Barriers Of Integrating Technology Into Instruction

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Abstract

The purpose of this study was to create a school district professional development plan to assist teachers with technology integration. This study investigated academic literature to identify barriers of technology integration and professional development to ensure teachers are prepared to integrate technology into curriculum and instruction. Research suggests the barriers of technology integration are complex. Based on the literature reviewed, the professional development plan was structured as an academy model and is titled Technology Integration Academy. The Academy is structured around three tiers of technology proficiency that address training for technology skills, applying technology toward student achievement, and practice integrating technology into curriculum and instruction.

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CHAPTER ONE

As modern digital technology tools emerge and evolve, the expectations and requirements on our workforce are changing to include new skills to use digital tools to communicate, collaborate, and create. These new expectations and requirements are challenging public Kindergarten-12 schools and teachers to adapt accordingly, including the use of technology tools to adequately prepare students to meet their future workplace requirements. Despite more than a decade of research, advances in technology, and challenges by national and business leaders for increased use of technology in classroom instruction, research indicates that educational technology remains underutilized by teachers (Ertmer & Ottenbreit-Leftwich, 2010). Since the development of the desktop computer and the Internet, schools have struggled to effectively integrate technology into classrooms and instruction, specifically those of novice teachers and experienced teachers who are uncertain about using educational technology. Integrating technology into classrooms and instruction implies teaching strategies change from those used in the past.

Problem Statement

Technology integration should be planned around high-quality professional development; without an integration model and specific professional development strategies, technology integration into K-12 curriculum and instruction is ineffective. Research suggests technology integration is a complex process (Somekh, 2008; Zhao & Frank, 2003). What can schools do to ensure technology is integrated into curriculum and instruction?

To adequately prepare students for success in the digital world, their K-12 education must involve digital tools in their instruction. In his 1997 State of the Union Address, President Clinton challenged that every classroom in American be equipped with digital tools and well-trained teachers (as cited in Schrum, 1999). The urgency of this challenge was emphasized in the U.S. Department of Education's 2004 *National Educational Technology Plan,* warning that schools will become increasingly ineffective and irrelevant if digital tools are not used to meet the instructional needs of students. As technology and society evolve, education must meet the challenge and integrate current digital tools into instructional practices.

Schools responded to President Clinton and the U.S. Department of Education's challenges by increasing the digital technology available to teachers and students, rather than focusing on professional development strategies to integrate digital technology into teachers' instructional practice (Cuban, 2001; Hew & Brush, 2007). School leaders assumed teachers would integrate technology into their classrooms more if they had greater access to technology tools. This assumption appears incorrect, considering curriculum and instructional practices involving the use of technology have not changed as a result of access to more digital tools (Hixon & Buckenmeyer, 2009). Part of the problem appears to be the lack of a universally accepted definition of technology integration and disconnect between the professional development strategies suggested by research and those practiced by schools (Hew & Brush, 2007; Hixon & Buckenmeyer, 2009).

Research suggests technology be integrated into curriculum and instruction, but the challenge is to ensure it is effectively used for instruction and results in enhanced learning. Although no clear model for integration exists, research indicates that faculty professional development for technology integration is complex and is impacted by multiple factors, that include teachers' technology skills, attitudes, and pedagogy regarding the use of technology for teaching to enhance learning (Ertmer & Ottenbreit-Leftwich, 2010; Harris, Mishra, & Koehler, 2009). Schools need to be aware of the potential barriers that affect professional development to ensure teachers have the necessary skills and resources to integrate technology into their curriculum and instructional practices.

Technology integration requires teachers be knowledgeable and skilled using digital tools. Technology related professional development for teachers typically focuses on how to use the tools, with little to no emphasis on integration of technology into curriculum and instructional practices (Ertmer & Ottenbreit-Leftwich, 2010). This has resulted in professional development, described as technocentric, focusing on the design and features of the technology itself (Harris, 2005). Over-emphasizing hardware and software skills has created a culture that focuses on digital tools, instead of how to use them to promote student learning. Similarly, Kopcha (2010) suggests, "teachers may not be adopting student-centered approaches to technology integration because they lack the knowledge to do so" (p. 176). Teacher training for technology integration should address basic technology skills, but these are not sufficient to result with teachers integrating technology into their instruction.

Transforming teachers' instructional practices requires time, and Schrum (1999) asserts that it takes teachers longer to learn about using technology than it does for them to learn a new teaching model. Considering this, how should professional development for technology integration be structured to meet the needs of teachers? How much time should be devoted to support teachers in changing the role technology has in their curriculum and instruction? The duration and scope of professional development activities may affect how well technology is integrated into instruction (Brinkerhoff, 2006).

