EXPLORING EDUCATORS' PERCEPTIONS OF COMPUTER SCIENCE IMPLEMENTATION IN K-2: A PHENOMENOLOGICAL STUDY

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EXPLORING EDUCATORS' PERCEPTIONS OF COMPUTER SCIENCE

IMPLEMENTATION IN K-2: A PHENOMENOLOGICAL STUDY

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ABSTRACT

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This study explored to provide insight into perceptions of computer science implementation in K-2. The participants were K-2 teachers who have taught computer science a minimum of two years. Data was gathered through note taking and recording of one on one interviews that relied on participant responses sharing their experiences about teaching computer science in K-2. Data from this research showcased the importance of computer science or technology to 100% of the educators who participated in this study. Sixty percent of the teachers interviewed felt that for other educators to overcome the negative perception associated with technology and computer science, administration will have to show support for both subjects. Overwhelmingly, 90% of the teachers felt that computer science and technology curriculum is not a top priority for schools because current school policies do not reflect this. This study found that eighty percent of the teachers who are interested in bringing computer science to their students find barriers because of inadequate funding. Ninety percent of these teachers shared that learning about computer science takes place on their own time and with their own resources. Without adequate training, there is not enough time in a day to learn how computer science and content can go hand in hand. The purpose of this study was to create an enhanced understanding of computer science in K-2. Increasing efforts to offer trainings on incorporating computer science within the current curriculum content will give

teachers the confidence they need to teach computer science. While computer science in K-2 was the focus of this study, encouraging teachers to integrate computer science in the curriculum still needs to be explored in future research.

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On a final note, I would like to dedicate this book to my students and community. Thank you for your kindness, patience and support throughout my own understanding of computer science implementation in K-5.

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Chapter I

Introduction to the Study

On December 9, 2013, many educational institutions participated in the Hour of Code sponsored by Code.org. For one hour during this week, both students and teachers explored alternative methods of collaborating and communicating together using computer-based games. To support teacher's continued interest in coding beyond the Hour of Code, Code.org created their free teacher professional development program. As of 2019, code.org has trained one million teachers in K-12 (code.org, 2019).

Looking back, in 2013, 90% of all K-12 schools in the United States had yet to teach any kind of computer science. Even though the Bureau of Labor Statistics had already shared that global demands for Computer Scientists' and technical professionals would grow by 34% and 51% of all STEM jobs would be in computer science related fields by 2018 (Smith, 2016). As of March 2019, 48 U.S. states changed policy to support computer science (code.org, 2019). Still minorities and females continue to be at a greater disadvantage when competing for the 55 million technical jobs (Czerkawski & Lyman, 2015). In 2016, there were 600,000 high paying technical jobs that were unfulfilled across the United States. Since many teachers are unfamiliar with the discipline of computer science, it is important to explore factors that may be discouraging them from teaching computer science (Guzdial & Bruckman, 2008).

This study sought to understand teachers' perception of computer science implementation in K-2 to determine what schools need to do to encourage participation in computer science. Data collected was used to build an initial Getting Started with Code workshop for K-2 educators to educate and encourage teacher participation in the instruction of computer science in K-2.

Background of the Problem

The United States, along with other countries associated with the Organization for Economic Co-operation and Development (OECD), have started exploring ways to develop integrated innovation policies to encourage technological literacy (Pelkonen, 2006). Many countries see this as an opportunity to contribute, create, and lead in technological and scientific fields through advanced technological discoveries (Pelkonen, 2006). Today, more than ever, technology is changing the way educators teach and deliver lessons (Wing, 2008a). However, despite all the technological advances, American students' achievement in math and science continue to fall behind that of other countries (Bakhshi, Downing, Osborne, & Schneider, 2017). When looking at comparable countries, children in the United States, perform much lower in math and science (Bakhshi et al., 2017). Boys continue to perform better than girls in science, while girls across most OECD countries outperform boys in reading (Bakhshi et al., 2017).

For instance, STEM can provide opportunities for students to analyze real-world scenarios as they practice problem solving and critical skills to discover solutions in real-world context (Bakhsi et al., 2017). Current STEM initiatives are providing educators and policy makers an opportunity to explore innovative policies promoting creative thinking within the curriculum to support future innovators (Soh, Shell, Ingraham, Ramsay & Moore, 2015). With early adoption of computer science in elementary schools, all students, regardless of nationality, income, or gender may be able to compete globally for well-paying technical jobs that have yet to be created (Wagner, 2012). Most importantly, students will be better prepared for the future due to ongoing practice with computer science concepts and computational thinking (Fluck et al., 2016).

Problem Statement

The demand for computer scientists and technical professionals is on the rise and will grow in the next 20 years (Bakhsi et al., 2017). If the United States continues moving at the same rate, students will not be able to meet the demands for tomorrow's economy because they lack the skill sets needed to persist, collaborate, and solve problems through multidisciplinary approaches (Wagner, 2014). According to Wagner most students are good at mastering current objectives, but these objectives may not translate into real world concepts and skills which may affect career opportunities. Today, 36 of the 50 states have statewide policies that promote computer science education, and most of it is done in secondary schools (code.org, 2018). The results of student performance from the 2015 PISA; provides evidence that schools need to change their focus to critical thinking, problem solving, effective oral and written communication, and other skills to produce highly innovative graduates (Wagner, 2015).

Under the ConnectED initiative, 100 million dollars went toward computer science instruction in K-12 (Smith, 2016). Computer science classes in college are gaining in popularity and this surge in interest starts in the primary and secondary schools (Guzdial & Bruckman, 2018). Students who need training the most may find it difficult to access programs of current computer science initiatives: online learning, coding camps, summer coding programs, after school coding, peer mentoring with CS volunteers and undergraduate CS courses. According to Chang and Kim (2009) a solution to this problem may rest in the creation of free and open education resources. "What matters today is not how much students know but what they can do with what they know" (Wagner, 2012).

Statement of the Purpose and Research Questions

The purpose of this study was to explore teacher's perception of computer science implementation in K-2. The following central question will be explored: What can schools do to encourage teacher participation of computer science in K-2? The following research questions were used to guide data collection and analysis for this study:

1. How do technology roadblocks contribute to a teacher's perceptions of computer science in K-2?
2. How do school policies affect a teacher's perception of the importance of technology/computer science in K-2?
3. How might a teacher's perception of technology affect how he/she uses it to teach students in K-2?
4. How do teachers overcome negative perceptions of technology or computer science use in K-2?

Rationale and Significance of the Study

This study adds information to the field of education as it examines teacher perceptions of computer science implementation in K-2. This study allows the researcher to identify roadblocks teachers feel prevent them from teaching computer science in the classroom. This study will inform stakeholders how computer science perceptions could influence negative perceptions of computer science. This study addresses a gap in the current research and adds to an area of research that has been under-examined in K-2 by studying perceptions of K-2 educators who teach computer science in the classroom.

Assumptions

Several assumptions were made for this study. The researcher assumed the following:

1. The responses of all the participants were honest and forthcoming.
2. The participants are employed and in good standing in the school district.
3. The participants are familiar with computer science.
4. The participants work with students in grades K-2.
5. The participants have access to technology.
6. The research questions were created to illustrate how to develop an understanding of computer science in K-2.

Limitations

Creswell (2013) stated that a limitation is an uncontrollable threat to the validity of a study or a potential weakness to the study. The limitations of this study include the following:

1. The researcher gathered data from one public elementary school focusing on the views of K-2 teachers.
2. The researcher did not utilize middle school, high school, or administration for this research.
3. Due to this type of study, it will be difficult to generalize the findings since only K-2 staff were used.

