

Elementary Education, There's an App for That: Communication Technology in the Elementary School Classroom

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Abstract

This research examined how various forms of communications technologies are being used as learning tools in elementary school classrooms. This study specifically focused on rural elementary schools near the Research Triangle Park in North Carolina, a state known for being a technology powerhouse. Using in-depth interviews with local elementary school teachers, the research revealed a positive correlation between technology in the classroom and an increased student motivation and participation. Findings also showed that technology is an integral part of learning in the classroom and students have begun to expect a seamless integration of technology into the learning process.

I. Introduction

In some elementary schools, a paper and pencil is no longer needed to teach a math lesson. Now thanks to Apple's new iPad, there's an app for that. Students can be more engaged than ever before and create their own math equations using the *Alien Equation* app on the iPad ("Apple"). The same holds true for learning grammar as well. Sentence structure diagrams on a chalkboard are a thing of the past now that grammar apps can be downloaded for the iPad through "TapToLearn" software. In many ways, these new forms of communications technologies have drastically changed the environment in classrooms and the overall student attitude towards learning ("Technology and Education Reform"). With technology available at a child's fingertips, they become the ones to manipulate the activity and can actively make decisions regarding the lesson.

The iPad is just one example of the many recent improvements in technology that have contributed to advancements in elementary education over the past decade. With a global boom in terms of communications technology, educational achievements have been fostered, and these improvements have made it possible to expand and expedite learning for children in the classroom. While there are numerous technologies available to teachers, one of the biggest technologies in terms of communication has been the increased use of the Internet for academic purposes. According to a 2002 Pew Research Study on student use of the Internet for school, with the exception of very low-income school districts, "it is now the case that the Internet is as common a school fixture as lockers and library books" ("Digital Disconnect"). Furthermore, this study also concluded that "One of the most common activities that youth perform online is schoolwork" ("Digital Discon-

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nect”). Although this study and many others like it are helpful for understanding the many academic uses of technology, the current research fails to address very specific regional areas.

While the state of education is an issue at the forefront of our country, it is also one that has been greatly affected by technology in the 21st century. This rapid increase in technology has revolutionized development in elementary education and has changed the typical dynamic between teacher and student. Teachers are now more actively engaging their students and captivating their attention through various forms of communications technologies. With the implementation of technology in the classroom becoming more commonplace for many schools across the country, administrators and educators alike are discovering the benefits these tools can have for students’ success.

This study will fill the gap in the existing research by focusing on communications technology in elementary school classrooms in the rural area of central North Carolina. It will serve to define exactly which types of technologies are being implemented in elementary school classrooms and identify what the possible disadvantages are as well. In addition, this study will highlight the newest technologies for communication and seek to predict the future of technology in the classroom. While technology has become critical in education, the use is different across states and this research focuses on a specific state in a specific location by talking to teachers who use technology in the classroom every day.

II. Literature Review

The state of education remains one of the most highly debated topics in the country, yet there is surprisingly little research on the current relationship that exists between communications technologies and education. Gradually, over the past few decades, various forms of communications technologies have been integrated into classrooms. This approach has been taken as a means of improving education and catering to different learning styles as well. The following review of the existing scholarship covers a key learning theory as well as the research to date on communications within the realm of education.

One of the most prominent education theories driving this specific research is Howard Gardner’s Theory of Multiple Intelligences. Gardner proposed that cognitive abilities are displayed in more ways than can possibly be measured by a simple IQ test. In one of his books, he proposes a radical vision, one that is “a pluralistic view of mind, recognizing many different and discrete cognitive strengths and contrasting cognitive styles” and he goes on to introduce the concept of “an individual centered school that takes this multifaceted view of intelligence seriously” (“Multiple Intelligences” 6). With technology now as a major part of classroom activities, teachers are able to use this theory and assess their students’ intelligences in more ways than ever before.

