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Interactive Technology Use in Early Childhood Programs to Enhance Literacy Development & Early Literacy Development for Children with Cochlear Implants

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**Interactive Technology Use in Early Childhood Programs to Enhance Literacy
Development**

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Early Literacy Development for Children with Cochlear Implants

by

Keri Ellingson

Starred Papers

Submitted to the Graduate Faculty

of

St. Cloud State University

in Partial Fulfillment of the Requirements

for the Degree

Master of Science in

Child and Family Studies

February, 2016

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Jane Minnema, Chairperson
Shannon Rader
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Dedication

These papers are dedicated to Michael for always providing me with moral support, knowledge, expertise, and patience throughout the process of finishing my master's project. I am especially thankful for his unconditional love. I would also like to thank my advisor, Jane, for providing the support I needed to finish within my goal timeline.

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Chapter 1: Introduction

Early literacy skills are the foundation for later reading skills. The components of early literacy include language, standards of print, letter knowledge, linguistic awareness, phoneme-grapheme correspondence, emergent reading, and emergent writing (Whitehurst & Lonigan, 1998). These skills are necessary for a child to continue their development of literacy and reading readiness. Yet, many children develop early literacy skills before they even enter a classroom as literacy happens within a child's daily routine and environments (Hutchison, Beschorner, & Schmidt-Crawford, 2012). Young children's accelerated literacy skill development may in part be due to technological advances of the 21st century.

Technology is always improving and changing every single day. A new form of technology is developed, a new idea is created, or a new page is posted. Technology defines many of the recent generations; therefore, our teaching methods must suit the needs of our learners. The International Reading Association (IRA) issued a position statement in 2009 stating that: "to become fully literate in today's world, students must become proficient in the new literacies of the 21st century technologies. Thus, literacy educators have a responsibility to integrate information and communication technologies (ICTs) into the curriculum to prepare students for the future (Hutchison et al., 2012).

Further, the 21st century is an age of mobility and ease. Traxler (2009) defined mobile learning simply as learning that is supported or delivered by a handheld or mobile device (Hutchison et al., 2012). Many of these types of technology resources can help students access a greater understanding of what they are learning by improving engagement. In this day and age, when children are immersed in technology in many of their usual environments, using technology in the classroom is a familiar experience that is applicable to many learning styles.

Children are increasingly more often using some form of technology at home which teachers can take advantage of to increase attention and engagement (Nichols, 2015). Technology has endless patience. A user can push the same button repeatedly and the technology will continue to provide the same feedback again and again.

Ertmer (2005) stated that an educator decides when and how to integrate technology into their daily lesson plans. But how to effectively implement technology into a classroom can be a challenging task for an educator. Thus, it is important for educators to understand what technologies are available as well as how these devices can best be used to enhance learning for young children.

Designing lesson plans is a key part of an educator's everyday schedule. There are many different aspects to be mindful of while planning such as student abilities, length of time, alignment to previous lessons, advancement of lesson, etc. Nichols (2015) discussed how Interactive Whiteboard use should enrich learning appropriate for the classroom setting versus dictating the lesson plan. But, incorporating technology into daily lessons can have its benefits and challenges.

With a variety of technology tools available, educators can design their classroom with technological components to fit the needs of all students. In contrast, technological components may not match a school's financial resources. Hutchison et al. (2012) stated that mobile devices, such as iPads and laptops, could provide opportunities for interactive learning, but expenses may prevent extensive availability for all students.

Importance and Purpose of Study

Many early childhood educators want to determine the best means of education for their population of students to achieve growth in a specific area of learning, such as literacy. There

are many different technologies available but it can be difficult to decide which is the best fit for the population one is working with. It can also be difficult to determine which technology will provide the optimum-learning outcome. Thus, the purpose of my research project was to understand how interactive technology enhances early literacy learning in early childhood programs. The importance of this review of literature is to understand what is in the classroom in terms of technology use. Many published studies focus on how technology can be used in the classroom. I would like to be able to identify how that technology facilitates learning when teaching early literacy skills.

