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# The Impact of a Professional Development Initiative on Technology Integration within Instruction

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# THE IMPACT OF A PROFESSIONAL DEVELOPMENT INITIATIVE ON TECHNOLOGY INTEGRATION WITHIN INSTRUCTION

By

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**Abstract**

THE IMPACT OF A PROFESSIONAL DEVELOPMENT INITIATIVE ON TECHNOLOGY INTEGRATION WITHIN INSTRUCTION

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The purpose of professional development is to give teachers the skills and dispositions that they need to increase student achievement. There are many programs and initiatives that school districts can follow, but do they actually work. This is the question that school districts have to be asking themselves in order to determine if the professional development is worth the investment. Does the training that we give our teachers make a difference in what they do every day with students?

This research seeks to answer the question ”Did the professional development initiative developed and implemented by this Midwestern suburban school district make a difference in the educational technology used during classroom instruction at the district’s twenty-five elementary schools?’ The research looks at, from the teachers’ perspective, did the professional development focusing on Digital Learning and best practices using digital resources, make a difference in the way that instruction was delivered in the classroom. Teachers were given a survey asking them to reflect on the integration of the digital resources in their classes. Responses were then compared to the

levels of innovators using Roger's Diffusion of Innovation Theory to see if the results were consistent with the expected results of other implementation experiences.

## Acknowledgements and/or Dedication

When I was a child, I had a wall hanging with the poem “Footprints in the Sand” etched on it. I can still see the image of the sandy beach two footprints changing to one. I am blessed to know that God has carried me through the struggles in my life. While this has been only one of them, I know that his love has always been my strength. He granted me grace when I didn’t deserve it, courage when I needed it, and determination when I didn’t have it. He blessed with a large number of people who have supported and encouraged me along this journey.

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## List of Multimedia Objects

# Chapter 1

Today's digital environment is the source for the spread of knowledge at a speed that no other generation ever experienced. Individuals use its digital resources to learn everything from how to fix a car to setting tile in a bathroom. It is also the way that current societies achieve important information through the digitalizing of primary documents from generations past. This rapid spread of current knowledge and access to past knowledge is allowing for the creation of new knowledge and thought. Today, humans have instant access to multiple perspectives and thoughts from a multitude of academic disciplines that influence the development of new ideas.

While technology has a huge impact on our world, it does not always translate to teachers using it effectively in classroom instruction. Teachers need professional development and training to prepare them to effectively implement and utilize digital tools in the classroom. Using technology for instruction is different than using a game for remediation or as a time filler when a student has completed another objective. Teachers must utilize the digital tools of the global, 21st Century marketplace to prepare students to enter into careers or post-secondary educational institutions (Prensky, 2013; Crockett, Jukes, & Churches, 2011, p. 11; Prensky 2005).

While many teachers recognize that the use of technology is important to their content, most have been ineffective in implementing that change as the result of several barriers (Ertmer, 2009). The effective implementation of technology has been affected by a lack of professional development on how to use these technologies to transform instructional practices in the classroom that promote student achievement (Hew & Brush,

2007). In order for change in these practices, teachers must have technology enhanced professional development that is personal, hands on, and content embedded (An & Reigeluth, 2011; Castle, 2009; Hew & Brush, 2007). These opportunities must have specific relationships between the technology itself and the curriculum content being taught (Hew & Brush, 2007). By engaging a school or district's entire staff in effective technology professional development, teachers provide support for each other as they develop their skills through job-embedded opportunities, professional learning communities, and the building network structure. (Desimone, 2011; Desimone, 2009; Manchester, Muir, & Moulton, 2004).

Educational technology focuses on technologies that are used specifically by teachers with students in the classroom to increase student achievement or motivation by developing their skills or knowledge. The introduction of technology itself is not what should be considered important; it is only a tool to be utilized as a means to improve teaching and learning within the content area (An & Reigeluth, 2012; Hew & Brush, 2007). More studies need to take place on the effectiveness of a professional development initiative on the implementation of educational technology on the instruction that takes place in the classroom.

**Digital Learning Initiative**

The Digital Learning Initiative is a professional development initiative designed by a mid-western suburban school district to provide teachers the hardware, software, and professional development to implement digital learning into all K-5 classrooms. It began through a partnership with community resources in order to provide the hardware for the

classrooms. Once the technology purchases were made and distributed, the bulk of the professional development was on the pedagogy of teaching and learning in a digital environment. This training included content on digital learning frameworks, including SAMR and TPACK, specific apps and digital resources for use with grade level content, and student technology profiles linked to lessons, which would be guaranteed for all students at each grade level.

**Purpose of Study**

Professional development is necessary in order to provide teachers with the necessary knowledge and skills by which to teach their students. However, districts often do not measure if the professional development covered is effectively being implemented in the classroom. At this time, educational technology is generally regarded as important for preparing students for the future that they will face (Prensky, 2013; Crockett, et.al., 2011; Prensky, 2005). It is widely accepted that students will need considerable skills and knowledge of how to use digital technologies in order to collaborate, create, communicate and think critically. If educators are to prepare students for the effective use of technology in order to be prepared for their future endeavors, teachers must be sure that these technologies are effectively being used in the classroom. Therefore, professional development providers must evaluate whether the opportunities provided for teachers are effectively transferred into classroom instruction.

The purpose of this study was to measure the effectiveness of this school district's Digital Learning Initiative. The research question stated, "As the result of the Digital Learning Initiative (DLI), what were teachers' perceptions of their integration of

educational technology within instruction in elementary classrooms? The effectiveness of this system-wide technology initiative varied among individuals in regard to the speed and depth of implementation. The theory used to frame the study was Roger's Diffusion of Innovation Theory and the categories at which individuals adopt new initiatives, including innovators, early adopters, early majority, late majority, and laggards. At the end of the 18-month initiative, these categories assisted the researcher in measuring the effectiveness of the professional development initiative with respect to teachers' perceptions of their own resource adoption within instruction.

**Research Questions**

"As the result of the Digital Learning Initiative (DLI), what were teachers' perceptions of their integration of educational technology within instruction in elementary classrooms?"

Sub-questions

1. How did the DLI effect teachers' perceptions of Digital Learning?
2. How did the DLI effect the integration of technology in instruction within the elementary classrooms?
3. What was the difference in the frequency of the use of a digital tool during the previous school year vs. plans for integrating digital tools in the upcoming school year?

**Definition of Terms**

- 21st Century Literacy- "Literacy has always been a collection of cultural and communicative practices shared among members of particular groups. As society and technology change, so does literacy. Because technology has increased the intensity and complexity of literate environments, the 21st Century demands that a literate person possess a wide range of abilities and competencies, and many literacies. These literacies are multiple, dynamic, and malleable. As in the past, they are inextricably linked with particular histories, life possibilities, and social trajectories of individuals and groups. Active, successful participants in this 21st Century global society must be able to
  - Develop proficiency and fluency with the tools of technology;
  - Build intentional cross-cultural connections and relationships with others so to pose and solve problems collaboratively and strengthen independent thought;
  - Design and share information for global communities to meet a variety of purposes;
  - Manage, analyze, and synthesize multiple streams of simultaneous information;
  - Create, critique, analyze, and evaluate multimedia texts;
  - Attend to the ethical responsibilities required by these complex environments" (National Council of the Teachers of English, 2008).

- Technology Integration- The use of computing devices such as desktop computers, laptops, handheld computers, software or Internet in K-12 schools for instructional purposes (Hew & Brush, 2007).
- 21st Century Skills- “21st Century Skills are the building blocks to 21st century learning and citizenship. They are essential for success in today’s world and include the 4Cs of critical thinking and problem solving, communication, collaboration, and creativity, and innovation. These skills are developed while students study core subjects” (Keywords and Glossary, 2016, paragraph 1)
- 21st Century Fluencies- “Structured processes for developing the skills that your students need to succeed, today and in the future.” (Global Digital Citizen Foundation, 2016, paragraph 1) The skills include “problem solving, creativity, analytical thinking, collaboration, communication, ethics, action, and accountability” (Crockett, et al., 2011, p 21).
- College and Career Readiness- “Practices and proficiencies” that students need in order to be prepared to enter the 21st Century workplace or higher education environment (Nebraska Summit on Career Readiness, 2009, p 8).
- Digital Citizenship- “Appropriate behavior in an online environment” (Crockett, et al., 2011, p 81).
- Digital Learning- “Instructional practices that effectively increase students and teacher productivity, creativity, innovation, personalization, and engagement through enhanced learning experiences using a wide spectrum of

digital resources that improve teaching, learning, and achievement" (Millard Public Schools, 2014).

- Digital Learning Initiative- A professional development initiative for teachers within a specific school district. It included training on digital hardware and resources and best practice for how to utilize them with students during instruction (Millard Public Schools, 2014).
- Digital Literacy- "The ability to use information and communication technologies to find, evaluate, create, and communicate information, requiring both cognitive and technical skills" (American Library Association, 2009, paragraph 2).
- Global Citizenship- "Awareness of the issues, traditions, religions, and core values and cultures of fellow global citizens" (Crockett, et al., 2011, p 81).
- Global Awareness- As defined by the Asia Society and the Council of Chief State School Officers, "A globally aware and competent student can: investigate the world, weigh perspectives, communicate ideas, take action, and apply expertise to different academic subjects" (Keywords and Glossary, 2016, paragraph 4)
- Instructional Technology- Use of digital tools and resources for instruction. The emphasis is on instructional design and learning theory in order to increase student achievement. This includes the student use of technology for learning as well as assessment of knowledge (International Technology Education Association, 2007).

- Professional Development- A comprehensive, sustained, and intensive approach to improving teachers' and principals' effectiveness in raising student achievement (Learning Forward: A Professional Learning Association, 2015, paragraph A & B).

**iPad Apps Utilized in the Initiative**

- Book Creator
- Explain Everything
- Green Screen
- iBook Author
- iMovie/iMovie Trailer
- Keynote
- Pages
- Pic Collage
- Puppet Pals

**Assumptions**

The researcher made the assumption that all of the teachers assigned as classroom teachers and included in this survey were employed as regular classroom teachers for the entirety of the time period included in the study. There was the possibility that a teacher changed grade levels or moved from a position that was not a regular classroom teacher, for example special education or as a specialist. Teachers not employed as regular classroom teachers did not receive all of the classroom teacher digital learning focused

professional development, but would have received training appropriate for their specialization.

The second assumption was that the classroom teachers attended all of the professional development sessions. On occasion, teachers miss for a variety of reasons including maternity leave, personal or family illness, or medical leave. There was no provision in this study to determine if a teacher attended all of the digital learning sessions in their entirety.

The third assumption was that the teachers answered the questions accurately based on the activities that actually occurred in the classroom. Teachers self-reported how they utilized these tools during instruction, not as a tool for remediation or as a reward. If the information was not reported accurately, the results are skewed.

**Limitations**

There were several limitations to this research that should be considered regarding the outcome of the results.

Limitation One: The Digital Learning Survey was sent to all K-5 regular classroom teachers employed with this district for the entire Digital Learning Initiative. The teachers submitted self-reported responses to the survey related to a professional development initiative on Digital Learning. As a result, there was no way to authenticate the answers that the teachers supply to the survey. Principals were not asked for any validation of the responses and no observations were performed.

Limitation Two: While all responding teachers were employed continuously as teachers, some of the responders may not have been regular classroom teachers during the entire training cycle. Some responders may have been special educators or serving a school as a teaching specialist. In these cases, teachers may not have received all of the Digital Learning Professional Development as designed for classroom teachers.

Limitation Three: Some teachers may have changed grade levels during this time frame. As a result, they may not have received the specific training on apps based on the grade level that they currently teach.

Limitation Four: The Digital Learning Initiative completed the first full school year in May, while the survey was given in September of the following school year. The delay was caused by the summer vacation and the fact that teachers were unavailable during this time frame. By choosing to send the survey in September, the researcher was trying to be sensitive to the workload of teachers at the beginning of a new school year. Waiting until "Back to School" activities were completed allowed teachers more time to complete the survey.

Limitation Five: Teachers in this study had periods of time between their professional development, their reflection of digital learning practices, and the responses to this survey, these periods create the possibility of survey response biases. Hindsight bias and reconstruction bias are two conditions that may affect the outcome of this research. Hindsight bias occurs when the knowledge learned affects the way an individual remembers past ideas or predictions (Erdfelder, et al., 2007; Hoffrage, Hertwig, & Gigerenzer, 2000). Reconstruction bias is an example of a form of hindsight bias. In this particular subset of hindsight bias, the individual must create a "plausible candidate for a

past prediction given current knowledge" (Erdfelder, et al., 2007, p. 115). These two biases were important because the teachers in this study were asked to reflect on their definition of Digital Learning prior to the district's digital learning initiative. This reflection focused on information prior to February two school years prior, as well as use of digital tools during the course of the previous school year. As they reflected on their thoughts of digital learning in their own classroom, they may recollect that their definition of Digital Learning and their use of digital resources closer to the pedagogy given in the professional development initiative that it actually was in thought or practice. There was no way to separate their response from the reality in their classroom.

**Delimitations**

This study was conducted to identify the impact of a digital learning initiative at one mid-western public school district in the United States. It included regular classroom teachers in grades Kindergarten through fifth grade and teachers who had been employed by this school district for the two years included in the initiative.

All classroom teachers received six iPads to be used in the classroom during instruction and training related to their grade level apps and curriculum ties. If teachers changed grade levels at any time during the initiative, there was an impact on the training that they received in relation to their grade level curriculum and app list.

District Level Leaders, including Instructional Technology Facilitators, Curriculum and Instruction Facilitators, and Leadership and Learning Facilitators, were responsible for the planning and training of all Digital Learning Professional Development Sessions. Teachers registered for sessions based on their grade level and

district requirements. The sessions were held through a combination of during school sessions, requiring a substitute teacher, professional development days, and required afterschool sessions.

**Significance of the Study**

The purpose of this study was to identify the impact of the Digital Learning Initiative on instruction within the elementary classroom. The school district spent a great deal of time and money investing in numerous areas, including hardware and apps, as well as employee time. Invited teachers were given off-contract time to assist in the planning and facilitation of professional development. The researcher hoped to prove that the investment by the school district was positively effecting instruction in the classroom.

This district has a history of intentional and well developed professional development. The Leadership and Learning department's sole focus is on preparing teachers for district level initiatives designed to improve instruction to increase student achievement. While this initiative was intentional and well developed, it was different in that it was also innovative and gave teachers the flexibility to try things that were new. District level leaders, professional development facilitators, and technology technical support did not have all of the answers before the initiative started, which was a distinct difference from previous initiatives. It was the hope of the researcher that this flexibility and permission to try something new, would show innovation in the classroom.

This study opened the door for a broader look at digital learning and student achievement. Since this initiative shows an impact on classroom instruction, student

achievement needs to be examined to see if there is a correlation between effective instructional practices with digital learning strategies and higher levels of achievement for students. Instructional practices by themselves are not important. The results of instructional practices in relation to student achievement and finding solutions to real-world problems will be of the greatest value.

On a broader scale, this professional development initiative is similar to other educational technology initiatives. School districts are looking at technology that can be effectively implemented in a manner that takes student achievement to the next level. In spite of dwindling budgets, the educational system has to begin preparing students for their future not the systems of the past. In order to do that, we have to be preparing our teachers. This study will look at the effectiveness of this professional development for digital learning. Other school districts will be able to identify if the methods and content of this initiative impacted instruction in the classroom. If effective, it will also be valuable to justify the expense of the extensive professional development program. This cost is measured in both time and money. If successful, then other school districts implementing digital learning initiatives can use this program as a model.

**Diffusion of Innovation Theory in Education**

The Diffusion of Innovation framework looks at the adoption of a new idea or practice and the individuals and their rate of speed of the adoption (Diffusion of innovations theory, 2016 (2016; Crompton and Keane, 2012; Vanderlinde & Brask, 2011; Harris, 2008; Rogers, 2003). In education, this impacts the manner in which techniques, tools and ideas spread within a social group (Harris, 2008; Vanderlinde & Brask, 2011).

In the case of a school district, often the early stages of the innovation adoption are completed at the district level, so teachers are not specifically involved. However, there is a great deal of interpersonal relationships that affect the adoption of a technology at the teacher level (Harris, 2008). These relationships and the personality of the teacher impacts the rate at which true integration of the technology and the curriculum intersect.

**Framework: Diffusion of Innovation Theory**

Diffusion is the process of an innovation being communicated through a process over time through a social system (Rogers, 2003). In an educational system, new ideas spread through a diffusion process. Sometimes they are through formal channels, sometimes just through collaboration with other teachers. In this study, the Diffusion of Innovation Theory is the basis for identifying the manner in which the Digital Learning Initiative diffused through the district to become a part of daily instruction.

In this theory, there are four components: the innovation, the communication channels, the time of the initiative, and the members (Rogers, 2003). For the purpose of this research the components are as follows:

1. The innovation is the Digital Learning. This incorporates the use of the hardware in the classroom as well as the apps and resources that were formally trained in the professional development sessions.
2. The communication channels include the Digital Digs, short after school training sessions focusing on one app, and formal professional development sessions as part of district lead opportunities.

3. The initiative began in the spring with the distribution of and basic operational training of six iPads. The professional development sessions continued throughout the following school year. In total the time frame is 18 months.
4. The social system in this case includes the Kindergarten through fifth grade regular classroom teachers. There are 25 elementary schools in the school district of study. The teachers included in the study had to be continuously employed by the school district as a regular classroom for the full time period of the initiative.

**Innovation**

In this study, the innovation is the use of iPads in the classroom as an instructional resource. The level of comfort with this technology for the teachers was very different for every teacher. Some were already comfortable with the devices as they had personal iPads or iPhones. Since the iPhone is a smaller version, they were comfortable with the device on a basic level. Other teachers did not have prior experience with the devices. Most had never used a device in a classroom setting since there were only a few in the district and mostly in Special Education situations.

