DIGITAL TECHNOLOGY IN THE ELEMENTARY LIBRARY

by

Olivia Schuman

An Abstract
of a research paper in partial fulfillment
of the requirements for the degree of
Master of Science in Library Science and Information Services
in the Department of Educational Leadership and Human Development
University of Central Missouri

July, 2013
ABSTRACT

By

Olivia Schuman

The use of technology in the elementary school is growing and evolving. This changing environment means that mobile devices are being used alongside computers and laptops and district policies are changing to meet the new demands. Student achievement and motivation can be increased through the use of technology in the classroom. The amount of information available can make finding quality resources challenging. This paper provides information to assist teachers in integrating quality resources in the elementary school in the subjects of language arts, math, science, and social studies. It also includes resources that can be used to differentiate instruction to meet the needs of gifted, special needs students, and English language learners. These resources give teachers a good place to start looking for new technology and reduce the hours spent searching for quality resources. These technologies can be used with students to help them achieve at a higher level.
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CHAPTER 1: INTRODUCTION

Increasing students’ on-task behaviors, attitudes toward learning and achievement are results of pairing quality instruction with digital technologies in the elementary classroom. Using technology on a regular basis gives students and teachers opportunities to apply real-world problem solving skills and to explore new avenues to learning that a traditional classroom setting does not provide. Elementary teachers teach all subject areas and have limited time to do additional work, so searching for resources to use in lessons can get pushed aside and never happen. The amount of information available is daunting and makes finding good resources challenging. Quality resources for language arts, math, science, and social studies are available in a variety of forms. These resources increase teachers’ effectiveness in teaching concepts to students and give students opportunities that would not be available without digital technology. Programs, websites, mobile apps, blogs, and wikis have been created to assist teachers in making planned lessons more meaningful and applicable to students. Additional resources are available to ensure teachers can differentiate their instruction to meet the diverse needs of all learners in their classroom, including English Language Learners, special needs students, and gifted students without hours of additional planning.

Statement of the Problem

Research shows digital technology resources increase student engagement, achievement, and attitude; but implementing quality resources can be a struggle when it takes time to find and learn the resources, district policies are out-dated, or reliable technology is limited. Teachers spend many hours creating lessons to teach to state and national standards. Creating those lessons becomes even more frustrating when something does not go as planned and educators are
forced to make major modifications in the middle of a lesson. Teachers are also required to differentiate their instruction to meet the learning needs of students with special needs, English language learners, average students, and gifted students; all of which can be sitting in the same classroom. Digital technologies can make this job easier, but educators need help in finding quality resources that can meet the diverse demands found in the elementary school.

**Purpose of the Study**

The purpose of this research paper is to identify quality digital technologies that can be used in the elementary school setting in a variety of curricular areas to increase student engagement, motivation, and achievement.

**Research Questions**

This paper was written to answer the following questions:

- What is the best way to implement new technology in the elementary school?
- How can technology improve students’ academic performance as well as attitude toward school?
- What digital technological resources are available for the elementary school?

**Limitations of the Study**

Digital resources are constantly growing, changing, and being replaced. The technologies in this paper are current and working at the time this paper was written in the spring of 2013. As technology continues to improve and be expanded, these unforeseen changes and new resources cannot be included in this work.
CHAPTER 2: REVIEW OF THE LITERATURE

Introduction

This research explores the challenge of choosing and integrating digital technology to use in the elementary school library. Digital technologies include; devices, programs, mobile apps, websites, and digital libraries. These technologies will be referred to throughout this document often in the general term, technology. This research looks at the challenge in making the decision to purchase technology, the effects technology can have, and what resources can have the best impact on student achievement. First, the research looks at factors to consider when implementing this technology into an existing library media program. It will also demonstrate why it is necessary to evaluate and address the current technology used in the school. Then it will identify types of technology that can be implemented in the elementary school and the effect they can have on students and teachers. The research will also demonstrate how looking at the needs of the school, students, and teachers can help to guide the library media specialist in making the best purchases for meeting the diverse needs found in an elementary school. Finally it will present a variety of technological resources that can be purchased or are freely-accessed in each of the content areas to best support the elementary library media center.

