Technology Teams: The Only Component of Successful Integration?

A Current Issue in School Systems

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Introduction

Effective technology integration is problematic in today's school systems and has been since the turn of the century. Professionals in the field of education and related disciplines have asked why school systems fail to create 21st learning environments, only to unveil a hierarchy of needs that would lay a foundation for success (Papa, 2011; Frazier, 2010; Hanover Research Council, 2010, Dessoff, 2011). To understand issues that global school systems face regarding foundational needs for a 21st century school, the reviewers of this current paper examined research in the form of commentary, observational studies, surveys, and statistical reports. Using literature published in the last twelve years relevant to educational technology and leadership, this paper will examine technology teams, professional learning, Communities of Practice, age appropriate technology in addition to assessment and evaluation plans with reference to integration. Findings in the literature suggest human beings as complex variables in the technology integration process, to which Papa (2011) adds "successful implementation is a struggle between resources and philosophy" (pp 53. par. 4). The final discussion of each topic analyzes the limitations of the literature reviewed and suggestions for future study concerning the extent to which technology teams are essential in facilitating successful integration programs.

Literature Review

Technology Teams

Given the insight of six professionals who served as Chief Information Officers, Chief Librarians, or other information technology leaders, it can be argued that the role of head IT leaders has and will continue to evolve. Maas, Paige, Ridley, Rowel ,Wandschneider and Woo (2012) participated in a panel discussion to share what they believed to be critical competencies for a technology leader, specifically a Chief Information Officer or the equivalent. In the 2012 panel discussion, Mass et. al. offered answers to three questions regarding 1) professional experiences beneficial to serving as a technology leader 2) personal strengths tied to job related success and 3) critical competencies for future CIOs or the equivalent.

Mass et. al. suggested that prior experience in computer analysis, information science, business, etc. allow for situated learning and the the acquisition of skill sets essential for leading a IT team. In whole, the "variety" of skills that a seasoned CIO acquires overtime allows a company/school to hire a leader with specificity. The panel encouraged anyone interested in the field of technology to seek jobs and learning experiences that have an exciting nature and/or promise personal advancement in terms of professional knowledge construction (Mass et. al., 2012). In addition, members of the panel acknowledged that having direct contact with learners, various learning styles, software, and hardware to be implemented could empower tech leaders and their teams to act as change agents. Mass et. al. (2012) provided support in their discussion for a background with multiple disciplines to provide a larger foundation for technology focused individuals. Specifically, the wealth of experiences would enable CIOs or the equivalent to build connections with other professionals.

According to Mass et. al. (2012) empathy and having an understanding of various perspectives allows a team or individual leader to predict the reactions of stakeholders concerning planned technology integration. This idea is well supported by early work in adult learning by Malcolm S. Knowles (1988), in that professional leaders must be concerned with the goals and interests of individuals, institutions and society. Mass et. al. (2012) found that exemplary leaders/teams have collaborative relationships, strong, diverse partnerships centered on shared objectives and an understanding that collaboration is a muscle that can grow stronger through frequent movement. Further, Mass et. al. noted that a leader or team should be organized and plan interventions that implement technology in a sensible fashion.

In his empirical study involving surveys, technology implementation training, and elementary school teachers, Chang (2012) studied the influence that principals can have on teachers as they create technology enhanced learning experiences. In attempts to collect a range of data, Chang's (2012) study included one thousand elementary school teachers from one hundred schools, spanning across five major cities in Taiwan. Three survey instruments were sent out to evaluate Principals' Technological Leadership, Teachers' Technological Literacy, and Teachers' Teaching Effectiveness. Overall, each tool addressed constructs in technology and leadership such as software, hardware, planning before/after integration, and communication, ideas similar to those previously described by Mass et. al. (2012). Of the survey instruments sent out, 60.5% were returned and analyzed. A structural equation model (SEM), a tool used in empirical studies that allows researchers to correlate data for each construct at the same time, indicated a common fit between the constructs and survey results (Chang, 2012). The study confirmed earlier research regarding principals' influence and found that principals' support directly impacts teachers' technological literacy and teaching effectiveness when integrating technology

into academics.

A principal, because of his/her natural leadership role in a school setting, is an integral part of a technology team. Chang's (2012) research indicated that the technological leadership of a principal improves the effectiveness of technology utilization in educational instruction by way of changing a school community's culture of teaching and learning. Chang (2012) additionally suggested that teachers transformed into technology leaders in their own classroom, using actual content from professional learning.