Because of the lack of experience with this tool in the classroom, the researcher is going to consider it the innovation. Our goal is to have teachers utilize the tool as a method of instruction within the classroom environment, not as an extension or remediation activity. We are focusing on utilizing the tools for student collaboration and creation. For this innovation to be adopted the teachers view it as reducing uncertainty

and making a job easier (Rogers, 2003). There are five characteristics of innovations as experienced by the innovator:

1. Relative advantage- it has to make life easier than it was before
2. Compatibility- how it works with what you already know and understand. This includes your values, experiences, and needs.
3. Complexity-how difficult it is to use
4. Trialability- how easy it is to experiment with it
5. Observability- how easy it is for others to see results
6. For the classroom teacher, all of these characteristics affect the manner in which they adopt and the level at which they implement the new technology within instruction in the classroom.

**Communication Channels**

In the case of this particular technology initiative, the innovation was introduced as a part of a top down instructional process. The superintendent along with an educational foundation secured the financing for the initiative and as such secured the adoption. However, in top down structures such as this, there are many interpersonal channels that affect the adoption of the innovation. District level instructional and technology leaders were recruited to use their support and relationships with building and teacher leaders to promote the communication process.

**Time**

The rate of adoption is determined by the amount of time that it takes a person to move from the knowledge of the innovation to adoption or rejection, the early or lateness of the adoption, and the rate within the system (Rogers, 2003). For our purposes, we are looking at the frequency that teachers say they utilize the tools during instruction in the classroom. Teachers will self-report whether or not they are using the iPads, and how frequently they use a given app. They will then continue to identify the frequency in which they plan to use a given app in the upcoming school year.

As a part of this time component, Rogers (2003) identifies five adopter categories. These categories are based on the rate, or how fast, a person adopts the new idea. The categories are as follows:

1. Innovator (2.5%)- seeks out the new and different to try. They are not afraid of new tools and are not limited by financial resources. They are often outside the norms of the group.
2. Early Adopter (13.5%)- They are insiders, respected in the group. Others look to their leadership for new ideas.
3. Early Majority (34%)-They are very deliberate in their decisions. They look to others to see how it works for them before they move ahead.
4. Late Majority (34%)- They are the average. They wait until they have to make a move forward.

5. Laggards (16%)- They focus on the past, and try hard not to move forward. They are outside the norms of the local group. They are suspicious of change and resistant.

Because of a lack of intermittent data, the researcher is not attempting to place teachers in specific categories based on the responses to the survey questions. However, the data was be used to identify the categories of those adopting the tools verses those who did not. Over the course of 18 months, and using the two distinct categories of adopter verses laggard, we can identify the impact of the initiative on teacher's perceptions of the innovation, the use of digital tools during instruction.

**Social Structure**

The social structure of this school district is hierarchical. The school district consists of 36 schools in a suburban mid-western city. It is overseen by a Board of Education that employs a Superintendent of School. The Superintendent is responsible for the oversight of the entire school system and its educational program.

In this case, the Digital Learning Initiative was not only started by the Superintendent, but is identified as one of the three goals for the year by the Board of Education. As a result, it is a priority for all district level leaders, principals, and building personnel. Even with this very specific structure, personal opinion, experience, and relationships among the teachers will influence the rate of adoption with buildings and classrooms.

## Rate of Adoption

Upon receiving the surveys from the teachers, the focus is the rate at which the teachers adopted the innovation, in other words the adoption categories. In our initiative, many of the elements of this diffusion are controlled from the top down. The district identified the time frame and the social structure. Professional development facilitators provided the initial training and shared the same initial knowledge with all teachers involved in the process. The goal in this study is to see how fast and to what degree the teacher as a part of the daily routine adopt and implement the innovation.

## Impact on Professional Development

These Diffusion of Innovation categories can help designers of professional development programs identify the personal willingness of teachers to adopt to create appropriate technology opportunities for growth (Harris, 2008; Vanderlinde & Brask, 2011). If a teacher has a willingness to try and use a new innovation, they will be faster to adopt the innovation. These categories are also effected by a teacher's background in educational technology, those more comfortable with it will adopt it more rapidly than those who do not (Harris, 2008).

Change Agents (Crompton & Keane, 2012; Vanderlinde & Brask, 2011; Rogers, 2003) are individuals that lead the charge in adopting a new innovation within a social group. For a school or district, this person could be a technology coordinator, professional development coordinator or building representative. This person is responsible for providing the vision for how the innovation is to be implemented (Vanderlinde & Brask, 2011).

Harris (2008) describes each of the levels of adoption and how they can affect the school adoption process. For teachers who are more comfortable with technology, innovators, should be given individualized opportunities to experiment. Early adopters can be used as role models to lead other teachers into using the new technology. Early majority teachers should be given the opportunity to work together, collaborate, and discuss their experiences with other teachers. The late adopters are the last large group to adopt. They do so out of necessity, everyone else is already using it. They may require peer coaching and hands-on opportunities. Laggards, while often looked at negatively, have an important place because they provide history and continuity to a building. They keep everyone from jumping into everything new.

**Outline of the Study**

The study information is organized into five chapters. The first chapter is the introduction which introduces the purpose of the study and the operational definitions that are necessary. The literature review covering the topics of 21st Century Literacy Skills, Professional Development, Technology in Education, and Digital Learning Initiative are covered in Chapter 2. This chapter also includes a brief description of Roger's Theory of Innovation as it relates to this research. Chapter 3 identifies the methodology used during the study. The results of the study are detailed in Chapter 4 along with detailed visuals of the results. Finally, Chapter 5 is a summary of the study results along with the implications of the findings.

# Chapter 2

## Review of Literature

Over the course of history, the process of educating students has changed. Yet, the goal has always been the same; to create a generation of literate students prepared for the world that they will encounter. The innovativeness of the human mind has created a multitude of educational technologies designed to transfer knowledge and skills in new and creative ways. These new technologies are the tools of the educational trade. At the same time, the methods for instruction, or pedagogy, give teachers a way to differentiate instruction to meet the needs of each student. For these two concepts to seamlessly intersect and maximize the effectiveness of instruction for students, teachers must understand effective ways to implement educational technology within instruction. Professional development must support and stretch the teacher's knowledge base for this to occur. The intersection of these things, technology, professional development, and pedagogy, is the focus of this study.

## History of Technology in Education

Technology has not always been at the forefront of education. In the fifth century, Socrates was the most significant teacher of the time; yet, he didn't use any form of technology. His method of instruction was through dialogues, or conversations, with his students or people on the streets (Socrates, 2016; Nails, 2014; Biography.com, n.d,b). His philosophy focused on asking questions and making people think about the world around them. It was these questions that others found threatening and lead to his early

death. It is only through the use of technology by one of his students that we have any record of his teaching.

One of the earliest forms of technology in the field of education was the use of pen and ink to write down the knowledge of a culture. Fortunately, Plato was willing to write *The Socratic Dialogues*, the only written history of Socrates's work. It is from these beginnings that Plato founded "The Academy" in Athens, the first organized school in western civilization (Meinwald, 2016; Hare, 2010; Biography.com, n.d.a). Schools continue to use these teaching methods as the basis for the Socratic Method and Socratic Circles (*The Socratic Method: What it is and how to use it in the classroom*, 2003) for developing students' critical thinking and reasoning.

Technology has developed over time, facilitating access to information to a far greater audience. Around the 1440's, Johannes Gutenberg broadened access to the written word through the invention of the printing press (Oregon State University Libraries, n.d.). The press allowed for the easy creation of multiple documents through movable typeset made from an original. The duplication of documents could be made faster and thus cheaper than anything else that had been written by hand. As a result of the production of the *Gutenberg Bible*, the masses had access to a written work and a reason to learn to read (Oregon State University Libraries, n.d.).

The origins of the Internet Era are traced back to the invention of the Gutenberg Printing Press (Rash, 2014). For the current generation, the Internet is the method by which knowledge and skills are spread to the widest audience. No longer do educators make multiple copies of a single document. Users can access one document in a digital format from a single location posted to the Internet. Today, the audience for information

is not just those who have access to a printed book, but a global audience with access to the World Wide Web.

**Technology Today**

> The dogmas of the quiet past are inadequate to the stormy present. The occasion is piled high with difficulty, and we must rise with the occasion. As our case is new, so we must think anew and act anew. We must disenthrall ourselves, and then we shall save our country. (Abraham Lincoln Online, 2015, paragraph 4)

In a TED talk (Robinson, 2010), Sir Ken Robinson used this quote from Abraham Lincoln to illustrate the need for a new educational system. Today, schools are faced with the need to change the way that things have always been done in order to make a better way for our students to learn. (The RSA, 2013) Educators must rise with the challenges that we face today, address them, and develop solutions that will allow the system to meet the ever-changing needs of the students that we serve. Sir Robinson called this challenge much more than a reform, he called it a revolution because we need to throw out what we have always done, and create new pedagogies for our students in the 21st Century (The RSA, 2010).

**21st Century Skills**

21st Century Literacy Skills is the term used to identify the skills required to be literate in today's changing landscape, students must be digital citizens in a global

environment in order to stay current. Schools must change and incorporate these skills into the standards and methodologies that teachers use. A modern school must

> Bring together rigorous content and real world relevance. It must focus on cognitive skills as well as those in affective and aesthetic domains. It must be attentive to the needs of the individual child and to society as a whole. (Intellectual and Policy Foundations of the 21st Century Skills Framework, p.6)

The digital literacy skills taught in the K-12 ranks will impact individuals as they enter the workforce and the realm of higher education. According to Holum and Gahala, students must have an "expanded understanding of literacy because of the technology skills associated with communicating, investigating, assessing and using information, computing thinking critically about messages" (Holum & Gahala, 2001,p.1). The Education Testing Service and a consortium of higher education institutions came together to form the National Education Information and Communication Technology Initiative. Its purpose was to create an assessment that identifies a set of skills that they believe are necessary for individuals to be successful. They believe that if schools access the needs of the workplace, teachers can better identify the skills that need to be taught. These skills, known as the Information and Communication Technology Literacy Skills, differ slightly from the 21st Century Literacy Skills as they focus on the "proficiency divide," the gap between people who have the skills to find information and use it effectively and those who do not (Educational Testing Service, 2013a; Educational Testing Service, 2013b).

**Research on 21st Century Skills**

In 2002, Ken Kay (Partnership for 21st Century Learning, n.d) brought together a collaboration of business leaders, educational specialists, and government officials, to look at 21st Century readiness and the ability of schools to teach these skills to all students. This meeting of the minds became the national organization known as the Partnership for 21st Century Skills (P21). Through its leadership, a framework was created blending the traditional 3Rs and the 4 C's: Creativity, Critical Thinking, Collaboration, and Communication (P21 framework definitions, 2015). It is the inclusion of the 4 C's that incorporates the 21st Century Skills that business and global leaders advocate students will need in the global marketplace (Partnership, 2007).

Following the identification of these 21st Century Skills by P21, many professional organizations adopted these objectives for standards and objectives specific to the needs of their members and students. In 2007, the American Association of School Librarians (AASL) and the International Teachers for Technology in Education (ISTE) created organizational standards. AASL's Standards for the 21st Century Learner (2007) includes standards, dispositions, and responsibilities for P-12 students in four categories: Inquire, think critically, and gain knowledge; Draw conclusions, make informed decisions; apply knowledge to new situations, and create new knowledge; Share knowledge and participate ethically and productively as members of our democratic society; and Pursue personal and aesthetic growth.

ISTE went even further in their development of standards for 21st Century Skills. They created lists of standards for several groups in the field of education (International

Society for Technology in Education, 2016b): ISTE Standards for Students; ISTE Standards for Teachers; ISTE Standards for Administrators; ISTE Standards for Coaches; and ISTE Standards for Computer Science Educators. These standards indicate the skills that individuals need proficiencies with to successfully prepare students for the 21st Century. However, the focus of this study will be on the standards for students (International Society for Technology in Education, 2016c): Creativity and Innovation; Communication and Collaboration; Research and Information Fluency; Critical Thinking, Problem Solving and Decision Making; Digital Citizenship, and Technology Operations and Concepts.

Beyond these standards ISTE also created specific Technology Profiles for students (International Society for Technology in Education, 2016a). These profiles go beyond identifying the skills that students must have in these categories to be successful, they share specific experiences that the students should have and the relationship of the experience with the skills. In this way, teachers have examples of ways to implement the technology in productive and creative ways.

While the presentation of these standards look different, the basic message is the same from all organizations. It is clear that teachers and students must embrace the skills and dispositions of 21st Century Learning in order to prepare students for the modern workplace.

**Goal for 21st Century Literacy Skills**

The goal of teaching 21st Century Literacy Skills is to give students the tools they need to be successful in an ever-changing digital environment. Educational Leaders say

that students are preparing for jobs that require very different skills than for previous generations (Zhao, 2012, p. 44; Crockett, et al, 2011, p 5). As a result, our students do not need to learn content or a specific curriculum; they need to learn to learn. Students need the ability to learn one method for achievement of a goal, unlearn it, and relearn a new and different approach to solving that same problem. They need the skills to adapt and change as the workforce and global environment changes. But, they also need the tools to make sure that they use this new ability for the betterment of all. Crockett, et al (2011, p. 79) refer to this person as a Global Digital Citizen.

A Global Digital Citizen has the tools to use information and technology for many reasons, and yet, chooses to use them in a positive way. They have a sense of personal responsibility and accountability in their life choices in how they work and the endeavors in which they participate. A Global Digital Citizen is a positive force in the workplace, but also in the realm of the online environment. They have a "commitment to respecting and protecting themselves, others and intellectual property" (Crockett, et al., 2011, p. 81-82). Finally, a Global Citizen thinks outside of the individual. They see the value in others and work for the benefit of all. They consider the issues, cultures, and traditions of people from around the world. They participate in altruistic service for those less fortunate, through church and school related activities. Environmental causes foster a respect and protection of our Earth.

The objectives for schools can no longer be about specific information or a specific curriculum. Educators cannot be considered experts or the "sage on the stage." "Our connected-global world calls for different learning opportunities and newly designed curriculum, instruction and assessment" (Beers, 2011, p. 20). The goal must be

to create lifelong learners who can adapt and change as our knowledge and needs change. Students must be creative, critical-thinkers who can communicate a message and a passion for what they do. These students must be able to work with others on a global scale in order to protect each other and our world. It is a moving target for schools, yet educators must make it happen or fail to prepare students for their future.

**Educational Technology Research**

Technology has impacted the manner in which individuals intact with the world. No matter the industry or personal life, there are a multitude of ways that technology influences what people do and think. According to Prensky (2013), technology is an extension of our brain and has allowed us to develop a new way of thinking. It has been developed out of our need to deal with a world that is constantly changing and becoming more complex. This rapidly changing digital environment has caused changes in the way that today's students think and process information in their world. The term, "Digital Native" (Prensky, 2005) is used to describe these students whose fluency in all things digital has sparked a need to change the way we use technology in the classroom. Rather than "turning off" the technologies that student so seamlessly weave into their personal lives, educators must learn to effectively engage students in the use of technology as a means to increase student motivation and achievement.

Experts agree that the today's students are going to enter a workforce that is vastly different than it is today. Educational leaders recognize that the jobs of tomorrow are not even imagined today (Zhao, 2012; Crockett, et al., 2011, p. 12-13, Prensky, 2005). As a result, we must prepare students to use technology and develop the 4 C's,

Collaboration, Communication, Creativity, and Critical thinking, instead of the 3 R's, Reading, Writing, and Arithmetic, as was required in the past (Nebraska Department of Education, 2009; Zhao, 2012 p.8; Crocket, et al., 2011, p. 18; Partnership for 21st Century Skills, 2007; AASL 2007; ISTE 2007; Ertmer, 1999). Our focus is not to be on straight content knowledge, rather it must be on gathering information from a variety of sources using multiple methods and then doing something with the knowledge to solve a problem or meet a changing need.

"Technology has become foundational to both education and life "(Prensky, 2013). As a result, technology must be integrated into the natural routines of the classroom as a way to make connections between the content that the students need to have and multidisciplinary learning goals (Ertmer, 1999). It involves curriculum content, pedagogy, and considerations based on the attributes of each individual technology being adopted (Harris, 2008). Effective integration is not the result of having a large number of computers in a classroom, rather the impact that the tools have on teaching and learning for students. For this to occur, teachers must overcome barriers that limit the effectiveness of technology as a tool for instruction.

There are two categories of barriers to instructional technology in the classroom, first- and second- degree barriers. A first-degree barrier is placed on teachers from outside themselves (An & Reigeluth, 2011; Hew & Brush, 2007; Ertmer, 1999). These barriers include resources to which the students and teacher have access, the curriculum, and the manner of assessment. Much of this is controlled by the institution of which the teacher is a member. Second-degree barriers come from within the teacher. These influences include their own attitude toward technology, teacher experiences with the

tools, their knowledge of and skills with using technology (An & Reigeluth, 2011; Ertmer, 1999). These two types of barriers are not isolated from one another, and to be overcome must be looked at simultaneously (An & Reigeluth 2011; Ertmer, 1999).

First-degree barriers are place on the teacher by some outside source. These barriers are often the first reason that technology integration is not effective. Individuals identify lack of access to digital resources, both hardware and software, as the reason that technology is not integrated into instruction. Hew & Brush (2007) identified a lack of institutional leadership as a significant barrier to successful integration initiatives. The lack of a shared vision, district-wide planning, and lack of time negatively effects the implementation of technology integration. In order to conquer these barriers, districts must be strategic in the areas of access, time, training, and support (Ertmer, 1999).

