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Effects of Increased Use of Technology on Elementary School Students in the Classroom

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Abstract

Technology has become a big part of the education system. Students use technology, such as tablets in their classrooms as early as preschool. There is much debate on whether or not the use of technology is needed in the elementary grades. This capstone closely examines how students are affected by the increased use of technology in the classrooms. In addition, the project explores how the intended technology affects students' development, social skills, and learning. Though technology has become an effective tool for students to use in our classrooms, it should be limited for young children, and should only be used for educational purposes. The findings of this capstone indicate that technology is an effective learning tool for teachers to incorporate into their pedagogies to engage students in their learning.

Effects of Increased Use of Technology on K-2 Students in the Classroom

Introduction and Background

I accumulated my in-service learning hours throughout college in a few different k-2 elementary school classrooms. I was always really intrigued by the use of technology in the classrooms because throughout my elementary school educational journey the use of technology was fairly sparse. In my elementary school, we only used computers individually once a week for 30-45 minutes starting in 2nd or 3rd grade for lessons in typing and on how to use a computer. As I observed classrooms for my in-service learning hours, each day students were required to split into groups. Two or three groups worked individually on a chrome book or tablet with headphones plugged in. While most students were plugged away on devices, the teachers worked with one group during that time on a separate activity. Students would rotate groups by day to work with the teacher. More often than not, as I observed these classrooms and students doing the activities on their devices, a majority of students were not on task. Since students have their headphones on during this time it is hard to see what they are doing unless someone is actively walking around helping them. I observed students stray away to free time games or even some would just press any button to make the lesson complete. In kindergarten students are just learning to read which makes it challenging for students to navigate devices at this age.

I knew I wanted to base my capstone project on how students at the younger grade level are affected by the increased use of technology. I wanted to know if this was affecting brain development or if students were learning from the time they spent on their devices that I

witnessed in my service learning. After meeting with Dr. Paoze Thao, we narrowed my ideas down and came up with my primary and secondary research questions. My primary research question is “what are the Effects of Increased Use of Technology on K-2 Students in the Classroom?” Through our meeting, I was able to narrow down my field of research. I began my research by extensively searching through peer-reviewed articles on this topic. I was able to find information and detailed timelines on the life history of technology in our education system. There was a significant amount of research on how technology is affecting classroom learning. Through the CSUMB library database, I retrieved journals with information on teachers' perceptions of technology in their classrooms, students learning with technology, and the history of technology in education. Through internet research, I found information on screen time recommendations through different organizations, information on programs used in classrooms, etc.

Technology is advancing every day. We all use some form of technology in our day-to-day lives. Whether it is searching for something on a computer, talking on our phones, or watching tv, we use technological devices all the time. Technology was first seen as a novelty. It was rare to come by. Now, it is changing the way we live in many aspects, including the education system. Technology was initially introduced into the education system as preparation to succeed in a world where the advancements of technology were rapidly increasing. “The Vocational Education Act in 1963 funded technology use in schools. As a result, students learned programming languages like BASIC, and PCs gradually made their way into some classrooms” (Christensen, 2019). Over the years, technology has become much more accessible to classrooms at a younger age and has been implemented into many school curriculums as early as kindergarten.

To prepare students to thrive in the digital age, the United States has committed to providing students with the skills and resources they will need to succeed in technologically advancing life (CEO Forum, 2001). It has created opportunities and challenges for the education system. With the increase in technology, students are using smart devices to assist their learning beginning in kindergarten sometimes even earlier. This means that these students will be using technology for their entire educational journey. In 2018, California adopted its first state standards for computer science. “The standards start in kindergarten with the expectation that by the end of 2nd grade they will not only learn to use common computer hardware and software but will be able to create simple computer programs and debug errors in an algorithm” (Lambert, 2018).

Many school districts have different budgets that affect how much technology each school has access to. [Eighty-five percent (85%) of U.S. schools have multimedia computers, and the average ratio of students to computers is 24 to 1, nearly five times the ratio recommended by the U.S. Department of Education. The ratio ranges from about 9 to 1 in Florida to about 63 to 1 in Louisiana. Students attending poor and high-minority schools have less access than students attending other schools” (Cuban, 2001, p3).

Given the state standards for computer science on the increased use of technology for K-2 students in the classroom, this senior capstone will seek the answer to the primary research question, “How does an increased use of technology affect K-2 Students in the classroom? Several secondary or related research questions are:

1. What is technology? What kinds of technology are being used for K-2 students? When has technology been used in K-2 students in the classroom?

2. What does the research say about the effects of increased use of technology for K-2 students?
3. What do the state standards say about how technology is mandated to be included in the elementary school curriculum? What about the common cores?
4. How do in-service teachers implement the use of technology during the allotted time to enhance teaching and learning K-2 students? And to what extent, does it affect students academically?
5. Are the resources available for in-service teachers with regard to technology to enhance teaching and learning to K-2 students?
6. What will the future hold for technology to be utilized with K-2 students in the classroom?

Literature Review

After conducting an extensive literature review on the effects of increased use of technology on elementary school students in the classroom, this section will discuss the intended use of technology, screen time recommendations, negative impacts, and effects on learning and brain development.

Some teachers report that devices don't begin to be implemented until after elementary school, while other elementary school teachers share that they have a set of computers that students share between multiple other classrooms. However, since the Covid-19 pandemic, a third-grade teacher from the Arlington School district shares, "before COVID, her class had to share devices with up to three other classrooms in-school, but once the pandemic hit and students were learning remotely, that all changed. Now every student in her class/school has a one-to-one

Chromebook" (Johnson, 2021). Schools that have tighter budgets have implemented something called blended learning. "In a kindergarten class, for example, some students work on a small-group vocabulary lesson while other students work on a lesson on computers in another corner of the room. After some time, the two groups swap places. The idea is to keep the feel of a small class without the cost of additional staff (Abramson, 2011). Blended learning is consistent with the learning I observed during my in-service learning hours where one group of students worked with the teacher while the rest did work independently on their Chromebooks.

There is research that shows how the increased use of technology in classrooms affects children's development in multiple ways including; social-emotional, cognitive, language, and even literacy skills. Increased use of technology at a young age has also shown effects on attention span and focus (Novak, 2021). There are both advantages and disadvantages to having technology readily at hand in the classroom. Technology is used as a tool to improve the learning process. Technology will continue to advance and be used more frequently in our daily lives. It is not to be argued that technology should be taken out of classrooms completely but that we find ways to use time with technology more effectively in elementary school classrooms because of the effects it has on someone at a younger age.