Chang (2012) found that principals who encouraged staff members to integrate technology into academics, while offering technology workshops for professional support, increased their own technological leadership skill, improved teacher competency, and opened communications for a shared vision in 21st century teaching. Complementary to Chang's (2012) findings, Mass et. al. (2012), also suggested that a modern leader is a lifelong learner, grounded in professional development who perseveres academically by engaging in activities that construct job related knowledge. Both sources found it equally important to apply active listening as well as professional learning, Mass et. al. (2012) in the form of empathy and understanding compared to Chang (2012) in the form of interpersonal communication and a shared vision, when leading an initiative. Chang's (2012) empirical study however, focused more on the principal as leader and change agent for technology while Mass et. al. (2012) provided an array of qualities that a technology leader may have. An interesting comparison between the two articles was that Mass et. al. (2012) did not specifically reference a principal as someone who could " develop, guide, manage, and apply technology to different organizational operations so as to improve operational performance" (Chang, 2012, pp. 328 par 3) although the panel discussion revolved around those topics.

In her analysis of the collaborative efforts between Library Media Specialists and classroom teachers, Frazier (2010) defined the technological benefits of adding a Media Specialist to a leadership team. Pulling from her experiences as a graduate student in the Library Information Science and former elementary educator in Southern California schools, Frazier (2010) inquired about the barriers and benefits of having a Library Media Specialist in the technology leadership team. In her article, she shared benefits of collaborating with educators as well as students. The majority of her article addressed communicative barriers and possible solutions for 1) time 2) technology troubleshooting 3) narrow focus for integration 4) faculty perceptions 5) restrictive control and 6) lack of administrative support (Frazier, 2010). Findings that surfaced later in 2012 from Mass et. al's discussion and Chang's study identify with the barriers that Frazier (2010) examined, especially in the areas of administrative support and faculty perceptions. All of the authors in review cited evidence or personal experience that highlighted the need for mutual understanding in redefining education that includes technology.

Although Frazier (2010), like Chang's 2012 study, singled out a specific group of possible leaders or team members in relation to technology, her suggested competencies were in sync with other literature reviewed in this paper. Using a survey conducted in 2008 by the Library Media Connection, Frazier (2010) cited that more than half of the librarians who participated felt they were the second in line for technology support in the school settings, meaning staff members would utilize them when problems would arise. Being open minded about helping those in need is a competency already described as collaboration or having a team mentality by Mass et. al.'s (2012) and Chang's (2012) agreement of a technology leader's disposition. Since Frazier's (2010) survey of Librarians was conducted prior to the Mass et. al.'s and Chang's, her findings support the evolution of a technology leader being described in this present paper.

Media Specialists are technology leaders and team members, especially when districts are pushed to make budget cuts in their IT departments (Frazier, 2010). The librarian (2010) found that a true collaboration existed when teachers and Media Specialists "united to create lesson plans, facilitated engaging student activities, and developed authentic assessments for evaluating student progress" (pp 34 par. 3). In connection, Chang's (2012) data revealed that principals have a significantly positive influence on teachers' technological literacy and teaching effectiveness when they designed and implemented a vision plan before, during and after technology initiatives. However, the survey Frazier used was focused on the opinion of librarians concerning technological collaboration, while Chang's 2012 data reflected surveyed opinions from teachers regarding a principal's competency. Since the target audiences of both surveys differ, it is possible to argue that teachers and librarians can be agents for technological change if administrative support, e.g. principal, is available (Frazier, 2010; Chang, 2012). Going further, it can be argued from the articles presented thus far that principals are in need of support from administrators higher up, e.g. Chief Information Officers or the equivalent, as well as from staff members below to provide open communication about barriers that prevent effective teaching with technology from happening (Mass et. al., 2012; Frazier, 2010; Chang, 2012).

Compared to the conclusions of authors discussed in this present paper, Frazier (2010) asserts that " today's school librarians are not just part of the tapestry, they represent the vital golden thread that pulls it all together, connecting teachers and students to the information and modern day tools necessary for 21st century success and lifelong achievement" (pp. 36 par. 6). Where a principal would provide leadership that fostered an environment for change and work to change the mindsets of staff regarding new instructional models, a library media specialist would act as a resource provider beyond print materials, model collaborative constructivism, and would address the issue of information literacy with

professional development (Chang, 2012; Frazier, 2010; Mass et. al., 2012). Finally, literature related to this topic indicated that an upper-level administrator also serves as a technology leader or possible member of a team due to the position of authority to create planning sessions, invite or include diverse members of a school community to participate in decision making, and to organize or arrange funding opportunities that support 21st century technology trends in the form of staffing, materials, or training (Papa, 2011; Mass et. al., 2012; Knowles, 1988; Chang, 2012; Frazier, 2010).