One purpose of this study is to investigate literature that provides information for the creation of a district professional development plan and a highly structured approach to ensure teachers are prepared to integrate technology into their curriculum and instructional practices. A second purpose of this study is to examine the potential barriers, if any, to integrating technology into instruction. If barriers exist, what can be done to counter those barriers so teachers effectively integrate technology into their instructional practice? This study will address the following research questions:

1. What barriers exist, if any, to integrating technology into instruction?
2. If barriers exist, what professional development is necessary to break down the barriers, so teachers effectively integrate technology into instruction?

Importance of the Study

Teachers need to be skilled to use digital technology tools to meet the needs of students in the twenty-first century. Effective teaching today requires that teachers have knowledge and skills to use technology to engage students in meaningful learning

experiences. Research suggests technology must be recognized as a component of good teaching to result in technology integration (Ertmer & Ottenbreit-Leftwich, 2010). It is difficult for teachers to stay current with the evolving features and instructional applications digital tools offer. Schools need appropriate professional development strategies to ensure all teachers are educational technology literate and can integrate technology tools into their instructional practice.

Methods

The author will use EBSCOhost, Eric, SAGE Journals Online, and similar databases to locate relevant academic literature for research about educational technology and professional development for technology integration. All research will be analyzed and evaluated to identify information about technology integration in pubic Kindergarten-12 curriculum and instruction. Research will be reviewed to identify potential barriers of technology integration and professional development that can be utilized in a school district professional development plan for technology integration. The goal of the school district professional development plan for technology integration is to assist teachers to effectively integrate technology into their instruction.

Limitations of the Study

Limitations of this study deal with factors and professional development involved with technology integration. First, this study will only address the barriers, if any, to integrating technology into public Kindergarten-12 curriculum and instructional practice. The complexity of teaching is beyond the scope of this paper. Second, this study is limited to professional development for technology integration although the information

discussed will be applicable to other educational areas. This research effort will examine the potential barriers to technology integration and professional development for teachers regarding the use of technology in their instructional practice. The goal is for teachers to be prepared to effectively integrate technology into their curriculum and instruction.

Creative Project

A Creative Project is the design of this study, and it will be comprised of two sections. The first section will review relevant literature that focuses on theories and professional development strategies to integrate educational technology into public Kindergarten-12 curriculum and instruction. The second section will be the creation of a school district professional development plan for technology integration that will be structured as an academy model to assist teachers to apply educational technology in their instructional practice.

Definitions of Terms

Andragogy - The art and science of helping adults learn by involving them as self-directed learners in as many aspects of their education as possible and including the creation of a learner centered environment (Conlan, Grabowski, & Smith, 2003).

Best practice - Serious, thoughtful, informed, responsible, state-of-the-art teaching (Zemelman, Daniels, & Hyde, 2005).

Educational technology - Any technology used by educators in support of the teaching and learning process (Lever-Duffy & McDonald, 2011).

Educational technology literacy - The ability to employ technology to enrich teaching and to enhance student learning. Because technology is perpetually changing, it is important that literacy skills be continually updated (Lever-Duffy & McDonald, 2011).

Pedagogy - The knowledge and skills teachers apply to student learning, classroom management, instructional planning and implementation, and student assessment that requires an understanding of cognitive, social, and developmental theories of learning and how they apply to students in the classroom (Harris, Mishra, & Koehler, 2009).

Professional development - A comprehensive, sustained, and intensive approach to improving teachers' effectiveness in raising student achievement (Hirsh, 2009).

Professional Learning Communities - A professional development strategy where teachers and administrators in a school continuously seek and share learning and then act on what they learn to enhance their effectiveness as professionals for the benefit of students (Hord, 1997).

Project-based learning - A dynamic approach to teaching where students explore authentic problems and challenges, simultaneously developing cross-curriculum skills while working in small collaborative groups (Edutopia staff, 2008; Conlan, Grabowski, & Smith, 2003).

Technology integration - The process of using digital technology tools to support learning in student-centered ways centering on best practices of incorporating technology into instructional practice (Kopcha, 2010; Keengwe & Onchwari, 2009).

CHAPTER TWO

REVIEW OF THE LITERATURE

Effective teaching in the twenty-first century requires teachers to integrate technology into their curriculum and instruction (Ertmer & Ottenbreit-Leftwich, 2010). The process of integrating technology is complex and involves various factors, including technology tools, resources, such as technology support and time, teachers' knowledge and beliefs, school culture, and professional development available in district. Successful technology integration is the result of these factors working together (Zhao & Frank, 2003). Due to the complex relationship between these factors and the nature of the research questions posed in Chapter One, this literature review will be presented in two parts. In the first section, literature will be discussed that identifies the factors involved in technology integration, and what barriers exist, if any, to integrating technology into instruction. Second, professional development strategies for faculty that focus on technology integration and the need to break down the barriers of technology integration, if any, will be discussed. The complexity of professional development is beyond the scope of this paper, but the key points that pertain to the topic of integrating technology into curriculum and instruction will be discussed. This review will conclude with a brief summary that discusses the connections between the barriers of technology integration and technology integration professional development, and how they may influence a district technology integration plan.