4. K-2 students' use of iPads for computer science technology (hardware/software) was not standardized in all K-2 classrooms.
5. All teachers involved in this study do not teach computer science regularly.
6. Not all teachers in this study have been trained to teach computer science in K-2.

Delimitations

1. The participant must be 18 years of age or older.
2. The participant must be an educator.

Definitions of Terms

The following operational terms were used for this study:

- *Computer science* is the study of computers and their uses as part of a curriculum (Wing, 2006). Computer science is finding answers about how to best understand what information computation is, how computation helps our understanding of what we already know, and how it also limits it. It is the practical approach and application of computing (Denning, 2007).
- *Computational thinking* "is conceptualizing i.e., thinking at multiple levels of abstraction and it complements and combines mathematical and engineering thinking" (Wing, 2006).
- *Critical thinking* is the use of higher level thinking skills such as problem solving, reasoning, logical thinking, and higher order thinking by students

that allow them to find a path that leads to answers not easily foreseen (Enis, 1985).

- *Problem solving* allows students to bridge the gap between missing information through analysis, abstraction, inference, and logic to find answers (Hayes, Gershman & Bolin, 1980).
- *Universal design for learning* is an instructional planning framework for meaningful engagement of all learners by addressing barriers to learning (Isreal, Wherfel, Pearson, Shehab & Tapia, 2015)
- *SAMR* is a framework through which teachers can assess and evaluate technology use in the classroom: Substitution, Augmentation, Modification, and Redefinition (Puentedura, 2010)
- *STEM* is science, technology, engineering, and math (Tsalapatas, Heidmann, Alimisi & Houstis, 2012)

Summary and Organization of the Study

The dissertation is organized into five chapters, a project, and appendices. In Chapter I, the author introduced the study and provided appropriate background information, along with the statement of the problem, and the purpose and significance of the study. Additionally, assumptions, limitations and delimitations, terms and specific information regarding the setting and participants of the study were included. Chapter II provides an in-depth literature review of the topic. It is divided into significant components related to encouraging teacher participation of computer science in K-2: encouraging student innovation as part of 21st century learning, exploring benefits technology computer science as a pedagogy, and benefits of technology.

In Chapter III, the researcher outlines the methodology of the study, including research questions, research design, participants, setting for the study, data collection procedures and analysis, and provisions of trustworthiness. Chapter IV provide a summary of the findings while Chapter V concludes with the researcher's perspective on future research and concluding remarks.

Chapter II

Review of the Literature

The purpose of this study was to explore teacher's perceptions of computer science implementation in K-2. The following central question was explored: What steps can schools take to encourage teacher participation in computer science? The literature review was divided into several sections: 21st Century Learning, Challenges and Opportunities of Technology in Schools, Computer Science as a Pedagogy, and Benefits of Technology.

The research questions focused on discovering how teachers' experiences with technology shape their beliefs, attitudes, and perceptions about teaching computer science in K-2. The researcher documented and analyzed perceptions educators hold regarding teaching computer science in K-2 while also understanding the impact roadblocks may have in the overall success of a K-2 computer science program. Lastly, the research concludes with recommendations and suggestions for implementing a computer science program in K-2.

21st Century Learning

Technology education was first introduced in Finland in 1985 as part of its Framework Curriculum Guidelines to help students develop independence, growth of problem-based learning, and technical literacy (Pelkonen, 2006). Five factors were considered: position and status of technology education in the curriculum, aims of technology education, pedagogical means and methods for technology education, main themes and structures of the curriculum content, and characteristics of the teachers in charge of technology education (Pelkonen, 2006). Taken together, these factors aimed to improve technology literacy in schools and increase girls' interest in science, technology, engineering, and math, also known as STEM (Tsalapatas et al., 2012). The Science and Technology Policy Council recommended technology literacy should be studied across curriculum. If the same innovative technological practices are embedded within the natural sciences, environment aspects, and technology in everyday life, students receive a holistic education in which they can explore the importance of technology and the impacts it has in their lives (Tanriverdi & Apak, 2010)

In the United States, current technology practices in many classes serve one purpose, to sustain the functions of the old technology (Cinnamon & Sutherland, 2018). Which still include basic knowledge of word processing skills on outdated computers and within computer labs. Many teachers lack understanding and knowledge of basic 21st century technology; preventing many students from accessing learning tablets and applications that will get students ready for the future (Chant, Moes and Ross, 2009). Despite this, teachers are being asked to take current technology and utilize it in new ways that will allow them to innovate new life into old practices (Li, 2015).

The technology framework of Puentedura (2010) is based on how teachers can integrate technology in the classroom based on four levels: substitution, augmentation, modification and redefinition (SAMR). According to Puentedura (2014), technology should be strategically used to change learning outcomes and provide students an opportunity to redefine ways technology is used in the classroom. The SAMR framework, according to Peuntedura (2014) will allow students to move from consuming content to innovators of knowledge. Through ongoing and effective integration of technology, students will be able to select tools to analyze and synthesize information as they gain greater insight of concepts (Punya, 2013).

Technology as a learning tool. With mobile devices in and out of the classroom, students can find answers to their questions faster and with greater efficiency, pursue their own interests, and manage their own learning (Sanford & Naidu, 2016). Children who are scared to speak gain confidence with applications that allow them to participate and demonstrate what they know without being physically proximate to others (Schumann, Zaki & Dweck, 2014). They are more engaged because they can create content that allows them to show mastery of their learning goals (Pelkonen, 2006). The true power is in a student's ability to play with and explore computational thinking (Shein, 2014).

Technology continues to change the way we live and how students learn. Through ongoing interaction with technology, students will understand the role of creativity and innovation in the world (Tsalapatas, Heidman, Alimisi & Houstis, 2012). Programming is a fertile ground for fostering problem solving, decomposition, explicit representation, abstraction, debugging and thinking about abstraction (Tsalapatas et al., 2012).

Technology concerns in K-5. The American Academy of Pediatrics (Hill, 2017) outlines some risks associated with media use such as: negative effects on sleep, attention, and learning, depression, exposure to inappropriate, inaccurate information, and compromising their privacy and confidentiality. Mobile device use has become universal and 98% of kids under 8 years of age live in a household with technology; teachers must take the lead in educating both students and parents on learning with technology (Hill, 2017). Teachers can help students take ownership of their digital lives: digital footprint, media balance, cyberbullying, online privacy, communication, news, and media literacy to make smart choices about being online (Knutson, 2019). Adults must monitor and be consistent about rules for media use to support students in making smart choices while utilizing technology in and out of the classroom (Chassiakos, Radesky, Christakis, Moreno, & Cross, 2016). According to Hill (2017) one in five parents know about media use recommendations, such as:

- creating a family media use plan that meets your family's needs
- discussing appropriate screen time for online work and other activities
- establishing boundaries for going online
- accessing content
- sharing personal information
- encouraging children to visit age appropriate material
- having an open line of communication as a family

Students have many more opportunities for online communication: Youtube, Instagram, Snapchat, Twitter, Google Hangouts, Google Messages and Skype; the above recommendations will help students establish safe, responsible, and balanced media habits (Knutson, 2019).

From consumers to creators. According to Goldin & Katz (2007) education has been running a race with technology. Every time there have been technological changes, society has generally suffered due to new practices imposed on them. With time, people have learned to take advantage of all the opportunities created by new technological advances. Education is credited with helping society develop skills necessary to adapt to these radical changes (Goldin & Katz, 2007).

Increased demands for highly skilled workers are on the rise, while the demand for low-skill workers is in decline (Goldin & Katz, 2007). The new challenge for educators is to prepare a future generation of workers who will benefit from the economic growth and privileges that come with new knowledge (Pace, 2012). Educators must take advantage of a child's uniqueness, their creativity, their emotional intelligence, and their entrepreneurial mindset (Wagner, 2012). Educators have an opportunity to use rich resources and guide students to explore, experiment with, and expand their interests, passions, and potential (Zhao, 2016).