Integrating Technology in the Elementary School

Integrating new technology in the elementary school can be a daunting task. There are many factors to consider when looking at making changes, improvements, and purchases. An assessment of the school’s current technology integration needs is essential: recommending that district policies on student technology use, such as using blogs and wikis, need to be examined; teacher collaboration needs are taken into account; as well as the factors that influence technological integration for teachers, students, and support. An evaluation of how technology is
integrated and supported in the school can also lead to a smoother transition of implementation of new technologies. Schools that see lack of money, rigid school policies, Internet filters, aging equipment, lack of bandwidth, or uncertain connectivity as challenges often give up before they have begun (Haynes 11). These constraints need to be considered, but do not have to limit or prohibit the use of new digital technologies. They are opportunities for growth within the school.

New technologies can become frustrating when they do not work with the current network limitations in the school. However, even a small technological purchase can become a huge success when it meets the needs and expectations of teachers as well as students. Loertscher suggests that two goals drive all district policies, technology assessments, and future purchases: first ensure all students and staff have access to fast, reliable devices; and second, focus on maximizing learning (46). Rubenstein puts it quite simply, “Use technology only when it enhances your content -- not the other way around. It is less effective if you use technology for technology's sake” (Rubenstein). Once the focus is established, teacher and student needs should be addressed to ensure each purchase reaches maximal potential and dollars are not wasted.

School districts today have written technological use policies that should be reviewed and updated periodically. One current pattern seen in schools is the discussion about whether the district should provide all computing devices or should allow students to bring their own personal devices to school. Allowing students to use personal devices such as laptops, tablets can ease spending costs for districts and enable the school use funds toward providing cloud computing and access to networks without large additional expenses (Loertscher 46). This also opens up more money for the district to provide greater access to students who are unable to provide their own devices as well as to purchase additional resources. A technology advisory committee that includes administrators, teachers, parents, students, and the technology
coordinator can help the district assess the school’s current policies, needs, and establish future plans (Gatewood and Conrad 250).

Teachers can be an important support system to new technology integration or the biggest challenge if not properly trained, collaborated with, and supported. The Glazer et al. study examined factors that influence technology integration in the elementary school and found that collaboration, time, curriculum, and comfort level were all factors that impacted how technology was integrated in the school (38). For example, Google Apps for Education is a free service used by millions of students and teachers worldwide for email, document sharing, calendars, and more (Google Apps). This service can open a pathway to sharing, collaborating, and training in an easy to use format that does not put further strains on the already limited time of teachers.

“Experienced teachers reported that opportunities to use technology with their students increased [teacher] comfort and confidence” (Glazer et al. 30). Teachers in The Glazer et al. study also reported that as they became more comfortable with technology, less training was needed. Taking the time initially to introduce new technologies to teachers and giving them opportunities to try out the systems with support can greatly increase the amount of technology that is integrated and can reduce the amount of future training required. It will also ensure that new purchases are used and do not sit collecting dust, wasting valuable money that could be used somewhere else.

Technology integration that is evaluated periodically ensures student learning is being maximized and that students are developing the technological skills they need for future success. Teachers who understand the use of the technology as well as its functions can make choices about what technology to use to meet their needs. Teachers will also need these technological skills in order to select which technologies to use and to be able to request additional resources to
enhance their lessons to meet learning goals and expectations. When teachers are given the opportunity to help guide or influence new technology purchases they will feel ownership for the purchases and less money will be wasted on trying to guess what materials teachers will use.

**Technology for the Elementary School**

Digital technology can provide many benefits for the elementary school. Students are expected to be responsible citizens in the classroom, the community, and the digital world. These skills need to be taught and students given opportunities to practice them in a controlled environment. Heaser suggests that skills to help students become responsible digital citizens be introduced in kindergarten and continued to be taught to students within all subject areas throughout their entire elementary school experience so these skills can be developed, reinforced, and expanded upon as students grow and mature. An opportunity for students to use technology in the classroom builds skills, increases motivation, and improves academic achievement.

**Improving classroom instruction with technology.**

Lioa, Chang, and Chen discovered in their research with elementary students in Taiwan that student achievement was positively affected by computer application instruction versus traditional instruction. Teachers at Forest Lake Elementary Technology Magnet School discovered that technology enhances collaboration and supports teaching state standards (53). Supporting students is vital to successful technology integration (Steck and Padget 35). Davies suggests that if technology is going to be used as a learning tool, students need guided practice in using it with purpose. They cannot be turned loose and expected to know what to do with it (46).