Gardner’s theory then becomes critical for creating Internet-based lessons for students. Since students can learn in so many different ways, it is important to keep in mind the range of brain compatibility and multiple intelligences. As Gardner argued, “there is the faith that central to any understanding of the human mind is the electronic computer. Not only are computers indispensable for carrying out studies of various sorts, but, more crucially, the computer also serves as the most viable model of how the human mind functions” (“Mind’s New Science” 6). In addition, “numerous books and articles are available to educators that relate directly to brain-compatible learning. Yet, educators are still searching for how to relate these ideas to specific curriculum domains” (Nelson 20). In this way, communications technologies are being used outside of the classroom to help educators better understand their students and how they learn best, especially through the technology of PET scans, MRIs and even EEG tests.

Furthermore, this same resource also discusses how there are very key points for learning how to search on the Internet, and how teachers should provide their students with this type of instruction for their benefit. Specific instruction to students is key, especially regarding “(1) the significance of word choice, (2) the power of spelling, and (3) the value of quality over quantity” (Nelson 61). Clearly, the Internet as a communications technology in the classroom can prove to be very powerful, but there must also be some critical basic skills in place for this to be effective.

The existing research shows that when technology was first introduced into classrooms, teachers were uncertain about how it should be incorporated. One study specifically looked at the factors affecting early technology use and determined that “there are conflicting ideas about the value of technology and

hence conflicting advice to teachers about how technology should be used in schools” (Zhou and Frank 809). Some of the contributing factors to this cause include the constant changing nature of technology as well as the unreliability and lack of reliable support. In related research, it was also determined that while technology is a valuable resource, it should not be used to teach everything. For some lessons, technology isn't necessarily the best means of teaching, and more importantly, as just “one tool among many, technology cannot be expected to change bad teaching into good” (Sandholtz et al 174). As a whole, it is most appropriate to use technology in the classroom for concept development and critical thinking activities.

In one of the more recent articles relating to this subject, it describes how “virtual education,” or teacher and student interactions that are computer-mediated, have grown from being a novelty to commonplace in the classroom. It is no longer surprising that an educational institution would offer some form of online class, and the existing statistical data clearly support this notion. “In a non-random 2007 survey of school districts, as many as three out of every four public K-12 school districts responding reported offering full or partial online courses” (Glass 1). This is one of the more complex and challenging areas of communications technologies in education because the rapid growth of this phenomenon prompts policy changes, questions of cost, and funding from officials and school boards. In addition to these numerous challenges, there is also the issue of the Internet as a distraction to students. While some websites can be filtered due to age inappropriate content, there is concern from teachers about “competition from Web sites put up by ESPN, CNN, and CBS sports, as well as myriad other pop culture sites that are not on the filter list but distract attention in the classroom” (Pflaum 193). Although the Internet can be a great classroom resource, teachers need to constantly play the role of a monitor for online distractions.

In another, not quite as recent resource, technology is seen as a benefit and described as helping to reinforce critical skills. On the topic of inquiry-based curriculums that deal with gathering, evaluating, analyzing and presenting skills, it has been argued “technological tools exist for each of these skills. Both students and teachers need to be aware of the choices they have so that they effectively use the right tool for the job at hand” (Holcomb 12). Technology in this case also takes learning one step further because it can offer so many supplements to plain text. “Classroom research today takes the text-based references familiar to most adults and augments them with CD-ROMs containing music, speeches, diagrams, animations and film clips” (Holcomb 12). This resource also explains how technologies in the classroom can prompt education reform as far as using it to include and plan goal-setting techniques.

In reviewing the existing literature on the subject of communications technologies in education, it can be seen that there was a gradual shift over time in how exactly technology has been implemented in the classroom. The earlier literature deals with the very basics of technology, defining it and even stating possible impacts or repercussions. In a review of a dated piece of literature, visual presentations are considered for learning. What is completely commonplace in classrooms and during presentations today, once started as a unique concept. Programs such as Microsoft PowerPoint can create “presentations suitable for the classroom by offering a multimedia environment for concepts and ideas important for student understanding” (Tomei 73). Furthermore, multimedia Clip Art, pictures, sounds and movies can be added in to enhance the final product. While communications technologies have certainly come a long way over time, little is currently known about what the most popular forms are today for elementary schools and how teachers implement them within their classrooms and individualized curriculums. This study will fill the gap and create a greater understanding of how education can benefit from improvements in communications technologies.