Future research, possibly including longitudinal or latitudinal studies of school systems that could identify all members of the integration process from start to finish and their roles, would perhaps shine light on who is needed to accomplish a technology mission. From the literature reviewed, it is evident that not many researchers have had the opportunity to analyze a successful integration program and the people who were responsible for it. The authors in this present paper have offered some strength by sharing personal experiences in leading technology positions and diverse findings from focused groups of education related staff in constructs that denoted leadership qualities, materials and training. Those interested in this topic can infer from the literature that a school community must undergo a complete social and cultural change. This transition into 21st century learning is daunting for one person to tackle, therefore future researchers should investigate as many successful schools as possibles, documenting each recipe for success.

Professional Learning

The "lack of technology integration among teachers in American classroom is a major concern in education today" (Zhao & Bryant, 2005). In a nationwide survey Abbot (2003) found that over half of teachers do not regularly use technology in their classrooms. More than half of the students also responded that they used technology no more than once a week. Research showed that to integrate

technology effectively teacher must participate in training that moves beyond basic computer skills and instead focuses on technology integration into the curriculum (Baylor & Ritchie, 2002; Becker, 2001; Redish, 1997; Reynolds & Morgan, 2001; Roberts, 2003; VanFossen, 2001; Wenglinsky, 1998). After initial training, follow-up and mentoring programs are necessary to help teachers with the challenges that come with technology integration in the classroom (Carlson, 2002; Di Benedetto, 2005; May, 2000; O'Dwyer, Russel & Bebell, 2004).

Zhoa, and Bryant, researchers at Georgia State University studied technology integration after a state mandated 50 hour technology training. The "InTech training was designed to prepare teachers with the skills to: 1) incorporate technology into curriculum standards; 2) utilize various technological resources; 3) incorporate these resources into new designs for teaching and learning; 4) development effective classroom management strategies; and 5) development a new enhanced classroom pedagogy with technology (State Data and Research Center, 2002-2003). Their goal was to discover if technology integration alone lead to high levels of technology integration. The study examined two qualitative datasets. The first dataset focused on social studies teachers who attended the state of Georgia Technology Integration (InTech) training. These teachers received no support after initial training. The second dataset were elementary teachers who received mentoring after technology integration training. Data was collected through interviews, classroom observations, and document analysis. Results showed that the initial training covered too much information in a limited amount of time. Mentoring was the most beneficial after initial training because it reduced the preparation time and catered to individual learning needs. Teachers felt more comfortable integrating technology because they had support available. The findings matched other research and confirmed that mentoring or follow-up training is necessary to enable teachers to integrate technology in their classrooms. The

amount of teachers studied (22) and the fact that the two datasets were from different types of schools (elementary and high school) are limitations of the study. That aside the impact of the technology integration specialist being readily available was very beneficial for teachers and could potentially eliminate the need for the initial InTech training for all teachers.

Jonathan Brinkerhoff, a researcher at the University of New Mexico analyzed the effect of a long-term professional development academy on the technology skills, beliefs, and practices of teacher. Technology integration fails due to barriers such as "resources, institutional and administrative support, training and experience, and attitudinal or personal factors" (Brinkerhoff, 2006). The most common resource barriers included availability of a limited amount of computers and/or software and outdated or slow hardware, software, and Internet. Another barrier for teachers was the one time professional development with no follow-up as well as lack of prep time for technology integration. Teachers also had the perception that that technology should be "taught by a specialist, much like physical education or music. (Brinkerhoff, 2006) Attitudes towards technology were another major impeding force which can lead to teachers feeling overwhelmed when attempting to integrate technology in their classroom because students may be more knowledgeable than they are. This lack of confidence in computer competency and implementation can result in the choice to not implement technology into their classroom. To address the barriers relating to professional development and attitudes toward technology the state of New Mexico created a technology academy model. The academy extended through two academic years staring with a 15-day training in June of 2003 from 8:30 a.m. to 4:30 p.m. daily. During the 2003-2004 school year teachers attended five in-service trainings. This schedule repeated in the summer of 2004 and during the 2004-2005 school year. Teachers volunteered for the program and were paid a stipend for their attendance in addition to provided meals, accommodations,