Barriers of Technology Integration

When analyzing technology integration, access to technology in schools is a natural starting point. Limited or no access to technology tools is a barrier when teachers integrate them into their curriculum and instruction. Technology integration cannot exist without technology; therefore providing access is "the first step to integration" (Buckenmeyer, 2008, p. 7). Over the past decade, schools approached technology integration by focusing on teachers' and students' access to technology. Wells & Lewis (2006) found the ratio of students to computers with Internet access in schools in the United States improved from 12.1 to 1 in 1998 to 3.8 to 1 in 2005, suggesting that schools assumed that teachers would integrate technology into their curriculum and instruction if they had access to technology. Despite improved technology access, the availability of technology has made little impact on changes in instructional practices (Hixon & Buckenmeyer, 2009). Teachers having access to technology can also be a barrier to integrating technology into curriculum and instruction. Successful technology integration requires compatibility between the technology and the learning environment to avoid conflicts with existing classroom routines (Ertmer & Ottenbreit-Leftwich, 2010; Zhao & Frank, 2003). The process of integrating technology is more complex than just providing tools; technology itself will not lead to change (Koehler & Mishra, 2005). Integrating technology into curriculum and instruction involves careful consideration about how the technology tools will impact student achievement.

Identifying the factors involved with integrating technology into classroom curriculum and instruction is important for understanding their relationship to the

learning environment and how they may be barriers of technology integration. The literature on technology integration is extensive and identifies a number of factors that can be barriers of technology integration as summarized in Table 1. Hew and Brush (2007) classified barriers of technology integration into six categories: resources, knowledge and skills, institutional factors involving leadership, teachers' attitudes and beliefs, demands by high-stakes assessments, and the instructional norms involved with the culture of the classroom subject area. The comprehensiveness of these categories implies that everything involved in education has the potential to be a barrier of technology integration.

Table 1
Summary of barriers of technology integration identified in literature

Article reference	Barriers of technology integration
Frederick, Schweizer, & Lowe (2006)	• Student mobility • Students with special needs • Low expectations on teachers • Unexpected administrative mandates • Lack of teacher collaboration • Teacher anxiety of being judged as competent based on standardized test results • Poorly designed classrooms • Insufficient time to master new software • Habitual ways of conceptualizing what and how students should learn

Hew and Brush (2007)	• Resources
	  • Lack of technology
	  • Lack of access to technology
	  • Lack of time
	  • Lack of technical support
	• Knowledge and skills
	  • Lack of technology skills
	  • Lack of technology-supported-pedagogy skills
	  • Lack of technology-related-classroom management skills
	• Institution

	• Leadership • School time-tabling structure • Lack of technology integration plan • Attitudes and beliefs • Teacher attitudes and beliefs towards technology • Assessment • The activity of measuring student learning • High-stakes testing associated with NCLB • Perceived tension between using technology and conforming to external requirements of traditional examinations • Subject culture • The institutional practices and expectations surrounding a particular school subject that define the norm for teaching that subject
Ertmer and Ottenbreit-Leftwich (2010)	• Technology tools are constantly changing • Low teacher self-efficacy • Existing school culture and belief systems • Technology is not included in the definition of good teaching
Brinkerhoff (2006)	• Resources • Institutional and administrative support • Training and experience • Attitudinal or personality factors
Chen and Reimer (2009)	• Teachers not feeling well-informed about how to integrate technology into their instruction • Out-of-date equipment • Lack of technical support
Kopcha (2010)	• Lack of time for teachers to learn new technology • Lack of time for teachers to prepare instruction that includes technology • Teacher beliefs that do not support using technology for learning • Lack of adequate technology • Professional development that only focuses on technology skill training • A school culture that does not promote technology use or adopting new instructional practices
Liu and Szabo (2009)	• Teachers' lack of ideas about how to integrate technology into curriculum and instruction • Lack of time to learn how to integrate technology

	into curriculum and instruction • Lack of encouragement or support to take-risks and experiment using technology in curriculum and instruction
Lowther, Inan, Strahl, & Ross (2008)	• Availability and access to computers • Availability of curriculum materials • Teachers' beliefs • Teachers' technological and content knowledge • Technical, administrative, and peer support