When I have previously done student teaching hours in a few different kindergarten classrooms, I observed that there were designated times and lessons that required students to spend time isolated on laptops or tablets. Mostly, students were not supervised which I noticed led to students straying away to play games, not knowing what to do, and just pressing anywhere on the screen. In a third-grade class in Arlington, VA students were given the option for 'free' time and instead of playing with friends or doing activities, the students all played games on their tablets (Truong, 2020). A volunteer parent that was in the classroom described

them as being “zoned out like zombies” (Truong, 2020). This initially piqued my interest in research because I want to find out how students might be affected by this increased time with technology and how the time can be used more efficiently. As a future educator, this is important to me because it will allow me to find the information needed to effectively use technology in my classroom.

As it is essential to look into the quantity of technology used in their classrooms, there is no denying that the use will continue to increase along with the advancements in our digital age. The quantitative use of technology should be dependent on at what age the use will not negatively affect a student's development. We must look into the quality of the technology used in classrooms. Recent research indicates that even when technology is used at a certain frequency, not all technologies are found to be beneficial, constructive, or helpful (Lei, & Zhao, 2007).

***Intended use of technology in the classroom*.** Technology is increasingly recognized as an integral learning tool for promoting the social, linguistic, and cognitive development of young children (Gimbert & Cristol, 2004; Information Society for Technology in Education [ISTE], 2007; National Association for the Education of Young Children [NAEYC], 1996). The most common type of technology that elementary school students use while learning is computer tablets or Chromebooks. Tablets sometimes referred to as tablet computers, feature the integration of several systems like GPS and built-in cameras in each device. They also typically are touchscreen with no built-in keyboard or mouse (Hennesy, 2015). When used appropriately and effectively, this kind of technology can create an excellent learning environment for students. In 2001, the no child left behind act recommended that technology should be integrated into the educational system with the intention of students improving their digital literacy (Tran,

2018). Digital literacy is the ability to use technological tools and media to find, create and communicate information (Tran, 2018).

Technology can play a great role in play-based learning. The idea of play-based learning is for students to make sense of the world around them, learning from mistakes and trial and error (UBC, 2019). “Students in a primary school in Australia utilized iPads to play literacy-themed games and to create their own audiovisual alphabet books” (Lynch & Redpath, 2014). while students in a US kindergarten classroom used iPads to engage in creative storytelling and share these stories with their families” (UBC, 2019). One teacher shares that many of the different online tools that they like to use during their class time to assist play-based learning. These include the Scratch Jr Coding app and the Ozobot robot. In a study of 3-6-year-olds that use computers as a learning tool have been shown to have greater gains in intelligence, structural knowledge, problem-solving, and language skills compared with those who did not implement technology into their learning (Couse, L. J., & Chen, D. W., 2010).

In a study done that surveyed 310 students, 59% of students reported that the use of technology in their classrooms helped improve their engagement in class. ((Carstens , Mallen, Bataineh, & Al-Bataineh, 2021). Preschool students are using computers for projects like drawing self-portraits. It was reported that the student's engagement and interest in drawing their portraits increased when using computers (Couse, L. J., & Chen, D. W. (2010). They found that students' drawings were more detailed and looked more similar to the students when completed on the computer (Couse, L. J., & Chen, D. W. 2010). This study was conducted using mouse-driven programs for drawing. In addition, it explains that the drawings turned out to be better because when using a computer, students are required to use different fine motor skills than when drawing with a pencil, pen, or marker and paper. It was also suggested that “for some

children, the computer could be a more interesting tool and therefore might be able to maintain their interest longer and lead to the inclusion of more details in their drawings" (Couse, L. J., & Chen, D. W. 2010). Chromebooks provide activities like sound recognition and give access to digital books with the right literacy software (Johnson, 2021). Touchscreen chrome books with programs like these can be extremely engaging for students before they acquire literacy, navigation, or keyboard skills.

The international society for the technology of education provides a set of standards to ensure that learning is a student-driven process. Through these standards, students are expected to become:

> (1) an empowered learner, Students leverage technology to take an active role in choosing, achieving, and demonstrating competency in their learning goals, informed by the learning sciences. (2) digital citizens, Students recognize the rights, responsibilities, and opportunities of living, learning, and working in an interconnected digital world, and they act and model in ways that are safe, legal and ethical. (3) a knowledge constructor, Students critically curate a variety of resources using digital tools to construct knowledge, produce creative artifacts and make meaningful learning experiences for themselves and others. (4) an innovative designer, Students use a variety of technologies within a design process to identify and solve problems by creating new, useful, or imaginative solutions. (5) computational thinkers, Students develop and employ strategies for understanding and solving problems in ways that leverage the power of technological methods to develop and test solutions. (6) a creative communicator, Students communicate clearly and express themselves creatively for a variety of purposes using the platforms, tools, styles, formats, and digital media appropriate to their goals. (7) a global communicator, Students use digital tools to broaden their perspectives and enrich their learning by collaborating with others and working effectively in teams locally and globally (ISTE, 2022).

In 2013, Scholastic released a program called I-read which 125,000 k-2 students began to use in their classes. (Frey, 2015) I- read is beneficial for students who are English learners or students with dyslexia because of the reliance on visuals that i-read provides. (Frey, 2015). Scholastic then did an assessment that showed that "[Ninety] 90 percent of 1st-graders who

were below average in reading reached grade level or above after finishing 100 topics in I-Read. Each topic focuses on a specific task, such as recognizing the uppercase letters A and B. And 35 percent who were far below average – which included 2nd-graders reading at kindergarten level – reached grade level or above after 100 sessions" (Frey, 2015). Another program called ST math was found to make a significant difference in California Standard math test scores (Frey, 2015). This is true for students across California in grade 2 who were in schools that fully implemented ST Math compared to similar students who were not (Frey, 2015).

Screen time recommendations. Many associations that are attentive to children's health, such as governments and medical societies setting guideline recommendations for the amount of screen time different age groups should be exposed to. They do this as a precaution for the negative effects that overexposure to screen time can have at certain ages. The American Academy of Pediatrics, whose mission is to ensure the health and well-being of all children, recommends that for children 2-5 screen time should be limited to 1 hour per weekday (AACAP, 2020). That includes leisure time and educational time combined. Many other countries also have standard guidelines and recommendations for screen use limits. (Gottschalk) A study done by the Organization for Economic Co-operation and Development (2019) compares screen time recommendations in different countries.