According to Zhao (2016) a true paradigm shift begins by moving away from a culture that defines a child by their weaknesses by abandoning standardized tests such as Common Core State Standards. In other words, students should not be labeled, tracked or sorted based on the results of any standardized tests (Zhao, 2016). As an example, Zhao suggests schools abandon policies that try to fix children through remedial programs or mandated grade retention. Certainly, this process will help identify student's strengths, passions, and interest to begin encouraging passion-driven projects and policies (Zhao, 2016). With the creation of these opportunities, school leaders could increase a child's ability to explore and discover their true strengths.

Challenges and Opportunities of Technology

As of 2018, only 36 states have adopted a policy to bring computer science to students in K-12, but 22 states have created K-12 computer science standards (Code.org, 2015). As of 2017, less than 20,000 females have taken an AP CS exam and of these less than 15,000 were minority students. Code.org (2015) reported that only 40% of all U.S. schools taught some sort of computer programming and most of it was done in secondary schools. This same year only 22 percent of those students taking the AP Computer Science exam were girls, and 13 percent were African-American or Latino (Smith, 2016).

In 2016, President Obama pledged 100 million dollars towards computer science instruction in K-12 (Smith, 2016). The funding was to support computer science adoption at local and national levels and create high-quality resources for educators, training, and regional partnerships with computer scientist in K-12 (Smith, 2016). In 2017, President Trump continued to support this initiative by pledging an additional 200 million to prepare students for digital jobs. Code.org (2016) currently recommends nine policies as a framework for educational stakeholders such as local and state agencies, representatives from the states executive branch, local computer science teachers, national groups and industry leaders with experience in computer science and legislatures (Smith, 2016). These nine policies provide a better understanding of computer science standards, allocation of funds, certification pathways for teacher's who do not have a computer science degree, and partnerships with local universities to create high-quality programs for preservice teachers in STEM. The goal of Code.org (2015) is to support all students in exploring computer science.

Understanding computer science. Even with all this effort, teachers continue to try to make sense of computational thinking, the process of formulating a problem and expressing its solution in a way a computer or person could solve it (Hoffman, 2012). Understanding strategies to teach computer science embedded within math, science, arts and even English classes will help teachers develop understanding of the problem-solving skills students can learn outside of noncomputer science classes (Guzdial, 2016). Computational thinking can easily be argued as an extension of current scientific inquiry derived from the scientific framework (Day & Golstone, 2012). Teachers must visualize computer science in the classroom as an extension of the wider world making up the sciences (Rasinen et al., 2009). According to the U.S. Bureau of Labor Statistics and NESTA the Global Innovation Foundation, UK, reports the demand for computer scientists and technical professionals is on the rise by 35%. This demand will continue to grow in the next 20 years (Bakshi et al., 2017). Wing (2008a), an early advocate of computer science instruction in public schools, believes computer science will teach students how to break problems into smaller pieces, think abstractly, strengthen their problem-solving skills, and build academic resilience. Students will apply their creativity and problem-solving skills across all curriculum through ongoing creative opportunities (Epstein, Kaminaka Phan & Uda, 2013).

Schools need to investigate teacher belief, attitudes, and degree of confidence toward technology because this will help schools design future technology development training programs suitable for their community and students (Li, 2015). However, further research on the topic and resources are needed to standardize computer science in K-12 help to dispel the confusion, misconceptions, and fear teachers currently have. If computer science is to last in K-12, teachers need to be trained in this area to grow in confidence and experience (Guzdial, 2008).

New way of thinking. In computer science, computational thinking is taught so students understand how something that cannot be seen or understood can be solved (Wing, 2010). With very young students, this can be introduced when word problems are first introduced, as it augments problem solving (Aiken et al., 2013). In fact, mathematical modeling of word problems on electronic devices often makes it easier for students to understand and possibly investigate alternate solutions, as they are encouraged to innovate (Sanford & Naidu, 2016).

Since computational thinking is a tool that can be applied across multiple disciplines, it should be regarded as a foundational skill all students need. To begin with schools that embed computational thinking within grade-level foundations will support students' ability to develop analytical thinking in reading, writing, and arithmetic (Wing, 2008a). Confidence in teaching computer science in noncomputer science subjects help students to develop a deeper understanding of computational thinking and allows teachers to understand how it can be used to reinforce grade-level content (Epstein, Kaminaka, Phan & Uda, 2013). A child who is skilled at coding will be more precise about how they communicate and problem solve, increasing the odds of being successful in their personal and professional life (Fluck et al., 2016).

Computational thinking in grade school. Sanford and Naidu (2016) believe it will give students the skills and confidence in mathematics and develop their problem-solving skills. According to Wing (2006), math naturally enhances one's ability to think logically. She highly recommends that computational thinking be taught as a complement to mathematics to support multiple levels of abstraction. In fact, computer science can augment everyday experiences such as human thinking and understanding. Sanford & Naidu (2016) also encourage teachers to introduce computational thinking right after students have learned to read, write, and have started exploring early arithmetic, the early years. Surprisingly, mental arithmetic builds the framework for problem solving and mental logic as it will support students' knowledge of math concepts (Wing, 2006).

Computer Science as a Pedagogy

According to Zhao (2016) curriculum design is often determined by pedagogy, social trends, and political agendas tied to voting results. These decisions reflect stakeholder interest and knowledge of educational growth. Today's educational stakeholders should explore the economic implications that computer science curriculum has on the future.

According to Fluck et al. (2016), the up-and-coming computer science professionals will support innovation and development of current and future products and services locally and globally. There is an urgency from different governments to devise national computer science curriculum to produce and maintain that competitive edge (Fluck et al., 2016). According to Wagner (2012) future ready students are innovators and creators of content others will consume.

Computer science curriculum provides opportunities for students to become leaders, creators, and innovators of solutions to concerns that affect their everyday lives (Yang, 2013). According to Wagner (2012) placing a great emphasis on technology to drive innovation over knowledge and skills will encourage students to explore, study, and choose technological careers. In doing so, it will allow students to be creators of content or resources that highlight customs, attitudes, and ethical values that reflect their country (Hamelink, 2015).

Students will drive change, rather than having outside technological values imposed on them (Hamelink, 2015). This is especially important for those countries that want to compete for the monetary wealth that comes with the creation of video games, movies, online shopping services, social media sites, telecommunications, apps, music, art, fashion, and other goods (Hamelink, 2015). Of all the rationales for the advancement of computer science curriculum, the most important is providing students an opportunity to develop technology literacy to understand and contribute to new and ever evolving knowledge (Thorsteinsson, Ólafsson, & Autio, 2012).

Fixed mindset versus growth mindset. President Obama (2006) once said that the empathy deficit problem plaguing America was much more pressing than the very large federal deficit. A recent meta-analytic study of American college students supports this claim. It showed that empathy has declined significantly over the last 30 years (Schuman, Zaki & Dweck, 2014). In today's educational climate, the fixed mindset and growth mindsets are going head to head; teachers want change, but educational leaders continue to hold onto old ways of teaching (Zhao, 2016). At the heart of the CS-for-all initiative is the notion that all students, regardless of nationality, social, economic, and cultural status, will amplify their voices through coding projects, placing great importance on the creative, collaborative, problem-solving, and critical-thinking strengths of each child as they create (Wagner, 2014). According to Dweck et al. (2014), being able to put oneself in the student's shoes will help you empathize with the physiological or affective states of the child.