The second-degree barriers come from within a teacher. They are more individualized by the teacher's experience and beliefs about the value of technology in education. While many teachers are implementing technology in the classroom, it is often as a replacement for some other traditional method of instruction, for example math practice on a website rather than a worksheet. This is the result of teachers having a lack of pedagogical knowledge on how to effectively tie a digital tool to the content and as well as an appropriate classroom management style for learning (Hew & Brush, 2007; Ertmer, 1999). Professional development related to technology knowledge, pedagogy knowledge, and content knowledge can assist teachers with overcoming these obstacles (An & Reigeluth, 2011; Harris, 2008; Hew & Brush, 2007; Rosenberg 2006; Ertmer, 1999).

Research has been conducted to identify approaches to overcoming both types of barriers. The first institutional barrier that must be overcome is through the creation of a common vision. This includes how to use technology to achieve instructional goals. The vision gives teachers a place to start, milestones to accomplish, and goals to reach (Vanderlinde & Brask, 2011; Castle 2009; Ertmer, 1999). A district vision allows teachers to overcome a lack of resources, lays a foundation for a change in attitude, focuses professional development, and instigates the discussion of appropriate assessment (An & Reigeluth, 2011, Hew & Brush, 2007). This vision can be shared through a series of modeling, reflection, and collaboration between teachers (Castle, 2009, Ertmer, 1999). This vison should include an acceptance that implementation of technology includes anxiety and struggle for teachers (Hew & Brush, 2007). It acts as a blueprint for identifying the goals that the school wants to achieve and outlines the technology philosophy of the school (Vanderlinde & Brask, 2011).

Specific professional development on a variety of topics must be developed at the district level. These programs must have specific goals identified through individual sessions or over the course of a series of sessions. (Harris, 2008) According to Harris (2008), there are six goals for technology implementation within a professional development program: (1) Awareness of a technology tool, (2) Curriculum integration of a tool, (3) Change in instructional practice, (4) curriculum reform, (5) School or organizational change, (6) Social change. The content of the program must include technological pedagogical knowledge, content pedagogy as related to technology implementation and curriculum development, and classroom management (An & Reigeluth, 2012, Hew & Brush, 2007, Ertmer, 1999).

In the past for many districts, professional development focused more on the knowledge and skills of using the tool, not the implication on that tool within the content of the course (Hew & Brush, 2007). In contrast, teachers must have a solid foundation in pedagogy of engaging students through a continuum of replacement, amplification and transformation by way of digital tools (Common Sense Media, 2016; Hew & Brush, 2007; Puentedura, 2006). Once the pedagogy is in place, it must be embedded in the curriculum with specific steps on how that technology will be implemented (An & Reigeluth, 2011; Hew & Brush 2007; Prensky, 2005, Ertmer, 1999). Teachers must be involved in this identifying how and where this technology integration should occur (Ertmer, 1999). Teachers must have professional development related to classroom management. This includes device management, as well as student management while using the resources (Hew & Brush, 2007; Ertmer, 1999). Digital resources can be used with no change in instruction, but they will definitely change how the classroom works (Ertmer, 1999).

The effective integration of technology into instruction requires teachers to look at the pedagogy related to technology, not just at the technology skills of using the resource. To do this, this district used two instruction technology implementation models that are widely used, SAMR and TPACK. Both allow teachers to look at why and how students are using technology within the learning in their classes. They are tools for self-assessment as related to the planning of a lesson and an evaluation piece at the conclusion of a lesson or unit of study.

## SAMR Model

The SMAR Model was created by Dr. Ruben Puentadura in 2001. It is designed to allow teachers to reflect on the technology usage in their lessons to determine the level at which technology is implemented. The goal is to have students use of technology transform the learning in such a way that it could not have been completed using traditional methods.

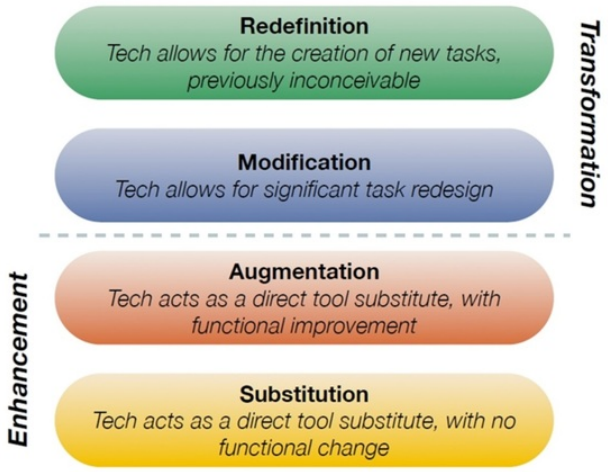


Figure 1. SAMR Model (SAMR, 2011, Puentadura 2006)

## TPACK Model

The TPACK model is similar to the SAMR Model in that it is a way for teachers to assess the level of technology in their lesson, but it goes much further to focus on the pedagogy of learning using three types of knowledge: content, technology, and pedagogy (Koehler, Mishra, Cain, 2013). This model helps teachers identify how these three areas overlap. Teachers usually have expertise in content knowledge and pedagogy knowledge. However, even those teachers with technology expertise struggle with implementing the technology in the content area. This model is designed as a guide on how to utilize the

three areas to transform learning. According to Hew and Brush (2007), this model helps teachers develop subject/content specific technology integration opportunities for authentic teaching and learning. In their research of Information and Communication Technology Integration (Vanderlinde & Brask, 2011), identify TPACK assisting teacher in identifying competencies that teachers need to have as related to educational practice, integrative knowledge of technology skill and knowledge and subject matter content and pedagogy.

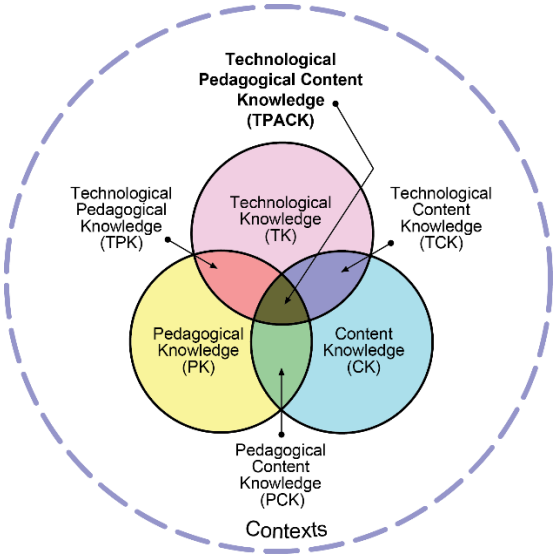


Figure 2. TPACK Model (Rosenberg, 2006)

## Professional Development in Education

> We are now in a better position than ever to organize and conduct professional development activities that not only yield valid evidence on the effectiveness of current practice but also inform future endeavors. (Guskey, 2009, p. 233).

The purpose for professional development is not to remove teachers from the daily responsibilities of the classroom in order to give them something else to do. Its purpose is to inform and prepare teachers to utilize methods that will improve their instruction and, as a result, improve student achievement (Desimone, 2011; Ertmer, 1999). Borko (2004, p. 3) states, "Professional development can lead to improvements in instructional practices and student learning." The goal is to provide teachers with professional development in order to prepare them to meet the "demanding new standards" (Borko, 2004, p. 3).

Unfortunately, according to November (2012b, paragraph 2), "We are often too focused on training teachers to use a tool without the clear vision of how we can transform learning for our students." Borko (2004, p. 3) adds, "Professional development currently available to teachers is woefully inadequate." So, educators preparing and presenting professional development opportunities to teachers must begin to analyze what they are doing and why they are doing it in order to best meet the rapidly changing needs of today's educators. For this to occur, Desimone (2011, 2009) identifies a professional development framework that includes professional development opportunities that increase the teacher's knowledge and skills related to their attitudes and/or beliefs. This new knowledge or skill must transfer into the classroom to improve instruction and/or pedagogy, and then maximizes student learning.

Teachers want to be more effective in the art and practice of maximizing student learning. In the quest to make this a reality, there are some concepts that need to be considered when planning effective professional development. For Guskey and Yoon (2009), professional development must be determined by the content, the nature of the

work, and the context of the work itself. This includes a focus on the subject that the teacher teaches and the manner in which student acquire the necessary knowledge and/or skill. In a review of research on technology integration, Hew and Brush (2007) identified three major focuses for professional development: content including technology, pedagogy, and classroom management, make the professional development "hands-on", and make it be what the teachers need.

For Guskey and Yoon (2009, p. 499), "effective professional development requires considerable time, and that time must be well organized, carefully structured, purposefully directed, and focused on content or pedagogy or both." To do that, there are three characteristics of professional development and that same professional development must be evaluated for its effectiveness (Guskey, 2000, p. 17-19). These characteristics include: an intentional process that teachers understand and are aware of the goals; is ongoing, teachers continue personal learning, reflect on that learning, and apply it in the classroom; and is systemic, allowing for consistency, continuity, and cohesion It is only after they are evaluated will we truly know their impact on student learning. Unfortunately, he believes that "valid and scientifically defensible evidence on the relationship between professional development and improvements in student learning is exceptionally scarce" (Guskey, 2009, p. 231-232).

The first of Guskey's characteristics is that professional development must be intentional (2000, p. 38). This intentionality starts with the leadership of the school district (Hew & Brush, 2007). "If school leaders succeed in creating workplace conditions that offer learning opportunities and learning space, learning experiences, the

milestones for professional development, will originate" (Clement & Vandenberghe, 2001, p. 43). This does not mean that teachers “sit and get,” rather teachers become both the learner and teacher, experiencing technology as a means to increase student achievement through experimentation and struggle. “Through this process, their (teachers’) creativity and innovation is encouraged and allowed to flourish as they apply what they are learning” (Castle, 2009, p. 38). It allows teachers to become part of the leadership to plan, make decisions and evaluate the professional development activities (Hew and Brush, 2007; Manchester, et al, 2004; Ray & Pike, 2004). All the while, they are improving their own knowledge and skills for designing and delivering professional development for adult learners (Hew & Brush, 2007, Ray & Pike, 2004).

The second of the characteristics for professional development states that the learning is ongoing (Guskey, 2009 & 2000, p. 38). Castle (2009, p. 33) is even more specific when he states that it must be “sustained, ongoing, intensive, and supported by modeling, coaching, and the collective solving of specific problems of practice” and connected to other change initiatives within the school community. Since it is a part of the school community and its change, the professional development must be “collaborative, involving a sharing of knowledge among educators and a focus on teachers' communities of practice rather than on individual teachers” (Castle, 2009, p. 33). “The role of professional development is building professional cultures that support and sustain ongoing improvement and the use of best practice.” (Loucks-Horsley et al., 2010, p. 26).

The third characteristic focuses on the systemic nature of the program. “Principles that guide the reform of student learning should also guide professional

learning for educators" (Loucks-Horsley et al., 2010, p. 29). When Loucks-Horsley, et al. (2010, p. 29) looked specifically at professional development opportunities for Math and Science teachers the authors identified the need for teachers to "walk their talk." "People teach as they are taught, so engaging in active learning, focus on fewer ideas more deeply, and learning collaboratively- all of these principles-must characterize learning opportunities for adults" (Loucks-Horsley et al., 2010, p. 29).

Borko (2004) identifies key elements that professional developers must address when looking at a professional development system. These elements include the teachers (learners) involved, the facilitators (teachers of the new content), the professional development program, and the context of the professional development.

She continues to develop her system by looking at phases of the program. In the first phase, researchers gather proof that the teacher has learned and transformed their teaching. It is the most commonly researched phase of the system. Generally, it is the individuals who develop the professional development who are the researchers during this initial phase. She identifies two more phases as areas that are under researched, professional development across multiple sites and facilitators and comparative information about implementation, effect and resources requirements (Borko, 2004, p. 4).

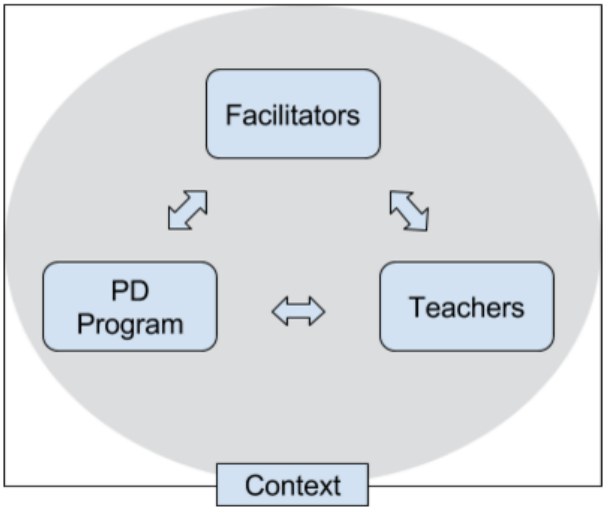


Figure 3. Elements of a Professional Development System (Borko, 2004, p. 4)

In Borko's (2004) first phase, the focus is on the individual teacher and the effect that the professional development has on their instruction. The researcher is looking for evidence that the content of the initiative affected the teacher's knowledge of teaching and their understanding of student thinking and instructional practices. In this phase, strong professional learning communities help to move the teacher forward in their development. However, the time line for this learning will vary by teacher much like it does for students in the classroom.

November (2012b) focuses his attention for professional development specifically on using educational technology to increase student learning. "The goal is no longer about technical mastery but about designing learning environments where technology could help children learn, regardless of whether the teacher actually acquired the technical skills" (November, 2012b, paragraph 7). His design of the professional development model includes four phases:

- Learn how students learn: Teachers need to observe the students in the classroom (Guskey, 2000, p. 36). Watch how they interact with each other and the technology that they use.
- Engage with students: Work with students, see how the technology is engaging the student and how the students use it to show what they know
- Reflective collegiality: work with each other to reflect on the things that worked in the classroom and plan with each other based on experiences
- Continued dialogue: build capacity for teachers to continue discussions in person, as well as through online opportunities.

Through these processes, teachers can move away from needing to have all of the answers related to the use of technology in the classroom. Rather they can focus more on the students' creativity and less on their own technical skills (November, 2012b).

In all cases, professional development researcher agree that more research is needed on the relationship between professional development and changes in instruction and student achievement. (Guskey & Yoon, 2009; Borko, 2004). As budgets dwindle, school districts need guidance on how to best utilize professional development in order to increase teacher effectiveness and, thus, student achievement.

**Maine Digital Learning Initiative**

The "Maine Learns Initiative" has put many of the above characteristics and phases of professional development related to technology to the test. This initiative was designed to place a laptop computer in the hands of every teacher and middle school student in the state. Its focus was to use technology for learning, not just as a tool

(Manchester, et al., 2004). "This is not about technology. It's about understanding the impact of technology on how students learn" (November, 2012a, paragraph 32). In order to do this, the state initiative focused on the teacher as the instructional leader and the foundation of the educational system (Manchester, et al., 2004; Ray & Pike, 2004). According to Alan November, teachers need to be able to focus on teaching and not technology skills (November, 2012b). "This is not about technology. It's about understanding the impact of technology on how students learn" (November, 2012a, paragraph 32). In Maine, collaboration between the teachers and students was the beginning of the success of the program.

The state of Maine embraced the ongoing nature of professional development when developing its Technology Learning Leader program. The focus of this initiative was always on student learning, not about the technology. It was designed to help teachers “rethink” the way that students and teachers do work in the school setting (Manchester, et al., 2004) and was designed to create effective, purposeful, and productive teams of teachers to lead technology usage to support standards-based teaching through practical, meaningful and continuous improvement (Ray & Pike, 2004).

In this way teachers began to use technology as a tool in the learning process rather than the focus of the instruction. In all cases, the program developed an environment where the teachers and students were able to take ownership of their own learning (Manchester, et al., 2004). In 2011, Jeff Mao, Learning Policy Director for the state of Maine Department of Education attributed Leadership as the decisive key to the initiative's success (Mao, 2011). Today, all high school and middle schools in Maine have wireless networks and students utilizing laptop devices for learning. The leadership

and passion for the program began at the state level, with the Governor, included the local leadership of the principals. However, it was recognized that the teacher is the "Foundation of the educational system" (Manchester, Muir, & Moulton, 2004). As a result, teachers who were instructional leaders at each building became the guiding force for the initiative. (Manchester, et al., 2004; Ray & Pike, 2004). The Maine Learning Technology Initiative is still supported financially through a foundation created and maintained by the originating former governor.

**Digital Learning Initiative**

During the fall semester of a new school year, a Digital Learning Initiative began in the focus district. The initiative was pioneered by a new superintendent of schools who believes that to be a "world class school district," students need to be prepared for the digital environment they enter in a 21st Century workplace. The superintendent became the "innovation champion" for the project and sparked a new level of cooperation between district systems. In collaboration with the Associate Superintendent of Educational Services , Executive Director of Technology, and the Director of Early Childhood and Elementary Education, the Digital Learning Initiative began at all of the elementary schools in the district.

The initial stages of the initiative began with the top administrators of the district. The Superintendent and Executive Director of Technology worked with community members and the school district's foundation office to share information and gather financial support for the initiative. This collaboration provided the funding for the

purchase six iPads for every elementary classroom in the district. These devices were distributed over the course of a two-month period in the spring of 2015.

Once the purchase was confirmed in the fall of 2014, district level leaders in the areas of Instructional Technology and Staff Development were tasked to create a training plan and application list for the iPads. These leaders worked with grade level teachers to develop lists of applications that would support specific student grade level objectives while providing for applications that would encourage the college and career readiness skills of creativity, critical thinking, collaboration, and communication. They would also provide opportunities for computational thinking through a coding experience.