Additionally technologies can increase student motivation and attitudes toward learning. Cavanaugh, Dawson, and Ritzhaupt conducted a study in forty-seven K-12 schools in eleven districts where students and teachers had one-to-one access to laptop computers every day. Their
findings showed that independent inquiries by students as well as teachers teaching critical thinking skills were significantly increased with the addition of technology being readily available in the classroom environment (367). Using technology on a regular basis gives students and teachers opportunities to apply real-world problem solving skills and to explore new avenues to learning that a traditional classroom setting does not provide. Positive changes in students’ enjoyment, motivation, engagement, on-task behavior, and attitude toward school were all reported by over 60% of the teachers in the study by Cavanaugh, Dawson, and Ritzhaupt (370). In order to achieve successful changes in the classroom, students, as well as teachers, Cavanaugh, Dawson, and Ritzhaupt recommend students and teachers have instant access to high quality technological resources and devices in addition to the training and desire to implement these resources into everyday instructional practices. The study also reported higher test scores, increased thinking skills, higher student retention, and transfer of learning in classrooms that utilized the technology available (369). Technology that delights students can increase student motivation and attentiveness.

**Improving student achievement with assistive technology.**

This section explores how assistive technology can be used to improve student achievement. Assistive technologies are any devices or programs that can help students who are struggling to overcome learning barriers. Assistive technologies work either through individualized modifications or bypassing the barrier all together (Berkeley and Lindstrom 49). These devices can be used for a wide variety of students, from those with learning disabilities, vision or hearing impairments, and English Language Learners, to regular education populations and gifted students. “Access to assistive technology in schools and public places is an attempt to
“level the playing field” for individuals with disabilities by providing them with access to services, education, and employment” (Ennis-Cole and Smith 86).

One type of assistive technology are remote clickers. These devices can be used with the entire classroom, but can be programmed to offer a variety of questions based on student needs. Some clickers offer simple color coded buttons for answering questions, while others are more complex. These devices can be used to help a teacher quickly identify struggling or advanced students to modification further instruction without students being aware of differences. Since these devices are programmable they can be used in all subject areas and provide instant feedback to the teacher. The entire student population can use clickers, no matter the grade or ability level. If the teacher uses clickers in a small group setting, gifted students can have more complex answers to questions available as choices on the clicker while students with special needs may have more simplistic answers to choose from.

**Improving student achievement through increased motivation.**

Autio, Hietanoro, and Ruismaki discovered that both male and female students are more motivated to learn using technology because it gave them independence, an opportunity to work with their hands, and an opportunity to express creativity (259). Technology gives students an opportunity to create a project in a way that they enjoy. Students can create presentations, make video or audio clips, use mind maps, and communicate with others with the variety of resources available. This variety creates a sense of control for students and increases excitement for new learning situations that engages students at a higher level.

Ju-Ling et al. also discovered that elementary students given mobile learning opportunities through using mobile devices with access to digital libraries showed an increase in achievement, motivation, and learning attitude (488). In this study, students used mobile devices
such as an iPod Touch or Android tablet to go outside and conduct research on butterflies. A digital library with meaningful resources for the students was created before the lesson to allow students easy access and retrieval of information in the field. The elementary students in this study reported feeling more relaxed and learning more using the mobile devices and digital library (501). The study also found that students were able to make their own discoveries and conduct research independently with immediate access to reliable resources in the field (502). Research suggests that combining technology through mobile devices, digital libraries, and providing choices for students increases student motivation and attitudes toward learning.

**Digital Resources for Elementary Library Media Centers**

Technology, such as e-readers, interactive whiteboards, tablets, remote clickers, and the growing amount of online resources, has an increasingly powerful influence in the library media center and its impact has been seen in all areas of the school. The amount of resources available to educators today is vast and constantly changing. It can be a challenge to keep up with the large selection of resources available for use as well as make informed choices about what technologies are the best fit for your student and teacher population. When the library media specialist is making a digital technology purchase, consider overall cost, what is going to be done with the technology, and what kind of technology is desired (Shull 29). Some resources for each curricular area can be obtained for free while others may require a significant investment. The key to finding quality products is to look at what the resource offers to see how it fits with the current technology and curricular needs and to look at professional reviews of the product. Once the initial search has been done, the library media specialist determines if the cost can be justified by the additional benefits or to identify a product that could better meet the needs of the school.
Programs, mobile apps, websites, and digital libraries for all curricular areas are readily available and can be found in abundance. The library media specialist can guide classroom teachers to resources that will enhance their teaching, provide students with additional support, and engage as well as challenge students to reach higher academic goals.

Many free Web resources have been created to help teachers implement state standards as well as make it easier to differentiate instruction for students. One example is 4Teachers.org, a website that provides a wide variety of professional development tools to help teachers incorporate technology into their classrooms. This website provides professional development and helps teachers locate online quizzes, games, and resources.