Education continues to hold onto a fixed mindset that perpetuates priority of standardized tests (Zhao, 2016). Administrators must create conversations around building knowledge together to understand computer science in the classroom (Shein, 2014). In doing so, both teachers and administrators adopt the growth mindset in which challenges are often seen as a positive experiences and opportunities to improve limitations (Chant et al., 2009). Persistence through unpredictable or unforeseen challenges will help improve teachers understanding of new ideas (Dweck et al., 2014).

Universal design for learning. Some benefits of implementing a computer science program into the already existing universal design for learning time slot provides opportunities for students to apply and practice real-world math contexts as students learn with algorithms and practice problem solving and collaborative inquiry (Israel, Wherfel, Pearson, Shehab & Tapia 2015). Since computing is flexible regarding expression of understanding, students would practice higher order thinking through collaborative projects with peers or teachers while computational thinking is reinforced (Israel et al., 2015). A common obstacle teacher's often deal with when implementing a computer science program in their universal design is finding a balance between explicit instruction of computer science and independent computing time for students (Israel et al., 2015). Monitoring how software or hardware is being used may present barriers to a student's learning, and participation in classroom projects is recommended. Teachers will need to examine the accessibility of such hardware or software being used (Israel et al., 2015). Providing ample opportunities for student creation will increase students understanding and application of computational thinking: inference, abstraction, and algorithms outside on non-computer-based games (Wing & Stanzione, 2016).

Benefits of Technology and Computer Science

According to Code.org (2018) computer science encourages students to be active citizens as creators and not just consumers of technology (Smith, 2016). In a world driven by technology, student's innovative ideas may be able to meet the demands of the ever-changing technology world (Bakhshi et al., 2017). Through our support of computer science curriculum, students will be at the forefront of change, addressing and challenging the problems facing society (Guzdial, 2008).

Computational thinking in elementary can be taught through puzzles, science, math, music, art, and play (Mishra & Yadav, 2013). It can be as simple as solving puzzles that can then be analyzed on a computer or by a friend (Aiken et al., 2013). Game play enhances students' motivation to learn while providing them with an alternative learning experience not available in a traditional learning environment (Anton & Barany, 2013). Attention, repetition, and connection will help students develop their creative abilities while applying computational concepts in noncomputing subjects. Through game-play, students will explore and develop their own understanding of programming by solving problems found in their environment (Kafai, 2016).

STEM in the classroom. Technology is changing the classroom environment. Through its real-world applications, STEM teaches students to analyze as they develop critical thinking skills that allow them to solve real-world problems. STEM allows students to develop an early understanding of technology, science, and math functions and the innovative ways they are used to develop a deeper understanding of computer science (Smith, 2016).

Before any student can write code, they must learn how to think by breaking problems apart for another person or computer to solve (Wing, 2008b). This fundamental skill will allow our students to compete globally (Smith, 2016). "If I had a magic wand, we would have some programming in every science, mathematics, and arts class, maybe even in English classes too" (Shein, 2014, p. 18). Computer science in primary schools will provide all students an opportunity to learn more about STEM as a career and will help teachers engage their students (Tsalapatas et al., 2012).

Game-based coding through programming. According to Tsalapatas et al. (2012) game-based programming facilitates collaboration, computational analytical thinking, and problem solving to engage students in STEM. Likewise, Anton & Barany (2013) feel game design can facilitate computational thinking as students design and create their own games. Through game design, teachers will learn how to shift their own way of teaching and create relevant learning environments for students (Anton & Barany, 2013). It will also support teachers own understanding of game design and how game design can lend itself to reinforce critical thinking in everyday classroom activities (Wing & Stanzione, 2016).

Computer science standards. In 2016, the K-12 interim computer science standards were released to the public (Smith, 2016). These standards can be met if teachers are provided with extensive professional development to better prepare them to fulfill expectations (Fluck, Webb, Cox, Angeli, Malyn-Smith, Voogt & Zagami, 2013). Teachers could decide the role of these new standards in different curriculum contexts and will encourage growth and understanding of computer science fundamentals (Shaffner, 2018). Supporting teacher knowledge of computer science with targeted professional development may present diverse opportunities for networking with computer science organizations and allow them to further understand the role of computer science in the classroom (Guzdial & Bruckman, 2018).

Summary

This chapter defined computer science education and 21st century learning, described technology as a learning tool, explores challenges and opportunities of students who use technology at home and school, explores perceptions of computer science as a pedagogy, and outlines benefits of game-based programming. Through this research, it is evident many feel computer science is important but too many teachers lack the skills to teach it. Schools need to encourage stakeholders to explore how it can be taught parallel to math and science and not as a single subject in K-2.

The new challenge for educators is to prepare a future generation of workers who will benefit from the economic growth and privileges that come with new knowledge (Pace, 2012). Since computational thinking is a tool that can be applied across multiple disciplines, it should be regarded as a foundational skill all students need. Teachers will be able to support student's mastery of K-12 concepts through the instruction of computer science with knowledge and skills they will need for the future workplace (Day & Goldstone, 2012). Computer science curriculum can provide opportunities for students to design, create, and innovate solutions to issues affecting their everyday lives (Yang, 2013). According to Smith (2016) it is these fundamental skills learned at school which will allow students to compete globally.

Chapter III

Methodology

The purpose of this phenomenological research study was designed to encourage teacher participation of computer science in K-2. The chapter consists of the following elements of the research methodology: purpose of the study, research questions, setting/participants, data collection and analysis, and provisions of trustworthiness. The researcher concludes with a brief summary.

Purpose of the Study and Research Questions

The purpose of this study was to explore teacher's perception of computer science implementation in K-2. The following research questions were used to guide data collection and analysis:

1. How do technology roadblocks contribute to perceptions of computer science in K-2?
2. How do school policies affect a teacher's perception of the importance of technology/computer science in K-2?
3. How might a teacher's perception of technology affect how he/she uses it to teach students in K-2?
4. How do teachers overcome negative perceptions of technology or computer science use in K-2?

Research Design

This qualitative study used a phenomenological approach to understand the perceptions of computer science implementation in K-2 by educators. The use of this methodology allowed the researcher to collect data from several individuals to examine and describe the lived experiences or phenomenon of the study by participants (Creswell, 2013). The data collection methods for this study included: questions, listening to, and recording participant responses. The diversity of opinions by participants was used to develop a “structural description of experiences” to identify themes (Creswell, 2013).

The Setting and Participants

The study was conducted at a large Title 1 urban district in California. Approximately 87% of the students attending are English language learners. The school district participates in the national free school lunch and breakfast programs. This school is a 3rd-year recipient of the Apple Distinguished Program by Apple Education. It has a 1:1 iPad to student ratio. Each teacher has access to: one teacher iPad plus a Dell or Mac computer, smart board plus accessories, portable charging stations for student iPads, document camera. Apple TVs are in some but not all K-2 classrooms. Teachers assigned or managed lesson delivery with Google Classroom, Apple Classroom, or both. Each grade level has set up a digital communication platform to communicate with parents between home and school. The school has both a teacher tech mentor and an ITS to assist with technology issues or PD as needed by individual teachers. The library has a STEM/Robots cart that teachers use to check out robots in TK-5.

During the selection process, the researcher selected 10 elementary K-2 teachers who had a minimum of 2 years of teaching experience, and have taught computer science within the past 2 years. All participants were in good standing and employed at this school district at the time of the study. The method for selecting participants for this study was purposeful sampling; this is the selection of participants or sites to purposely inform and understand research problems and central phenomenon (Creswell, 2013). The essential criteria for selecting participants was their experience teaching computer science in K-2. School leaders and school personnel were notified via email regarding purpose of the study. Once a list of potential candidates was generated, the researcher reached out to each one via email. The email contained outlined information regarding the study, confidentiality statement, and the interview process. The participants were also provided a copy of the Invitation to Participate in the Study form from Appendix D. All participants were informed at various stages of the study that they were not obligated to participate, and that their participation was voluntary.