and necessary materials. The academy focused "on skills development as stepping-stones to new ideas and practices for instruction rather than end goals" (Brinkerhoff, 2006). Instructional activities included sharing ideas, discussion, and applicable use of the materials in the classroom. Teachers were also asked to complete a self-assessment rubric and set personal goals for their use of technology in the classroom. Finally, in order to address the administrative support barrier participants were required to provide a letter of support from an administrator committing to the required training session and any other necessary support to enable the teacher to be successful in technology integration. The academy was evaluated using surveys of participants focusing on their feelings and beliefs. These surveys were given at the first and last days of training. Teacher interviews were also used to evaluate the effectiveness of the academy. Three questions were asked "concerning the perceived change in computer self-efficacy, technology skills, and feelings towards technology integration during the course of the academy (Brinkerhoff, 2006). The research showed that the academy was successful in working to eliminate the training and experience, and attitudinal or personal factors barriers. Teachers increased their technology skills, had more confidence in integrating technology, and altered their teaching as a result of attending the academy. The reliance on only interviews and questionnaires was a limitation of the study. Classroom observations could have increased the validity of the study. The voluntary participation in the technology academy also is an important factor to consider because it could be implied that these teachers already had an interest in technology before beginning the academy which could skew the data. The same could be said about the financial incentives of attending the academy.

Lowther, Strahl, Inan, and Ross researchers at the Center for Research in Educational Policy at the University of Memphis analyzed the effectiveness of technology integration when the key barriers are removed. The researchers agreed with Zhao and Bryant regarding the minimal use of technology in

classroom. If technology was used in the classroom it was simple and low level tasks. As in the Brinkerhoff research, this study focused on barriers impacting effective technology integration. Barriers included "availability and access to computer, availability of curriculum materials, teachers beliefs, demographic characteristics of teachers, teachers' technological and content knowledge, and technical, administrative, and peer support (Lowther, Strahl, Inan & Ross, 2008). The study reported the findings of the effectiveness of the Tennessee EdTech Launch (TnETL). The goal of the TnETL was to prepare students to meet academic standards not only in core subjects but also technology literacy. In addition, all teachers being qualified to teach technology was also a goal of the program. Instead of providing extensive off-site professional development to individual teachers like the previous studies, a full-time, on-site technology coach was assigned at each school. These coaches who were past teachers at their school went through extensive on-going professional development focusing on "preparing teachers to create student-centered environments that engage students in critical thinking and use of computer as a tools in order to increase learning and performance and to gain 21st century skills" (ISTE, 2007; McCain, 2005; Morrison & Lowther, 2005). The program was implemented in two cohorts known as Launch 1 and Launch 2 over a three-year period (2003-2006). Launch 1 included 26 schools (13 program and 13 matched control). The "matched pairs of school were formed according to the following criteria: locale, grade levels, number of students, percent qualified for free/reduced lunch, ethnicity, and achievement" (Lowther, Strahl, Inan & Ross, 2008). Launch 2 was similar with 28 schools (14 program and 14 randomly selected controls). Program effectiveness was measured using surveys, observation, interviews, focus group, and student data analysis. Results showed that program students marginally out performed the control students in a majority of cases. Program students were more likely to be observed using student-centered or project based learning instructional strategies

which could have lead to an increase in critical thinking skills that could positively impact student achievement on standardized assessment.

To conclusively confirm this data the study would have to continue for more than the 3 years. Teacher attitude toward technology also increased during the study. They felt more confident in integrating technology into their lesson and creating more student centered activities but they still needed more professional development to expand their knowledge on effective use of technology. The length of the study is a limitation especially when analyzing student achievement data. That being said Lowther, Strahl, Inan & Ross were the only researchers who attempted to analyze student achievement data. They also studied 27,735 students and 1,746 teachers ranging from kindergarten to twelfth grade and used seven different data gathering tools, which solidifies the validity of their results.