III. Research Questions

This study investigates how communications technologies in elementary school classrooms are used on a daily basis. The research is specific to rural North Carolina and identifies the various forms of technologies used by the teachers as well. The purpose of this study is to determine whether or not communications technologies are a help or a hindrance to both students and teachers at the elementary school level.

The main questions of this study asked:

RQ1: What forms of technology are used in elementary school classrooms?

RQ2: What is the level of the effectiveness of the technology that is used?

RQ3: What are the obstacles of communications technologies? Has it made teaching/learning more

efficient or more difficult?

RQ4: Where do teachers see the future of technology in classrooms going?

These questions help to shape the main focus of this research and identify how communications technologies are perceived by the practitioners of elementary education. This research is important because technology is infused in every part of our daily life. It is therefore critical that children learn this early on, not just at home, but in the classroom as well. Most children growing up in today's society have access to a great deal of technology in their homes, and if there is a disconnect between home and school, they will fail to be motivated in the classroom. When elementary school teachers use different forms of communications technologies, they are actively engaging their students and creating stimulating work environments.

While the existing research has been conducted on a national level, this specific study is unique because it focuses on a small area of the country at a very specific education level in a state considered to be a research and technology powerhouse. North Carolina is home to several of the nation's top universities and the Research Triangle Park, a globally prominent high-technology research and development center ("Research Triangle Park"). Therefore it is critical to understand how different forms of technology are being implemented in the surrounding area. This study specifically focuses on the implementation, the effectiveness and the future of digital technology in the elementary school classrooms, adjacent to the Research Triangle Park.

IV. Method

In order to answer the proposed research questions, in-depth interviews were conducted with eight different teachers randomly selected from three local elementary schools in the area. Since the answers would be qualitative rather than quantitative in nature, interviews were used to obtain "unique information or interpretation held by the person interviewed" (Stake 95). Initially phone calls were placed to the schools to determine the best way to contact the potential respondents, and emails were then sent to each of them explaining the purpose of the study and asking if they would be willing to participate. The selected teachers were seven females and one male, representing the elementary grades from first through fifth.

All of the respondents were told that the responses would remain anonymous and there would be no identifying factors within the study. As stated in Bruce Berg's book on qualitative research, "Researchers commonly assure subjects that anything discussed between them will be kept in strict confidence" (Berg 65). The researcher reiterated the purpose of the study before the interview and asked if the respondents had any questions before beginning. Typically the interviews lasted between 20-30 minutes and were conducted at a time most convenient for the respondents so they were comfortable and willing to give information. The overall structure was flexible so the researcher could alter or change questions based on information provided by the elementary school teachers.

Ten questions as shown in Appendix were asked to seven of the eight respondents via telephone interviews, and one replied via email response. The first question asked for very basic information regarding number of years teaching and current grade level so a teaching background for the individual could be established. The second question was the one that respondents took the most amount of time to answer, since it asked them to identify any and all types of communications technologies that they use in their classroom. The third question sought to discover the true benefits of using technology in the classroom, and the fourth asked respondents to consider whether or not they felt communications technologies were a real aid to learning, or if they were more of a hassle and poor use of class time. The last question in the first part of the interview asked about the difficulties associated with using technology.

In the second half of the interview, respondents were asked if they see a learning curve with their students for using technology, and if some students fall behind when it is used. Respondents also had to quantify the amount of time they spend on a daily basis using communications technologies in their classroom. Additionally, respondents were asked to discuss the existing monetary support for communications technology from the state or school district. The final two interview questions asked the respondents to think futuristically and describe their ideal classroom with technology, and finally, predict where they see the future of communications technologies evolving for the elementary school classroom. The specific questions are attached at the end of this study.