Data Collection

Data was collected through one-on-one recorded interviews. Extensive notes were taken both during and after the interview to ensure success of the data collection. Recorded interviews were then transcribed as a means of further documentation. The researcher analyzed participants' responses to find themes.

Treatment of the Data

The researcher utilized the suggested methods by Creswell (2013) for qualitative research analysis. This method included determining a phenomenon of interest through data collection from in-depth interviews recorded on an iPad using the speech-to-text tool. This method allowed the researcher to determine the common phenomenon experienced by participants. The researcher then analyzed the data by reading all the transcribed interviews and highlighting "significant statements" known as horizontalization (Creswell, 2013, p. 82) Themes were extracted after the researcher transcribes participant responses to research questions 1-4 and bundled themes of shared phenomenon according to the recommendations of Creswell (2013).

1. How do technological roadblocks contribute to perceptions of computer science in K-2?
5. How do school policies affect a teacher's perception of technological importance in K-2?
6. How might a teacher's attitude or perception of technology affect how he/she uses it to teach students in K-2?
7. How do teachers overcome negative perceptions of technology or computer science use in K-2?

Provisions of Trustworthiness

Trustworthiness was established in this study according to triangulation methods, peer review, member checking, rich descriptions, and an epoché. Peer review allowed another researcher to listen to the audio of the interviews, review observation notes, analyze document categories, and ensure there was no bias. Member checking allowed the opportunity for the participants of this phenomenological study to judge the accuracy of the researcher's findings. Participants were emailed a transcript of their interview and encouraged to provide feedback on discrepancies they found. During the study, the researcher acted as an observer, data collector, and active participant in the interview process. To avoid this bias, the researcher bracketed her own personal feelings or biases by sharing experiences as a teacher, trainer, author, and content developer on an epoché. The dissertation committee assessed the study's interview questions, data, coding procedures, data collection, data analysis, and completion of the study.

Epoché

There was an attempt by the researcher to maintain a neutral role toward participants of this study, since the researcher has a connection to the computer science community and worked on the 2017 CSTA K-12 Computer Science Standards and may have slightly been influenced by personal beliefs or biases.

Summary

In Chapter III, the researcher outlined the design of this study. Chapters IV provided analysis of data, findings, and practical applications. Chapter V provides the summary, conclusions, implications, and recommendations for future studies.

Chapter IV

Analysis of Data, Findings, and Practical Applications

The purpose of this qualitative phenomenological study was to explore teacher's perception of computer science implementation in K-2. The following central question was explored: What can schools do to encourage teacher participation of computer science in K-2? Participant responses provided insight into how personal perceptions affect a teacher's willingness to teach with technology and explore computer science in K-2. The responses are important as they provide solutions for creating understanding of the common phenomenon experienced by this group of teachers'. The following research questions were used to guide data collection and analysis for this study:

1. How do technology roadblocks contribute to perceptions of computer science in K-2?
2. How do school policies affect a teacher's perception of the importance of technology/computer science in K-2?
3. How might a teacher's perception of technology affect how he/she uses it to teach students in K-2?
4. How do educators overcome negative perceptions of technology or computer science use in K-2?

Treatment of Data and Summary of Results

In Chapter III, a detailed account of data and analysis was presented as suggested by Creswell (2013) for qualitative research analysis. This method included determining a phenomenon of interest through data collection, in depth interviews which were recorded, transcribed and analyzed to determine the common experience of participants. The researcher analyzed the data by reading all the transcribed interviews. Data recording was done by highlighting “significant statements” (Creswell, 2013, p. 82) known as horizontalization to develop clusters of themes of the common phenomenon. Those themes were extracted after the researcher transcribed participant responses to research questions 1-4.

Findings for Research Question One

Research question one focused on understanding how one’s own personal perceptions of computer science affect how technology is used in the classroom. Three themes emerged from the analysis of the research question. The themes were *confidence with technology, knowledge of technology, fear of technology*. Of the ten teachers who were interviewed, 90% believe that a teacher’s confidence with technology affects how they use it to teach students in K-2. Ten of 10 (100%) teachers felt that one’s knowledge of how technology can be used in the classroom does affect how they use it or how they integrate into their classroom lessons to support understanding of content standards. Eight of 10 (80%) teachers responded that overcoming fear of technology helps when they have the support from teachers who are experts in the area that are willing to take them by the hand.

Table 1
Teacher's perceptions and the effects on classroom use for instruction

Theme	Quotations
Confidence with Technology	If a teacher is not comfortable with technology, we are less likely to implement it. The more we can become comfortable with uncertainty and let the children drive the instruction the more likely teachers will grow from the experience
	I think if a teacher is more in tune with the actual user, what technology is and keep pushing to use technology then teachers can expand a little bit more with it and maybe they could include coding and you know stuff like that.
	It all depends on the awareness of a teacher. If they are trained on technology they are going to using it. It might help them become more familiar with it and they are going to feel comfortable to use it in the classroom daily.
Knowledge of Technology	I think training either encourages you or discourages you to bring technology into your class. I got some training, afterwards I had more questions and there was not the support.
	If the teacher feels that technology is not very important the teacher will not integrate technology within the school day.
	We will grow as well as learn along with the children, there is a fear in shift from teacher directed to student directed instruction. Watching them learn, made me want to learn more and team them more with technology.
Fear of Technology	I think as a teacher we feel like we must maintain control in the classroom. We also have discomfort when it comes to feeling like we are not in control.
	I have a positive perception of technology in the classroom. It is a way for students to be able to see things in real life and in real time in whatever subject matter that I am teaching.
	Technology is scary, like it is hard to incorporate within the class when it is not. I have learned to choose one thing at a time and try something, I have to kind of pep talk myself to be willing to just try it.

Findings for Research Question Two

Research question two explored how teachers deal with technological roadblocks to determine if these roadblocks affect how they see, think, use technology in K-2. The three themes that emerged from the line of questioning were: *equity and access to CS resources, administration support, no funding for computer science*. Eight of 10 (80%) teachers felt there when it comes to equity to technology it varies from one classroom to another. Six of the 10 (60%) felt their administration does not support coding, and because they do not support it they rarely teach it. Nine of the 10 (90%) feel that there is no funding towards computer science and everything they do to understand how to use it must be done on their own time and with their own resources.

Table 2

The effects of technology roadblocks on a teacher's perception of computer science

Theme	Quotations
Access to CS resources	Lack of resources such as iPads, computers appropriate apps does affect how technology can be used to teach with.
	A roadblock that I see would be where to get started, where would I look for resources and how to incorporate in my regular curriculum throughout the day while having other areas to cover.
	There is a lack of computer science tools. There is a big gap between the learning strand the school says it is teaching and the actual tools teachers have. I was very surprised that not every teacher has an Apple TV and those that do have it do not use it.
	I do not pursue teaching computer science because there is no professional development geared towards really teaching computer science within other content areas. I know I would have to figure that out on my own.
Support from Administration	Coding is another world to me, and our district has not tackled it yet. Our students' world and our districts world have not come together, they have yet to make a connection and we still no not know how both can come together.
	If something is supported by admin it will be funded therefore, I will have easier access to resources that I can use. If it not funded teachers will most likely not use it.
	As teacher's we need to be creative and keep insisting, one of my goals would be support from the people in charge.
Funding for CS	The future is coming so fast and we need computer science because this is the future and we need to figure it out ourselves. We do not have funds that we need to support our class to continue learning technology but as teachers we need to be creative.
	I would like to join some sort of after school or before school technology club where we can work and play around but there is no support or funding for this.
	A lot of roadblocks may be due to funding, if it is not funded teacher's will not teach computer science.