These three case studies have shown how states can implement a technology-training program and provide day-to-day support for teachers in technology implementation. Zhoa and Bryant studied the effectiveness of both the initial training and the follow-up support while Brinkerhoff focused specifically on initial training. Both of these studies showed positive results in the areas of teacher attitudes and confidence towards implementing technology in the classroom but did not dive deep enough to measure the impact on student achievement. A drawback of the two studies is the major financial investment that would be necessary to initially train thousands of teachers. The third study by Lowther, Strahl, Inan & Ross Both could be an alternative training method to the previous two studies especially since teachers felt that they still needed more professional development beyond the initial training. Instead of training multiple teachers from each school off-site, Tennessee EdTech Launch (TnETL) trained one technology mentor from each school. This could have major cost savings and would also alleviate the problem of on-going professional development. Technology mentors who

were already trusted members of the school community would take what they learned off-site and implement it at their schools. Both Brinkerhoff 's and Lowther, Strahl, Inan & Ross' study showed that teachers felt more comfortable implementing technology because they had support available at their school. Overall these studies show the importance of initial training and follow-up mentoring programs when implementing technology.

Communities of Practice

A teacher's decision to use technology is based in part on how they see their peers react to and accept new technology (Ertmer 2005; Hu 2007) and their own beliefs about how technology improves student learning (Lim 2006.) A culture that supports and promotes technology adoption and the adoption of new teaching practices is one that encourages risk-taking, immerses the teacher in technology use, and provides ongoing support (Vanatta and Fordham 2004). A positive school culture encourages civility, and respectful communication that encourages and facilitates open discussion and thoughtful decision-making.

School Administrators have a major responsibility for initiating and implementing technology and can facilitate complex decisions to integrate it into learning. They must also be able to implement technology and benefit from various positive facets of technology such as improved learning environments, increased student and teacher motivation, enhanced student learning, and more student involvement in instructional activities (Bauer & Kenton, 2005). School administration must understand, promote and implement the notion that technology integration is not about the technology; it is about focusing on the future generations and leading teachers to a change in pedagogy.

Establishing a culture of technology integration, modeling technology use, and creating teacher leaders, school districts will have a greater chance in shifting the culture of the school to embrace the

technology. Administration must develop a team of stakeholders, including teachers, administrators, parents, assistants, and technicians, who are devoted to the technology integration process. Establishing this team is important because it facilitates teacher buy-in and prevents the technology integration process from becoming the agenda of one or a few people (Hayes, 2007; Hinson, 2005). When administrations shifts the responsibility for making decisions about curricular policies, contributing to school-wide technology goals, and disseminating information regarding the curricular and policy changes that often come with the integration of technology they establish a community of practice. Teachers greatly appreciate the support and encouragement provided by their school and district administrators in their technology implementation efforts, and most teachers are grateful for the availability of technology resources thereby.

Richard C. Overbaugh, professor at Old Dominion University, conducted a study to examine teacher perceptions of the impact the school environment on the use of instructional technology. The study participants were comprised of K–12 in-service teachers in Virginia who volunteered to take one or more instructional technology integration professional development courses. At the conclusion of the professional development course students were given a four-section survey instrument. Overbaugh, concluded that the most serious problem facing K–12 teachers in their technology implementation efforts was time constraints, followed by technical problems that could not be taken care of in a timely manner. Access to adequate and appropriate software seemed somewhat problematic as well. In contrast, the two areas that were perceived to be particularly satisfactory were administrative support and continual technology education opportunities, which indicated the general recognition of the importance of technology in education at the administrative level. The major flaw with this data comparison was the disparity of resources available for urban schools versus rural schools.

Kopcha, a professor a San Diego State, surmised that teacher mentors provide assistance in overcoming the multiple barriers (time, professional development, and culture) on teachers who are learning to integrate technology. Kopcha suggest establishing a culture of technology integration, modeling technology use, and creating teacher leaders. The establishment of a teacher-led community of practice that uses the resources currently available at a school supports and sustain the integration of technology. The support the mentor provides is in the moment thereby eliminating the learning curve time factor. This is important because it could translate into a more substantial use of technology for learning. Researchers have suggested that these approaches to learning lead to higher levels of motivation, deeper levels of learning, and skills that are transferable to new and unknown situations (Glazer, 2005).

Moving teachers toward using technology in a problem based student centered way reduces the demands associated with an outside expert who conducts a one time professional development. In order to promote long-term integration efforts, a community of practice around technology must be established taking into account teacher self efficacy as it relates to technology.