As these application lists were being generated, the same district level leaders were designing staff development opportunities. This training would then be delivered to classroom teachers at every elementary school as a part of the device deployment. This training would include the following topics:

- District Definition of Digital Learning
- District Vision for Digital Learning
- Pedagogy and Use of SAMR Model
- Deployment of the Device
- Use of the Hardware
- Settings on the Device
- Classroom Procedures
- Device Management
- Application Training
- Sample Activities for Use in the Classroom

- Student Technology Profiles
- Required Lessons based on Student Technology Profiles per grade level

Beginning in December of 2014, Instructional Technology Initiators and Staff Development Leaders identified for step-ahead classroom teachers and teacher librarians with whom to begin training. The building teacher librarian was included in the training as a part of the teacher support and leadership for the initiative training. Teacher librarians as well as these step-ahead teachers continue to be building level leaders for classroom teachers in all aspects of the Digital Learning Initiative.

In the starting semester of the Digital Learning Initiative, District level Instructional Technology Initiators and Staff Development Leaders began elementary classroom teacher deployment and training of the classroom iPads. Building teacher librarians were recruited to assist with the district planned sessions. These sessions were designed to give classroom teachers a solid foundation upon which to build a Digital Learning Ecosystem (Clark, 2014) for the students. It incorporated pedagogy on digital learning and best practice on the use of educational technology in the classroom as well as hands-on experiences with the hardware, setting, and selected applications. Teachers were introduced to the SAMR Model (Puentedura, 2006) as a way of self-evaluating the purpose and strength of the digital tools during instruction.

At the end of the training, teachers had the rest of the semester to experiment with the use of the digital tools in the classroom. District Level Instructional Technology Initiators were available to visit schools with more staff development, if requested, or to

visit/collaborate with teachers for planning or lesson implementation. There was no pressure or expectation to perform required lessons or objectives.

Professional development was an important element of the Digital Learning Initiative during the school year. Topics for the year included pedagogy on the use to digital tools during instruction, the SAMR Model, Technology Profiles, research projects, and Digital Digs. Pedagogy, the SAMR Model, and the district definition of Digital Learning and its vision for the future were revisited at all of the half-day professional development sessions. Each session was designed to build on the topics from previous experiences.

The following spring, District level District Curriculum and Instruction Facilitators, District Instructional Technology Facilitators, classroom teachers, and school administrators developed a list of grade-band profiles, Technology Profiles (Millard Public Schools, 2016a-d), which students will be exposed to over the course of their time in the school district. These profiles purposefully link the district curriculum, college and career readiness skills, and technology experiences in the classroom. The objectives are guides for teachers and parents to see the types of technology infused experiences that students will have during their time in the district.

Upon completion of the Technology Profiles, grade level teachers began infusing the Technology Profiles into the district- approved curriculum by creating grade level lessons. For the first year, the lessons were related to a research project to be implemented during the spring semester of the following year. Topics included:

- Kindergarten- Trees using Pic Collage (Science)
- First Grade- Families using iMovie Trailers (Social Studies)

- Second Grade- Insects using Keynote (Science)
- Third Grade- Omaha History using Pages (Social Studies)
- Fourth Grade- Nebraska History using Book Creator or iBook Author (Social Studies)
- Fifth Grade- Biomes using iMovie and Green Screen (Science)

Professional development was delivered on the research projects and apps during a staff development day in January. Each grade level focused on the Technology Profile that was related to their Science or Social Studies related topic. Grade-level Teacher facilitators tied the lessons to the district's college and career readiness standards and best practice for teaching using educational technology in the classroom. Teachers then had time to process the material in order to being to plan how the research project would be implemented in their classroom.

The second phase of the professional development for teachers was through a series of short, required after school sessions called Digital Digs or a Tech Open Form Session. Teachers had to attend three sessions over the course of the year. Each session focused on a different application: Puppet Pals, Explain Everything, and Book Creator. These sessions were 30 minutes of hands-on guidance through the app and fifteen to twenty minutes of time to experience and play with the app. The recommendation was to come with another grade level teacher so they could use the time to talk and discuss how they could use the app with students in the classroom. If a teacher had previous experience with an app, or if they needed assistance on a different application, they could opt to go to a free form session called Tech Open Form. These sessions are participant

driven and technology staff is available to assist staff on an individual basis. In this case, teachers would be expected to work with another teacher to learn the Digital Dig apps.

District level leaders are continuously looking at the planning for subsequent school years. Teachers will be participating in professional development related to a second set of Technology Profile Lessons. These lessons will focus on collecting and analyzing data. For students in the primary grades, teachers will be utilizing the Numbers app on the iPad. Students at the intermediate grades will be using Google Forms to gather data and then building in the use of Google Sheets. The skills within these lessons will build upon each other using a Gradual Release of Responsibly Model.

As this district moves toward its second full year of the Digital Learning Initiative, there are questions as to how this initiative is being, or is it, being implemented in the classroom. Is the professional development and focus on digital tools for instruction paying off in the classroom with teachers utilizing them for instructional purposes or are the devices and resources being used primarily for remediation and/or reward? The goal is not to identify the educational technology utilization that building administrators see happening during instruction within the classroom, but to identify the educational technology that teachers have and are planning to use in their classroom instruction.

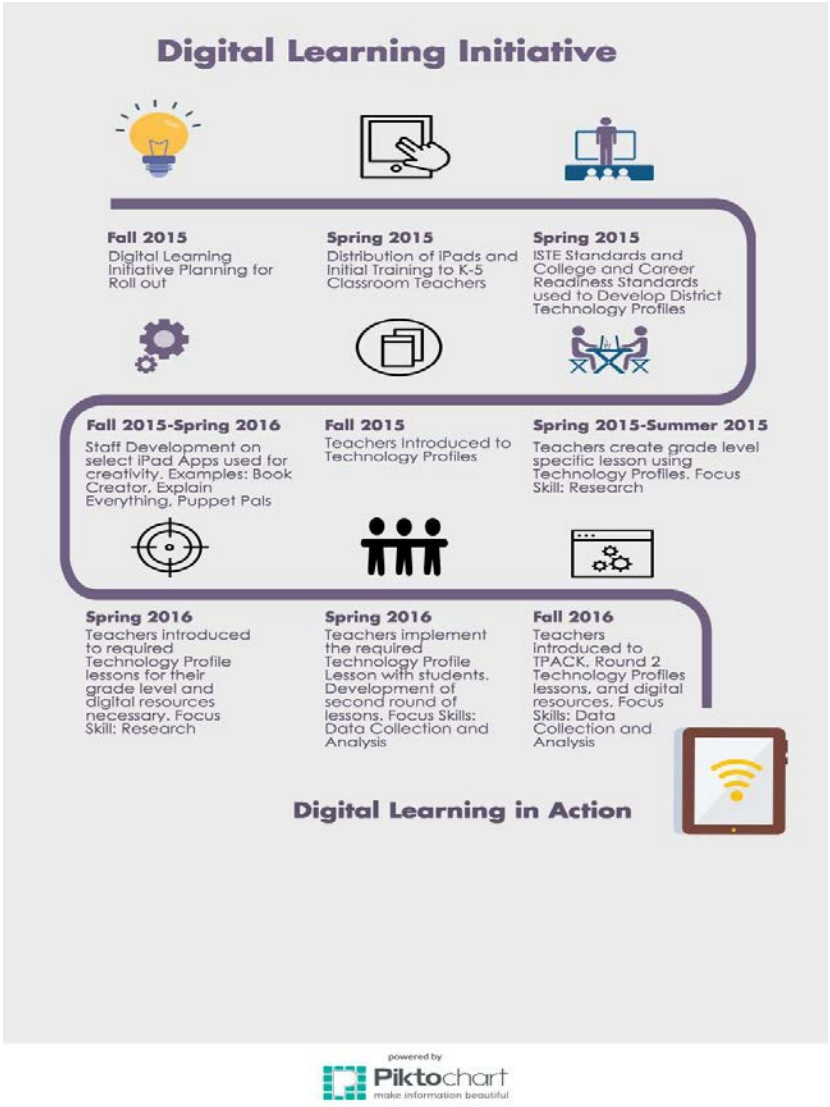


Figure 4. Digital Learning Initiative Overview and Timeline

**Professional Development**

The professional development was created under the guidance of the district's Director of Early Childhood and Elementary Education and Director of Digital Learning. A district level team of four Curriculum and Instruction Facilitators and five Instructional Technology Facilitators planned and facilitated the introductory sessions of the digital learning initiative. As the program developed, approximately thirty classroom teachers

were utilized to facilitate grade level specific sessions that focused on integrating digital tools into district curriculum. These teacher leaders were chosen because of their technology experience and instructional leadership. Building teacher librarians were also used as facilitators to introduce the "Google Apps for Education" tools to students and staff in all 25 elementary schools. Their digital expertise continued as "just-in-time" building level support for staff.

The professional development within the initiative focused on the use of iPads in a digital learning ecosystem. The district's definition of digital learning is:

> Instructional practices that effectively increase students and teacher productivity, creativity, innovation, personalization, and engagement through enhanced learning experiences using a wide spectrum of digital resources that improve teaching, learning and achievement. (Millard Public Schools, 2014)

This definition and the district's strategic plan are the foundation for all professional development related to digital learning. As teachers began to analyze the impact of educational technology on instruction, the SAMR Model served as the framework.

**Summary**

By looking at the intersection of educational technology, creation of professional development opportunities, and Rogers's innovation groups, districts can use data to help them make informed decisions. Maximizing teacher readiness to prepare students for the 21st Century workforce will require school districts to utilize all of the tools that they have at their disposal. Schools districts will have to overcome first- and second-order

barriers by creating and communicating solid visions for how educational technology is going to fit into the district digital learning environment. Then, they will have to overcome the accessibility issues including infrastructure, hardware, and software needs. They will have to prepare teachers by way of planned and structured professional development opportunities that meet teachers where they are using differentiated methods. Only by finding a way to balance these factors will we find the "sweet spot" for instruction and increased student achievement (Koehler, Mishra, & Cain, 2013, Robinson, 2010).

# Chapter 3

## Methodology

### Brief Overview

The purpose of this research was to look at teachers' perceptions of how the Digital Learning Initiative in this school district affected the use of technology during instruction in the classroom. This study asked teachers to reflect on their teaching practices and instruction at the end of the first full year of this Digital Learning Initiative and consider the year ahead. The survey was sent in September of the second year of the initiative, which gave teachers the summer to reflect on their practice and for many to plan what they were going to do differently for the upcoming school year.

### Design

The format of this research was a cross-sectional survey using a web-based questionnaire. The survey format was selected because of its ability to identify the beliefs, attitudes and practices of a population (Creswell, 2014, p. 377) and allowed for a comparison of teacher experiences across a district (Desimone, 2011). According to Desimone (2011, p. 71), it is "the most cost-effective way to study professional development."

For the purpose of this study, the researcher collected the beliefs and attitudes of a large number of teachers from a single district. These teachers all received professional development through the Digital Learning Initiative. However, they did not all receive exactly the same training. There were variations in the professional development content

based on grade level and content. As a result, the researcher wanted to hear the voices of as many people as possible (Creswell, 2014, p. 381). The use of a case study or interview would not necessarily be a good indication of the beliefs of all teachers in the district.

The survey was emailed to 416 K-5 classroom teachers from a single large mid-western suburban school district. Each of the teachers who received the survey were continuously employed by this school district for the entire period of the Digital Learning Initiative. As a result of their employment as a regular elementary classroom teacher, they participated in the entire district level Digital Learning Initiative up to the time of this study. This included professional development on the hardware and digital resources related to the objected of this specific district level initiative.

The survey was sent through a digital format because the school district had adopted Google Apps for Education (GAFE) during the Digital Learning Initiative. The researcher used Google Forms to create the survey. It consisted of fourteen questions, that included multiple choice and open-ended questions related to Digital Learning, Digital Tool Usage, Use of Digital Learning in Instruction, and Teacher Demographics (See Appendix A).

The basic technology usage questions were based on previously written surveys measuring the use of educational technology by teachers (Project Tomorrow, 2016; An & Reigeluth, 2011). They were adapted by the researcher to meet the specific needs of this research and initiative. Questions related to the use of specific digital resources used within this Digital Learning Initiative were created by the researcher,

Survey questions were related to the impact of the district Digital Learning Initiative on the teachers' implementation of technology in their instruction. It included the teacher's understanding of the district's definition of Digital Learning and its implementation in instruction. It also asked questions about the teacher's utilization of educational technology, including iPads, within instruction in the classroom. Questions established the frequency of the use of specific digital tools and resources during classroom instruction. It also identified if teachers planned to use the tool more frequently in the future.

**Construct Validity**

To heighten the construct validity of the survey instrument, a number of measures were used for the survey question evaluation. The researchers used the feedback of several district-level instructional leaders to improve the content-related validity of the survey questions (McMillan, 2015, p. 156: Mills & Gay, 2016, p.134-135). The first round of evaluation was by members of the Digital Learning Initiative Development team. They looked at the questions to identify the evaluated content. The district's Executive Director of Technology and Director of Digital Learning were involved in the approval of the asked questions. As a former member of the district's Department of Research and Assessment and current member of the teaching staff at the University of Nebraska at Omaha, Dr. Tamera Williams was consulted as to the validity of the questions and gave assistance to rewrite some questions.

In the spring, a small group of teachers, not included in the official survey, completed a pilot of the survey questions. The fifty teachers and district level leaders in

this small group were members of a district step-ahead community, Apple Step-Ahead Teachers. These teachers participated in an extension of the Digital Learning Initiative. In addition to the district level training, the Apple Step Ahead Teachers received an additional six days of training with Apple Certified Trainers. These selected teachers participated in the group as the result of an invitation from their principals. The qualifications for inclusion were a principal recommendation, instructional leadership in their building, and a willingness to participate. There was no technology prerequisite to be a member. A variety of technology related skill sets added to the diversity within the group. Because of the addition training, these teachers were not included in the actual survey. Of the fifty members of this group, the identification of 38 classroom teachers became the pilot group.

After the completion of the pilot with 38 Apple Step Ahead Teachers, the researcher received 14 responses from teachers. These responses measured the construct validity of the survey. The feedback that was received was positive. All questions returned answered and one respondent stated that the questions were clear. A first grade teacher stated that not all of the digital tools listed in the questions were appropriate for the development skill of her students. The suggestion to add an option to this question "Not developmentally appropriate for my grade level." was approved and added to the question matrix.

The final step of the construct validity phase came with the approval of the research question and survey by the district Department of Research and Assessment. In order for the research to take place within this district, this department had to approve of

the purpose of the research, the research questions asked, and the survey questions that were going to be asked of the teachers. The approval was granted in the spring of 2016.

**Research Questions**

The focus of this research centered on the question "As the result of the Digital Learning Initiative (DLI), what were teachers' perceptions of their integration of educational technology within instruction in elementary classrooms? This was determined by looking at the responses from individual teachers and compiling the results to generalize the responses. The researcher asked teachers to rate their own level of knowledge regarding the definition of Digital Learning and technology skills prior to the Digital Learning Initiative and the frequency of the use of iPads during instruction. The four sub-questions were related to the teacher's use of technology as a result of the professional development in the Digital Learning Initiative.

1. How did the DLI effect teacher's perception of Digital Learning?
2. How did the DLI effect the integration of technology in instruction within the elementary classroom?
3. What is the difference in the frequency of the use of a digital tool during the previous school year vs. plans for integrating digital tools in the upcoming school year?

There were three sub-questions related to the research question. Each of these questions made an inference on the effectiveness of the Digital Learning Initiative on all members of the teaching staff in K-5 regular elementary classrooms. The first sub-question related to the teachers understanding of Digital Learning. The second sub-

question focused on the frequency in the use of technology during instruction in the classroom. Sub-question three looked at the individual digital resources that were presented as a part of the Digital Learning Initiative to determine what resources the teachers actually used and the level at which they were used. Finally, the last question identified the resources that teachers plan to use and the frequency of use in the upcoming school year.

For sub-questions one and two, the researcher utilized frequency tables to identify the number of times that each response was given by teachers. The displayed data is in table and histogram format to obtain a visual of the responses. This helped the researcher determine if there was a positive skew in the responses that the DLI did increase the teachers' level of technology knowledge. This information translated into percentages to determine the percentage of individuals who felt a particular way regarding the influence of the Digital Learning Initiative.

Sub-question number three looked at the difference between the responses that teachers gave regarding digital resource use during the past school year versus planned usage for the upcoming school year. The researcher identified the difference between the usage that took place during the previous school year and compared it to the planned usage for the upcoming year. This identified the tools that the teachers found most beneficial to their teaching.

**Subjects**

The subjects of the research are K-5 classroom teachers continuously employed by a specific school district during the entire Digital Learning Initiative. Teachers were

asked to share the following demographic information at the end of the survey: Level of Education (B.S., M.S., etc.), number of years teaching experience in the current school district, number of years teaching experience in total, number of years' experience at the current grade level, number of students in the class during the previous school year.

School district e-mail system distributed the survey to 415 elementary classroom teachers. It was open for a period of three weeks. Teachers received a reminder message halfway through and again one day prior to the end of the period. In total, 126 teachers (30.4%) responded to all of the questions within the survey. Of these 126 teachers, 33 (26.3%) hold Bachelor's degrees, 90 (71.4$) have Master's degrees, and 3 (2.4%) are Educational Specialists.