Findings for Research Question Three

Research question three explored teacher's perceptions of school or district policies to analyze how these policies encourage teaching of technology or computer science. If teachers felt these policies did not support the instruction of CS or technology, they were asked to elaborate on the topic. Four themes evolved because of the interviews: *computer science is not important*, *mandated instructional minutes, not enough time, figure it out.* Nine of the 10 (90%) of the teachers felt that computer science is not important to their school leaders and school policies do not support computer science in the classroom. Seven of the 10 (70%) of the teachers also felt school policies do not provide time within the mandated instructional minutes to teach computer science. Seven of the 10 (70%) of the teachers also felt that with everything they must teach there is no time left over to have students code. Nine of the 10 (90%) of the teachers felt pressured to use technology because it was paid for even though they have not had adequate training of technological pedagogy that supports integration across grade level content.

Table 3

The role of school policies to influence a teacher's perception of technology

Theme	Quotations
Technology does not matter	If administration and district personnel would get behind the importance of teaching computer science in the classroom it would help a teacher feel more comfortable with teaching computer science.
	With the lack of support, one being professional development, training, buy in from teachers, time to collaborate, time to ask/answer questions technology can be daunting.
	I would say that policies should include technology because it is part of math and reading. The future is technology and the policies do not are not including technology. They are giving teachers a negative message about technology.
	Teachers must go by school policies and sometimes computer science or technology is not that important to the district or to the school or administrator.
Instructional Minutes	At times I do feel kids are a little bit deprived from science or coding for longer periods of time just because the emphasis is in language arts and math.
	Our day is so impacted with curriculum requirements and it is hard to fit in computer science that is why we are being asked to integrate technology into our curriculum, but that is kind of left up to the individual teacher. It is very inconsistent
	District requirements of the number of minutes per subject that needs to be taught in the classroom will affect the amount of time teachers can use to teach technology and computer science.
Not Enough Time	How much time does that teacher want to spend on researching and learning new technologies and how to integrate it with other content areas.
	When teachers do not have time to teach computer science, they will not even attempt it, when every minute counts.
Figure it Out	I think the message teachers get is we paid for the technology, you better use it.

Findings for Research Question Four

Research question four investigated how educators overcome their own negative perceptions or deal with the negative perceptions of others who do not support their teaching of technology or computer science in K-2. The three themes that were common among participant responses were: *be positive.* Nine of the 10 (90%) teachers felt that overcoming negative perceptions has a lot to do with keeping a positive attitude about the new learning that comes with teaching computer science or using technology in K-2.

Table 4
Overcoming negative perceptions of technology

Theme	Quotations
Be Positive	Keep an open mind, you must be willing to see possibilities even when the mandates keep coming and this is what we must do to teach technology.
	I think the best combination is technology plus a very open minded teacher who can incorporate technology with the best practices education that we already use.
	We should be looking at technology as something that is good and something that will help our students for the future.
	Educators can overcome negative experiences by experiencing more technology. This will help them develop a positive perception of the way it can be used and how students can and will be more engaged when you add technology in their learning.
	I try to talk to teachers who have a positive attitude towards technology and try to work with that group of educators to see how we can positively influence the naysayers of technology and computer science.

Practical Application of Findings

Based on the conclusions and implications of this study, the following recommendations are provided:

- Website-create a website that provides information and ideas that will help K-2 teachers understand computer science in the classroom and the diverse ways it can be used to support K-2. The website will follow the format of an informative website that holds content and resources that reflect current ideas, theories or practices of computer science. The site will contain the following topics/resources: overview computer science, literature reviews, considerations and suggestions for starting to code, explanation of the K-2 computer science framework concepts and practices, strategic planning tools, sample lesson ideas for teaching computer science in K-2, and links to other related computer science resources.
- iBook – create an interactive multi-touch iBook to help educators understand how coding/computer science can be taught in K-2. The iBook will follow the same format of the Get Started with Code books in the iBook's store. There will be approximately 8 getting started with code lessons on each book. Each lesson will begin with an introductory page that outlines lesson objective, length of time needed to teach each lesson, materials needed and key vocabulary to be taught with the lesson. The book will also contain a table of contents and glossary.
- Workshop- create a workshop and template to be used in the district, county, state or out of state by educators to promote computer science in K-2 teachers. The workshop should cater to all teachers including those in induction programs and

should focus on explaining what computer science and how it can be taught across content areas to encourage understanding of how it can be applied in the classroom. This workshop should cater to all educators interested in understanding computer science in K-2.

Introduction to the Project

The purpose for conducting my research was to understand how teachers could be encouraged to teach computer science in K-2. In doing so I discovered that there is a lack of understanding about what computer science is and how content can and does support it. The proposed project idea is to develop a workshop that develops understanding of computer science and how early computing concepts can be introduced during math or language arts instruction.

The researcher will reach out to the following organizations CSTA (Computer Science Teachers Association), CUE (Computer Using Educators), ISTE, CABE (California Association of Bilingual Educators), The Ventura County Stem Network, local community colleges and universities and the Ventura County Office of Education all of which she is a member of. In doing so the researcher helps to create awareness and encourage teacher participation in computer science instruction in grades K-2.

Chapter V

Summary, Conclusions, Implications, and Recommendations

Summary of the Study

The purpose of this qualitative phenomenological study was to explore teacher's perceptions of computer science implementation in K-2. The following central question was explored: What can schools do to encourage teacher participation of computer science in K-2. The following research questions were used to guide data collection and analysis:

1. How do technology roadblocks contribute to perceptions of computer science in K-2?
2. How do school policies affect a teacher's perception of the importance of technology/computer science in K-2?
3. How might a teacher's perception of technology affect how he/she uses it to teach students in K-2?
4. How do teachers overcome negative perceptions of technology or computer science use in K-2?

This study used a phenomenological approach to understand the perceptions of computer science implementation in K-2 by educators. Participants were interviewed in person with an iPad that allowed the researcher to capture the audio. As the participant answered the research questions, spoken words were transcribed into text and uploaded to the Notes app on the iPad. Using the text to speech feature allowed the participant to read transcribed text for accuracy. Once all interviews were completed it allowed the researcher to analyze the data. The clusters of meanings or themes were then used by researcher to describe participant experiences through imaginative variation or structural description to determine the essential experienced by all participants in this study (Creswell 2013). There were several themes that stood out throughout this study: 90% of the participants felt *computer science does not matter,* 100% of the participants felt *knowledge of technology* use is a predictor for whether you will use it, 90% felt that the first obstacle to teaching computer science or using technology is one's own *confidence with technology,* 90% felt that too often they are left to *figure it out* and become frustrated because they do not have adequate support, lastly 90% felt that to overcome negative perceptions of technology/computer science one needs to keep a *positive outlook.*

Conclusions

Data from this research showcased the importance of computer science or technology to 100% of the educators who participated in this research. However, 60% felt that for other educators to overcome the negative perception associated with technology and computer science, administration will have to show support for both subjects. Overwhelmingly 90% of the teachers felt that computer science and technology curriculum is not a top priority for schools as current school policies do not reflect this. Without adequate funding going towards the advancement of computer science in K-2, 80% of the teachers who are interested in bringing computer science to their students cannot. Teachers are aware that there is simply not enough time in a day (70%) to teach computer science. Without adequate training, there is not enough time in a day to learn how computer science and content can go hand in hand. As stated in the literature the demand for technical skills is on the rise yet our schools, educational stakeholders and policy makers have yet to do anything to change this. Even though this was a very small study that explored educator's perception of computer science. The proposed project idea is to develop a workshop that develops understanding of computer science and how early computing concepts can be introduced during math or language arts instruction. The researcher will reach out to the following organizations CSTA, CUE ISTE, CABE, The Ventura County Stem Network, and the Ventura County Office of Education in hopes of being able to share this workshop with other members of these organizations.