Allen suggests that teachers and library media specialists who work cooperatively have the greatest opportunities for identifying resources that fit the unique needs of each individual student in the school. Through a collaborative partnership, teachers and the LMS can identify learning goals and work to find the resources available to best meet those goals. They can each use their own area of expertise to build a plan to increase student achievement. It is the educator’s responsibility to stay abreast of technology by discovering new and innovative ways to develop and present curriculum (Jackson et al. 73).

Apps, small programs typically designed for mobile devices, are another great resource that can be used with hardware like smart phones and tablets. Many apps are cross-curricular and incorporate a variety of skills, such as reading and investigating used together in PBS Kids. Many apps are free or low cost and can be used with students alone or one-on-one with a volunteer or paraprofessional (Larsen ‘Technology’ 49). Apps are an excellent resource to consider when sharing information with parents, since they can be used at home for additional practice and support. Apps often are set up as games and give students an opportunity to practice
skills in a fun way. They can also be used in all subject areas including math, language arts, science, and social studies.

**Digital Technology Resources for Mathematics**

Mathematics is an area where there are numerous resources available for elementary schools to enhance instruction with the help of technology. Interactive whiteboards can give students an opportunity to use math digital manipulatives when physical manipulatives are not available in all classrooms. Qing Li and Xin Ma examined 85 studies involving over 36,000 kindergarten through twelfth grade learners, looking at the effect of student academic performance in mathematics when paired with computer technology programs. The study found mathematics achievement was positively affected when paired with computer technology instruction either through drill and practice software, tutorial programs, exploratory games, or computer programming tools for students (226).

Games such as Math Blaster and drill and practice software such as Accelerated Math, A+Math, and Math Facts in a Flash are resources that can be used to assist student learning in the area of mathematics. The Khan Academy provides videos, assessments, and activities for students as well as access for teachers to view what their students are learning. The site *AMaths Dictionary for Kids* provides simple definitions for multiple math terms in an interactive and animated way that can lead to increased student motivation and engagement. *The Geometer’s Sketchpad* provides additional geometry instruction and data analysis software can give students opportunities to explore connections and manipulate data easily. When paired with quality instruction, these offer students additional opportunities to learn and practice skills in a fun and adaptable environment.
Digital Technology Resources for Language Arts

Liao, Chang, and Chen discovered that reading and language arts showed the highest effect size in growth with computer assisted instruction (56). *Gliffy, Bubbl.us,* and *MyWebinspiration* software can be used by students to create mind maps that show their thinking and learning (Marcoux and Loertscher 15). These maps can be used by the teacher to identify areas where students need additional support and identify strengths and areas which can be used to challenge students. *MyReadingCoach* is software that can be purchased and tailored to fit the specific reading needs of individual learners. The program tracks where a student is academically and gives them additional practice opportunities to strengthen and build skills. Students advance to higher levels when they are ready. *Starfall* is a popular website for lower elementary students or emergent and new readers. This company also has an app that can be used on the iPad at school or home that works very similar to their website.

*Earobics* and *Lexia* are additional technology resources that can be purchased making learning individualized when used with struggling readers. *StudyIsland* is a program that can be used with all elementary students that tracks student’s progress on specific skills. It is tied to Common Core and gives the teacher valuable data to track how a student is doing on reading concepts. These resources can make targeting specific weaknesses and strengths much easier and often give ideas or resources for additional instructional ideas or plans.

A study of students in Kansas by Cindy Pfeiffer discovered that the Reading Renaissance Accelerated Reader program helped them transform from a school where students were not making adequate yearly progress to a school that met the standard of excellence by state standards just two years later. Reading Renaissance is the parent company of Accelerated Reader, but also offers programs specifically designed for struggling students in the Response to
Intervention model adopted by many schools. In this study the library became the hub of learning and reading achievement for the school. The elementary librarian collaborated with teachers, worked with students, and helped to meet the diverse needs of the student population through the Reading Renaissance programs. The library media specialist played a key role in this transformation and the adoption of emphasizing literacy school wide (61).

Students can use technology to help complete research papers or other writing assignments. *Mindmeister* is a program that can be used for brainstorming ideas at the beginning of the writing process, and *Kidspiration* is an excellent resource for outlining a writing project or research assignment. These resources are designed for elementary students, so they are user-friendly and give additional guidance as the student works through each step of the research process.