**Teachers Highest Level of Education**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Bachelors Degree | 33 | 26.2 | 26.2 | 26.2 |
| | Masters Degree | 90 | 71.4 | 71.4 | 97.6 |
| | Educational Specialist | 3 | 2.4 | 2.4 | 100.0 |
| | Total | 126 | 100.0 | 100.0 | |

Figure 5: Teachers Highest Level of Education

The researcher identified teachers experience within the school district through a set of incremental year categories. The categories identified are "1-5 years", "6-10 years", "11-15 years", "15-20 years" and "20+ years. For teachers to be included in this survey, they had to be working within the school district for at least the two school years

of the Digital Learning Initiative. The category breakdown is 27 (21.4 %) teachers identified themselves within the "1-5 years" group, 28 (22.2%) teachers selected "6-10 years", 38 (30.2%) chose the "11-15 years" category, 19 (15.1%) included themselves in the "15-20 years" group, and 14 (11.1%) had "20+ years" of experience within the district.

| Number of Years within the School District | | | | | |
|---|---|---|---|---|---|
| | | Frequency | Percent | Valid Percent | Cumulative Percent |
| Valid | 1-5 years | 27 | 21.4 | 21.4 | 21.4 |
| | 6-10 years | 28 | 22.2 | 22.2 | 43.7 |
| | 11-15 years | 38 | 30.2 | 30.2 | 73.8 |
| | 16-20 years | 19 | 15.1 | 15.1 | 88.9 |
| | 20+ years | 14 | 11.1 | 11.1 | 100.0 |
| | Total | 126 | 100.0 | 100.0 | |
| | | | | | |

Figure 6: Number of Years within the School District

The researcher was also interested in knowing how many years teaching experience was included within the subject group. When broken down, over 50% of the respondents fell into two categories. These two groups "11-15 years" and "20+ years" included teacher identification as 36 (28.6%) and 34 (27.0%) respectively. The other three categories were very similar in the totals. Teachers including themselves in the "1-5 years" category was 18 (14.3%), "6-10 years" as 19 (15.1%) and "16-20 years" as 19 (15.1%).

| Total Years Numbers of Years Teaching Experience | | | | | |
|---|---|---|---|---|---|
| | | Frequency | Percent | Valid Percent | Cumulative Percent |
| Valid | 1-5 years | 18 | 14.3 | 14.3 | 14.3 |
| | 6-10 years | 19 | 15.1 | 15.1 | 29.4 |
| | 11-15 years | 36 | 28.6 | 28.6 | 57.9 |
| | 16-20 years | 19 | 15.1 | 15.1 | 73.0 |
| | 20+ years | 34 | 27.0 | 27.0 | 100.0 |
| | Total | 126 | 100.0 | 100.0 | |

Figure 7: Total Number of Years Teaching Experience

The final area of demographics for teachers included specifics about the teacher's class. Teachers identified the grade level taught and the length of time teaching at that grade level. The response included all grade levels from Kindergarten through 5th grade. Sixty-one teachers identified themselves as primary level teachers, 16 (12.7%) at Kindergarten, 23 (18.3%) as first grade teachers, and 22 (17.5%) as second grade teachers. Similar frequencies represent the intermediate level teachers, including third grade at 15 (11.9%), fourth grade at 23 (18.3), and fifth grade at 27 (21.4), for 65 total responses.

| Current Grade Level Taught | | | | | |
|---|---|---|---|---|---|
| | | Frequency | Percent | Valid Percent | Cumulative Percent |
| Valid | Kindergarten | 16 | 12.7 | 12.7 | 12.7 |
| | 1st Grade | 23 | 18.3 | 18.3 | 31.0 |
| | 2nd Grade | 22 | 17.5 | 17.5 | 48.4 |
| | 3rd Grade | 15 | 11.9 | 11.9 | 60.3 |

| | | | | | |
|---|---|---|---|---|---|
| | 4th Grade | 23 | 18.3 | 18.3 | 78.6 |
| | 5th Grade | 27 | 21.4 | 21.4 | 100.0 |
| | Total | 126 | 100.0 | 100.0 | |

Figure 8: Current Grade Level Taught

The breakdown of the number of years that a teacher had been at the current grade level was interesting. Those teaching "1-5 years" were by far the largest category at 47.6% with 60 responses). Those teaching "6-10 years" and "11-15 years" were similar in number including 27 (21.4%) and 24 (19.0%) respectively. The final two groups were also similar in number: "16-20 years" was identified 9 times (7.1%) and 6 (4.8%) for those with "20+ years" of experience.

| **Number of Years Teaching Current Grade Level** | | | | | |
|---|---|---|---|---|---|
| | | Frequency | Percent | Valid Percent | Cumulative Percent |
| Valid | 1-5 years | 60 | 47.6 | 47.6 | 47.6 |
| | 6-10 years | 27 | 21.4 | 21.4 | 69.0 |
| | 11-15 years | 24 | 19.0 | 19.0 | 88.1 |
| | 16-20 years | 9 | 7.1 | 7.1 | 95.2 |
| | 20+ years | 6 | 4.8 | 4.8 | 100.0 |
| | Total | 126 | 100.0 | 100.0 | |

Figure 9: Number of Years Teaching at Current Grade Level

The class size for the teachers was very similar across the board. By far the largest category of class size was "21-25 students." The school district does have a standard of twenty for class size; however, it is not always achievable. For this research, 85 teachers (67.5%) identified the class size as "21-24 students" and 25 teachers (19.8%) said 16-20.

The two-outlier categories were “Below 15 students” with 3 teachers responding (2.4%) and “25+” with one teacher in this category (0.8%).

| Number of Students in Class during the 2015-2016 Year | | | | | |
|---|---|---|---|---|---|
| | | Frequency | Percent | Valid Percent | Cumulative Percent |
| Valid | Below 15 students | 3 | 2.4 | 2.4 | 2.4 |
| | 16-20 students | 25 | 19.8 | 19.8 | 22.2 |
| | 21-25 students | 85 | 67.5 | 67.5 | 89.7 |
| | 26-30 students | 12 | 9.5 | 9.5 | 99.2 |
| | 30+ students | 1 | .8 | .8 | 100.0 |
| | Total | 126 | 100.0 | 100.0 | |

Figure 11: Number of Students in the Class during the 2015-2016 Year

**Limitations**

There were several limitations that the researcher needs to acknowledge. The researcher assumed that the teachers participated in all of the Digital Learning Initiative staff development sessions since their employment matches the period of the initiative. There were no considerations for those with long-term substitute teacher situations or absenteeism. The researcher is a member of the Instructional Technology Team in the district. Because of this position, the researcher was responsible for developing the content and professional development within the Digital Learning Initiative. In several instances, the researcher was also one of the individuals that delivered the content to the teachers or the facilitators when the professional development used a train-the-trainer model.

Because of a lack of intermittent data, the researcher is not attempting to place teachers in specific Theory of Innovation categories based on the responses to the survey questions. There is no way for the teachers to be categorized based on how quickly they adopted the digital resources as a part of their instruction. Nor does this research attempt to validate the teacher's perspective by following up with observations of the digital instruction taking place in the classroom. However, this data was to group the teachers into those who adopted the resources and those who did not. For the purpose of this research, Rogers' categories of Innovator, Early Adopter, Early Majority, and Late Majority will be considered "adopters." Roger's category of "Laggards" will be considered as non-adopters. Over the course of 18 months, and using the two distinct categories of adopter verses non-adopters, we can identify the impact of the initiative on teacher's perceptions of the innovation, the use of digital tools during instruction.

**Data Collection**

"Teachers' Perceptions of a Digital Learning Initiative's impact on Educational Technology Integration within Classroom Instruction" Survey

The distribution of the Google Forms survey relied on the use of the school district Google Apps for Education domain. The researcher selected the Google Forms tool as the method for collecting data because all materials are gathered and stored within the school district's servers and under district authority. Forms gave the researcher the ability to collect data within a spreadsheet available for export, extract, and manipulation quickly and easily for analyzing.

The school district's Google Apps for Education Gmail accounts facilitated the distribution of surveys. Teachers received an email with the Informed Consent Letter and survey. The gathering of email address for all K-5 classroom teachers continuously employed during the Digital Learning Initiative. The teachers received three weeks to complete the survey. The distribution of a reminder email took place halfway through the allotted time and the day before the survey closed.

The researcher created the instrument used in this study. The Director of Technology, Director of Digital Learning, and other district level instructional leaders who had participated in the development and implementation of the Digital Learning Initiative evaluated the questions and made suggestions as to their structure. Before the survey was distributed, the district Department of Assessment and Research approved a request for internal research in which the survey was included.

**Method**

Once the data was compiled, the researcher entered the data into SPSS to code each variable. The researcher used SPSS to identify the frequencies of responses based on variables. Each variable was identified by a numeric code. These codes were used to run paired sample *t*-tests in order to determine if there were significant increases or decreases in the Means between the two variables. Questions measuring Pre- and Post-Digital Learning Initiative beliefs of the teachers related to their understanding of Digital Learning were used to identify teachers in the Digital Learning Initiative. The researcher used the teachers' reported usage of the apps during the first year of the initiative verse

their intended usage during the second year to identify the impact of the professional development sessions on teachers' usage of the apps during instruction.

# Chapter 4

## Results

The purpose of the research was to identify the impact of the school district's Digital Learning Initiative as related to teachers' perceptions of its impact on the instruction in their classroom. The focus of the research questions was on how the teachers understood the district's definition of Digital Learning and utilized the digital tools included in the professional development within the initiative itself. The research question is "As the result of the Digital Learning Initiative (DLI), what were teachers' perceptions of their integration of educational technology within instruction in elementary classrooms?

Sub-questions:

1. How did the DLI affect teachers' perceptions of Digital Learning?

   There was a statistically significant difference in teachers' perceptions of Digital Learning as a result of the Digital Learning Initiative, $t(125)= -7.509$, $p>.000$. This indicates that teachers had a positive response to the staff development within the initiative and had a stronger understanding of the term at the end of the sessions.

   The means and standard deviations of the teachers' perception of Digital Learning are in Table 1.

| Combined Results of the Perception of Digital Learning | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Paired Samples Statistics | | | | Paired Samples Test by Digital Resource | | | | |
| Perception Prior to Digital Learning Initiative | | Perception Post Digital Learning Initiative | | | | | | |
| Mean | Standard Deviation | Mean | Standard Deviation | Mean | Standard Deviation | *t* | *df* | Sig (2 tailed) |
| 3.13 | .852 | 3.62 | .564 | -.484 | .724 | -7.509 | 125 | .000 |

Table 1: Combined Results of the Perception of Digital Learning

2. How did the DLI affect the integration of technology in instruction within the elementary classrooms?

The survey showed that teachers perceived an increase in their use of educational technology in their instruction as a result of the Digital Learning Initiative. The teachers were asked to place their use of technology within a category from “Strongly Disagree” to “Strongly Agree.” Only 21 (16.7%) teachers identified that they “Strongly Disagree or “Disagree” that the initiative made a difference in their instruction. The overwhelming majority of teachers (79 or 83.8%) indicated that the DLI improved their use of educational technology in their instruction in the classroom.

The teachers’ responses to the question related to their use of educational technology for instruction are listed in Table 2.

| Teachers' Perception that the DLI Improved the use of Educational Technology in their Instruction | | | | | |
|---|---|---|---|---|---|
| | | Frequency | Percent | Valid Percent | Cumulative Percent |
| Valid | Strongly Disagree | 10 | 7.9 | 7.9 | 7.9 |
| | Disagree | 11 | 8.7 | 8.7 | 16.7 |
| | Agree | 78 | 61.9 | 61.9 | 78.6 |
| | Strongly Agree | 27 | 21.4 | 21.4 | 100.0 |
| | Total | 126 | 100.0 | 100.0 | |

Figure 11: Teachers' Perceptions that the DLI improved the Use of Educational Technology in their Instruction

3. What was the difference in the frequency of the use of a digital tool during the previous school year vs. plans for integrating digital tools in the upcoming school year?

The teachers were asked to reflect on their use of specific digital resources that were a part of the professional development within the Digital Learning Initiative and the frequency that they plan to use the resource during the second year of the initiative. While all teachers received training on all of the tools, some grade levels received more in-depth and intentional training on certain digital tools. However, in the case of all of the resources, the difference between the use during the 2015-2016 school year and the intended frequency of use in the second year (2016-2017) were statistically significant.

All three of the Apple native apps showed a statistical significance in the amount of change for usage. There was a statistical significance as related to the

teachers' use of Pages with $t(125)= -3.547$, $p>.001$. Keynote also showed a statistical significance with t(125)= -3.416. iMovie/iMovie trailer showed the largest significance with $t(125)=-4.532$, $p>.000$.

The three third part apps showed even higher significance that the Apple apps. Book creator has a statistically significant change with $t(125)-=-5.479$, $p>.000$. Puppet Pals had a statistically significant change with $t(125)=-4.169$, $p>.000$. Explain Everything was the app with the highest significance of change with $t(125)= -5.876$, $p>.000$.

The Paired Samples Responses and Paired Samples Test for teachers' responses to the question related to their use of an individual digital resource in 2015-2016 versus the intended use of a resources in 2016-2017 are listed in Table 3.

| Combined Results of the Individual Digital Resources | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Paired Samples Statistics | | | | Paired Samples Test | | | | |
| | Frequency of Use 2015-2016 | | Intended frequency of Use in 2016-2017 | | | | | | |
| Digital Resource | Mean | Standard Deviation | Mean | Standard Deviation | Mean | Standard Deviation | *t* | *df* | Sig (2 tailed) |
| Pages | 1.29 | .840 | 1.48 | .978 | -.190 | .603 | -3.547 | 125 | .001 |
| Keynote | 1.22 | .714 | 1.39 | .894 | -.167 | .548 | -3.416 | 125 | .001 |
| iMovie/ iMovie Trailer | 1.81 | .690 | 2.02 | .687 | -.214 | .531 | -4.532 | 125 | .000 |
| Book Creator | 1.90 | .798 | 2.25 | .748 | -.357 | .732 | -5.479 | 125 | .000 |
| Puppet Pals | 1.87 | .999 | 2.16 | .942 | -.294 | .791 | -4.169 | 125 | .000 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Explain Everything | 1.62 | .982 | 2.13 | 1.117 | -.476 | .910 | -5.876 | 125 | .000 |

Table 2: Combined Results of the Individual Digital Resources

The Null Hypothesis for the research questions stated above was two-fold. The first of the hypothesis stated that there would be no significant difference between the means of the initial school year usages (2015-2016) and the second year (2016-2017). This means that the distributions for the teacher's responses would remain in the same category. The second hypothesis was there would be no significant increase in the frequency in which the teachers use the resource as a part of their instruction.

The results of this study indicated that in all cases the professional development that was included in the Digital Learning Initiative by this district had a positive impact on the teachers' use of digital resources within the classroom. More importantly this initiative increased the use of technology as a means of instruction, not just as a productivity tool. As a result of these responses, the researcher can make the claim that intentional, strategic, planned professional development does make a positive difference in instruction.

## Conclusions

**Sub-Question One:** How did the DLI affect teachers' perceptions of Digital Learning?

The district defines Digital Learning as "Instructional practices that effectively increase students and teacher productivity, creativity, innovation, personalization, and engagement through enhanced learning experiences using a wide spectrum of digital resources that improve teaching, learning and achievement" (Millard Public Schools, 2014). This definition was included in the professional development as a way to adopt a common language with which to implement a standard within instruction. The first sub-

question looked at the impact of the initiative on a teacher's understanding of Digital Learning and its influence on instruction.

There were 126 responses (100.0%) to each of the two questions related to teachers' perceptions of the definition of Digital Learning. The first question asked teachers to reflect on their understanding of Digital Learning prior to the start of the DLI. It is clear that the vast majority of teachers had some experience and understand of Digital Learning before the district began its initiative. Only 3 teachers (2.4%) stated that they had never heard the term, while 29 teachers (23.0%) said they had heard of it but not considered it in terms of their teaching. Most teachers were investigating the use of it, 42 (33.3%) or were implementing a form of it within their classroom, 52 teachers (41.3%).

**Perception of DL prior to 2015**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | I had never heard the term. | 3 | 2.4 | 2.4 | 2.4 |
| | I had heard of it, but did not think of it in terms of my teaching. | 29 | 23.0 | 23.0 | 25.4 |
| | I was investigating how I could implement it in my classroom. | 42 | 33.3 | 33.3 | 58.7 |
| | I was implementing a form of digital learning in my classroom. | 52 | 41.3 | 41.3 | 100.0 |
| | Total | 126 | 100.0 | 100.0 | |

Figure 12: Teachers perception of the Digital Learning definition prior to 2015

At the time of the survey, a year and a half into the Digital Learning Initiative, the responses of the teachers showed movement between the categories. At this time, only one teacher (0.8%) stated that they had never heard the term Digital Learning and two

teachers (1.6%) were not considering it as a part of their teaching practices. The rest of the respondents identified that they were investigating implementation, 41 (32.5%) or using it within their classroom instruction, 82 (65.1%).