Research has identified 123 barriers of technology integration (Hew & Brush, 2007), of which Inan and Lowther (2009) found teachers' readiness to be the single strongest influence on integrating technology into instruction. Teachers are less likely to integrate technology into their curriculum and instruction if they feel uninformed about the process of technology integration, perceive they have out-of-date equipment, and don't think they have technical, administrative, and peer support for integrating technology into their instructional practices (Chen & Reimer, 2009). Frederick, Schweizer, and Lowe (2006) identified nine barriers teachers face when integrating technology into curriculum and instruction. Unclear expectations, unexpected administrative mandates, and limited or no teacher collaboration for integrating technology into curriculum and instruction do not provide teachers the leadership and resources they need to integrate technology into curriculum and instruction. (Frederick, Schweizer, & Lowe, 2006). Teachers' anxiety of being judged as competent based on standardized test results and students with special needs who are given higher priority over technology by teachers are barriers of technology integration (Frederick, Schweizer, & Lowe, 2006). Teachers are not integrating technology into their instructional practices because the barriers are complex and prevent them from doing so (Kopcha, 2010).

Technology literacy is now one of the basic skills of teaching (Lawless & Pellegrino, 2007). When teachers are technology literate they are aware of the technology tools available and they have the skills to use them. Just as carpenters and mechanics need to know how to use their tools, teachers need to possess basic technology knowledge and skills before they can integrate technology into curriculum and instruction. Not having the necessary technological knowledge and skills is a barrier of technology integration. Teachers will inconsistently integrate technology if they are unfamiliar with the tools or how they function (Inan & Lowther, 2009; Matzen & Edmunds, 2007). Teachers who are inexperienced using technology will abandon or not even try integrating technology into their curriculum and instruction if they experience frustration while using the tools (Liu & Szabo, 2009). Teachers will resist technology integration if their lack of technological knowledge and skill will embarrass them in front of their students, who likely know more about the tools than they do (Chen & Reimer, 2009). Technology integration requires teachers have technology knowledge and skill, but preparing teachers can be a challenge and is a barrier to integrating technology into curriculum and instruction.

Technology tools are constantly changing, and "learning about technology is equivalent to asking teachers to hit a moving target" (Ertmer & Ottenbreit-Leftwich, 2010, p. 260). Schools have addressed the evolutionary nature of technology by structuring technology professional development around in-district and short-duration skill training (Harris, 2005; Schrum, 1999). Research suggests this approach is ineffective. Clearly, teachers must know how to use technology, but knowing how to use

tools is not enough to ensure technology is integrated into curriculum and instruction (Ertmer & Ottenbreit-Leftwich, 2010).

The challenge is not getting technology into classrooms rather how to ensure teachers are prepared to integrate the technology into their curriculum and instruction (Buckenmeyer, 2008). Buckenmeyer (2008) suggests technology integration begins with the teacher, not technology. Ineffective professional development is a barrier of technology integration. Professional development for technology integration has overemphasized how to use the tools and has not given enough attention to strategies and ideas about how to integrate technology into curriculum and instruction (Harris & Hoffer, 2011; Liu & Szabo, 2009; Koehler, Mishra, & Yahya, 2007). Technology integration involves more than just access and skills using tools. Matzen and Edmunds (2007) assert that professional development that focuses on technology skills is flawed. Teachers will revert to technology uses that are consistent with their existing instructional practices unless they are provided a new vision and opportunities to experiment using technology in their instruction (Liu & Szabo, 2009; Somekh, 2008; Matzen & Edmunds, 2007). Effective professional development for technology integration will prepare teachers to design curriculum and instruction that involves appropriate uses of technology for student achievement.

Without adequate time for learning new technology and preparing technology infused instruction, teachers will not integrate technology into their curriculum and instruction (Kopcha, 2010). Research suggests it takes three to five years for teachers to transition from novice technology users to be practitioners who integrate technology into

their curriculum and instructional practices (Lowther, Inan, Strahl, & Ross, 2008). Teachers will not integrate technology into their instruction if they perceive it will take a lot of time, and specifically time that is wasted due to technical problems or that they believe will negatively impact student achievement (Liu, 2011; Chen & Reimer, 2009). Similar to the results of skill focused professional development, Buckenmeyer (2008) suggests when teachers do not have adequate time to plan and practice the integration of technology into their curriculum and instruction, they will resort to existing instructional practices. Without opportunities for professional development and support for teachers to experiment using technology in the classroom, technology integration will be inconsistent and ineffective.