Table 1.1. Screen time recommendations in different countries

Country/institution	Infants/toddlers	Early childhood	School-age - adolescence	Other recommendations
AAP (United States) (AAP, 2016[8])	None, except video chatting (under 18 months); Only high quality programming (18-24 months)	1 hour of high quality programming, co-view	Consistent limits on time and type	Turn off screens when not in use; ensure screen time doesn't displace other behaviours essential for health
Canada Canadian Society for Exercise Physiology (CSEP, 2017[9]) Canadian Paediatric Society (Canadian Paediatric Society, 2017[10])	None	<1 hour	<2 hours (CSEP only)	Limited sitting for extended periods (CSEP); Adults model healthy screen use (CPS)
Australian Government Department of Health (Australian Government Department of Health, 2017[11])	None (under 12 months); <1 hour (12-24 months)	<1 hour	<2 hours (entertainment)	
New Zealand Ministry of Health (Ministry of Health, 2017[12])	None	<1 hour	<2 hours (recreational)	Adapted from CSEP guidelines
German Federal Ministry of Health (Rütten and Pfeifer, 2016[13])	None	30 minutes	1 hour (primary school) – 2 hours (adolescents)	Avoid as much as possible; avoid screen time completely for children under 2 including background television

Source (OECD Gottschalk, 2019) (table 1.1)

> The current guidelines from the AAP have been updated from previous ones that recommended no screen time for children under the age of 2 (American Academy of Pediatrics, 2001[15]), and were criticized by many researchers due to lack of empirical support for this zero-tolerance approach (Courage and Howe, 2010[16]). However, this guideline persists in many contexts, with some more restrictive guidelines suggesting no screen time for children until the age of 3 [e.g. the carnet de santé released by the French Ministry of Health and Solidarity suggests not even placing a child before the age of 3 in the same room where a television is on (Ministère des Solidarités et de la Santé, 2018[17])]. One of the motivations for this zero-tolerance approach, as put forth by the AAP for example, was that screen time was taking time away from participation in other less sedentary or more productive activities (Foster and Watkins, 2010[18]) ((OECD Gottschalk, 2019)).

Screen Time guidelines are important to ensure that screen time at a young age is being used effectively. It is essential to verify that screen time is used in ways that build creativity and connection.

Negative impact and Brain Development. There is much debate on technology having negative effects on children's development. Common sense media reported that in 2021, on average children from ages 5-8 spend about 3 hours a day at home on technological devices (screen time). Brain plasticity is the brain's ability to change as a result of one's experience (Gottschalk, 2019). The brain is most vulnerable during childhood and adolescence. Some challenges of technology in the classroom in relation to development are that the brains of the youth are not yet fully primed for self-regulation, attention, switching (cognitive flexibility), and inhibition control (Letrick, 2016) There are increased rates of psychological concerns due to the overuse of technology, such as ADHD, sensory processing issues, learning disorders, anxiety, and depression (Bell, 2019). Brain scans show that 5 hours of use a day show neurological pruning in the executive functioning tracks of the brain (Bell, 2019). "With the increased use of technology, children might not be adequately developing their social skills. This can lead to more children being socially awkward, withdrawn, shy, or intimidated by social situations" (IyanKym, 2022). Screen use releases dopamine in the brain. Dopamine is the hormone responsible for driving and reinforcing habits, so the dopamine released from screens results in addiction to screen use.

The more time spent on screens takes away from time to develop social and emotional skills. A study done by the Pew Internet project that surveyed around 2,500 teachers found that 87% of K-12 teachers believe that digital technologies are causing students to be easily distracted with short attention spans. It also reported that Four-fifths of students aged 8 – 18 multitask while in class while using digital media (Britannica, 2019). A Canadian survey found that 99% of students examined found that technology was the number one distraction in their classrooms (Lettreick, 2016). "These distractions can show up as hyper focus: difficulty staying attuned to

the teacher's directives due to the inability to pull away from the screen, cognitive overload, and delay when completing tasks" (Lettreick, 2016). However, other studies report that tablets cause distraction because they add an additional layer of complexity compared with traditional means of completing similar tasks. (Culén & Gasparini, 2012). Complexity due to technical problems with tablets and applications used. In addition, adding entertaining features to increase interest in a lesson may ultimately distract learners and lead to poorer learning outcomes (Iserbyt et al., 2014). Teachers report that the hardest part of integrating technology into their k-2 classrooms is teaching students how to actually use the technology. "The biggest challenge for us is teaching them how to sit at the computer, how to use the mouse, how to enter their password" (Ambranson, 2011). Barbara Anderson, a kindergarten teacher with that I conducted an interview shares,

> I have been teaching for 35 years and most of it was without technology! While I think it is important for children to learn to use technology and feel comfortable with it, I am not all for it, especially in Kindergarten. I do not think there is any better way to teach a child than human contact! I want a child to be actively engaged in learning! It becomes too much stimulation for kids and not enough "hands-on" time! A child is missing out on oral language skills and communication skills. What is more important than an adult interacting and reading a book to a child!" (Anderson, personal communication, 15 November 2022).

First-grade teacher, Geralyn Budenholzer who also teaches at University Park Elementary shares that, she personally thinks the time spent on technology in her 1st-grade classroom is not efficient. She shares that she would rather have those minutes back for more instruction.

> Students enter school with far less sound knowledge and some have never had a book read to them at home. Not only are they on technology too much, but so are their adults. The ability to focus and pay attention in class has diminished so much since I started teaching" (Budenholzer, personal communication, 11 November 2022).

A recent study (Rich, 2019) showed that screen time impacts language development in children. Children who spend more time on a screen instead of talking suffered in their language development because the lack of face-to-face interaction is drastically different than what a screen can offer (Rich, 2019).

Effects on learning. In a review of 23 different studies, it was found that 16 out of 23 studies had positive results when students used different types of technology in their classrooms (Hennesy, 2015). In a US-based study, students who used a math program for fraction learning over the span of one week showed a 10%-15% improvement in their test scores. When analyzing student performance, it was found that students who had experiences with a tablet in their classroom showed higher levels of connectivity and collaboration, and also participation (Hennessy, 2015). On the other hand, one class spent 45-60 mins 3 times a week on learning reading comprehension on tablets. Over the course of several weeks, their learning showed negative results (Hennesy, 2015).

Dimitri Christakis, Director of the Center for Child Health, Behavior, and Development in Seattle shares that technology is much more rewarding because it is so action-packed and fast-paced (Lettrick, 2016). This leads to increased risks of attention span issues. It can be hard to get students engaged in non-electronic activities, such as playing with toys to foster imagination and creativity, exploring outdoors, and playing with other children to develop appropriate social skills after they have been introduced to electronic learning activities. (Cross, 2021). Kindergarten teacher, Anderson, shares with us that she has noticed significant changes in students' learning since technology has been implemented in her classroom.

