The final prong is the step-by-step instruction for the teacher in products, technologies, or outcomes required by the state or school district (McCullen, 2002,p.48).

"Teachers learn exactly what they need and want, when they want to learn it" (McCullen, 2002, p.49). The Lubbock (Texas) School District employs this statement to ensure their

professional development program is tailored to the needs of the individual teacher. Teachers are able to complete professional development through off and on-line sources from universities, district classes, distance learning, and independent reading. The district provides onsite instructors to give immediate attention to the individual teacher's needs and requirements. Teachers are asked to demonstrate their mastery of the required skills through performance tests given at the district offices. Teachers are able to take the assessments as often as needed to show mastery. Rewards are ample as teachers demonstrate mastery of the skill levels. Level one mastery earns a computer, level two a printer and projection system, level three allows the teacher to apply for pilot programs involving technology (McCullen, 2002, p.49).

Common threads found in successful professional development programs begin with assessment of needs, nonthreatening discussions, and surveys to assist trainers in the preparation of presentations that meet the needs of the audience. Feedback gives the school the information to stay on task and provides a concrete way to prove skill development is taking place. Budgetary conditions must be understood; there is no point in training teachers to use equipment or programs that are not available to them in the classroom. Teachers should be trained at convenient sites that meet the needs of the participants. Instruction should be meaningful, long-term, and predictable. "Hit and run" classes do not provide sustaining results. Incentives such as computers, software, and other tangible rewards keep interest strong during classes as well as during follow-up. Training the teachers to be onsite mentors and facilitators helps everyone get questions and problems answered quickly with little frustration. Follow-up is probably the most important part of the equation. Support through site visits, additional classes, and onsite mentoring boosts morale and provides accountability (McCullen, 2002; Milone, 2002).

Technology has permeated our culture to the point that it is at times lost in the background. However, not all schools and teachers have been able to effectively integrate technology into the curriculum so that the background is a support for student achievement. Research has proven a connection between student achievement and the use of technology, but the integration of said technology is left up to the individual teacher. Well-designed and implemented professional development is critical to support the teacher's need to feel comfortable integrating technology into the curriculum and increasing student achievement. Additional research and proper planning must be done to ensure proper integration of technology into the curriculum. Stand-alone technology does not return the consistent benefits of technology integration, so professional development must give teachers the tools to fully integrate technology into their curriculum to increase student achievement.

As I prepared my culminating project for my master's degree, I did additional reading and thinking about professional development in technology integration for teachers. I made use of several books and articles to further define my thoughts regarding how teachers learn about technology and how we should present technology in support of the curriculum. While looking through the new information and rereading this paper, it is my opinion that professional development is the key to the integration of technology into the curriculum. There are many approaches to teacher training, the development of "technology-rich model schools, training a cadre of teachers who support and help their colleagues, providing expert resource people, giving every teacher a computer, training administrators alongside teachers, and establishing teacher resource centers" (Whitehead, Jensen & Boschee, 2003, p.71). To plan for technology in the schools, twenty to twenty-five percent of the budget must be used for professional

development. Critical components of the budget must be onsite ongoing support for teachers, and hands-on training (Whitehead, Jensen & Boschee, 2003). Another critical approach is to train the administrators as the teachers are trained. Creighton (2003) suggests that a pitfall of technology implementation is the “lack of appropriate leadership” within the school. Many administrators dictate the staff development with no concern for staff needs while others have a hands-off approach to staff development. Planning for technology integration must involve all members of the staff in order to get buy-in from the classroom teacher. Changes in the integration of technology into the curriculum must come from within the organization (Creighton, 2003). McKenzie (1999) uses a results-based model to help schools integrate technology. The integration of technology must start with evaluating how the technology fits into the stated learning goals. Teachers must see the connections between the technology and the curriculum, be provided the time (three to five years) to learn and implement the technology, have access to the equipment, and they must make a personal connection to the technology. Teachers should learn how to use technology for themselves; then they will be more receptive to using it with their students. Not to be forgotten is the “just in time” assistance provided the teachers, and the continuing assessment of the benefits the technology has brought to the curriculum and student achievement (McKenzie, 1999, p. 2-9).

What is the most effective way to integrate technology into the curriculum? Technology must become more than an isolated standard to have a second grader be able to use colored fonts in a poem. Teachers, through personal identification, must find value in the use of technology to support learning goals. These goals must be results-based and frequently monitored for progress. The integration of technology will not arrive via an administrative mandate or the

purchase of a laptop computer for each student, rather it will arrive when both the preservice and inservice teacher finds technology's power to create a change in student learning and achievement.

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