Overbaugh, Etmer, and Kopcha's studies all refute the notion that leadership is the single most important factor affecting successfully integrating technology into schools. All three studies conclude that without a pedagogical change in the school culture, and personal beliefs about teaching with technology, integration will not be effective. Teachers with more traditional beliefs will implement more traditional or "low-level" technology uses, whereas teachers with more constructivist beliefs will implement more student-centered or "high-level" technology uses. In order to facilitate change, efforts must be placed on assisting teachers to understand how student-centered practices, supported by technology, affect student learning outcomes. School administration must go beyond communicating the

advantages of instructional technology and providing surface support and concentrate on high-quality training for teachers in the area of instructional technology.

Based on this present literature review, new research is needed to measure the permeability of teachers' experiences and developed thoughts as it relates to technology integration. Additional research should be conducted make a comparison to identify the disparities between teachers' self-perceptions of their confidence in their ability to use instructional technology and their actual implementation or use of instructional technology.

Age-Appropriate Technology

Children today live in a world of interactive media. They are growing up at ease with digital devices that are rapidly becoming the tools of the culture at home, at school, at work, and in the community (Kerawalla & Crook 2002). Technology tools for communication, collaboration, social networking, and academic content have caused a transformation in culture. In particular, these tools have 1) transformed how parents and families manage their daily lives and seek out entertainment, 2) how teachers use materials in the classroom with young children and communicate with parents and families, and 3) how we deliver teacher education and professional development (Rideout, Vandewater, & Wartella, 2003). The pace of change is so rapid that society is experiencing a disruption almost as significant as when there was a shift from oral language to print literacy, and again when the printing press expanded access to books and the printed word. The shift to new media literacies and the need for digital literacy that encompasses both technology and media literacy will continue to shape the world in which young children are developing and learning (Linebarger & Piotrowski, 2009).

The prevalence of technology in the lives of young children means that they are spending an increasing number of hours per week in front of and engaged with screens of all kinds, including

televisions, computers, smartphones, tablets, handheld game devices, and game consoles. The distinction among the devices, the content, and the user experience has been blurred by multi-touch screens and movement-activated technologies that detect and respond to the child's movements. With guidance, these various technology tools can be harnessed for learning and development; without guidance, usage can be inappropriate and/or interfere with learning and development.

In the last decade or so, the world has been wrapped up in a technological revolution. Technological advances have impacted our daily lives in many different ways. A growing number of experts believe that including technology in education will best prepare our young generations for the future. Also, many of these critics argue that it must be developmentally appropriate technology, there is some argument on what that means for what age groups. In "Missing the Boat with Technology Usage in Early Childhood Settings," the authors argued that not enough developmentally appropriate technology was used in early childhood classrooms, and if that were to be increased, we would see a improvements in early childhood education overall. However, the authors also argued that teachers are not yet prepared for this kind of jump. Parette, Quesenberry and Blum (2010) demanded improvements in teacher training with respect to integrating technology, especially in early childhood, if developmentally appropriate tech was available.

In "Tots to Tweens: Age-Appropriate Technology Programming for Kids," librarian Madeline Walton-Hadlock (2008) discusses some of the upsides to developmentally appropriate technology. She points out that, "technology is exciting for children, and it may draw new young people to the library…that technology could enhance learning by engaging children in problem solving, teamwork, decision making, and the development of fine motor skills and coordination." Walton-Hadlock (2008) also discussed fears shared by some parents, educators, and health experts that children can be

overexposed to technology. Walton-Hadlock wrote:

> "Parents and educators often worry that too much technology will lead to problems such as poor socialization, short attention spans, and even childhood obesity. Most experts agree that a child's exposure to technology should be meaningful, involve collaboration with other people, include time limits, and moreover should not be a substitute for outside play, exposure to print, and personal interactions. While different families may develop their own limits, the Center on Media and Child Health recommends no more than two hours of screen exposure per day for any child over the age of two." (p. 54)

Walton-Hadlock is a Media Specialist who (2008) recommends several different types of technologies for use by teachers or parents, in order to enhance the educational process for their students and children. They include music CDs, electronic toys, computer software programs, Internet games, and video games.