Students can use programs such as *Animoto, iMovie, and Movie Maker* to create video book trailers instead of giving traditional book reports (Chance and Lesene 27). Technology such as flip cameras, iPads, and e-books, and Web resources such as blogs, wikis, and author websites can transform a traditional language arts lesson into one where students are working hands-on to explore, create, learn, and share key concepts. These approaches engage elementary students and give them a variety of tools to complete an assignment using their own creativity and ideas.

**Digital Technology Resources for Science**

Bryce conducted a research study with four teachers’ pairing of a science textbook with technology to support student learning. In this study she found that using technology, specifically interactive whiteboards to show an enlarged version of the textbook enhanced student engagement and attention (482). It also aided the teacher in helping students understand
the language and meaning of new and often difficult vocabulary found in science textbooks. The combination of using technology and the textbook together gave the teacher new opportunities to boost student’s awareness of text features, develop reading comprehension skills, and build student knowledge through the use of vocabulary and visual images. “Teachers also used technology to gain access to additional nonfiction information; provide students with an interactive experience, which served to motivate and focus them while reading; and support them in creating their own digital texts in response to their reading” (484). Students were also able to transfer their learning, creating digital projects highlighting key learning objectives. Programs such as PowerPoint can give students an opportunity to create presentations with a lot of flexibility for inserting content and animations or videos. Animoto gives students an opportunity to create short video clips in a user-friendly program. Inspiration, YouTube, and NASA Education can be used to enhance and extend student learning in the field of science education. In the article ‘Why Didn’t I Think of That?’ Larsen recommends involving students in contests to showcase inventions. Additional Web resources for science include Discovery Education, The Khan Academy, PBS Kids, Student Ideas for a Better America, and Toshiba ExploraVision, (19). These sites include a variety of science resources to enhance and expand science instruction. Many offer contests for elementary students to show exceptional ideas and inventions that they have created.

Apps for the iPad or Andriod platforms enhance science instruction as well and give students opportunities for additional practice. PBSKids offers a large variety of apps for science as well as reading and mathematics. BrainPop has a featured movie app students can view daily and interact with to gain a deeper understanding of the science content. Additional apps to check out for elementary science include Dr. Frankenstein’s Body lab, Monster Physics, Sound Touch,
and Kapu Toys. These apps can be used in the school and at home for students with access to iPad, Android, or other OS devices.

**Digital Technology Resources for Social Studies**

Social studies is an area where technology is often underused, overlooked, and elusive to teachers (Torrez 148). It is also an area where technology can take students to new places with the click of a mouse. Interactive Internet museums and other sites that offer virtual field trips can give students a firsthand look at places and artifacts they might never have a chance to visit or explore. “Educators can use museums to teach content that is squarely situated within the curriculum, and they can do so in more interesting, authentic ways than in the traditional classroom” (Bruger 33). For many elementary schools with budget constraints, rural locations, or limited resources, virtual field trips and museum visits can be an easy, inexpensive alternative to loading students on the school bus and visiting a physical museum.

Other technology tools can help teachers strengthen their social studies curriculum and increase student engagement with a little advanced preparation and outside the box thinking. Student projects or assignments can be modified to allow easier implementation of a variety of resources. Torrez created a project where students used Web 2.0 tools and Flip video cameras to conduct oral history projects, where they interviewed individuals to give additional depth to their projects (146).

Torrez further explained that online primary and secondary sources, digital archives, and other Web-based resources are readily available for students and that these resources engage students in inquiry-based learning objectives (148). Many resources for podcasting, blogging, wikis, Internet research, and making digital movies, are free to use and give teachers flexibility
in assigning projects to students. These projects offer higher student engagement with lower levels of teacher training.

Video sites such as Discover Education and YouTube can be used to offer students video footage from monumental historical events or even audio clips of famous speeches that can be integrated into classroom instruction or student projects. iPad has an app available for lower elementary students called LEGO Superheroes Movie Maker where students can make a movie of their own would help students show knowledge of community helpers in a fun and exciting medium.

Sites such Authorstream.com allows students to collaboratively work on presentation. This site also enables students to turn a PowerPoint into a video. The Smithsonian American History Museum’s Webpage and USHistory.org allow users to view exhibits, resources, and blogs and webcasts for a wide variety of topics. PBS Kids has videos, games, apps, and activities for elementary students. Enchanted Learning offers resources for teaching social studies curriculum that can enhance ordinary lessons and subject matter teachers have taught for years with little additional work or training (Hamilton 50).