In total, eight respondents were interviewed for this study due to the amount of resources available.

The general guideline for arriving at this number within the field of qualitative research can depend “on the nature of the topic, on the numbers of different milieus that are considered relevant, and of course, on the resources available” (Bauer and Gaskell 43). The responses started becoming similar by the eighth interview, which can be common with in depth interviews, and at “some point a researcher realizes that no new surprises or insights are forthcoming” and no further research is necessary (Bauer and Gaskell 43). After all of the interviews had taken place the researcher transcribed the notes and analyzed the data for the common themes and key issues related to the questions. The data was then reviewed several times and the results were built from this careful analysis of the data.

V. Findings

Regarding the first research question of determining how technology is used in elementary school classrooms the majority response given by seven out of the eight respondents was that they most often use a SMART board. This technology is an interactive whiteboard that has been designed to positively increase learning. It combines the “simplicity of a whiteboard with the power of a computer” and allows teachers to “deliver dynamic lessons, write notes in digital ink, and save [their] work – all with the simple touch of a finger” (“Smart Tech”). Not only do the SMART boards help to captivate student interest better than a whiteboard and marker can, but the work and the notes never have to be erased and can be saved and accessed for a later lesson.

Another common form of technology mentioned by the respondents were Classroom Performance System (CPS) clickers, a form of instant response technology which teachers can use for assessment purposes. According to the company website, the clickers are “small, handheld devices that allow students to respond to questions asked verbally, on paper or on screen” for which the teacher then has immediate access to (“E Instruction”). The respondents who use the CPS clicker technology in their classrooms found it to be beneficial as a form of assessment or as a review tool for their students.

The third most common answer given by the respondents was the Internet, or use of the respective elementary school’s website. In this case, common uses of the Internet were for interactive education websites, online assessments, and student blogging as well. Some teachers stated that their students email them about homework outside of class, and parents use the school website as a crucial tool for involvement and up-to-date information. In one third grade classroom, the website *Discovery Education* was used as a part of the science unit, a website which specifically has a network for “educators passionate about teaching with digital media” (“Discovery Education”). Another website that attracts technology-savvy educators is called *Study Island*, an online tool that provides standards-based instruction, practice and testing for the End of Grade (EOG) assessments. *Study Island* is specific to each state in the country and it adheres to the North Carolina Standards and Common Core Standards Mastery objectives (“Study Island”).

The final forms of technology listed by the eight respondents included Microsoft PowerPoint, audio or recording devices for reading activities, in some rare instances, iPad applications and an ELMO Document Camera, which is the latest technology to replace overhead projectors. The ELMO technology is used as a digital visual presenter for the students, and replaces the days of making overhead transparencies for the teachers (“Protech Projection”). As one of the more recent changes in classroom technology for teachers, the ELMO model comes equipped with audio and video recording capabilities, simple aspects that were not previously possible with an overhead projector.

The second research question had to do with the success of the technology teachers use in their classrooms. The research indicated that each of the eight respondents felt that without technology, their students would fail to be as interested as they currently are. The majority of responses mentioned the benefits of using communications technologies in the classroom, and all of the respondents agreed that it helps to actively engage their students. For some teachers, they stated that because technology is such a large part of daily life and many children have access to it at home, a classroom without any technology would be completely unappealing.

Students become immediately more excited when technology is introduced into their education. Communications technologies in the classroom can provide a better hands-on, or even a better visual experience for students than what they would take away from just reading a textbook. Through using these mediums of technology, their interest is piqued and they can develop a stronger understanding of key ideas and concepts.

Furthermore having access to technology for the elementary school classroom helps to keep lesson plans from becoming boring or stale, and increases overall student involvement and willingness to participate.