Jennifer Demski, a freelance writer based in Los Angeles, reiterated in her 2010 article that people are still trying to find the web 2.0 tools that best facilitate collaboration--one of the fundamentals of 21st century learning. As the number of tools continues to grow, and fuzzy terms like "cloud computing," "hashtags," and "synchronous live platforms" are introduced into the lexicon daily (Parette, Quesenberry & Blum, 2010). The most tech-savvy educators can have trouble determining which technologies have a role in a collaborative academic environment and which are simply new toys. In this article, three top ed tech consultants--Steve Hargadon, John Kuglin, and Leslie Fisher--select web 2.0 tools they believe are ideal for fostering collaboration in teaching and learning. A compilation of technologies that can "do things of value" in the instructional and professional development realms, and in both the traditional and the virtual classroom. Within the confusing and trend-seeking world of

education technology, Steve Hargadon, John Kuglin, and Leslie Fisher offer web 2.0 tools that enhance teaching and learning. Web 2.0 tools offer education technology experts ways to get them to strive to separate the trends from the utility.

Assessment and Evaluation

The International Society for Technology in Education (ISTE) advocates for the "continuous assessment of teaching, learning, and leadership, and evaluation of the use of information and communication technology and digital resources" in the classroom ("Nets Standards", 2012). There is a need to evaluate the learning that is going on in the classrooms to ensure that the needs of students are being best served by the technology being integrated into the curriculum. Program assessment and evaluation play a critical role in determining what successful integration looks like and how to continuously ensure best practices in the learning environment.

The Northwest Educational Technology Consortium (NETC) has been providing services and products in the Northwest since 1995. The consortium is made up of the state education agencies from Alaska, Idaho, Montana, Oregon, and Washington, and the Northwest Regional Educational Laboratory in Portland, Oregon. NETC is one of the network of 10 Regional Technology in Education Consortia in the U.S. and receives funding from the U.S. Department of Education. The mission of the Northwest Educational Technology Consortium is to provide professional development opportunities, access to technical assistance, and support for collegial interaction that allow and encourage educators throughout our region, and especially in K-12 schools, to become informed and fearless users of technology (NETC | Program Evaluation, 2005).

The NETC defined program evaluation as "the systematic investigation of a project or program to determine its worth or merit." The organization supports that the core value of any program is the

degree to which it makes a difference in the "teaching, learning, and the school environment" Their article is intended to act as a guideline for evaluating such programs, in particular, technology-related programs (NETC | Program Evaluation, 2005).

The NETC highlighted the needs for program evaluation to ensure that administrators have hard data at hand to "identify needs, problems, and opportunities, and make informed decisions about which aspects of the program should be sustained, improved, or eliminated" (NETC | Program Evaluation, 2005). The article points out that it is important to ensure that all stakeholders have the information on a program's evaluation. When these stakeholders, policymakers in particular, have data that indicates a program is successful in making a positive impact on student learning, they are much more likely to advocate for the continuation of that program (NETC | Program Evaluation, 2005).

In order to make sure that the proper data is being collected, the NETC recommended that technology plans for schools, districts, and states should not only outline what a program will do, but also how it will be evaluated and data will be collected. "Along with goals, objectives, and activities, the technology plan must include indicators, benchmarks, and data sources" (NETC | Program Evaluation, 2005).

The NETC acknowledged that there are several challenges faced during the evaluation of most technology programs, placing special emphasis on the fact that evaluations often lack qualified individuals to oversee their implementation. The article concluded with a list of guidelines for program evaluation. Some of the key items in this list include the need to identify issues, determining how to collect and utilize data, identifying evaluation design, and the role staff members will play in the process (NETC | Program Evaluation, 2005).

The primary focus of NETC's evaluation process is in line with the beliefs of other

organizations. In particular, the International Society for Technology in Education's (ISTE) NETS standards similarly call for conducting assessments of professional development programs to ensure that they make a positive impact on student learning ("Nets Standards", 2012).

Other than a list of possible questions to examine, such as "What concerns about our facilities should we be aware of as we look ahead to the next 3-5 years," there are few concrete examples of what program evaluation should actually look like or how it should be implemented. So, the NETC's recommendations acts more as a theoretical guideline than a "how to" for program evaluation.

Louanne Smolin, currently an independent education consultant, spent time as a as a clinical associate professor of Curriculum and Instruction in the Department of Education at the University of Illinois Chicago. Smolin specializes in curriculum development and evaluation, particularly with respect to multimedia and technology integration in public school classrooms. Kimberly A. Lawless, currently a professor and Chair of Educational Psychology at the University of Illinois at Chicago, partnered with Smolin in research of contemporary measures to evaluate technology integration programs. Lawless' research has involved understanding how individuals search for, evaluate, and integrate information across multiple sources of information, particularly those that are found in digital, networked environments.