**Digital Technology Resources for Special Services**

Ennis-Cole and Smith conducted a study examining the use of assistive technology with students diagnosed with autism. The study found that using communication devices such as an iPad and iPod touch can be used with applications like iCommunicate, LearntoTalk, and Speakit! to improve communication functions in all subject areas for these students (88). This type of assistive technology was found in their study to actually decrease delayed or inappropriate speech patterns for these students and increase appropriate speech as transferred to the classroom setting. In addition to computers and assistive technology Ennis-Cole and Smith found that
interactive white boards, audiovisual equipment, computer games, the Internet, and audio books were highly effective in assisting learning for students with autism. These technologies can easily be integrated into the current curriculum and adapted to fit the individual learning needs of each student in the classroom.

In a tutoring project, Barbara McClanahan et al. found that assistive technology in the form of an iPad helped an attention deficit hyper-activity disorder (ADHD) student focus better and become more metacognitive in reading. The student in this study showed a full year’s growth in reading in just 6 weeks with interactive textbook access, downloaded iPad applications, and individualized instruction delivered through the iPad. (20)

In addition to the iPad and iPod touch mentioned for assistive technology with students with autism or ADHD, assistive technology devices such as Digital Accessible Information System [DAISY] Players, e-book readers, or MP3 players can be used to help relay learning objectives to students with disabilities in an easily manipulated format. When a library media specialist looks for resources for these devices, the LMS can first look at resources available from the textbook publisher. Publishers often offer their product in additional formats or even offer e-texts online (Berkeley and Lindstrom 48). There are also vendors that will provide audio CD or MP3 formats of their text. For students with visual impairments an e-book is an effective resource because the text size can be enlarged easily without additional cost.

International Society for Technology in Education at ISTE.org (Cummings 70). Another example of a website that lists appropriate resources for special needs students is the National Center on Accessible Instructional Materials' Accessible Instructional Materials Navigator (Berkeley and Lindstrom 49). Many states also provide resources, such as Missouri’s Wolfner library, that can be accessed by students with visual or physical disabilities (Wolfner).

Digital Technology Resources for ELL Students.

Teaching students whose first language is not English can pose a challenge for all educators. The library media specialist can help teachers identify resources that will be most beneficial for their individual students. Technology can help teachers bridge the language barrier without being bilingual. For example Bookflix can be used to read a book in both English and Spanish. World Book Online offers articles in different languages. MyReadingCoach is another resource that can be beneficial to ELL students. “ELL students found technology tools to be more forgiving of their mistakes and thus were more motivated to return to them for further language instruction” (Marcoux and Loertscher 20). Using technology can help the teacher relay information to ELL students in both English and their native language to help students meet the learning objective as well as to hear the English translation.

Conclusion

When implementation of technology in elementary school is intentional and well-planned, student achievement is increased. In order for technology to be implemented effectively, identifying and assessing needs and limitations is a top priority. Updated and periodically reviewed district policies will help to keep technology use and implementation current. Teachers who are trained and supported while learning new technology pick it up faster and need less support later. Regularly evaluated and modified technology use ensures that money is not being
wasted or resources wasted. The results for the classroom and library are increased student achievement for students with learning disabilities as well as the regular education population.

Elementary students that use technology become more motivated and teachers have additional resources to teach core curriculum. The students also have a greater opportunity to develop the skills necessary to become responsible digital citizens now as well as in the future. Technology can be used in all subject areas with mathematics and language arts showing the largest positive effect on educational growth in the form of student achievement and learning. Technology for science, social studies, special services, and ELL classes increases student engagement, understanding of content, and improves student attitudes toward school.

All areas of the school are positively affected by high-quality technology integration. “Technology-rich learning environments bridge the gap between knowing and doing, thereby moving knowledge from an inert to an active state as it is applied to immediate problems presented through the technology” (Cavanaugh, Dawson, and Ritzhaupt 361). Research shows that technology integration in the school, with help from the elementary school librarian, can have a lasting positive effect on teaching practices, student learning, and academic success.
CHAPTER 3:
CONCLUSIONS AND RECOMMENDATIONS

Introduction

Technology usage has become standard teaching practice in elementary schools across the country as well as around the world. As more districts and communities accept this new norm, some teachers are left with nervousness and trepidation at the daunting task of implementing new teaching methods. This chapter explores the following questions in regards to technology in the elementary library. First, what is the best way to implement new technology in the elementary school? The research identifies issues to take into consideration when looking at new technological purchases and writing school policies. Next the chapter explores the question, how can technology improve students’ academic performance as well as attitude toward school? Technology can affect students and teachers in the classroom as well as in the workplace and community. Finally, it will identify what digital technological resources are available for the elementary school. Resources are available for a variety of curricular areas. Technological resources can help the teacher fit the diverse needs of learners in the classroom. These resources can benefit students that have special needs as well as regular education and gifted students.