Chen and Reimer (2009) found that teachers are unlikely to integrate technology into curriculum and instruction if they are concerned about the impact that technology will have on their classroom and resource management. Teachers' concerns about classroom interruptions, content-related schedules, reactions from students, parents, and administrators, and pressures to prepare students for high-stakes tests will be barriers to successfully integrating technology into curriculum and instruction (Chen & Reimer, 2009). For example, teachers will be hesitant to use technology if they believe technology is a barrier to their ability to maintain control in their classroom or that it will distract from preparing students to pass a test required for graduation or demonstrating adequate yearly progress in accordance with the Elementary and Secondary Education Act (2001), also known as No Child Left Behind. Teachers' beliefs is one of the essential factors that influences technology integration, and core beliefs are the most difficult to change

(Ertmer & Ottenbreit-Leftwich, 2010; Inan & Lowther, 2009). Teachers filter new ideas and information about technology through their perceptions and beliefs about its role in curriculum and instruction. Convincing veteran teachers to rethink the role of technology is critical for them to realize the value it brings to instruction and student learning (Plair, 2008). If teachers do not believe using technology tools will benefit their instruction, technology integration will not happen.

Teachers resist changes that challenge existing practices, such as integrating technology instruction (Chen & Reimer, 2009; Zhao & Frank, 2003). Teachers' attitudes and openness to integrating technology into their curriculum and instruction is influenced by their knowledge about the relationships between technology and curriculum (Lowther et al., 2008). Changes to instructional practices should not be predicated on technology itself. Technology integration should include all of the factors involved with teaching.

Research has identified what components are required for technology integration, but there are limited findings about how to make it happen (Zhao & Frank, 2003). The characteristics of both technology and the learning environment must be compatible to integrate technology into curriculum and instruction. Teachers will only use technology to meet their most direct needs and bring about the most benefit without reorganizing their current teaching practices (Zhao & Frank, 2003). When integrating technology into curriculum and instruction, consideration for the factors of technology integration is required to ensure they do not become barriers to integration. Meaningful professional development that considers the compatibility between factors will assist teachers to be prepared to integrate technology into curriculum and instruction integration.

Professional Development for Technology Integration

Technology integration requires relevant, continuous, and timely professional development (Buckenmeyer, 2008). High-quality professional development is key to any education improvement effort involving integrating technology into curriculum and instruction (Martin et al., 2010). Appropriate professional development is relevant, because every teacher changes their instructional practices at their own pace and in different ways (Chen & Reimer, 2009). A one-size-fits-all approach will not result in technology integration.

When applying professional development strategies to technology integration, it is important to identify how and why technology should be integrated. Rodriguez and Knuth (2000) suggest professional development for technology integration is a complex and an ongoing process that should provide connections to student learning and involve hands-on technology use. Active teacher participation in collaborative learning experiences that are specific to curriculum and encourage exploring new roles for teachers using technology in their curriculum and instruction are considered to be appropriate strategies for technology integration professional development (Rodriguez & Knuth, 2000). Effective professional development for integrating technology into curriculum and instruction includes sufficient resources for time, funding, technical assistance and support, and built-in evaluation to ensure they do not become barriers to integrating technology into curriculum and instruction (Rodriguez & Knuth, 2000). Breaking down barriers will result in successful technology integration.

Technology integration involves more than just access to tools, therefore professional development for technology integration that focuses on technology skills training is inadequate. Technology needs to be connected with curriculum from the start of integration and should be supported by high-quality professional development that is personalized, focuses on teachers' beliefs, and provides ongoing support (Martin et al., 2010; Hixon & Buckenmeyer, 2009). Hixon and Buckenmeyer (2009) suggest that professional development for technology integration should enable teachers to see the relationships between the content, their beliefs about teaching, and the how technology can fit into their current practices. High-quality strategies for technology integration professional development include teachers and administrators sharing a vision for technology integration and an integration plan that addresses pedagogy, curriculum, and teacher beliefs, which are sensitive to the barriers of technology integration.

Professional development opportunities and support should encourage teachers to take risks and experiment using technology in the classroom and allow time for collecting data to justify instructional changes (Liu & Szabo, 2009; Brinkerhoff, 2006). In his study about the effectiveness of a technology integration academy, Brinkerhoff (2006) emphasizes technology training and hands-on technology integration projects for teachers should focus on teachers' technology interests. Brinkerhoff (2006) found the extended nature of the academy model led to increased teachers' skill level through training and practice over an extended period of time. Teachers' technology skills and self-confidence to integrate technology into instruction increased after participating in a technology integration academy (Brinkerhoff, 2006). Results from the academy suggest that teachers

apply their new skills and ideas immediately, which will require schools to consider to increase teachers' contract hours each day to provide time for training and practice of technology skills (Brinkerhoff, 2006). Professional development for technology integration should be designed around a clearly defined goal and a timeline that includes training for technology skills, supports the infusion of technology into instructional practices, and encourages problem-based learning that is student centered and supported by technology (Brinkerhoff, 2006).