The third research question mainly focused on the obstacles associated with using communications technologies. While technology is an advantage for student engagement and participation, it is not a resource completely void of challenges. In answering this question, both the students and the teachers must be considered. For the teachers, they found communications technologies to be an obstacle when there was an error or glitch with technology, whether this be a frozen program, blocked website, or just a general malfunction. Some respondents also mentioned that financial constraints are often an obstacle because then there is either a lack of technology, or the existing technology cannot be updated.

The respondents also answered that communications technologies can be challenging for their students to use. While this answer was more common for the lower elementary grades, it can also be an issue for the upper grade levels when a new student enters the class and must quickly catch up on the technology being used. Despite these difficulties faced by both the students and the teachers, overall, respondents agreed they felt communications technologies have helped to make learning in the classroom more efficient. The majority of the respondents also felt that time allowance for technology can be difficult, especially with system glitches which can take away valuable academic time during the day. As communications technologies are being used more frequently in the classroom, the respondents agreed that even with certain obstacles, it can be a true aid to learning.

Finally, the last research question addressed the future of technology in elementary school classrooms. Respondents were each asked at the end of the interview to design an ideal classroom with technology and predict where they see the future of technology for education evolving. All of the respondents wished they had more technology available to them for their respective classrooms. Each respondent gave the same answer in predicting the future of this technology, and that is a movement towards more individualized education. Whether it is an iPad or a laptop for every child, each respondent saw the future of technology in classrooms to be individual and personal technology for every student. Not only would this help to captivate attention from students, it would also allow teachers to differentiate instruction and tailor assignments to individual students' interests and ability level.

As another prediction for the future of this technology, respondents identified a form of paperless assignments and assessments. In some elementary schools, the end of grade (EOG) testing has already been moved to an online format. In the future, communications technologies could be used for having assignments submitted electronically in an effort to go paperless. The last prediction respondents offered dealt with one specific form of communications technology, the peer-to-peer video chat capabilities of Skype. While some respondents saw this as a great way to have guest speakers talk to their class, or have online pen pals, one respondent stated that Skype had the ability to completely alter parent and student communication for the future, strongly implying that Skype could revolutionize the future of parent/teacher conferences and peer-to-peer communication within education.

VI. Discussion

One of the main themes that emerged from the research was the idea that technology and teaching have become seamlessly woven together. As both teaching styles and school systems continue to evolve, so too does the learning environment for students. Since technology is such a large part of daily life, students have become accustomed to not only using it at home, but in the classroom as well. They quickly become bored with a typical textbook reading lesson and find school more exciting when technology is put into their hands to manipulate and learn from. As stated by the respondents, communications technology is beneficial because it engages students and provides them with a hands-on learning experience.

With the use of technology in elementary schools becoming widespread, children are being socialized to learn with the latest innovations available. Teachers are already employing various forms of communications technologies in their classroom to pique the interests of their students and compete with video games and iPod applications. Learning has now become more of a game more than ever before as children use electronic programs, and virtual applications instead of a pencil and composition paper. As teachers are integrating these electronic approaches in their classrooms, their students are rapidly developing high ex-

expectations for technology in the learning process. A direct cause and effect relationship then occurs from the elementary age; as students grow accustomed to using technology, their expectations of school for the rest of their educational career are thus molded and shaped.

The obstacles and challenges associated with using communications technologies was another key theme made evident by the research findings. While this current new generation of teachers does not view the unpredictability of technology as a major issue that would cause them to stop using it in their teaching, there are other associated issues that are important to address. A main concern expressed by several teachers was a lack of resources or funding for technology. In some classrooms there can be brand new laptops for the students to use, but there will only be 10 for a class with 20 students. With these situations where there are limited resources, both teachers and students face constraints for maximizing the effectiveness of the technology. These ever changing forms of communications technologies can be very expensive and this is difficult for budgeting purposes since the money allocated for such resources varies by school district. Some schools can be awarded money based on growth scores at the end of the year but this a particularly tricky cycle if the technology is not up to date because it then only further perpetuates a lack of growth and failure to obtain funding for technological improvement.