Implementing New Digital Resources in the Elementary School

Implementing new technology effectively takes a collaborate effort by the district, administration, teachers, and students. The top priority for districts adding new technology is to ensure all students and staff have access to fast, reliable devices and Internet access (Loertscher 46). When students and staff can rely on being able to use the technology they have planned to utilize, they will make a habit of using it without fear of it not working or being too slow to get the job accomplished. It is important that teachers trust the time they spend planning lessons
incorporating technology will not be wasted. Teachers need to be confident in knowing the technology they have access to will work and they will not need to scramble to come up with an alternative lesson because of an unreliable or slow device.

All new technology considerations should focus on maximizing student learning. The amount of digital resources available now is staggering and constantly changing. This gives elementary educators the advantage of selecting resources that are high quality and will meet the diverse needs of the student population. Looking at assessment data and talking with staff to identify areas where students are weak, they can determine where to spend money to ensure where the biggest gains in learning can be made with new technology.

Finally elementary educators constantly assess current and future needs and plan for purchases. This planning includes teacher training as well as looking at how devices will be available for all students either provided by a school purchase or by allowing them to be brought from home. Reviewing district policies regularly and updating them as needed ensures they are adjusted to meet changes in technology. These steps will help reduce wasted dollars, ensure student’s learning is maximized, and provide support for elementary teachers to make technology integration as trouble-free as possible. This will allow them to focus on creating lessons that will increase students’ learning.

**Improving Elementary Students’ Academic Performance with Technology**

Students that use technology are given the opportunity to develop skills to become responsible digital citizens, increase problem-solving skills, and enjoy learning. Students that use technology have been reported to have increased motivation and better attitudes toward learning (Cavanaugh, Dawson, and Ritzhaupt 367). When students are motivated to learn they are more engaged in learning activities, have higher levels of on-task behavior, and retain more
of what they have learned. Using technology regularly helps to prepare elementary students for future learning and the real world by developing the skills they need to be successful in a fun and engaging format.

Gifted students can use technology to explore concepts more in depth, regular education students can use technology to practice skills further, and struggling students can use technology to get more background information in order to understand new concepts better. Technology gives students the ability to complete work in a variety of methods on their own level. Many programs are available to assist teachers in tracking student progress and identifying specific strengths in individual students. Technology gives learners and teachers the opportunity to immediately explore new ways of learning information that would not be possible in a traditional classroom.

Assistive devices can be used to improve student achievement for special needs students. This technology includes any device or program that will help struggling students overcome or bypass learning barriers (Berkeley and Lindstrom 49). Remote clickers can be used by the teacher to quickly identify areas students understand and areas where additional instruction is needed. This information can be stored to track student growth throughout the year. The iPad can be used to help students with communication disorders, visual or hearing impairments, and students with disorders such as Autism or Attention Deficit Hyperactivity Disorder. These devices provide an avenue for students that struggle to overcome the limitations a disability may place upon them, giving them the opportunity to perform at a much higher level.
**Digital Technology Resources Available for the Elementary School**

Many resources are available to enhance instruction for students as well as allow for opportunities to practice skills independently. Cloud computing can be used to enable the district to allow students network access without large additional expenses. Technological devices such as laptops, iPads, iPhones, iPod touch, Android tablets, e-books, remote clickers, interactive whiteboards, audiovisual equipment, audio books, mobile devices, flip cameras, Digital Assessible Information System Players, and MP3 players can be used to run a wide variety of programs, resources, applications, and/or instructional services to enhance and extend instructional opportunities for all students in the elementary school. These devices can be purchased by the school or student owned, if your district has a student use policy in place.

Many resources can often be obtained for free while others require a subscription or purchase. Resources for students and teachers include Google Apps for Education, interactive textbook access, downloaded iPad applications, access to digital libraries and archives, author websites, blogs, wikis, virtual field trips, interactive museums, podcasts, presentation programs, and word processors can be used for any elementary content area.