Teachers are more likely to transform their instructional practices rather than focus on technology as a separate activity or concept when professional development for technology integration is presented in terms of student-centered instructional practices (Matzen & Edmunds, 2007). It is necessary for teachers to develop a deep understanding about the purpose and expected outcomes before they are required to implement a new innovation into instruction (Park & Ertmer, 2008). Professional development that is limited to training about technology skills will lead to low level technology integration or no integration at all, because teachers tend to integrate technology into their instruction similarly to how they were taught about the technology (Matzen & Edmunds, 2007). Problem-based learning with technology integrated into it is a constructivist teaching method where students learn content knowledge using technology tools to locate and analyze information to solve problems. Park and Ertmer (2008) suggest problem-based learning is an effective way to prepare teachers to integrate technology into curriculum and instruction. Matzen and Edmunds (2007) found teachers transform their instruction and integrate technology when they experience professional development for technology

integration modeled through a constructivist approach. Therefore, problem-based professional development for technology integration will provide teachers meaningful opportunities to learn how to integrate technology in the context of a specific instructional practice.

Good teaching with technology requires understanding of the relationships between technology, pedagogy, and content knowledge (Wang, 2008; Koehler, Mishra, & Yahya, 2007). Koehler and Mishra's (2005) Technology Pedagogical Content Knowledge (TPCK) framework defines technology as a knowledge system and emphasizes the interplay between technology knowledge and teachers' pedagogy and content knowledge. Traditional professional development, such as workshops, are not suited to helping teachers develop the understanding necessary to integrate technology into instruction because it does not consider the relationships between technology, pedagogy, and content knowledge. (Koehler, Mishra, & Yahya, 2007). Teachers will effectively develop their skills of technology, pedagogy and content knowledge when they integrate technology for pedagogy while considering their subject matter. Technology should be integrated into instruction because it is the most appropriate tool, not because it is new or for the sake of simply using technology (Harris, Mishra & Koehler, 2009). Mishra & Koehler (2006) believe developing technology, pedagogy and content knowledge is an essential requirement of teachers. Developing technology, pedagogy and content knowledge requires teachers to be sensitive to the dynamic and interdependent relationships between technology, pedagogy, and content knowledge. (Koehler, Mishra, & Yahya, 2007). Teachers must be able to design curriculum and

instruction that considers technology, pedagogy, and content together instead of treating them as independent features (Harris, Mishra, Koehler, 2009).

The Technology Pedagogical Content Knowledge (TPCK) framework lends itself to a constructivist learning approach that can be implemented through a learning technology by design model (Koehler, Mishra, Yahya, 2007; Mishra & Koehler, 2006). In learning technology by design, teachers work as a team and collaborate over extended periods of time to solve real problems that are focused on the relationships between technology, pedagogy, and content knowledge (Koehler, Mishra, & Yahya, 2007). Learning technology by design is well suited to help teachers simultaneously develop knowledge and skill using technology, pedagogy for integrating technology into curriculum and instruction, and content as they create authentic instructional materials (Koehler, Mishra, & Yahya, 2007). When teachers participate in learning technology by design they learn about technology while they create lesson plans and accompanying materials that integrate technology. Developing technology, pedagogy, and content knowledge through learning technology by design occurs when teachers are active design participants, rather than passive consumers of information (Koehler, Mishra, & Yahya, 2007). Learning technology by design creates awareness about how technology tools can be applied to curriculum and instruction as teachers plan and participate in decision making to determine the best tools and strategies to use through technology integration (Harris, Mishra, & Koehler, 2009).

Technology integration should be rooted in curriculum of the learning environment instead of focusing on technology itself (Harris & Hoffer, 2011). Student

achievement is the principal factor that influences the decisions teachers make about integrating technology into their curriculum and instruction (Liu, 2011). Research suggests that if teachers are not able to see a connection between technology and the content, they will not integrate technology into curriculum and instruction (Harris & Hoffer, 2011). Harris and Hoffer (2011) assert that the key to successful technology integration is to include technology in instructional planning that focuses on student achievement instead of the technologies themselves. Professional development that utilizes practical experiences and reflection, such as learning technology by design, will stimulate deeper meaning regarding the relationships between technology and the context of the learning environment (Stein, Ginns, & McDonald, 2007; Koehler & Mishra, 2005). Teachers will more likely integrate technology into curriculum and instruction if professional development helps them make direct connections between the technology, instructional practice, and student achievement.