> The lack of human contact has taken a toll! Children need social-emotional time and social interaction with peers. I have noticed students are less attentive and have difficulty concentrating and staying on tasks. They need instant gratification and can

> be less imaginative and creative. Another big difference I see is children beginning Kindergarten with a lack of fine motor skills! No experience holding a pencil, coloring, cutting, etc. (Anderson, personal communication, 15 November 2022).

Students' decrease in attention span due to constant multi-tasking may lead to cognitive or information overload. Cognitive overload is defined as “a condition resulting from an excessive amount of information beyond an individual’s capacity” (Shrivastav & Hiltz, 2013, p. 2). Overuse of highly stimulating technologies has the potential to overstimulate and max out the capacity of the developing brain students. Cognitive overload significantly impacts knowledge construction and puts students at risk of information anxiety which further inhibits learning (Shrivastav & Hiltz, 2013). A study in 2010 found that when instructional information was presented to students in a way with complex tasks such as reading online articles or online notebooks, led to an increase in cognitive load. Whereas when the instructional information was presented in the form of interactive activities like a discussion with peers led students to retain the information (Chang & Yang, 2010). Dr. Dimitri Christakis stated, “I observe that many of the children I see suffer from sensory overload, lack of restorative sleep, and a hyper-aroused nervous system, regardless of diagnosis—what I call electronic screen syndrome. These children are impulsive, moody, and can’t pay attention” (Becker, 2015).

Budenholzer also shares a similar experience with technology use in her classroom. When asked what learning differences they have experienced in their classroom Budenholzer shares, “students use technology so pervasively at home. They are less able to attend to instruction and stick to things because they aren’t getting all the bright lights and sounds and feedback for every little thing they do like the technology we use gives them” (Budenholzer, personal communication, 15 November 2022).

Anderson's and Budenoldzer's classrooms are required to spend 40 minutes a day on two different programs, Lexi (language arts program) and Dreambox (math). They spend 20 minutes each on these programs. Twenty (20) minutes of Lexia, a literacy program is done in class during small groups, and Twenty (20) minutes of dream box, a math program is done at home for homework every weekday. Both Budenholdzer and Andersen believe the time that students are required to spend on these activities is too much. This would require students to spend 3 and a half hours on educational programs a week. The time required to spend on technological devices for these classrooms is over half of the recommended time per day as seen in chart 1.1. This does not include any screen time children are using on their own time.

The Kaiser foundation shares that children are using four to five of the recommended amount of technology and believe it to have serious, life-threatening qualities (Larson, 2022). Waldorf schools, which have a different approach to learning as opposed to the traditional school system don't introduce technology to their students until middle school. Waldorf schools prioritize student/teacher engagement (Larson, 2022). It is not until middle school that students begin to engage in internet research and computer science. Even in highschool, there are no smart boards or i- pads in Waldorf classrooms, out of the belief that these devices can create distraction and dependency, and can take away from students' ability to develop the capacities to calculate, analyze and connect with others (Larson, 2022) Many worries that students who are taught with this type of approach won't succeed in their future careers but the Waldorf schools show that students are still successful and have no issues picking up on how to use technology when it is introduced at a later time in life. Many of their students have become successful in the world of technology (Larson, 2022).

Is indicated by many researchers that the increased use of technology has many effects on elementary school students. While there are some cases where technology is shown to effectively increase students' classroom engagement and learning, there are many results that show the increased use of technology has negative learning effects on the adolescent brain, leading to an increase in many learning disorders. There is a large discrepancy in results being positive or negative in regard to learning outcomes which seems to be a result of each teacher's own pedagogies and perceptions of using technology in their classrooms. Because technology is an everlasting factor in the education system, it is important to take a look into each teacher's own views on using technology to understand the discrepancy in results.

Methods and procedures

In order to seek the answers to the research questions posed in the Introduction and Background section, review of extensive literature review on the effects of increased use of technology on elementary school students in the classroom, some interviews with teachers (See Appendix A for Interview Questions to Teachers) along with school observations were done. I knew I wanted to interview Mrs. Andersen (See Appendix 1 Interview with Teacher Barbara Anderson) as well as other teachers (See Appendix 2 Interview with 1st Grade Teacher Budenholzder; See Appendix 3 Interview with 2nd Grade Teacher Monica Villanueva, and See Appendix 4 Interview with K Teacher Rocio Ruvalcaba) that I did service learning with to understand their perceptions and pedagogies of using technology in their classrooms. All of the interviews in this research project were conducted via email communication. I hit a few roadblocks trying to contact teachers for this research. Barbara Andersen was the first teacher I reached out to and was able to get responses from. From there she put me in contact with 3 other

teachers grades k-2 to conduct interviews with. 1st-grade teacher: Geralyn Budenholzder, Kindergarten teacher: Rocio Ruvalcaba, and 2nd-grade teacher: Monica Villanueva.

I developed my interview questions to get a better understanding of how each teacher integrates the use of technology in their classroom. (Interview questions and teachers' answers are located in appendices 1-4.) I first acquired background knowledge from each teacher. Name, Grade taught, and asked questions like; *Are students required to use technology in your classroom? How often? How is this regulated? What subjects are taught through technology?* To get an understanding of what technology use is required by students and teachers at University Park Elementary when using technology in their classrooms. Then, I further developed questions to understand each teacher's thoughts on said technology use; *Do you think time spent on devices is efficient for students' learning? (or do you believe there are better methods?) If so, what are they? Have you noticed any differences in learning from when students did not use technology?* These questions were to help me seek the answers to my primary and secondary research questions. In addition to questions to understand each teacher's experience in their classrooms with technology. *Have you seen the increased use of technology affect students' literacy skills? How does your classroom benefit from technology?* Lastly, I asked each teacher *What is your pedagogy and perception of using technology in your classrooms?* To understand how each teacher is implementing technology in their classrooms.

Results, Findings, and Discussion

The results of the interviews with teachers at University Park Elementary school showed that all classrooms required students to use technology in their classrooms. Students are required to spend forty 40 minutes a day, independently on educational programs using technology. Fifty percent [50%] of teachers found technology to be useful in their classrooms while the other fifty

percent [50%] would rather have the required time back for hands-on and face-to-face instruction. It was found that teachers have a hard time rewarding students with instant gratification the way that technology does. Multiple teachers reported that they find students to be easily distracted and have a loss of attention span when using technology. All teachers agreed that it was important for students to become familiar with technology however it was suggested that grades Kindergarten, 1st, and 2nd grade may be too young to be introduced to technology.