Math resources include many different resources from skill practice, differentiated instruction, hands on learning opportunities, and tutorials. Geometer’s Sketchpad provides geometry instruction for upper elementary students. Data analysis software can assist elementary students in using data to create graphs and make representations of data they have collected. A+Math has online games, flashcards and worksheets for young learners. The site *Math Facts in a Flash* gives drill and practice opportunities in a fun manner. The Khan Academy offers a selection of math and science videos. Accelerated Math assists teachers in differentiating instruction to target skills students need. Virtual math manipulatives give students access to
resources that the district may not have available such as pattern blocks or base ten models. *Math Blaster* makes math practice fun through games, activities and lessons. *AMaths Dictionary for Kids* provides simple definitions for math terms in an interactive and animated way. These math resources can expand the amount of information and practice a teacher can give all students. Many of these resources can also be accessed at home, giving students greater opportunities to practice and master math skills.

Language Arts resources include a variety of resources for reading, writing, or creating projects. *StudyIsland* is a web-based program that gives students opportunities to practice targeted reading skills and the teacher can print out progress reports to identify strengths and weaknesses unique to each individual student. *MyReadingCoach, Earobics, Lexia, Reading Renaissance* are additional reading programs that work to increase reading proficiency and skills in a differentiated manner for elementary students as early as preschool. *Bookflix* pairs classic stories to nonfiction texts in a video format to help lower elementary teachers tie fiction and nonfiction together. *Gliffy, MyWebinspiration, Kidspiration and Mindmeister* are mapping programs where students can create diagrams and flowcharts which can be used to make mind maps or added to research papers as well. *iMovie* and *Movie Maker* can be used to complete book reports, introduce research papers, or share a project with the class. *Audacity* is a free multilingual audio editor for Windows, great to use with ELL students.

Resources for enhanced Science instruction could include *NASA Education* which provides thematic units for elementary students as well as projects to enhance science education for students. *Student Ideas for a Better America* offers competitions for preschool and lets students submit inventions. *Toshiba ExploraVision* is another science competition that allows
students to explore the scientific process in a hands-on manner. *Young Inventor’s* provides contests, lesson plans, home work help and summer camps for elementary students.

Social Studies class offers opportunities to utilize online primary and secondary sources, as well as *The Smithsonian American History Museum’s* Webpage and *Discovery Education*. *The Smithsonian* provides lesson plans, web-based activities, and links to their collections and research. *Discover Education* has images and video clips that include full length videos of primary sources that can bring additional depth to lessons taught. These resources as well as virtual field trips can bring history into the classroom for very little cost.

Websites such as *YouTube* can provide instructional tutorials on how to solve specific types of problems. This is great to share with parents so they can help with homework or to share with students that need additional instruction. If you want to create your own instructional video for students or give students an opportunity to create a video to share with the class *blabberize.com* or *Animoto* are quick and easy sites to make simple videos. *4Teachers.org* provides a wealth of information for educators to ease technology integration for all subject areas through resources, podcasts, blogs, tools and ideas for differentiated instruction. *Bubbl.us* is a Web 2.0 tool for teaching critical thinking and other 21st Century learner skills. *Enchanted Learning* can be used in a variety of contexts for instruction and to help students conduct research or complete assignments.

Additionally, assistive technologies have websites that include; *Missouri’s Wolfner library, ABLEDATA, Adaptive Technology Resource Center, Alliance for Technology Access, AssistiveTech.net, Bookshare.org's Workshops, Don Johnston, Inc., the International Society for Technology in Education and the National Center on Accessible Instructional Materials’*
Accessible Instructional Materials Navigator. These are all websites that can assist elementary educators in finding technology to help special needs students.

Applications like iCommunicate, LearntoTalk, and Speakit! can be used in language arts or with ELL students. PBS Kids, BrainPop, Dr. Frankenstein’s Body lab and Monster Physics makes science exploration exciting for students. Starfall ABC gives lower elementary students early reading practice. Sound Tech gives students sounds and images which can be extremely beneficial at building vocabulary and background knowledge on topics. Kapu Toys brings students to play and learn about nature. LEGO Superheroes Movie Maker can be used by kids to make their own recorded story. Many apps can be used on iPad and/or Android platforms to allow students additional opportunities to explore topics at school or home.

The key to finding quality products is to look at what the resource offers to see how it fits with the current technology and curricular needs of the school. Then look at professional reviews of the product to ensure the resource fits with your needs and expectations. In the elementary school it is important to find resources that are kid friendly and easy to use as well as engaging. This will help to boost student motivation and learning as well as make implementation easier for educators.
WORKS CITED


*Wolfner Talking Book and Braille Library*. Missouri Secretary of State.