Professional development should not exist in isolation of the other factors involved with technology integration. A professional development approach that considers the complexity of curriculum and instruction will manage potential barriers and create a teacher-centered process for integrating technology into curriculum and instruction (Kopcha, 2010; Zhao & Frank, 2003). Kopcha (2010) determined that teachers who integrated technology into student-centered instructional practices had increased success when technology was integrated over a long period of time and was supported by clear expectations and mentoring. Teachers are more likely to change their beliefs and practices integrating technology in their instruction if influenced by their

peers rather than an outside change agent (Zhao & Frank, 2003). Zhao and Frank (2003) had earlier determined that assistance provided by colleagues strongly influenced teachers' beliefs and instructional practices. Mentors and peer coaches provide just-in-time support and modeling for technology integration that is aligned within the context of teachers' classroom (Kopcha, 2010). Research suggests peer coaching will lead to technology integration through timely and contextualized support that address perceived concerns about barriers that may disrupt learning time and student achievement (Lawless & Pellegrino, 2007; Zhao & Frank, 2003).

Making Connections

The research reviewed indicates that complex and inter-related barriers of technology integration exist. Professional development strategies to assist teachers to integrate technology into curriculum and instruction should be considered. Limiting professional development for technology integration to training teachers about technology skills is not sufficient to result in effective technology integration. Research indicates a technology integration plan should consider the inter-connected relationships between technology, pedagogy, and content knowledge, which are critical for integrating technology into curriculum and instruction. Ongoing technology integration that is sensitive to pedagogy and content cannot be simply pre-determined before a lesson. Technology integration requires teachers to be prepared for thoughtful and thorough planning (Wang, 2008). Appropriate professional development will help teachers develop technology skills, pedagogy and content knowledge and prepare them for integrating technology into curriculum and instruction.

Many factors are involved for teachers to develop technology, pedagogy and content knowledge. Integrating technology into instruction should involve problem-based learning that involves authentic tasks and group work to promote interaction and collaboration between colleagues during professional development (Wang, 2008). The literature reviewed suggests teachers who collaborate on authentic planning and decision making in a learning technology by design approach that is supported by clear expectations, mentors, peer coaches, and time for exploration and reflection will be prepared well for technology integration. Professional development for technology integration is a complex process and research indicates that integration cannot be achieved through short-duration technology skill training workshops. Since no specific model exists for preparing teachers to integrate technology into curriculum and instruction, this author will apply the information identified in the literature to the creation of a professional development plan for technology integration in the next chapter.

CHAPTER THREE

METHODOLOGY

Referencing the academic literature presented in Chapter Two, the author created a school district-wide professional development plan to prepare teachers to integrate technology into Kindergarten-12 curriculum and instruction. The plan describes professional development structured through an academy model supported by research discussed in Chapter Two. The model developed is titled Technology Integration Academy and is designed to help teachers rethink their pedagogy and organization of their disciplinary content knowledge to include the use of technology. Teachers may complete technology integration certificates that identify different levels of skill proficiency of basic skills using specific technology tools, applying technology tools to curriculum and instruction, and practicum for integrating technology into instruction that is appropriate for specific grade levels and content areas. Professional development activities are designed to instruct teachers to develop technology knowledge and skills in the creation of authentic digital instructional materials and experiment with integration of technology into their instruction. The goal of the Technology Integration Academy is to prepare teachers to be proficient users of educational technology and to know when and how to integrate it into their curriculum and instruction.

The professional development plan and Academy materials can be viewed by going to the following web site:

https://sites.google.com/site/lshtechacademy/

CHAPTER FOUR

SUMMARY AND CONCLUSIONS

The purpose of this study was to investigate literature to create a district professional development plan and Academy for technology integration, examine the potential barriers of technology integration, and identify how professional development will counter the barriers so teachers are prepared to integrate technology into their curriculum and instruction. This Chapter includes a summary of the literature examined in response to these topics, a description of the Creative Project including conclusions about assisting teachers to integrate technology into curriculum and instruction. This Chapter concludes with a discussion of the limitations of the study and suggested areas for future research.

Summary of the Research

The complexity of technology integration implies that all factors involved in education have the potential to be barriers to integrating technology in curriculum and instruction. Technology integration requires that teachers have access to technology and possess the skills necessary to both conceptually integrate and use technology tools to further student learning. Consideration of barriers is critical to ensure that they do not prevent successful integration of technology into enhancing curriculum and instruction. Many times when teachers do not successfully integrate technology into curriculum and instruction it is because the barriers are complex and prevent technology integration.