Based on research, technology can be a successful tool in elementary school learning as long as teachers are equipped with the knowledge and skills to give students engaging and effective content from technology. Through an extensive review of literature, in-service learning hours, and interviews with teachers at University Park Elementary, the following information was found;

1. *What is technology? What kinds of technology are being used for K-2 students? When has technology been used in K-2 students in the classroom?* For the purpose of this study, when referring to technology, it refers to electronic devices students might use independently in their classrooms such as Chromebooks, i-pads, or tablets. They also typically are touchscreen with no built-in keyboard or mouse (Hennesy, 2015). Technology is used in classrooms to enhance students learning as early as kindergarten. Technology is increasingly recognized as an integral learning tool for promoting the social, linguistic, and cognitive development of young children (Gimbert & Cristol, 2004) Students use online programs and applications to practice mathematics and language arts (Frey, 2015).
2. *What does the research say about the effects of increased use of technology for K-2 students?* The increased use of technology in classrooms affects students' social

development because screen use can become addictive due to the release of dopamine it creates. In addition, it affects cognitive development because through adolescence, our brains are constantly changing as a result of our environments and there is a correlation between the overuse of technology and increased rates of learning disorders, ADHD, anxiety, and depression (Bell, 2019, Britannica, 2019, Gottschalk, 2019, Letrick, 2016). There was a wide variety of results on whether or not students showed positive or negative results in learning literacy and mathematics (Frey, 2015, Johnson, 2021, Couse, L. J., & Chen, D. W. 2010). As stated above, 2 of the 4 teachers interviewed found the required literacy and math programs to be useful while the other 2 would rather have the time back for hands-on learning. Within the literature review, there were studies that showed significant positive results with programs like ST math and I-read scores (Frey, 2015).

3. *What do the state standards say about how technology is mandated to be included in the elementary school curriculum? What about the common cores?* Technology is available to schools depending on each district. Each school district gains access to funds for technology through grants, from federal agencies, state agencies, or foundations (CEO Forum, 2001, Christensen, 2019, Lambert, 2018). Students at University Park Elementary School have 1 Chromebook per student as well as headphones. This is common for most schools since moving to remote learning during the covid pandemic (Johnson, 2021). Students are required by the district to spend 40 minutes a day independently on their Chromebooks, 20 on a literacy program (Lexia), and 20 on a mathematics program (Dreambox) (Survey respondent 1, Personal Communication, 15 November 2022). Teachers have access to view what each student goes through on their Chromebooks and

there are many blocked and restricted activities. In general, there are corporations and institutions that put out guidelines that each district can also take upon themselves to follow.

4. *How do in-service teachers implement the use of technology during the allotted time to enhance teaching and learning K-2 students? And to what extent, does it affect students academically?* Besides what is required by the district, teachers at University Park Elementary use technology in their classrooms to share educational videos and make engaging presentations for their students. Teachers also use Seesaw which is a digital platform where teachers can create their own learning activities and assignments for students. These assignments can be listening to stories, worksheets, drawings, and videos.
5. *Are the resources available for in-service teachers with regard to technology to enhance teaching and learning to K-2 students?* - 94% of public schools surveyed reported they are providing digital devices, such as laptops or tablets, to students who need them for the 2022–23 school year and just 4% of respondents said they were not providing digital devices this school year. (Kuykendall, 2022) However, many teachers are not being prepared with the proper training to use technology effectively in their classrooms. Today's teachers are being prepared through college-level courses to use technology. Many teachers are having to adapt to the advancements in technology as they come which is causing a lack of training. U.S. schools regularly pay for tools but not for educator training, schools might spend $125,000 for a license, but decline the $25,000 training package offered along with it. (Kologrivaya, 2022)
6. *What will the future hold for technology to be utilized with K-2 students in the classroom?* Technology will continue to be prevalent in all future classrooms. There will

always be advances in technology so it is important that all teachers are constantly updated and trained on these new adaptations. Research proves that technology can increase students learning when used effectively but because it is shown to have adverse effects on the adolescent brain more research into what age is most appropriate for students to begin using technology in their classrooms should be conducted.

A recurring barrier to technology integration was the teachers' level of technology skills. An ICT literature test that was sent out to students and teachers to test “cognitive problem solving and critical thinking skills associated with using technology to handle information” reported that the teachers were reluctant to use technology in their classrooms because they lacked the skills to use the technology (Couse & Chen, 2010). Compared to the younger generation of teachers, there is still a generation of teachers who grew up without any use of technology. This makes it harder for them to adapt to new requirements of technology use in their classrooms.

There is a large gap of teachers who did not get the correct training to provide correct engagement with learning with technology. - However, within the same report, while 95% of the responding districts offered teachers professional development for integrating technology into teaching instructions, only 55% required teachers to take the professional development courses related to technology integration (Cuban, 2001).

The rate that technology is increasing is causing a discrepancy in the number of teachers who are equipped with the skills to effectively integrate technology into their classrooms. It was also reported that only 58% of the districts agreed that teachers were adequately trained to integrate technology in their classrooms and only 42% agreed that the funding for technology integration was sufficient in relation to their needs (Gray, 2010). Statistics reported by the National Center for Education Statistics (NCES), bring attention to two major issues. The first

issue is that there is a lack of accountability for funding to ensure that the mandates by NCLB (2001) and ESEA (2001) for technology integration are equal to all students. The second issue is the need for more teacher preparation and professional development to ensure that teachers have the proficiency to integrate technology into their pedagogies. According to Cuban (2001), there was a lack of funding for teachers to develop their new curricula when required to use technology. In order for technology to succeed in our student's classrooms, teachers must be set with the skills to help them effectively use technology to benefit their learning.

Problems and Limitations

The biggest challenge I faced while conducting research for this project was getting in contact with teachers. I reached out to multiple teachers that I had previously worked with during in-service training hours. I was only able to get in contact with one teacher for a while. It was from there that one teacher helped me reach out to the other 3 teachers. I would have liked to be in contact with teachers from more grades. The peer-reviewed articles obtain information from all grades k-6 but for the interviews, the information was limited to k-2 teachers. Having information from the rest of the grade levels would provide this study with a better understanding of what grade level is most appropriate to begin implementing technology. I also had issues reconnecting with teachers as I intended for some follow-up questions after the initial interview. This research would greatly benefit from the follow-up question “What results do you see from the required technology programs?”