**Perception of DL post DLI**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | I had never heard the term. | 1 | .8 | .8 | .8 |
| | I had heard of it, but did not think of it in terms of my teaching. | 2 | 1.6 | 1.6 | 2.4 |
| | I was investigating how I could implement it in my classroom. | 41 | 32.5 | 32.5 | 34.9 |
| | I was implementing a form of digital learning in my classroom. | 82 | 65.1 | 65.1 | 100.0 |
| | Total | 126 | 100.0 | 100.0 | |

Figure 13. Perception of Digital Learning post Digital Learning Initiative

After the individual responses were gathered, the researcher used SPSS to analyze the differences in the teachers self-reporting of their understanding of the definition of Digital Learning as defined by the school district initiative. A t-test determined the Mean, Standard Deviation, and Standard Mean Error of the data. The data shows that the teacher perception of Digital Learning prior to 2015 had a mean score of 3.13 and rose to 3.62. In both cases, all 126 respondents answered the paired questions. The standard deviation of the responses prior to 2015 was higher at .852, and decreased following the initiative to .564. The standard mean error was .076, and .050 respectively. The Paired Samples Correlation test showed that the results were significant at the .000 level with a correlation score of .541.

| Paired Samples Statistics | | | | | |
|---|---|---|---|---|---|
| | | | | | |
| | | Mean | *N* | Std. Deviation | Std. Error Mean |
| Pair 1 | Perception of DL prior to 2015 | 3.13 | 126 | .852 | .076 |
| | Perception of DL post DLI | 3.62 | 126 | .564 | .050 |

Figure 14. Paired Samples Statistics

| Paired Samples Test | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Paired Differences | | | | | | | |
| | | | | | 95% Confidence Interval of the Difference | | | | |
| | | Mean | Std. Deviation | Std. Error Mean | Lower | Upper | *t* | *df* | Sig. (2-tailed) |
| Pair 1 | Perception of DL prior to 2015 - Perception of DL post DLI | -.484 | .724 | .064 | -.612 | -.357 | -7.509 | 125 | .000 |

Table 3. Paired Sample Test related to Perception of Digital Learning

The teachers in this district receive a district owned laptop when they are hired. At the time of deployment, district level leaders provide basic laptop instruction regarding the policies and usage of the device. For this study, the teachers reported their perception of their own technology skills based on the level of usage within their classroom instructional practices. The overwhelming majority (104 or 82.5%) of

teachers identified their use of technology as being “Frequently- daily or weekly.” The category “Occasionally- more than once a month” was also a strong category with 16.7% or 21 teachers. Of the 126 that responded, only one (0.8%) identified that they “Rarely” used technology as a part of their instructional practices.

**Teachers Perception of their Technology Skills as a part of Instruction**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Rarely - I seldom (once a month) use technology as a part of my instructional practices. | 1 | .8 | .8 | .8 |
| | Occasionally - I sometimes (more than once a month) use technology as a part of my instructional practices. | 21 | 16.7 | 16.7 | 17.5 |
| | Frequently - I often (daily or weekly) use technology as a part of my instructional practices. | 104 | 82.5 | 82.5 | 100.0 |
| | Total | 126 | 100.0 | 100.0 | |

Figure 15. Teachers’ Perception of their Technology Skills as a Part of Instruction

**Sub-Question 2:** How did the DLI affect the integration of technology in instruction within the elementary classrooms?

In the second sub-question, teachers responded to how much the Digital Learning Initiative influenced their understanding of the integration of technology within their classroom. Teachers identified their level of understanding the term Digital Learning prior to the start of the Digital Learning Initiative by placing themselves on a continuum of understanding. At the beginning of the initiative, the majority of teachers (56.3%)

were investigating or had implemented a form of digital learning in the classroom. However, at this time, there was no standardization of what the term meant as a district.

Teacher reflected on how the importance of the DLI on their level of understanding technology knowledge. Teachers affirmed that the initiative affected their understanding: 79 teachers (72.7%) "Agreed" and 21 (16.7%) "Strongly Agreed" that the DLI improved the teacher's knowledge of technology. Only a few teachers felt that the initiative was not impactful to their technology knowledge, 10 stated that they (7.9%) "Strongly Disagreed" and three (2.4%) identified "Disagreed."

**Teachers' Perception that the DLI Improved their Technology Knowledge**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Strongly Disagree | 10 | 7.9 | 7.9 | 7.9 |
| | Disagree | 3 | 2.4 | 2.4 | 10.3 |
| | Agree | 79 | 62.7 | 62.7 | 73.0 |
| | Strongly Agree | 34 | 27.0 | 27.0 | 100.0 |
| | Total | 126 | 100.0 | 100.0 | |

Figure 16. Teachers' Perception that the DLI Improved their Technology Knowledge

As the focus of questions became more specific to the use of technology in instruction, the numbers changed slightly. In this statement, teachers identified if DLI improved their level of knowledge regarding how technology can improve instruction in the classroom. The responses again were favorable. The responses of "Agree" and "Strongly Agree" were much higher than "Disagree" or "Strongly Disagree." A total of 83.3% (79 and 34 respectively) of teachers responded that the DLI had a positive impact

on their understanding of how technology can improve instruction for students, while only 12.7 % (10 and 3 respectively) were not as convinced.

**Teachers' Perception that the DLI Improved their understanding of How Technology Improves Instructions**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Strongly Disagree | 10 | 7.9 | 7.9 | 7.9 |
| | Disagree | 6 | 4.8 | 4.8 | 12.7 |
| | Agree | 84 | 66.7 | 66.7 | 79.4 |
| | Strongly Agree | 26 | 20.6 | 20.6 | 100.0 |
| | Total | 126 | 100.0 | 100.0 | |

Figure 17. Teachers' Perception that the DLI Improved their Technology Knowledge

Finally, the focus shifted specifically to their own integration of educational technology within classroom instruction. In this case, the numbers were only slightly different than those from the question regarding the improvement. For this question, 78 teachers responded they "Agreed" that the DLI had improved their integration of technology in the classroom. Similarly, 27(27.4%) "Strongly Agreed." Conversely, the same number of teachers, 10 (7.9%), identified that they "Strongly Disagreed" with the statement as did the previous question. The number of teachers disagreeing with this statement rose from the previous question with 11 (8.7%) "Disagreeing."

| Teachers' Perception that the DLI Improved the use of Educational Technology in their Instruction | | | | | |
|---|---|---|---|---|---|
| | | Frequency | Percent | Valid Percent | Cumulative Percent |
| Valid | Strongly Disagree | 10 | 7.9 | 7.9 | 7.9 |
| | Disagree | 11 | 8.7 | 8.7 | 16.7 |
| | Agree | 78 | 61.9 | 61.9 | 78.6 |
| | Strongly Agree | 27 | 21.4 | 21.4 | 100.0 |
| | Total | 126 | 100.0 | 100.0 | |

Figure 18. Teachers' Perception that the DLI Improved the Use of Educational Technology in their Instruction

**Sub-Question 3:** What was the difference in the frequency of the use of a digital tool during the previous school year vs. plans for integrating digital tools in the upcoming school year?

It is important to look at each of these questions in relation to each other in order to identify whether or not the professional development provided during the Digital Learning Initiative had an impact on the teacher use of the tool within instruction. Each of the tools were discussed individually in terms of the usage in the first year and the planned usage during the second full year of implementation. Following the teacher responses, a statistical analysis of the responses was conducted to see if the change in planned usage was significant from the teacher's initial usage during the first year of implementation, and the year of professional development.

The focus of this set of questions was to identify the frequency that the teachers implemented the technologies included in the professional development sessions within

the instructional practices in their classroom. The focus was one a set of applications utilized in combination through iPads, laptop computers, and desktops in a lab setting. In this survey, the researcher did not evaluate the platform on which teachers used the resources. It is clear from the results that the first year was one of minimal usage and mostly experimentation. The applications included in the study included two categories, Apple-native apps and third-party iPad apps. The Apple-native apps included Pages, Keynote, iMovie and iMovie Trailer. The study also asked for responses related to three third-party iPad apps, Puppet Pals HD Directors Cut, Book Creator, and Explain Everything.

As a part of the roll out of this initiative, the school district created specific lessons that guarantee students receive an exposure to digital tools at specific grade levels. The goal is to expose students in all of the district's 25 buildings to the same digital tools and provide consistency of experience to students as they enter middle school. The digital tools discussed as a part of the professional development initiative are the tools teachers are required to use within these lessons. Each grade level has a different required research project that is part of the written curriculum in Language Arts. The required lessons merely blended the approved curriculum with a different digital tool. With the exception of Explain Everything, each of these tools are included in the required lessons. However, all teachers received the same training on all of the tools within this study.

The frequency of use of the Apple-native applications, Pages and Keynote, was lower than that of iMovie/Trailer and the iPad specific apps. Pages is a word processing application, while Keynote is a presentation development tool. In both cases, many

teachers felt that the resources were not appropriate for their grade levels (13 and 12) or they just did not use it (75 or 82) in the classroom. This means that 69.9 % of teachers did utilize Pages with their students and 74.6 % of teachers did not use Keynote. If used in the classroom, the frequency was more common at the monthly level (23.8% or 19.9%) and only a very few adopted it on a regular basis (1.6% or 0.8%).

**Pages.** Pages is an Apple native application that is used for word processing. It is available on both the iPad and laptop computer. The researcher did not distinguish between the platforms when utilizing this tool during instruction. Pages was one of the applications that was utilized by teachers the least as a part of classroom instruction. The results showed that 69.8 % (88) of teachers surveyed did not use it at all during the first year of the Digital Learning Initiative. Nor was there much of a decrease in this number in the survey of intendent usage. There are still 69 teachers (54.8%) not intending to use during the 2016-2017 school year.

The success in the implementation of the app is in the categories of teachers that do intend to use the apps with their students. There is growth in the teachers who intend to use it occasionally with their students. The number of teachers reporting that their monthly use increased from 30 (23.8) to 43 (34.1). In addition, the number of teachers who intend to use it weekly increased from 6 (4.8%) to 10 (7.9%). The number of teachers that intend to use it regularly with students increased. While zero teachers identified themselves as using it 2-3 time a week during the 2015-2016 school year, 2 (1.6 %) teachers said they were intending to use it during the 2016-2017 school year. There was no change in those identifying daily use between the two surveys.

| Frequency of use of Pages 15-16 in Classroom Instruction 2015-2016 | | | | | |
|---|---|---|---|---|---|
| | | Frequency | Percent | Valid Percent | Cumulative Percent |
| Valid | The resource is not appropriate for my grade level. | 13 | 10.3 | 10.3 | 10.3 |
| | I did not use it. | 75 | 59.5 | 59.5 | 69.8 |
| | I used it monthly. | 30 | 23.8 | 23.8 | 93.7 |
| | I used it weekly. | 6 | 4.8 | 4.8 | 98.4 |
| | I used it daily. | 2 | 1.6 | 1.6 | 100.0 |
| | Total | 126 | 100.0 | 100.0 | |

Figure 19. Frequency of the use of Pages in Classroom Instruction 2015-2016

| Planned Frequency of the Use of Pages in Classroom Instruction 2016-2017 | | | | | |
|---|---|---|---|---|---|
| | | Frequency | Percent | Valid Percent | Cumulative Percent |
| Valid | The resource is not appropriate for my grade level. | 16 | 12.7 | 12.7 | 12.7 |
| | I do not intend to use it. | 53 | 42.1 | 42.1 | 54.8 |
| | I will use it monthly. | 43 | 34.1 | 34.1 | 88.9 |
| | I will use it weekly. | 10 | 7.9 | 7.9 | 96.8 |
| | I will use it 2-3 times a week. | 2 | 1.6 | 1.6 | 98.4 |
| | I will use it daily. | 2 | 1.6 | 1.6 | 100.0 |
| | Total | 126 | 100.0 | 100.0 | |

Figure 20. Planned Frequency of the use of Pages in Classroom Instruction 2016-2017

The amount of change between the usage during the first year of the initiative and the planned usage during the second year was significant. The Paired Samples Statistics test as related to Pages showed that there was a change in the planned usage from the

actual usage in the initial year of the implementation. The mean grew from 1.29 to 1.48 with the same number of teachers responding (126). The standard deviation moved from .840 to .978 in that amount of time. This indicates that the usage of the tool to be more spread out from the first year. Teachers no longer just dismissed the resource as not being useful and plan to use it as a tool, on an occasional basis.

**Paired Samples Statistics related to Pages**

| | | Mean | *N* | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|---|
| Pair 2 | Frequency of use Pages 15-16 | 1.29 | 126 | .840 | .075 |
| | Intended Frequency of use Pages 16-17 | 1.48 | 126 | .978 | .087 |

Figure 21. Paired Sample Statistics related to the Pages

The Paired Samples Test indicates that there is a significant difference between the usage of Pages during the first school year and the planned usage during the 2016-2017 school year. The same teachers answered both survey questions. The resulting mean and standard deviation were -.190 and 0.603, respectively. The Standard Error Mean is .054 indicating that the difference between the sample mean and the population mean. In this case the Confidence intervals are -.297 and -.084. These numbers indicate that if the Digital Learning Initiative had no impact on the instruction in the classroom, the *t*-test should have fallen between these numbers. However, the resulting *t*-test of -3.547 indicates that the probability of the results fell well outside of this range. The high number of respondents give us a degree of freedom score of 125. Our resulting significance for the change in planed usage for Pages is .001 on a 2-tailed scale. This

indicates a strong relationship between the teachers' usage and the impact of the Digital Learning Initiative.

| Paired Samples Test related to Pages | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Paired Differences | | | | | | | |
| | | | | | 95% Confidence Interval of the Difference | | | | |
| | | Mean | Std. Deviation | Std. Error Mean | Lower | Upper | *t* | *df* | Sig. (2-tailed) |
| Pair 2 | Frequency of use of Pages 15-16 – Intended Frequency of use of Pages 16-17 | -.190 | .603 | .054 | -.297 | -.084 | -3.547 | 125 | .001 |

Table 4. Paired Samples Test related to Pages

**Keynote.** The results for the Apple-native application Keynote were very similar to those of Pages. Keynote is a presentation software. Its purpose is to create sets of slides used in a linear fashion to relay content as a presentation. When the initiative began, there was little use of this resource as 74.6 % (94) of teachers identified that they did not use it at all in the classroom. Only 25 (19.8%) of the teachers used it monthly and 6 (4.8%) used it weekly. Only one teacher identified its usage at the 2-3 times a week level and no one used it daily.

| Frequency of use of Keynote 15-16 in Classroom Instruction 2015-2016 | | | | | |
|---|---|---|---|---|---|
| | | Frequency | Percent | Valid Percent | Cumulative Percent |
| Valid | The resource is not appropriate for my grade level. | 12 | 9.5 | 9.5 | 9.5 |
| | I did not use it. | 82 | 65.1 | 65.1 | 74.6 |
| | I used it monthly. | 25 | 19.8 | 19.8 | 94.4 |
| | I used it weekly. | 6 | 4.8 | 4.8 | 99.2 |
| | I used it 2-3 times a week. | 1 | .8 | .8 | 100.0 |
| | Total | 126 | 100.0 | 100.0 | |

Figure 22. Frequency of the Use of Keynote in Classroom Instruction 2015-2016

The planned usage of Keynote did increase from the actual use in the previous year. In this survey, the majority of teachers (76/ 60.3%) identified that they still do not intend to use the resource with students. However the number that intend to use it on a limited basis in the classroom increased. The number of those intending to use it monthly increased to 38 (30.2%) and weekly to 10 (7.9%). One (.8%) teacher still identified their intended usage as 2-3 times a week and one teacher said they intend to use it daily (.8%).

| Planned Frequency of Keynote in Classroom Instruction 2016-2017 | | | | | |
|---|---|---|---|---|---|
| | | Frequency | Percent | Valid Percent | Cumulative Percent |
| Valid | The resource is not appropriate for my grade level. | 16 | 12.7 | 12.7 | 12.7 |
| | I do not intend to use it. | 60 | 47.6 | 47.6 | 60.3 |
| | I will use it monthly. | 38 | 30.2 | 30.2 | 90.5 |
| | I will use it weekly. | 10 | 7.9 | 7.9 | 98.4 |
| | I will use it 2-3 times a week. | 1 | .8 | .8 | 99.2 |
| | I will use it daily. | 1 | .8 | .8 | 100.0 |

| | | | | | |
|---|---|---|---|---|---|
| | Total | 126 | 100.0 | 100.0 | |

Figure 23. Planned Frequency of the Use of Keynote in Classroom Instruction 2016-2017

| Paired Samples Statistics related to Keynote | | | | | |
|---|---|---|---|---|---|
| | | Mean | N | Std. Deviation | Std. Error Mean |
| Pair 3 | Frequency of use of Keynote 15-16 | 1.22 | 126 | .714 | .064 |
| | Intended Frequency of use of Keynote 16-17 | 1.39 | 126 | .894 | .080 |
| | | | | | |

Figure 24. Paired Samples Statistics related to Keynote

The results of the Paired Sample Statistics test also showed similar results to those of Pages. The Mean spread out from 1.22 in 2015-2016 to 1.39 for 2016-2017. This indicates that the distribution of teachers' responses increased between the categories. The standard deviation also increased from .714 to .894, and as a result, so did the standard error mean from .064 to .080, respectively.

Based on the Paired Samples test, the Digital Learning Initiative had a significant impact on the usage of Keynote during the 2016-2017 school year. The mean for the paired difference was -.167 with the confidence intervals at -.263 and -.070. The standard deviation for the sample was .548 with a standard error mean of .049. With the sample of 126, the degrees of freedom was 125. The resulting *t*-test was -3.416 indicating a significance value of .001 in a 2-tailed test.

| Paired Samples Test related to Keynote | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Paired Differences | | | | | | | |
| | | | | | 95% Confidence Interval of the Difference | | | | |
| | | Mean | Std. Deviation | Std. Error Mean | Lower | Upper | *t* | *df* | Sig. (2-tailed) |
| Pair 3 | Frequency of use of Keynote 15-16 – Intended frequency of use of Keynote 16-17 | -.167 | .548 | .049 | -.263 | -.070 | -3.416 | 125 | .001 |

Table 5. Paired Samples Test related to Keynote

**iMovie/iMovie Trailer.** The usage of iMovie and iMovie Trailers was active during the 2015-2016 school year. 68.9% of teachers utilized the Apple application at some time during the school year. iMovie and iMovie Trailer allow for the creation of video projects using a variety of tools and templates. The vast majority of teachers reflected on using it monthly with students 56.3% (71 teachers), while 13.5 % (17 teachers) used it weekly. No one identified daily use. In this case, only three teachers (2.4%) stated that iMovie was not appropriate for their grade level and only 35 (27.8%) did not try it at all with students.

| Frequency of use of iMovie/Trailer 15-16 in Instruction 2015-2016 | | | | | |
|---|---|---|---|---|---|
| | | Frequency | Percent | Valid Percent | Cumulative Percent |
| Valid | The resource is not appropriate for my grade level. | 3 | 2.4 | 2.4 | 2.4 |
| | I did not use it. | 35 | 27.8 | 27.8 | 30.2 |

| | | | | | |
|---|---|---|---|---|---|
| | I used it monthly. | 71 | 56.3 | 56.3 | 86.5 |
| | I used it weekly. | 17 | 13.5 | 13.5 | 100.0 |
| | Total | 126 | 100.0 | 100.0 | |

Figure 25. Frequency of the Use of iMovie/iMovie Trailer in Classroom Instruction 2015-2016

iMovie and iMovie Trailer are digital resources that show an increase in planned usage. At the time of this survey, only two (1.6%) of 126 respondents said that the apps were not appropriate for their grade level. The number of teachers who stated that they did not intend to use it with their students also went down from 35 (27.8%) to 18 (14.3%). The decreases in these two categories caused large increases in the categories where teachers intend to use it with students. The largest increase came in the Monthly category with 85 or 65.3% of teachers responding. This answer increased by 14.2%. Teachers that intend to use it weekly stayed the same at 17 (13.5%). The other increase was for those that intend to use it several times a week. There were zero teachers who responded with this answer for the 2015-2016 school year, however 4 (teachers are planning frequent use in 2016-2017.