Recommendations for Future Research

Due to the small nature of this study, a quantitative study of a larger population of K-5 educators would be a good follow up. Another recommendation is to propose an online survey with approximately five closed-ended questions at the beginning of the workshop and five additional closed-ended questions at the end. This will inform the researcher of participant's computer science knowledge prior to the workshop and their willingness to teach it after. This information will help the researcher analyze current attitudes, opinions or practices regarding computer science in K-2. The hope is that with the new data it will inform educational stakeholders on the teacher attitudes about computer science and the need to encourage teachers to participate in teaching of computer science in K-2.

Self-Reflection

Since I started my doctoral program at Lamar I have had many amazing opportunities present themselves to me. I was a moderator in my states (California) educational twitter #CAedchat where I designed several chats around understanding computer science in the classroom. I started my districts own chat #oxnardk8 to encourage teacher collaboration in my districts 1:1 iOS environment. I was involved in collaborating with K-5 computer science educators from around the United States in revising and rewriting the national computer science standards, known today as the CSTA K-12 Computer Science Standards. I was part of the amazing Apple ConnectEd team both as a team leader and author of learning to code content for teachers throughout our 52 states. I was the recipient of the 2018 STEM Champion Award for Ventura County for my ongoing work with STEM. However, I am still saddened by the lack of resources teachers have, to further their own understanding of STEM/computer science in the classroom. It is my hope that the results of this small study will be used to inform others of the importance of supporting and encouraging K-2 teachers to explore computer science.

Concluding Remarks

The demand for computer scientists' and technical professionals is on the rise and will only continue to grow. There is a discrepancy between what is required of our students to be successful in the future and what they are being taught. Technology will continue to change; one must keep this in mind. Content must continue to reflect the current state of technology. Exploring teacher perceptions of computer science in K-2 will help us amplify their voices and help them find solutions which will make it easier to bring code to all students.

The implementation of the proposed workshop is a starting point and a small one at that. However, teachers need support and are dealing with frustration that they have no control over because they lack resources or personnel to encourage them when they need it. Through my ongoing work with CSTA, CUE ISTE, CABE, The Ventura County Stem

Network, and the Ventura County Office of Education I hope to bring the workshop to new and veteran teachers. Together we can move our students towards a better tomorrow through computer science, CCSS and a whole lot of creativity in K-2.

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Appendices

Appendix A

Inspiring Young Learners with Computer Science Workshop Project

Workshop tilte	Inspiring Young Learners with Computer Science
Description	Technology has changed the world we live in, and learning how it works is fundamental. Coding is an essential skill that teaches problem-solving, develops teamwork, and inspires creativity. Learn how you can engage your students in the world of coding with cross-curricular lessons designed for teachers.

Activity	Directions/Instructions/Detail	Timing
PollEv	Use PollEv to ask audience to respond with single words to this question: Why teach code? Hopefully responses may include problem solving, collaboration, prepare students, creativity, communication, innovation, etc	5m
Introduction: The WHY	Use keynote slides to help show the "why" of teaching computer science. Slides include stats that show impact of technology on our world and also on our students.	7-10 m
ECC Curriculum Intro: The WHAT	Give a birds-eye view of the K-2 ECC curriculum. This presentation will focus on the, Get Started with Code 1. Multi-touch books with embedded materials for teachers, cross curricular activities that meet multiple content standards. Designed to support & empower teachers who have no computer science background. Highlight integrated activities using journaling with Seesaw app and independent coding practice with codeSpark Academy and Tynker Apps.	10m
Lesson 2: You Can Step It: Sequence (K)	Objectives: Build a step by step sequence, understand the importance of order when sequencing instructions & code using sequences Show dance moves for "Hands, Shoulders, Knees and Toes" keynote slides. Have audience participate. Discuss sequence - the order of steps to complete a task. Is order important? Then go to next slide (order has changed). What impact did this have? When we give commands to a computer, they always perform them in the order given. Show either codeSpark Academy Donut Detective Levels 9-17 or Tynker Space Cadet Lesson 2 to show how students will practice creating their own sequences.	10m

Activity	Directions/Instructions/Detail	Timing
Lesson 4: You Can Do It Over and Over: Loops (Grades 1-2)	Objectives: Understand what a loop is, identify where a loop makes instructions more efficient and is powerful when writing code Ask for a volunteer. Ask volunteer to jump once on the spot. Using the exact same words "jump once on the spot", ask the volunteer to jump again. Then again, then again, each time using the exact same words. Now ask audience to consider this question: Would it have been easier for me to ask the volunteer to jump 4 times? What if I wanted him/her to jump 10 times? When coding and we want to repeat an action, that's called looping. What other everyday activities can you think of where you repeat or loop an instruction? Do Activity Body Percussion activity using Keynote slides in Lesson 4 (pg 31) Have audience clap, snap, pat & stomp with repeat loops. Show video of students creating & demonstrating own song (video is in lesson 4). Show puzzles in codeSpark Academy "Tool Trouble" Levels 1-16 or Tynker Space Cade Lesson 4 to show how students will practice using loops in their algorithms.	10m
Multi-touch Book, Tynker & codeSpark Demo	After the 3 Lessons are modeled - show where they can be found in the corresponding multi-touch books and corresponding app	5m
ECC Video	Give 1 minute to audience to discuss with those around them what a "profile of a computer programmer" would look like. Would it be male/ female? What would he wear? Eat? Drink? Age? Where would he live? etc . Have them shout out their ideas? Most likely the profile will be that of a 20 something year old male, drinking mountain dew, eating cold pizza, working in a basement, wearing a sci-fi t-shirt of some sort, playing video games, etc Then ask audience to watch for who is featured in the ECC video. Show video. Discuss age, demographics, geographic locations, etc of the programmers in the video. What did they all have in common? They all were inspired by need or a problem to solve. EVERYONE can code!	5-7m
Resources: The HOW	Leave audience participants with resources so that they can feel empowered to leave and begin teaching computer science to their students. Resources can include: ECC multitouch books, One Best Thing resources, Dash/Dot, Spheros, Scratch & Scratch Jr, Kodable, Code.org, etc	5m

Online Resources

iBook	Get Started with Code 1
iBook	Get Started with Code 2
IOS Application	iBooks
IOS Application	Tynker
IOS Application	codeSpark Academy
IOS Application	Seesaw
Standards	CSTA 2017 Standards

Cross-Curricular K-2 Lessons for Workshop

Coding Across the Curriculum K-2

English Language Arts	**Math**
Students can create a list of morning routines, they can discuss, model or write simple steps to these routines (putting on shoes).	Students gather data of morning routines through simple surveys. Students learn to graph and read information. Ex. What color is your toothbrush?
During concepts of print lessons, students will learn that letter or word formation also follows sequencing rules.	Students build shapes with tangrams. In what order were the shapes built? How many ways can you build the same shape using a different order (sequence).
Learn how to debug while students practice phonemic awareness . Have students unscramble words or sentences using problem solving strategies. What do you see, what do you notice, how can you solve it?	Practice debugging during math, have students solve basic word problems. Remind students to use basic problem solving strategies before they edit and submit work. (ex.)What do you see, what do you notice, how can you solve it, how can it be improved?
Algorithm- Have students discuss or write algorithms to classroom rules or procedures they want others to follow Connect concept to story time or Social Studies lesson.	Algorithm- while working in pairs (Partner A) will draw or write directions that teach (Partner B) a new math concept. Partner B, solves and give Partner A feedback.