Recommendation

The importance of this study and this message goes out to teachers, principals, parents, technology creators, and students. It is important to limit the use of technology students are introduced to in early childhood because the effects it has on the adolescent brain, (increased

rates of ADHD, learning disorders, screen addiction, decreased social skills, anxiety, and depression) have been shown to have increased rates in correlation with the use of technology. I think Kindergarten is too early for students to be expected to work individually on technology, in agreeance with teachers that were interviewed. One teacher recommended that 3rd grade would be more suitable for students to begin using devices independently. However, since the use of technology is going to continue to increase, it is important that all teachers are fully equipped with the correct training to provide students with engaging and effective activities. There is a large discrepancy between a generation of teachers who do not feel prepared to teach using technology. Comparing this to the recent generation of teachers who are being readily prepared to use technology in their classrooms, it is important that these teachers have access to resources to help them feel comfortable integrating technology into their pedagogies. Teachers should be required to attend yearly seminars to update and train them on technology the newest technology advancements. As well as be able to constantly introduce and execute the best use of technology in their classroom.

Conclusion

Technology is going to continue to play a vital role in our education system. We are constantly going to be introduced to new methods of teaching and learning through technology. So what are the effects of the increased use of technology on elementary school students in the classroom? It is significant that all future educators are prepared to take on the rapidly changing learning environment. If teachers are equipped with the knowledge and are aware of the negative effects that technology can have on the adolescent child, it is shown that students' learning does have positive results. These results include increased math test scores, increased engagement, increased independence, and an increase in students' general efficiency with using technology.

If teachers are not equipped with the knowledge to engage students in technology, results show that is when learning is not efficient. This results in, a lack of attention span, lack of creativity, screen use overload, and addiction, increased cases of ADHD and learning disorders. Teachers state that the bigger issue is the increased use of technology at home. Students are entering school with far less sound knowledge and social skills. If teachers are continuously updated with training on technology it can reduce the negative effects of increased technology use.

To continue to help reduce the negative effects related to the increased use of technology, it is significant that we continue to update screen recommendation times and look at beginning to implement independent technology use at a later age. As reported by many teachers, the younger students, grades k-2 benefit most from hands-on learning and social-emotional interactions instead of spending time locked into screens on their own. Multiple teachers state that there is nothing more effective than a face-to-face and hands-on learning environment. Overall, it is crucial to keep in mind the quantity of technology use our students are faced with but it is even more important to look at the quality of the technology being presented.

References

Abramson, L. (2011, June 22). Schools blend computers with classroom learning. Retrieved December 4, 2022, from https://www.npr.org/2011/06/22/137318998/schools-blend-computers-with-classroom-learning

Bell, N. (2019, July 12). Technology and the developing brain. Retrieved December 4, 2022, from https://pressbooks.pub/techandcurr2019/chapter/tech-and-developing-brain/

Bhat, J. (2017, August 14). Attention spans in the age of Technology. Retrieved December 8, 2022, from https://www.nami.org/Blogs/NAMI-Blog/August-2017/Attention-Spans-in-the-Age-of-Technology

Carstens, K. J., Mallen, J. M., Bataineh, M., & Al-Bataineh, A. (2021). Effects of Technology on Student Learning. TOJET: The Turkish Online Journal of Educational Technology, 20(2).

Carver, L., & Todd, C. (2016). Teacher perception of barriers and benefits in K-12 technology usage. INTED2016 Proceedings. doi:10.21125/inted.2016.1845

Chang, C., & Yang, F. (2010, August 31). Exploring the cognitive loads of high-school students as they learn concepts in web-based environments. Retrieved December 8, 2022, from https://eric.ed.gov/?q=load%2Band%2Bload&ff1=dtysince_2004&pg=12&id=EJ884446

Christensen, D. (2020, November 13). The history of the emergence of technology in education - classcraft blog. Retrieved December 4, 2022, from https://www.classcraft.com/blog/the-history-of-the-emergence-of-technology-in-education/

Coley, R. J., Cradler, J. D., & Engel, P. K. (1997). Computers and classrooms: The Status of Technology in U.S. schools. Princeton, NJ: Educational Testing Service. Policy Information Center.

Coley, R., Cradler, J., & Engel, P. K. (1977). Computers and Classrooms: The Status of Technology in U.S. Schools. Policy Information Report. Educational Testing Service, Princeton, NJ. Policy.

Couse, L. J., & Chen, D. W. (2010). A tablet computer for young children? exploring its viability for early childhood education. Journal of Research on Technology in Education, 43(1), 75-96. doi:10.1080/15391523.2010.10782562

Cross Save this to read later. Send to ema, J. (2021, November 03). What does too much screen time do to kids' brains? Retrieved December 8, 2022, from https://healthmatters.nyp.org/what-does-too-much-screen-time-do-to-childrens-brains/

Danniels, E., Pyle, A., & DeLuca, C. (2020). The role of technology in supporting classroom assessment in play-based kindergarten. Teaching and Teacher Education, 88, 102966. doi:10.1016/j.tate.2019.102966

El-Mouelhy, I., Poon, I., Hui, A., & Sue-Chan, C. (2013, December 27). Does a creative learning medium matter? impact of low-cost Android tablets on Elementary Students' English comprehension, perceived performance, and memory retention. Retrieved December 8, 2022, from https://www.scirp.org/journal/PaperInformation.aspx?PaperID=41432

Firmin, M. W., & Genesi, D. J. (2005). Technology implementation challenges for the classroom. PsycEXTRA Dataset. doi:10.1037/e574112010-003

Fisher, D., & Frey, N. (2015). Improve reading with complex texts. Phi Delta Kappan, 96(5), 56-61. doi:10.1177/0031721715569472

Frey, S. (2015, December 23). Technology takes hold in the early grades. Retrieved December 11, 2022, from https://edsource.org/2015/technology-takes-hold-in-the-early-grades/74465

Gimbert, B., & Cristol, D. (2003). Teaching curriculum with technology: Enhancing children's technological competence during early childhood. Early Childhood Education Journal, 31(3), 207-216. doi:10.1023/b:ecej.0000012315.64687.ee

Gray, L. (2010). Teachers' use of educational technology in U.S. public schools, 2009:. Washington, DC: National Center for Education Statistics, Institute of Education Sciences, U.S. Dept. of Education.