**Planned frequency of the use of iMovie/iMovie Trailer in Classroom Instruction 2016-2017**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | The resource is not appropriate for my grade level. | 2 | 1.6 | 1.6 | 1.6 |
| | I do not intend to use it. | 18 | 14.3 | 14.3 | 15.9 |
| | I will use it monthly. | 85 | 67.5 | 67.5 | 83.3 |
| | I will use it weekly. | 17 | 13.5 | 13.5 | 96.8 |

| | | | | | |
|---|---|---|---|---|---|
| | I will use it 2-3 times a week. | 4 | 3.2 | 3.2 | 100.0 |
| | Total | 126 | 100.0 | 100.0 | |

Figure 26. Planned Frequency of the use of iMovie/iMovie Trailer in Classroom Instruction 2016-2017

The Paired Samples Statistics results show that there is a difference between the initial usage of iMovie and iMovie Trailer between the two school calendar years. In 2015-2016, the Mean was 1.81 with 126 responses. This resulted in a Standard Deviation of .690 and a Standard Error Mean of .061. This differs quite a bit from teachers intended use in 2016-2017. In the second year, the Mean was 2.02 with a response rate of 126. The Standard Deviation decreased to .687 with a Standard Error Mean of .061. These numbers indicate that the usage of the digital resources by the group is going to increase and the differences between the responses decreased.

**Paired Samples Statistics**

| | | Mean | *N* | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|---|
| Pair 7 | Frequency of use of iMovie/Trailer 15-16 | 1.81 | 126 | .690 | .061 |
| | Intended frequency of use of iMovie/Trailer 16-17 | 2.02 | 126 | .687 | .061 |

Figure 27. Paired Samples Statistics related to iMovie/.iMovie Trailer

The Paired Samples Test related to iMovie/iMovie Trailer also showed that the change between the two school years was significant. In this study, the Mean between the two categories was -.214 with a standard deviation of .531. The resulting Standard Error Mean was .047. The lower confidence interval was -.308, and the upper was -.121. When the t-score results were -4.532 with 125 as the Degrees of Freedom. In a 2-tailed

test, the significance value was .000, indicating a strong significance with the change of usage during the two school years.

| Paired Samples Test related to iMovie/iMovie Trailer | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Paired Differences | | | | | *t* | *df* | Sig. (2-tailed) |
| | | Mean | Std. Deviation | Std. Error Mean | 95% Confidence Interval of the Difference | | | | |
| | | | | | Lower | Upper | | | |
| Pair 7 | Frequency of use of iMovie/Trailer 15-16 – Intended frequency of use of iMovie/Trailer 16-17 | -.214 | .531 | .047 | -.308 | -.121 | -4.532 | 125 | .000 |

Table 6. Paired Samples Test related to iMovie/iMovie Trailer

**Third Party Applications.** The frequency of the iPad specific apps was higher than that of the native Apple applications. These apps had at least 50% of teachers trying them over the course of the 2015-2016 school year. Book Creator was the app that was most utilized by classroom teachers, Puppet Pal came in second, and Explain Everything followed behind. Book Creator was by far the most popular of the three apps. This app allows the simple creation of digital books. Students can add video, photos, and text to pages within a book and then export the new book as an ePub, PDF, Word Document or Pages Document for publication. Four teachers (3.2%) identified they used it at least 2-3 times a week and 13 teachers (10.3%) who utilized it weekly. However, the overwhelming majority of teachers used Book Creator monthly with their students. Sixty point three percent of classroom teachers stated that they used the app with students. Only 33 (23.8%) teachers did not use the app with students at all during the school year.

**Book Creator**. The conversations related to Book Creator during the professional development indicated that it was going to be popular with the teachers. The survey results support that observation. While there were 33 (23.8%) teachers who did not use it, there were 93 (76.2%) that did use it. The bulk of the teachers used this app monthly; however, all fields received responses. Book Creator showed a strong usage with 76 (60.3%) of teachers using it every month and 13 (10.3%) using it weekly. There were four teachers evenly spilt (1.6% each) between the two-three times a week and daily.

**Frequency of use of Book Creator 15-16 in Classroom Instruction 2015-2016**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | The resource is not appropriate for my grade level. | 3 | 2.4 | 2.4 | 2.4 |
| | I did not use it. | 30 | 23.8 | 23.8 | 26.2 |
| | I used it monthly. | 76 | 60.3 | 60.3 | 86.5 |
| | I used it weekly. | 13 | 10.3 | 10.3 | 96.8 |
| | I used it 2-3 times a week. | 2 | 1.6 | 1.6 | 98.4 |
| | I used it daily. | 2 | 1.6 | 1.6 | 100.0 |
| | Total | 126 | 100.0 | 100.0 | |

Figure 28. Frequency of the use of Book Creator in Classroom Instruction 2015-2016

While the amount of usage during the initial year of the initiative was good, the results showed that the second year of usage was going to increase even more. With this app, the number of teachers not using it decreased to 13 (8.7%). This is the lowest number of all of the digital resources included in the professional development initiative. Over 57% of the teachers (72) are planning to use it during instruction at least monthly.

It is also the app with the largest weekly usage rate with a response of 27.8% or 35 teachers. While no one answered that they are going to use it daily in the classroom, 6 (4.8%) teachers indicated that students would use it two-three times a week as a part of instruction.

**Planned Frequency of the Use of Book Creator in Classroom Instruction 2016-2017**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | The resource is not appropriate for my grade level. | 2 | 1.6 | 1.6 | 1.6 |
| | I do not intend to use it. | 11 | 8.7 | 8.7 | 10.3 |
| | I will use it monthly. | 72 | 57.1 | 57.1 | 67.5 |
| | I will use it weekly. | 35 | 27.8 | 27.8 | 95.2 |
| | I will use it 2-3 times a week. | 6 | 4.8 | 4.8 | 100.0 |
| | Total | 126 | 100.0 | 100.0 | |

Figure 29. Frequency of the use of Book Creator in Classroom Instruction 2016-2017

The Paired Samples Statistic test indicate that there are differences between the two school years. During the 2015-2016 school year, the Mean for the responses was 1.90 with a response rate of 126. The Standard Deviation was .798 with a Standard Error Mean of .071. For the 2016-2017 school year, the Mean increased to 2.25 with the same response rate. The Standard Deviation decreased to .748 with a lower Standard Error Mean of .067. These numbers indicate that the usage of the app was going to increase and the distribution of the responses went down.

| Paired Samples Statistics related to Book Creator | | | | | |
|---|---|---|---|---|---|
| | | Mean | *N* | Std. Deviation | Std. Error Mean |
| Pair 6 | Frequency of use of Book Creator 15-16 | 1.90 | 126 | .798 | .071 |
| | Intended frequency of use of Book Creator 16-17 | 2.25 | 126 | .748 | .067 |

Figure 30. Paired Samples Statistics related to Book Creator

The Paired Samples Test shows a significant change between the two years usage and planned usage. The Mean is -.357 with a standard deviation of .732. The resulting Standard Error Mean is .065. With lower and upper Confidence Intervals of -.486 and -.228 respectively, the *t*-test is -5.479. A significance value of .000, indicates that there is a significant difference between the level of usage of Book Creator within instruction between the two school years.

| Paired Samples Test related to Book Creator | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Paired Differences | | | | | t | df | Sig. (2-tailed) |
| | | Mean | Std. Deviation | Std. Error Mean | 95% Confidence Interval of the Difference | | | | |
| | | | | | Lower | Upper | | | |
| Pair 7 | Frequency of use of Book Creator 15-16 – Intended frequency of use of Book Creator 16-17 | -.357 | .732 | .065 | -.486 | -.228 | -5.479 | 125 | .000 |

Table 7. Paired Samples Test related to Book Creator

*Puppet Pals HD.* The adoption rate of Puppet Pals was higher than other resources. This application allows students to create short videos using images found within the app or by taking photos and adding them to the photo album. Students can then use the backgrounds within the app to create puppet shows to relay a message. In the first year of implementation, 51 (37.3%) teachers did not use it with students. Of those, only 4 (3.2%) indicated that it was not appropriate for their grade level. Puppet Pals had rather large usage in the first year with 59.5% of teachers adopting at some level. Of those indicating that they used it, 47 (37.3%) used it monthly, 21 (16.7%) used it weekly, 4 (3.2%) used it two to three times a weekly, and 3 (204%) used it daily.

**Frequency of use of Puppet Pals HD in Classroom Instruction 2015-2016**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | The resource is not appropriate for my grade level. | 4 | 3.2 | 3.2 | 3.2 |
| | I did not use it. | 47 | 37.3 | 37.3 | 40.5 |
| | I used it monthly. | 47 | 37.3 | 37.3 | 77.8 |
| | I used it weekly. | 21 | 16.7 | 16.7 | 94.4 |
| | I used it 2-3 times a week. | 4 | 3.2 | 3.2 | 97.6 |
| | I used it daily. | 3 | 2.4 | 2.4 | 100.0 |
| | Total | 126 | 100.0 | 100.0 | |

Figure 31. Frequency of the use of Puppet Pals HD in Classroom Instruction 2015-2016

Puppet Pals had a considerable amount of change in responses of the intended usage during the 2016-2017 school year. The majority of that change moved into the monthly usage category. The number of teachers indicating that they would not use it fell to 24 (19.0) with only 2 (1.6%) indicating that it was not appropriate for their grade level.

The bulk of the responses fell in the monthly and weekly categories rates of with 47 (37.3%) and 21 (16.7%), respectively. The numbers of teachers planning frequent use of Puppet Pals also increased. Those using it two to three times a week increased to 5 (4.0%) and daily use to 4 (3.2%).

**Planned Frequency of the Use of Puppet Pals HD in Classroom Instruction 2016-2017**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | The resource is not appropriate for my grade level. | 2 | 1.6 | 1.6 | 1.6 |
| | I do not intend to use it. | 24 | 19.0 | 19.0 | 20.6 |
| | I will use it monthly. | 65 | 51.6 | 51.6 | 72.2 |
| | I will use it weekly. | 26 | 20.6 | 20.6 | 92.9 |
| | I will use it 2-3 times a week. | 5 | 4.0 | 4.0 | 96.8 |
| | I will use it daily. | 4 | 3.2 | 3.2 | 100.0 |
| | Total | 126 | 100.0 | 100.0 | |

Figure 32. Planned frequency of the use of Puppet Pals HD in Classroom Instruction 2016-2017

The Paired Samples Statistics test for Puppet Pals HD shows similar results to the other apps in the study. The Mean for the two years increased from 1.87 to 2.16. The Standard Deviation decreased from .999 to .942 and the standard Error Mean fell to .084 from .089.

| Paired Samples Statistics related to Puppet Pals HD | | | | | |
|---|---|---|---|---|---|
| | | Mean | N | Std. Deviation | Std. Error Mean |
| Pair 4 | Frequency of use of Puppet Pals 15-16 | 1.87 | 126 | .999 | .089 |
| | Intended frequency of use of Puppet Pals 16-17 | 2.16 | 126 | .942 | .084 |

Figure 33. Paired Samples Statistics related to Puppet Pals

The Paired Samples Test for Puppet Pals again showed a strong significant difference between teacher's responses for the two school years. The Mean was -.294 with a Standard Deviation of .791 and Standard Error Mean of .070. The lower confidence interval was -.433, while the upper was -.154. In a two- tailed test, the significance value measures .000 with a *t*-test or -4.169.

| Paired Samples Test related to Puppet Pals HD | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Paired Differences | | | | | | | |
| | | | | | 95% Confidence Interval of the Difference | | | | |
| | | Mean | Std. Deviation | Std. Error Mean | Lower | Upper | *t* | *df* | Sig. (2-tailed) |
| Pair 4 | Frequency of use of Puppet Pals 15-16 – Intended frequency of use of Puppet Pals 16-17 | -.294 | .791 | .070 | -.433 | -.154 | -4.169 | 125 | .000 |

Table 8. Paired Samples Test related to Puppet Pals HD

***Explain Everything***. Explain Everything was equally divided between those that used it and those that did not. This application is described as a "white-board" application. It allows students to write on a screen while recording the procedures in which they engage. Often, it gives students the ability to "show-they-know" by recording a process or procedure while explaining what they are doing. In this case, eight teachers (6.3%) felt that the app was not appropriate for their grade level, while 55 (43.7%) did not use it. Many teachers (46 or 43.7%) used it monthly with their students. Teachers used the app equally between teachers at the weekly and two-three times a week levels (8 or 6.3%). Only one teacher (0.9%) found it useful every day.

**Frequency of use of Explain Everything in Classroom Instruction 2015-2016**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | The resource is not appropriate for my grade level. | 8 | 6.3 | 6.3 | 6.3 |
| | I did not use it. | 55 | 43.7 | 43.7 | 50.0 |
| | I used it monthly. | 46 | 36.5 | 36.5 | 86.5 |
| | I used it weekly. | 8 | 6.3 | 6.3 | 92.9 |
| | I used it 2-3 times a week. | 8 | 6.3 | 6.3 | 99.2 |
| | I used it daily. | 1 | .8 | .8 | 100.0 |
| | Total | 126 | 100.0 | 100.0 | |

Figure 34. Frequency of the use of Explain Everything in Classroom Instruction 2015-2016

Explain Everything is gaining momentum in the school district according to teachers plans for usage during the 2016-2017 school year. The number of teachers not intending to use it fell to 33 (26.2%) with 5 (4.0%) indicating that it was not appropriate for the grade level in which they work. A strong number of teachers, 71 (56.3%) intend

to use it occasionally. There were 49 teachers who plan to use it monthly and 22 who will use it weekly. The teacher planning to use it regularly grew to 17 (13.5%). This was the highest number of teachers planning regular use of the digital resource in their classroom. There were 14(11.1%) intending to use it several times a week and 3 (2.4%) planning to use it daily.

**Planned Frequency of the Use of Explain Everything in Classroom Instruction 2016-2017**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | The resource is not appropriate for my grade level. | 5 | 4.0 | 4.0 | 4.0 |
| | I do not intend to use it. | 33 | 26.2 | 26.2 | 30.2 |
| | I will use it monthly. | 49 | 38.9 | 38.9 | 69.0 |
| | I will use it weekly. | 22 | 17.5 | 17.5 | 86.5 |
| | I will use it 2-3 times a week. | 14 | 11.1 | 11.1 | 97.6 |
| | I will use it daily. | 3 | 2.4 | 2.4 | 100.0 |
| | Total | 126 | 100.0 | 100.0 | |

Figure 35. Planned Frequency of the use of Explain Everything in Classroom Instruction 2016-2017

The Paired Samples Statistics for Explain Everything showed a considerable change in usage within the district. The Mean of the responses for the 2015-2016 school year was 1.65. This number grew to 2.13 during the second year of implementation in the district. The Standard Deviation began with .982 and a Standard Error Mean of .088 and grew to a Standard Deviation of 1.117 with a Standard Error Mean of 1.00. These

numbers indicate that the responses spread out across the options and that the number of respondents increased the level of usage of the app.

**Paired Samples Statistics related to Explain Everything**

| | | Mean | *N* | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|---|
| Pair 5 | Frequency of use of Explain Everything 15-16 | 1.65 | 126 | .982 | .088 |
| | Intended frequency of use of Explain Everything 16-17 | 2.13 | 126 | 1.117 | .100 |

Figure 36. Paired Samples Statistics related to Explain Everything

Finally, the Paired Samples Test also showed the results of the two paired survey questions to be significantly different. The Mean of the two is -.476 with a Standard Deviation of .910 and a Standard Error Mean of .081. This indicates that with a t-score of -.876 and the lower and upper confidence intervals of .637 and -.316, respectively, that the significance value is .000.

| Paired Samples Test related to Explain Everything | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Paired Differences | | | | | | | |
| | | | | 95% Confidence Interval of the Difference | | | | |
| | Mean | Std. Deviation | Std. Error Mean | Lower | Upper | *t* | *df* | Sig. (2-tailed) |
| Frequency of use of Explain Everything 15-16 – Intended frequency of use of Explain Everything 16-17 | -.476 | .910 | .081 | -.637 | -.316 | -5.876 | 125 | .000 |

Table 9. Paired Samples Test related to Explain Everything

# Chapter 5

## Digital Learning Initiative

In October of 2014, the superintendent of schools for a mid-western suburban school district in collaboration with funding from the district's foundation began a District Digital Learning Initiative with the purchase of six iPads for every elementary classroom. This initiative was intended to bring this "World class" school district into the digital environment with opportunities for all students to have access to digital resources as an instructional tool. Once funded the planning and implementation of the initiative was turned over to the Associate Superintendent of Educational Services, the Executive Director of Technology, the Director of Digital Learning, and the Director of Early Childhood and Elementary Education.