Science

Teach healthy teeth habits with Colgate Bright Smiles lesson plans

Follow the recipe that allows you to make play-doh, have students predict if sequencing will affect the outcome of the recipe if order is switched?

Debug-Plan and investigate if plants need sunlight and water to grow, change a variable and have students discuss how it affected the growth of the plant.

Algorithm- Students will write an algorithm to the life cycle of an insect and discuss the impact of humans on the insects world.

Art and Music

Students can create posters to teach everyday sequences to peers (brushing your teeth).

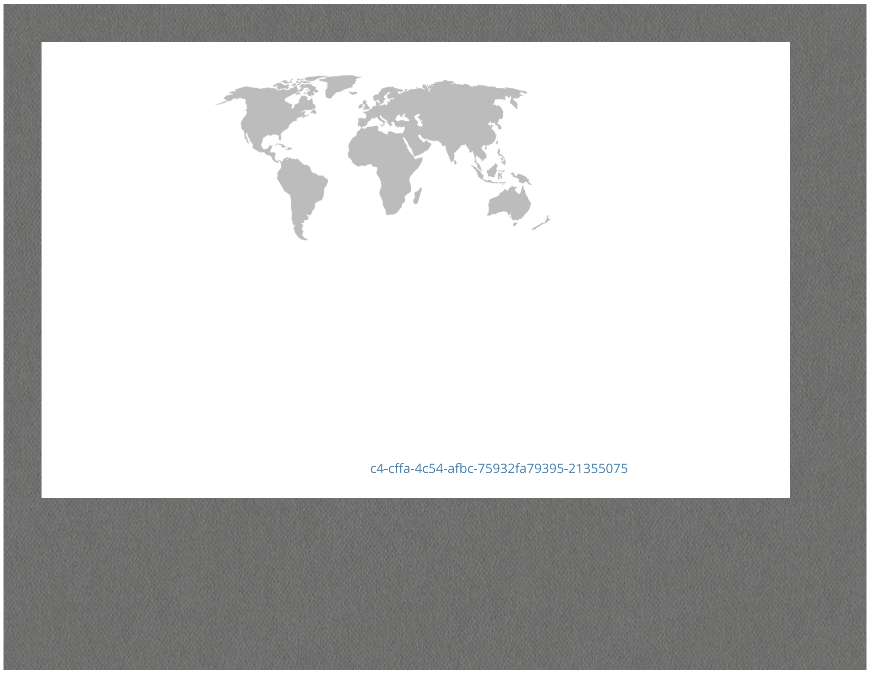
Make 3D shapes out of popsicle sticks.

Debug- Have students create draw, color and cut a picture into a puzzle, have peers solve the puzzle to uncover the picture hidden in puzzle.

Algorithm-Students can create a handshake, using iMovie student can record the steps for others to learn this new handshake, have students iterate algorithm to add a dance component to the handshake.

Appenidix B

CITI Completion Form



Appendix C

District Approval Letter

SCHOOL SITE PERMISSION LETTER

Date

Institutional Review Board
Lamar University

4400 S M L King Jr Pkwy

Beaumont, TX 77705

To Whom It May Concern:

Leticia Batista, a Doctoral student at Lamar University Center for Doctoral Studies in Educational Leadership is requested permission to conduct the research project named *Exploring Educators Perceptions of Computer Science Implementation in K-2* at McKinna Elementary during the period of March 4, 2019 to April 1, 2019. This letter seeks permission for Ms. Batista to conduct this research at the location listed below.

Research Project Title: Exploring Educators Perceptions of Computer Science Implementation in K-2

Principal Investigator: Leticia Batista

Study Site Location: Dennis McKinna Elementary
1611 S. J. St.
Oxnard Ca., 93033

Permission granted by:

Cesar O Morales

Superintendent

Wendy Ann

Principal

3/4/19

Date

Appendix D

Interview Protocol

Exploring Educators Perceptions of Computer Science Implementation In K-2
Interview Protocol

Part 1.

Instructions

Good afternoon, my name is Leticia Batista, thank you for coming. You are being asked to participate in an interview as a part of this study. In the interview, I will ask you about your experiences as an educator implementing computer science in K-2. The purpose will be to get your perceptions of your experiences inside and outside of the classroom. There are no right or wrong or desirable or undesirable answers. I would like you to feel comfortable with saying what you really think and how you really feel.

TAPE RECORDER INSTRUCTIONS

If given permission, I will be tape-recording our conversation. The purpose of this is so that I can get all the details but at the same time be able to carry on an attentive conversation with you. I assure you that all your comments will remain confidential. I will be compiling a report with all your comments without any reference to you.

CONSENT FORM INSTRUCTIONS

Before we get started, please take a few minutes to read this consent form (read and sign this consent form). The interview will begin once you turn in the consent form and at a scheduled time that is beneficial for both parties.

RESEARCH QUESTIONS

R1: How might a teacher's perception of technology affect how he/she uses it to teach students in K-2?

R2: How do technological roadblocks contribute to perceptions of computer science in K-2?

R3: How do school policies affect a teacher's perception of the importance of technology/computer science in K-2?

R4: How do educators overcome negative perceptions of technology or computer science use in K-2?

DEBRIEFING

Thank you very much for coming this afternoon. Your time is very much appreciated and your comments have been very helpful.

The purpose of this interview is to better understand educator's perceptions of computer science implementation in K-2 and of their experiences inside and outside of the classroom. We are interested in your opinions and your reactions. In no way is this interview designed to individually evaluate a person's abilities. Your only requirement was to do the best job that you could.

The results of this research will provide useful information to educators and school leaders, in helping them to structure computer science programs that teachers consider to be most effective and ideal in helping them teach computer science in K-2.

You will be kept anonymous during all phases of this study. Procedures for maintaining confidentiality are as follows, completed interviews will be kept for a period of three years after which they will be destroyed. To further help maintain confidentiality, computer files of responses will be created and participants will not be asked to provide their name. Identifiers such as names will not be placed on any data collections tools or research reports.

Appendix E

Participant Recruitment Letter

Dear K-2 Teachers,

My name is Leticia Batista and I am a student from Doctoral Studies in Educational Leadership at Lamar University in Beaumont, Texas. I am writing to invite you to participate in my research study about Perceptions of Computer Science Implementation in K-2. You're eligible to participate in my research study because you are a K-2 teacher who has taught computer science for a minimum of two years and you are over 18 years of age.

If you decide to participate in this study, you will participate in a face to face 60-minute interview that consists of four questions. I would like to audio record your responses to the four questions of this research and then I will use this information to gather data around teacher perceptions of computer science.

Remember this is completely voluntary. You can choose to be in the study or not. If you would like to participate or have any questions about the study, please email or contact me at lbatista@lamar.edu.

Thank you very much,
Leticia Batista

Biographical Note

Leticia Batista is a Dual Language teacher from Oxnard, California. She has been an educator for 13 years and has taught grades K-4. She works in a 1:1 district and is currently at McKinna Elementary, an Apple Distinguished School. She is a tech mentor and teacher at her school site. In 2015, she joined the Apple Distinguished Educator program and wrote her first Primary Coders book, Teaching with Unplugged Activities. In 2016, she joined the CSTA Interim Standards Revision Team and in 2017 co-authored the 2017 CSTA K-12 Computer Science Standards. She continues to work with CSTA (Southern California Chapter). As a former moderator of #CAedchat and founder of #OxnardK8 she realizes the importance of building and working across digital boundaries with other educators, allowing her to collaborate, share and meet so many educators from around the world. One can find her sharing her work as a CUE Lead Learner, bilingual conferences (CABE), and with other Apple Distinguished Educators.

Style manual delegation:	*Publication Manual of the American Psychological Association, Sixth Edition*
Typist:	Leticia Batista