Hennessy, S. (2015). Tablet uses in schools: A critical review of the evidence for learning outcomes. Journal of Computer Assisted Learning, 32(2), 139-156. doi:10.1111/jcal.12123

ISTE standards: Students. (n.d.). Retrieved December 4, 2022, from https://www.iste.org/standards/iste-standards-for-students

IyanKym. (n.d.). Impact of technology on children. Retrieved December 7, 2022, from https://ke.opera.news/ke/en/others/a51e17643a7b643f27141c22596c3924

Johnson, J. (2021, July 20). Is a Chromebook appropriate for a kindergartener? Retrieved December 4, 2022, from https://www.androidcentral.com/chromebook-appropriate-kindergartener

Kologrivaya, K. (2022, April 15). Teachers aren't getting enough training on technology. it's a global problem. - edsurge news. Retrieved December 9, 2022, from https://www.edsurge.com/news/2022-04-15-teachers-aren-t-getting-enough-training-on-technology-it-s-a-global-problem

Kuykendall, K. (2022, September 27). New data: Nearly half of schools providing home internet access to students who need it this school year. Retrieved December 8, 2022, from https://thejournal.com/articles/2022/09/27/nearly-half-of-schools-providing-home-

internet-access-to-students-who-need-it-this-school-year.aspx#:~:text=An%20overwhelming%20majority%20%E2%80%94%2094%25%20%E2%80%94,digital%20devices%20this%20school%20year.

Lambert, D. (2019, May 08). California adopts First Computer Science Standards for K-12 students. Retrieved December 4, 2022, from https://edsource.org/2018/californias-first-computer-science-standards-set-for-approval/601985

Larson, V. (2022, October 25). Shining Mountain Waldorf SchoolVivki. Retrieved December 4, 2022, from https://shiningmountainwaldorf.org/

Lei, J., & Zhao, Y. (2007). Technology uses and student achievement: A longitudinal study. Computers & Education, 49(2), 284-296. doi:10.1016/j.compedu.2005.06.013

Lettrick, S. (n.d.). The Clash of Brain Development and classroom technology. Retrieved December 4, 2022, from https://www.learningandthebrain.com/blog/brain-development-and-classroom-technology/

Montessori, T. (2018, March 13). Screen time syndrome: Brain images explain why kids are moody, impulsive & can't pay attention. Retrieved December 7, 2022, from http://trentmontessori.com/2018/03/13/screen-time-syndrome-brain-images-explain-why-kids-are-moody-impulsive-cant-pay-attention/

Nechtam, C. (n.d.). The impact of technology on children - cerritos college. Retrieved December 4, 2022, from https://www.cerritos.edu/hr/_includes/docs/August_2021_The_Impact_of_Technology_on_Children_ua.pdf

Nordström, T., Nilsson, S., Gustafson, S., & Svensson, I. (2018). Assistive technology applications for students with reading difficulties: Special education teachers’

experiences and perceptions. Disability and Rehabilitation: Assistive Technology, 14(8), 798-808. doi:10.1080/17483107.2018.1499142

Novak, S. (2021, December 10). Investigating screen time's impact on the attention span. Retrieved December 4, 2022, from https://www.discovermagazine.com/mind/investigating-screen-times-impact-on-the-attention-span

Rich By, M. (2020, February 03). Technology's impact on Childhood Brain, language development. Retrieved December 8, 2022, from https://www.wrvo.org/health/2019-12-21/technologys-impact-on-childhood-brain-language-development

Screen time reccomendations. (n.d.). Retrieved December 4, 2022, from https://www.aacap.org/AACAP/Families_and_Youth/Facts_for_Families/FFF-Guide/Children-And-Watching-TV-054.aspx#:~:text=Between%2018%20and%2024%20months,limit%20activities%20that%20include%20screens.

Shrivastav, H., & Hiltz, S. R. (2013). Information overload in technology-based education: A meta-analysis.

Tablets have too many distractions for classroom use. - tablets vs. textbooks - procon.org. (2019, August 28). Retrieved December 4, 2022, from https://tablets-textbooks.procon.org/arguments/tablets-have-too-many-distractions-for-classroom-use/

Truong, D. (2020, February 02). More students are learning on laptops and tablets in class. some parents want to hit the off switch. Retrieved December 4, 2022, from https://www.washingtonpost.com/local/education/more-students-are-learning-on-laptops-

and-tablets-in-class-some-parents-want-to-hit-the-off-switch/2020/02/01/d53134d0-db1e-11e9-a688-303693fb4b0b_story.html

U. (n.d.). Play-Based Learning: Introducing Digital (and other) technologies. Retrieved December 4, 2022, from https://scarfedigitalsandbox.teach.educ.ubc.ca/play-based-learning-introducing-digital-and-other-technologies/

Appendix 1

Barbara Anderson - Kindergarten teacher interview questions/answers.

1. Are students required to use technology in your classroom? In what ways?

Yes! Even in Kindergarten! My students are on Chromebooks during Literacy small group time where I pull out groups during this time to work on Language Arts skills.

1. How often?

Students are required to be on Lexia (language Arts Program) 20 minutes a day and Dreambox (Math) 20 minutes a day. For Kinder, I believe that doing both is much too long! We work on Lexia and Dreambox is part of homework each evening. Except for Fridays, in which all the children work on Dreambox at one time.

1. Are there restrictions (time limits, monitoring, blocked services)?

Yes...only 20 minutes is allowed/necessary.. There are definitely firewalls that prevent students from going to different websites, For the most part, Kindergarten students go to other websites by mistake.

1. What subjects are taught on tablets or Chromebooks?

As stated above, Lexia (Language Arts) and Dreambox (Math) are required. We also assign work on a program called Seesaw. Seesaw is a digital platform where teachers can create their own learning activities and assignments for students. These assignments can be listening to stories, worksheets, drawings, and videos...
The students are also given 3 assessments a year on the Star Early Literacy Program. This Program measures the assessment of early literacy skills. It adapts to how the student is progressing. Questions get harder or easier, depending on how the student is responding.

1. Do students stay on task while working individually on devices?

Haha! Most do! They wear headphones so that there is not too much distraction, however, there are a few that do not get very far in the 20 minutes!

1. How is this regulated?

I am there with the students so I can monitor what is happening in class.
We also have an App/ program for the Chromebook that teachers use to monitor called "Go, Guardian". It allows us to see exactly what the student sees on his or her Chromebook. We can block a page, screenshot, or message a student. It is private between teacher and student.

1. Do you think time spent on devices is efficient for students' learning? (or do you believe there are better methods?) If so, what are they?

This is a great question and I know there will be differing opinions on this. I have been teaching for 35 years and most of it was without technology! While I think it is important for children to learn to use technology and feel comfortable with it, I am not all for it, especially in Kindergarten. I do not think there is any better way to teach a child than human contact! I want a child to be actively engaged in learning! It becomes too much stimulation for kids and not enough "hands-on" time! A child is missing out on oral language skills and communication skills. What is more important than an adult interacting and reading a book to a child?

1. Have you noticed any differences in learning from when students did not use technology?

Oh yes! As I said above, the lack of human contact has taken a toll! Children need social-emotional time and social interaction with peers. I have noticed students are less attentive and have difficulty concentrating and staying on tasks. They need instant gratification and can be less imaginative and creative. Another big difference I see is children beginning Kindergarten with a lack of fine motor skills! No experience holding a pencil, coloring, cutting, etc.