Effective technology integration requires that technology be considered an essential component of curriculum and instruction. This is because teachers' attitudes and

self-efficacy can be barriers to changing instructional practices to include technology. Successful technology integration will not happen unless teachers believe using technological tools will benefit their instruction and if they believe they are prepared to use technology in their classroom. Kopcha (2010) asserts if teachers perceive they don't have professional development support and support from administrators and peers to change their instructional practices to include technology, it is unlikely they will integrate technology into their curriculum and instruction. In summary, integrating technology into curriculum and instruction will be at best inconsistent and ineffective without clear expectations and support from school leaders.

Assisting teachers to integrate technology into curriculum and instruction has proven to be a challenge and ineffective professional development is one barrier of technology integration (Harris & Hoffer, 2011; Matzen & Edmunds, 2007). Knowing how to use technology tools is not enough for teachers to effectively integrate technology. Technology integration requires that teachers be technology literate, which means teachers have both technology skills and understanding of how technology tools can be used to further student achievement. Matzen and Edmunds (2007) assert that teachers will integrate technology at low levels or not at all if technology integration professional development is limited to training about technology skills, because teachers will resist and eventually abandon technology integration if they experience frustration while integrating it because of their skill level.

Professional development concerning technology integration must connect curriculum and pedagogy to provide ongoing support to meet the individual needs of

teachers, because teachers integrate technology similarly to how they were taught to understand and use technology. Thus even though technology skills are essential for technology integration, professional development should focus on how technology can enhance existing instructional practices (Hixon & Buckenmeyer, 2009).

Research suggests a constructivist approach will be effective for technology integration professional development (Park & Ertmer, 2008; Koehler, Mishra, & Yahya, 2007; Matzen & Edmunds, 2007). Professional development that provides meaningful opportunities for teachers to collaborate with peers and experiment using technology in the classroom is recommended. This approach allows teachers to apply technology tools to their own curriculum and instructional practices. Learning technology by design is a constructivist approach that will prepare teachers to integrate technology into curriculum and instruction (Koehler, Mishra, & Yahya, 2007). Through learning technology by design, teachers will simultaneously develop technology understanding and skills, integrate technology in their pedagogy, and design curriculum materials that consider the relationships between technology and their content (Koehler, Mishra, & Yahya, 2007).

Brinkerhoff (2006) suggests an academy model of professional development is an effective way to prepare teachers to integrate technology into curriculum and instruction. An academy model will teach technology skills and support infusion of technology into current teaching practices through direct instruction and hands-on projects that focus around the teacher's technology interests. Through an academy model, teachers develop self-confidence to apply new skills and strategies for integrating technology into curriculum and instruction.

Summary and Conclusions about the Creative Project

The intended goal of the Technology Integration Academy is to prepare teachers to be proficient users of educational technology, knowing when and how to integrate technology into curriculum and instruction. The Technology Integration Academy is designed to provide teachers with high-quality professional development that is relevant, continuous, timely, and addresses the potential barriers teachers face when integrating technology into curriculum and instruction. Teachers' readiness is one of the strongest influences on the quality of technology integration (Inan & Lowther, 2009). The Technology Integration Academy combines activities for technology skill training with opportunities for peer collaboration to strategize how to integrate the use of technology on curriculum materials. The Academy model is different from traditional professional development for technology integration that typically is short in duration and is focused on training to develop only technology skills. The dual-phase approach is the prominent feature of the Technology Integration Academy. Teachers in the Academy focus on three tiers of proficiency for specific technology tools. The three proficiency tiers address basic skills of how to use the technology tool, how to apply the technology tool toward student achievement, and how to integrate the technology tool into their instruction. Teachers are awarded a certificate of technology integration proficiency when they demonstrate proficiency at all three tiers using and integrating a single type of technology into their curriculum and instruction. Certificates of technology integration indicate teachers are prepared to transform their curriculum and instruction to include technology with their pedagogy and content knowledge.

Limitations

This Creative Project provides a wide range of information on the barriers of technology integration and the professional development needed to overcome them. The review of research evidenced that barriers of technology integration exist, and are prevalent in Kindergarten-12 schools. Understanding this is crucial when considering technology integration and planning professional development to prepare teachers to integrate technology into curriculum and instruction. Meeting the specific needs of a single school culture and teacher beliefs are beyond the scope of this Creative Project. Needs assessment is recommended prior to implementation of the Academy to ensure teachers' beliefs and school culture are adequately understood so that barriers can be identified and appropriately addressed.

Future Research

This project is designed to assist teachers to integrate technology into their curriculum and instruction. Although current evidence is mostly qualitative in nature, additional quantitative research would be valuable to assist school districts as they integrate technology into curriculum and instruction. Research that examines the strength of barriers and the effectiveness of technology related professional development as a function of how lengthy the training program is will help school administrators and teachers make decisions about technology integration. The factors of technology integration are complex and require careful consideration to ensure they do not become barriers to integrating technology into curriculum and instruction.

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