The Executive Director of Technology had the responsibility to oversee the hardware and software purchases for the district. At that time, this position also provided guidance to the team of Instructional Technology and Staff Development personnel that would plan and implement the training for the initiative. In the second year of this initiative, the addition of the Director of Digital Learning was added to the district level positions. This new position took over the training aspects of the initiative.

The Director of Early Childhood and Elementary Education was included in the planning of the professional development related to this initiative. The time required for the training and the budget for substitute teachers fell into this department. It also provided facilitators for grade level professional development and the planning of lessons included in the initiative.

In the spring semester of 2015, all elementary regular classroom teachers were provided six iPads and initial training on the iPads for use during classroom instruction. The iPads had a set of apps that were assigned on a grade level basis. These iPad apps were selected by a team of district educators that included Instructional Technology Facilitators and grade level teachers who had been piloting iPads in the classroom. This list of 50 apps per grade level were then installed on five of the classroom iPads. The sixth iPad was identified as the teachers' iPad and had fewer restrictions, allowing the teacher access to the Apple Apps Store to download free resources.

The initial professional development was planned and facilitated by the district level Instructional Technology Facilitators. It focused on the district's definition of Digital Learning and a basic introduction to the iPad. The goal was to give the teachers a standard by which to start the initiative that would continue to grow every year. The definition of Digital Learning gave the educators a common terminology and created a vision for what it would look like within the district:

> Digital Learning is instructional practices that effectively increase students and teacher productivity, creativity, innovation, personalization, and engagement through enhanced learning experiences using a wide spectrum of digital resources that improves teaching, learning, and achievement. (Millard Public Schools, 2014)

The basic iPad training included the simple usage of the hardware. There was no assumption that teachers had used an iPad or other iOS device. All teachers received the same training in order to provide a baseline from which to start. The building teacher librarians and those who were part of the pilot classrooms were asked to provide

leadership and assistance during the professional development sessions. The focused apps during this training included Pic Collage, iMovie, and Pages.

Teachers were required to participate in three professional development sessions called “Digital Digs.’ These 45-minute after school focused on three iPad apps, Book Creator, Puppet Pals Directors Cut, and Explain Everything. Teachers could select from a menu of sessions, but had to attend each one during the 2015-2016 school year. These short session included a brief training on the app and then time to determine how to best utilize it in their own classroom. It was recommended that building grade level teams should attend together.

As a part of this initiative, teachers, administrators, teacher librarians and district level curriculum and instructional technology facilitators developed Digital Learning Profiles (Millard Public Schools, 2014). These profiles are digital learning experiences that students will experience during grade level bands in the school district. These profiles were developed using the Nebraska Standards for Career Readiness Practice (Nebraska Summit on Career Readiness, 2009), ISTE Standards for Students (International Society for Technology in Educators, 2016c), and district Business Information Technology Framework, Information Technology Pathway Standards (2014). Teachers then created grade level lessons that incorporated these digital skills to objectives with the district curriculum.

Once these lessons were created, teachers received professional development on the grade level lessons as well as the apps that were used in the lessons. The focus on this set of lessons was on writing and research in the areas of science or social studies. A scaffolded approach was taken in terms of app selection and curricular ties. Teachers

involved in the lesson development were utilized as facilitators for the professional development at each grade level. The lessons were required to be taught to all students during the spring semester of 2016.

While the Digital Learning Profile experiences continue to be built upon across the district, the second round of lessons and experiences were not a part of this study. However, they will continue to drive the direction of the professional development in the district until all of the grade band experiences have been incorporated into the district curriculum.

**Results**

The data collected from the teachers that responded to the survey indicated that the professional development delivered during the Digital Learning Initiative had a significant impact on the instruction in the elementary classroom. The survey itself had a strong response rate as 126 of 416 teachers responded to the survey. All survey questions had a degree of freedom at 125.

The first research question asked teachers to reflect on their perception of impact that the Digital Learning Initiative on their use of educational technology during instruction. It related to their understanding of the definition of "Digital Learning" prior to the Digital Learning Initiative (DLI) and compare it to their post DLI perception. From the results of a paired sample *t*-test, the researcher found that we can reject the null hypothesis that the DLI had no impact of the teachers perception of the Digital Learning definition with $t(125)=-7.509$, $p<.001$ $CI[-.612,-.357]$. This indicates that there is a statistically significant difference between teachers understanding of Digital Learning as

a result of the professional development in the DLI, and that the change was in the positive direction.

The second area of focus under the research question focused on the teacher's perception of their own technology skill at the beginning of the Digital Learning Initiative. This was intended to serve as a type of baseline to measure growth as the result of the professional development within the Digital Learning Initiative. The vast majority of teachers (92.2%) said that they utilize technology to some degree during instruction. All but one of the teachers responded that they used technology in their classroom more than once a month, and 104 teachers identified their usage as daily or weekly.

The second research question asked teachers to reflect on the impact of the DLI on the integration of technology in the elementary classroom. When asked if the DLI had an impact on their own technology knowledge 89.7% of teachers responded that they "Agree" or "Strongly Agree" that the initiative improved their level of knowledge. They were then asked if the DLI improved their understanding of how technology improves instruction. The results were also strongly positive with 87.3% of teachers responding with "Agree" or "Strongly Agree." Finally, they were asked if the DLI improved their own use of educational technology in their own instruction. Again, with a percentage of 83.3%, the study found that teachers perceived that the district's Digital Learning Initiative did have a positive effect on their instruction in the classroom.

Sub-questions 3 and 4 asked teachers to reflect on their use of specific apps used with the Digital Learning Initiative. All of the digital resources within the survey had specific and intentional professional development in relation to the grade level

expectations for the usage in the classroom. The training for each grade level was targeted to the expectations of the use of specific digital tools at a specific grade level. As a result, teachers received different levels of training on some of the digital tools.

The first digital resource that teachers were asked about were part of the Apple iLife Suite, Pages and Keynote. These apps are Apple native apps that come standard on the Apple iPad. Of the two apps, Pages was more popular and had a higher degree of significance than Keynote. However, both did return significant increases in usage. For Pages, we reject the null hypothesis that there was no significant increases with $t(125)=-3.547$, $p<.001$ *CI* [-.297,-.084]. The Mean, as related to the use of Pages in 2015-2016, grew from 1.29 to 1.48 as intended to use within the second year of the initiative. The results for Keynote were similar to those of Pages. We reject the null hypothesis that the DLI had no impact on the usage of Keynote with $t(125)=-3.416$, $p<.001$, *CI*[-.263,-.070]. The Mean also increased from 1.22 to 1.39 indicating that teacher are intending to use it more frequently in the second year of the initiative than they did in the first.

The third Apple app that was included in the Digital Learning Initiative was iMovie and iMovie Trailer. This was the most popular of the Apple native products. The Mean for this app jumped from 1.81 to 2.02. We reject the null hypothesis that there was no change in the usages of iMovie/iMovie Trailer as the result of the Digital Learning Initiative with $t(125)= -4.532$, $p<.000$, *CI*[-.308,-.121].

The last three apps that were included in the survey for the Initiative are third party applications. These apps were far more popular and had greater usage than the Apple native apps. They all were developed for the education market which does give them somewhat of an advantage with ease of use with younger students.

The first option was Book Creator. This app gives students the ability to create a digital or eBook on the iPad. Students can add photos, text, video, and art work to create a unique product that can be exported and read with a digital eReader. The Mean for this app grew from 1.90 to 2.25, a move of .35 in the positive direction. We are able to reject the null hypothesis that the DLI had no effect on the usage of this app with $t(125) = -5.479$, $p < .000$, $CI[-.486,-.228]$.

The second app was Puppet Pal Directors Cut. This app gives students the ability to participate in digital storytelling through the use of digital puppets and stages. Students can select from the characters and settings within the app or import their own photographs as characters or locations for the puppet shows. Again, we were able to reject the null hypothesis that the DLI had no impact on its usage with $t(125) = -4.169$, $p < .000$, $CI[-.433,-.154]$. The Mean moved from 1.87 to 2.16. This shows a growth in the positive direction of .29.

Finally, Explain Everything rounded out the third party apps that were in the Digital Learning Initiative. Of the three, this is the most complicated to use with students and saw the most grow in its expected use. Its purpose is to give the students a whiteboard upon which to explain processes. It has a multitude of uses that can be determined by the teacher, however with more flexibility comes more complexity. This app also increased its usage as the result of the DLI. We reject the null hypothesis that the DLI had no effect with $t(125) = -5.876$, $p < .000$, $CI$ $[-.637,-.316]$. The Mean moved from 1.62 to 2.13 indicating a positive move of .48.

In all cases the responses of teachers indicated that there was a statistically positive impact on how they are using educational technology in the elementary

classroom. These results are a positive message for the leadership of the district. For those involved in the planning and implementation of the professional development, it indicates that the sessions were effective in providing teachers with the knowledge to use the app. It also shows that the teachers felt equipped to use the apps with students as a part of instruction, both for pedagogical and content area purposes.

District level leaders will look at these results to prove that professional learning and the expense for these opportunities are paying off in the classroom. It takes financial resources in order to pay substitute teachers to provide training for teachers. It also requires money to purchase the resources to enter into the digital realm, as well as resources to maintain the software and hardware. Without an impact on instruction, it is not worth the expense.

**Implications**

This research supports the notion that educators need to make sure that professional development has an impact. Borko (2004), and Gusky and Yoon (2009), state that more research has to be made into the relationship between professional development and the impact that it has on instruction. This research fits into that category and supports a positive relationship between the two.

This study gives administrators data to prove that professional development for teachers makes a difference in instruction. The researcher found that teachers felt the time spent focusing on Digital Learning and the tools of the initiative made a difference in the instruction they provided in the classroom. In other words, it payed off. School districts, including this district, are facing budget shortfalls. Many of them are forced to

cut things from their budgets, including programs. Because they have to make very strategic decisions about what they are doing with their money, they have to know that the money that they do spend makes a difference. They have to be able to justify what they spend to the taxpayers who are funding the purchases and expenses. This research shows that the investment in professional development made a difference in what is happening with the digital tools in the classrooms.

While strategic, direct professional development was instrumental in the Digital Learning Initiative, teachers also identified other influences that supported their development of the implementation of educational technology in their instruction. These indirect influences included having access to the devices and the resources (17), having the support and influence of colleagues (17), watching the level of engagement in students (15), their own personal learning based on interest or graduate classes (13), being given time to try new things (7) and having it be a part of the written curriculum (5).

It is also important to note that not all responses were completely positive. Teachers expressed concern about the amount of screen time for our youngest students (3). They noted that outside of school, students have so much time with parents' devices and televisions that time at school should be limited "to when it enhances of the learning process." Another teacher expressed concern that it was too much in too little a time frame. Focus needed to be on one to two elements over a year's time so teachers are not so overwhelmed.

Future research by this district should include qualitative research regarding the aspects of the Digital Learning Initiative that made it successful for teachers. As funding

decreases and limits the amount of time for professional development, knowing the specific aspects of this initiative that were successful can help the district do more with less. Districts will have to plan strategic intentional professional development that develops teachers' ability to learn with students. They have to be given permission to try new things and fail in order to learn and more forward. Professional development will have to prepare teachers for the ambiguity of change.

Changes within technology itself will also affect professional development. 21st Century Skills tell us that students need to be able to adapt to change (International Society for Technology in Education 2016c; Nebraska Summit on Career Ready Practice, 2009; American Association of School Librarians, 2007). Finally, districts will have to plan strategic intentional professional development that develops teachers' ability to learn with students. They have to be given permission to try new things and fail in order to learn and more forward.

As the number and diversity of devices continue to increase in the classroom, districts will not have control over every device and app that is used within the classroom, teachers and students will have to adapt to the changes. Training on every detail of every device or app is unrealistic. If we expect our students to learn, unlearn, and relearn, we have to develop these practices in our teachers who model appropriate skills for the workplace.

**Conclusions**

It is clear that the Digital Learning Initiative in this school district was successful. The perceptions of the teachers proved that the professional development had a

significant positive impact on the use of educational technology in instruction of the classroom. This change in instruction creates an educational environment that promotes the use of digital tools for Digital Learning, thus creating an atmosphere to develop 21st Century Skills and digital fluencies.

However, this is not an initiative that can stand on its laurels. Digital Learning and 21st Century Skills are a moving target. Digital tools are constantly changing. Teachers and students must learn to be comfortable with change and the need to constantly modify the way things get done. Digital Learning is about becoming a life-long learner to prepare for a future of innovation and change. The teachers in this district will continue to rely on a professional development program that facilitates creativity, communication, collaboration, and critical thinking in order to continue to move its classroom instruction into more advanced forms of Digital Learning.

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# Appendix

# Appendix A

## Survey

Questions given to teachers through a Google Form using the district Google Apps for Education accounts.

# THE IMPACT OF A PROFESSIONAL DEVELOPMENT INITIATIVE ON TECHNOLOGY INTEGRATION WITHIN INSTRUCTION

In the Spring of 2015, Millard Public Schools began a Digital Learning Initiative. This sequence of professional development included training on Digital Learning and the use of digital resources. During the initiative, the following definition was shared:

"Digital Learning encompasses instructional practices that effectively increase student and teacher productivity, creativity, innovation, and engagement through enhanced learning experiences using a wide spectrum of digital resources that improve teaching, learning, and achievement."

This survey is designed to measure your perception of the MPS Digital Learning Initiative's impact on instruction in the elementary classroom.

* Required

## Prior to Spring of 2015, what was your perception of Digital Learning?

- ○ I had never heard the term.
- ○ I had heard of it, but didn't think of it in terms of my teaching.
- ○ I was investigating how I could implement it in my classroom.
- ○ I was implementing a form of digital learning in my classroom.

As the result of the Digital Learning Initiative, what is your perception of Digital Learning?

- ○ I had never heard the term.
- ○ I had heard of it, but didn't think of it in terms of my teaching.
- ○ I was investigating how I could implement it in my classroom.
- ○ I was implementing a form of digital learning in my classroom.

How would you rate your technology skills?

- ○ Never - I do not use technology as a part of my instructional practices.
- ○ Rarely - I seldom (once a month) use technology as a part of my instructional practices.
- ○ Occasionally - I sometimes (more than once a month) use technology as a part of my instructional practices.
- ○ Frequently - I often (daily or weekly) use technology as a part of my instructional practices.

The Digital Learning Initiative*

| | Stongly Disagree | Disagree | Agree | Strongly Agree |
|---|---|---|---|---|
| Improved my understanding of the definition of Digital Learning | ○ | ○ | ○ | ○ |
| Improved my technology knowledge | ○ | ○ | ○ | ○ |
| Enhanced my understanding of how teaching changes as technology is utilized in instruction | ○ | ○ | ○ | ○ |
| Enhanced my Integration of educational technology into instruction | ○ | ○ | ○ | ○ |

What other factors influenced your use of technology in your instruction?

Your answer

Good instruction happens in a variety of ways. Please share one example of an instructional activity that was enhanced through the use of educational technology.

Your answer

As a result of the Digital Learning Initiative, with what frequency did you use the following tools as part of your instruction in the past school year (2015-2016)? *

| | I did not use it. | I used it monthly. | I used it weekly. | I used it 2-3 times a week. | I used it daily. | The resource is not appropriate for my grade level. |
|---|---|---|---|---|---|---|
| Pages | ○ | ○ | ○ | ○ | ○ | ○ |
| Keynote | ○ | ○ | ○ | ○ | ○ | ○ |
| Puppet Pals | ○ | ○ | ○ | ○ | ○ | ○ |
| Explain Everything | ○ | ○ | ○ | ○ | ○ | ○ |
| Book Creator | ○ | ○ | ○ | ○ | ○ | ○ |
| iMovie/iMovie Trailer | ○ | ○ | ○ | ○ | ○ | ○ |

As a result of your experiences with the Digital Learning Initiative, how important will the following apps be in your instruction in the current school year (2016-2017)? *

| | I do not intend to use it. | I will use it monthly. | I will use it weekly. | I will use it 2-3 times a week. | I will use it daily. | The resource is not appropriate for my grade level. |
|---|---|---|---|---|---|---|
| Pages | ○ | ○ | ○ | ○ | ○ | ○ |
| Keynote | ○ | ○ | ○ | ○ | ○ | ○ |
| Puppet Pals | ○ | ○ | ○ | ○ | ○ | ○ |
| Explain Everything | ○ | ○ | ○ | ○ | ○ | ○ |
| Book Creator | ○ | ○ | ○ | ○ | ○ | ○ |
| iMovie/iMovie Trailer | ○ | ○ | ○ | ○ | ○ | ○ |

What is your highest level of education? *

- ○ Bachelors Degree
- ○ Masters Degree
- ○ Educational Specialist
- ○ Doctorate

How long have you been teaching in this school district? *

- 1-5 years
- 6-10 years
- 11-15 years
- 16-20 years
- 20+ years

How long have you been teaching?*

- 1-5 years
- 6-10 years
- 11-15 years
- 16-20 years
- 20+ years

What grade level do you teach?

- Kindergarten
- 1st Grade
- 2nd Grade
- 3rd Grade
- 4th Grade
- 5th Grade

How long have you been teaching at your current grade level?*

- ○ 1-5 years
- ○ 6-10 years
- ○ 11-15 years
- ○ 16-20 years
- ○ 20+ years

During the 2015-2016 school year, how many students were in your class? *

- ○ Below 15 students
- ○ 16-20 students
- ○ 21-25 students
- ○ 26-30 students
- ○ 30+ students

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Never submit passwords through Google Forms.