1. Have you seen this affect literacy skills in students?

Yes and no! If equipped with the right technology, a student can practice new skills, such as letters, sounds, blending, and decoding. fluency.. especially for those students whose parents cannot help them because of illiteracy or because another language is spoken at home. On the other hand, technology can be difficult for students who have some language delay or are second language learners. They need to engage all sensories to learn. It is important for them to see, hear or touch, which is not possible with a Chromebook!

1. What is your pedagogy and perception of using technology in your classroom?

First and foremost, I teach my students the guidelines and routines of what is expected of them. It is important to create an environment where students feel safe, comfortable, and want to learn! Whereas, some students are self-confident and risk-takers, for a student who is still learning to become independent and build confidence, a computer can be great! That child does not have to worry about making a mistake or saying the wrong thing, as no one will judge them.

1. How does your classroom benefit from using technology?

Technology can build on what a student already knows as it can provide opportunities for students to explore and become comfortable. It can reinforce the skills that we are learning in class.
If a teacher uses technology the correct way, it can provide fun and engaging ways to learn! As with anything...there are pros and cons! It can be a wonderful learning tool, as long as the activities are appropriate, engaging, and of course, educational!
And very importantly, technology prepares children for the future.

Appendix 2

Geralyn Budenholzder - 1st grade teacher interview questions/answers

1. Are students required to use technology in your classroom? In what ways?

Yes.

1. How often?

District asks us to have students work on district apps (Lexia and Dreambox) everyday. We aim for that but can't always do it.

1. Are there restrictions (time limits, monitoring, blocked services)?

I put time limits on tech use - 15 - 20 minutes per app each day we can do them. I can monitor on Go Guardian and the district monitors all devices. They block many websites for students.

1. What subjects are taught on tablets or Chromebooks?

I do not teach on Chrome books.

1. Do students stay on task while working individually on devices? typically they stay on task
2. How is this regulated?

I monitor in person and on Go Guardian

1. Do you think time spent on devices is efficient for students' learning? (or do you believe there are better methods?) If so, what are they?

I personally do not think technology is efficient for learning in first grade. I would rather have the minutes back for more instruction. Hands-on learning, more small group time

1. Have you noticed any differences in learning from when students did not use technology?

Absolutely! Especially because students use technology so pervasively at home. They are less able to attend to instruction and stick to things because they aren't getting all the bright lights and sounds and feedback for every little thing they do like the technology we use gives them.

1. Have you seen this affect literacy skills in students?

Yes students enter school with far less sound knowledge and some have never had a book read to them at home. Not only are they on technology too much, but so are their adults. The ability to focus and pay attention in class has diminished so much since I started teaching.

1. What is your pedagogy and perception of using technology in your classroom?

I use the technology that is required by my district. If it wasn't required, I wouldn't use it. I do believe students need to learn to be proficient at technology, but I think starting that in third grade is more developmentally appropriate.

1. How does your classroom benefit from using technology?

The ability to make presentations and share them with students is a benefit for my teaching. There are a lot of educational videos that also support my classroom instruction.

Appendix 3

Monica Villanueva -2nd grade teacher interview questions/answers

1. Are students required to use technology in your classroom?

Yes students use their chromebooks daily. 15- 20 minutes daily on the Math platform (Dreambox) designated by the district, and 15-20 minutes daily on the Language Arts platform (Lexia Core 5) also designated by the district. These platforms provide grade-level practice of the standards by grade. My students also use a platform called Xtra Math that provides basic math facts practice in addition and subtraction for 10 minutes daily. I use a monitoring program that shows me exactly what's on their screen Go, Guardian. This is a district monitoring application that I can set a timed session that allows me to monitor and keep students on task. Most students are responsible and stay on the designated task. I can block websites and also close tabs that they should not be on. This was more of an issue during distance learning

1. What subjects are taught on tablets or Chromebooks?

I use Chromebooks to teach Math/LA/Science/Social Studies. I like to use videos from youtube for any science and social studies unit or standard. If we are learning about government or Sea Otters I will attach a video from youtube and have students watch and retell two details they learned on Seesaw. Seesaw is a platform where you can assign assignments and students can respond with text, pictures, videos, or drawings. I like this platform because it provides students with different learning modalities.

1. Do students stay on task while working individually on devices?

Every student is different. Some are responsible and mature and will stay on task without being monitored. Other students need monitoring to stay on task and even then will need

reminders from their peers and teacher. Go guardian provides accountability by allowing the teacher to see exactly what each student's screen is on. Seesaw provides accountability by requiring students to submit their assignments and requiring the teacher to approve any edits or resubmissions.

1. Have you seen this affect literacy skills in students?

I think technology in my classroom is not affecting students' literacy skills because I have a balanced approach to teaching literacy. However, technology at home is affecting students' literacy skills because of the lack of interaction between students and parents.

1. What is your pedagogy and perception of using technology in your classroom?

A balanced approach where technology is used to enhance our learning and provide students with visual and alternative ways of learning.

1. How does your classroom benefit from using technology?

Technology when used correctly enhances learning with visuals, and interactive learning. The teaching has to be a balanced approach that provides different support for different learning styles.

Appendix 4

Rocio Ruvalcaba Kindergarten teacher interview questions/answers

1. Are students required to use technology in your classroom? In what ways?

Yes. They use them for Math App and Language Art App

1. How often?

20 minutes a day.

1. Are there restrictions (time limits, monitoring, blocked services)?

The time limit is 20 minutes at school and 20 minutes at home/

1. What subjects are taught on tablets or Chromebooks?

Math, Language Arts, Writing

1. Do students stay on task while working individually on devices?

Most of the students do stay on task.

1. How is this regulated?

The teacher walks around or we have our GoGuardian App on to see what site the students are on.

1. Do you think time spent on devices is efficient for students' learning? (or do you believe there are better methods?). If so, what are they?

I think it is good that students learn to do some work on Chromebooks. Helps students in their future learning as they progress to higher grade levels. They are learning new content. They are becoming comfortable with technology. It is useful.

1. Have you noticed any differences in learning from when students did not use technology?

No. I think a little technology is okay, but students do enjoy hands-on activities. Especially at the younger ages of Kindergarten.

1. Have you seen this affect literacy skills in students?

No.

1. What is your pedagogy and perception of using technology in your classroom?

I like to use it. Just think it has to be limited and used for educational purposes.

1. How does your classroom benefit from using technology?

Helps them to become independent. They can practice math and reading skills and they can see their progress.