Another obstacle that teachers face when working with assorted forms of communications technologies are the unpredictable challenges in the classroom such as student capabilities. Technology is such a powerful tool to have access to for teaching, but many activities that involve interactive technology can be difficult for a blind or deaf student. The most popular technologies used by teachers all have a visual element, which is why it is so engaging for students, but with a blind child in the classroom, the teacher must rethink using technology for the lesson. While some forms of communications technologies are fortunately compatible with Braille, not all of them are designed this way and can create an unforeseen obstacle for many teachers.

Individualized education was another prevalent theme that came through in many of the discussions. Teachers indicated that given the speed of technology advancements and the individualized development of software, the next big step is technology being able to adapt to individuals' different speeds of learning. Currently teachers are using a wide range of communications technologies to teach broadly to their students on a very general level. With technology rapidly evolving, it is not unreasonable to predict that in the near future, it will have the capability to become more personalized and specific to different needs.

Many of the respondents targeted this area and noted the need for improvement within their own classrooms. They hoped that in the future, technology would in fact become more personal and one day, each child would be able to have a personal laptop or iPad to use in the classroom. This would not only facilitate instruction for the teacher but it would also revolutionize the efficiency of assignments and make grading easier if students were to submit work directly from their laptops. In the future, communications technologies will be put into the hands every student so that instruction can be differentiated and assignments could be developed based on students' interests and ability level allowing them to be more engaged in learning than ever before.

VII. Conclusion

In the 21st century, technology in the elementary school classroom has not just become commonplace, but rather, it has become a staple. More than ever before, teachers are relying upon the latest technologies to actively engage their students in new lessons. Technology is now at the forefront of education and its role in the classroom has evolved from a mere distracting gadget to an integral teaching tool vital for effectively conveying information and knowledge. This study showed the impact and effectiveness that these technologies can have at the elementary school level. Popular technologies such as SMART boards, CPS clicker systems and interactive education websites form the basis of lesson planning and learning activities during the school day. These communications technologies help to actively engage students, drive participation, and are a vital part of both teaching and learning in the classroom.

There were some limitations that constrained this study, including the non random sample. While teachers were represented from every grade level, they were from only three schools in the surrounding area, and only one male teacher was represented. In addition, responses to the questions varied depending on the income levels for the school district. In some cases, certain schools had more money in their budget to put towards technology whereas others did not. This factor varied responses on how familiar respondents were

with certain forms of technology or what they had experience with using for their students.

Because of certain limitations to this study, there remains ample room for future research. This was a very specific study on a small portion of the education population and could be further expanded in the future to include other regions, or gather information from a statewide study. Additionally, since technology will continue to improve and evolve, there is always more current research to be done and the latest forms of innovation will need to be identified as well.

The topic of communications technologies in elementary education has proven to be an ever changing and dynamic. With so many different forms of interactive technology currently available to teachers, the possibilities for transforming education are endless. Children are learning to use technology earlier than ever before both at home and at school, and it is quickly beginning to shape how school curriculums are designed. Although working with technology can oftentimes be unpredictable, the advantages far outweigh the disadvantages in terms of educational benefit for the students. As a whole communications technologies in elementary school classrooms have proven to be a true aid to learning by actively engaging the students and encouraging participation.

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Appendix

Interview Questions

1. How long have you been teaching and what grade do you currently teach?
 2. What types of communications technologies do you use in your classroom?
 3. What are the benefits of using communications technologies?
 4. Would you consider communications technologies to be a real aid to learning?
 5. What do you find difficult about using technology?
 6. Is there a learning curve to it, are some students behind in it?
 7. How much of your daily classroom routine involves using communications technologies?
 8. Is there any support from the state, monetary or otherwise for communications in the classroom?
 9. What is your ideal vision of a perfect classroom with technology?
 10. Where do you see technology in the classroom evolving, what will it be like in the future for both students and teachers?
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