In their 2011 articles, the authors examine how technology integration professional development (TIPD) is evaluated. In the introduction of their article, Smolin and Lawless (2011) stated that while these programs are essential to effectively integrating technology into the classroom, the evaluation of these programs rarely "moves beyond participation satisfaction surveys, nor does it reflect the concerns of the multiple stakeholders participating in technology integration efforts" (p. 92).

The authors discussed what they termed "collaborative models" that hold potential for evaluating

TIPD partnerships. They advocated for TIPD partners to define a collaborative and holistic vision of success that can guide the evaluation process. Additionally, the authors discussed three specific collaborative evaluation models, examine key issues associated with implementing them, and analyze how each model has the potential to strengthen and sustain professional development partnerships.

In the conclusion, Smolin and Lawless (2011) overviewed key concepts related to the evaluation of technology implementation programs referred to as "Big Ideas." The first Big Idea detailed benefits of building collaborative partnerships for the evaluation process. Big Idea #2 reiterated how collaborative evaluation can provide data useful for adjusting the implementation of the program. Big Idea #3 stated that participants should be involved in developing the instruments of evaluation and in interpreting the findings. The authors summarized their article by stating the importance of including all stakeholders in the entire process of evaluating the effectiveness of a program.

According to NETC, "a person or committee with oversight for reporting technology progress" would be in charge of evaluating a technology integration program (NETC | Program Evaluation, 2005). Smolin and Lawless' (2011) article advocated for a very different approach. Unlike the NETC's (2012) recommendations, participation by the stakeholders at all levels is strongly advised by Smolin and Lawless (2011). NETC (2012) seems to advocate for program administrators and reviewers with high levels of technological expertise. Smolin and Lawless urge everyone in a school community to be involved at all levels of the evaluation process.

While Smolin and Lawless (2011) provided anecdotal evidence of their own experiences implementing TIPD, their article failed to provide many tangible steps for actually taking their research and putting it into practice.

As the current director of the Laboratory for Professional Development in Instructional

Technology for the Center for Excellence in Education, B.J. Eib utilized 20 years of classroom experience in elementary, middle, and high school levels when examining how contemporary technology integration is evaluated. Eib's use of truism in the introduction of her 2001 article signified that simply having hardware and software in a lesson plan did not equate to efficient or effective use of technology to enhance learn not guarantee technology will significantly enhance learning. She believes it is up to the principals to know and understand how technology supports learning objectives and to help them evaluate technology's usefulness in their schools. While the don't need to have all of the curriculum memorized, they should know enough about the technology standards to work with teachers to develop a vision and an approach to implementing technology-based learning activities.

Eib lays out specific steps for evaluating technology use, including the use of rubrics by the evaluator and a step by step process of what needs to be done. She also included a list of "Indicators of Engaged Learning" for use by the evaluators. These are broken into several categories including Vision of Learning, Tasks, Instructional Model, and Learning Context. Each category is complete with specific performance indicators. The article concluded with a look at "What To Look For in the Classroom", complete with a list of "What You Don't Want To See." This section again contains very specific, immediately actionable list of items an evaluator should be aware of.

Unlike the other two pieces, this article provides many suggestions for the actual implementation of technology evaluation. This includes a section that provides a list of actual tools to use in evaluation and suggestions for the types of questions that could be asked. Eib has provided rubrics and information that a program evaluator could review and immediately use to begin their own program evaluation. This differs significantly from the other literature on the subject. These pieces acted more as a theoretical starting point that could be used when designing your own program. Eib, on the other hand, provided a

"how to" for program evaluation.

Much like the other literature on the subject, Eib's article begins by clearly stating the real purpose of program evaluation is to ensure that technology is being used to enhance learning in the classroom. Where her article differed is that she provided several examples of exactly what that learning should look like. As was stated earlier, a program evaluator could enter a classroom and would have several criteria to use when deciding how effective technology integration was.

Eib put the responsibility on principals, not on a community of stakeholders, as Smolin and Lawless suggested. She advocates for a system more closely in line with that of the NETC, which called for the appointment of a person to oversee technology integration. In this class, that person would be the principal. Similarly to Smolin and Lawless, Eib believes that close relations with the teachers are important. Among her many actionable suggestions is the notion of having teachers, the ones responsible for the actual use of technology in the classroom, reflect on their own practices as part of the evaluation.

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