Research Question

In this paper I explore how technology can affect early literacy skills. The main research question of this literature review examines to what extent interactive technology enhances literacy skills in children ages 3-6 years in early childhood programs. There are multiple instructional purposes that drive the use of educational technology, but the primary focus of this paper is how technology is used best to promote literacy skills.

Literature Search Description

During my literature search I used the ERIC search database. I initially used the following search terms; “literacy and technology,” “early childhood and technology,” “preschoolers and technology,” “interactive technology and early childhood,” “early childhood and literacy,” and “early literacy in early childhood classrooms.” After reading the literature I noticed they used different terms, so I revised my search to “emergent literacy” instead of “early literacy.” I mainly used ERIC as my search database except when no results were found I would use Academic Search Premier or EBSCO.

Definition of Terms

Assistive Technology: Assistive technology means any item, piece of equipment, or product system, whether acquired commercially off the shelf, modified, or customized, that is used to increase, maintain, or improve the functional capabilities of a child with a disability (American Heritage Dictionary, 2015).

Early Literacy: Early literacy skills are developmental precursors to reading and writing (Whitehurst & Lonigan, 1998).

Emergent Reading: Emergent reading is decoding letters into corresponding sounds and linking those sounds to single words (Whitehurst & Lonigan, 1998).

Emergent Writing: Emergent writing is translating units of sounds into units of print (Whitehurst & Lonigan 1998).

Grapheme: A grapheme is a letter of the alphabet. All the letters and letter combinations that represent a phoneme, $f=ph$ (American Heritage Dictionary, 2015).

Inclusive: Inclusive settings are settings where children with disabilities are together with typically developing peers (Merriam-Webster Dictionary, 2015).

Interactive Technology: Interactive technology is relating to a program that responds to user activity. A user must manipulate the device in order to produce an outcome (American Heritage Dictionary, 2015).

Interface: An interface means to connect or become connected; the means by which interaction or communication is achieved (Merriam-Webster Dictionary, 2015).

Linguistic Awareness: Linguistic awareness is being able to take language as a cognitive object and to possess information about the manner in which language is constructed and used (Whitehurst & Lonigan 1998).

Phoneme: A phoneme is the smallest phonetic unit in a language that is capable of conveying a distinction in meaning (American Heritage Dictionary, 2015).

Self-contained Classroom: Self-contained classrooms are specifically designated for children with disabilities (Merriam-Webster Dictionary, 2015).

Closing

In the next chapter I discuss, in a literature review, how technology can be a highly useful tool for delivering instruction within a classroom. I briefly consider different variables affecting an educator's use of technology in the classroom. While literacy skills are not the only curricular area that can benefit from technology usage, a second focus of this literature review addresses literacy skill development in early childhood programs. A final topic of this literature review describes how children of the 21st century learn differently due to current technological advances.

Chapter 2: Literature Review

The purpose of this chapter was to review the literature that examines the use of interactive technology in early childhood programs. Interactive and assistive technologies may be used in both self-contained and inclusive classrooms. Assistive technology is purposed for adaptive uses with children with disabilities while all children can use interactive technology. This literature review focuses on interactive technology use in early childhood classrooms that does not include the use of assistive technology (Table 1). The first section addresses the use of iPads in literacy instruction within early childhood learning environments. A second section of this literature review pertains to teacher perceptions of technology use in early childhood education classrooms.

The Use of iPads in Literacy Instruction

Children do not learn to be literate at a certain stage in their development (Teale & Sulzby, 1986). Children are continuously learning by interacting with their social and physical environments. For over 30 years researchers have been investigating influences on early literacy development. Children of the 21st century are influenced by the expanding developments of digital technologies (Beschoner & Hutchison, 2013). Many children grow up watching adults in their environments use digital technology to communicate with one another. Observing these actions can assist in the development of the roots of literacy (Beschoner & Hutchison, 2013). Goodman (1986) defined literacy roots as: (1) the development of print awareness in situational contexts; (2) print awareness in books, magazines, or other environmental print; (3) functions and forms or writing; (4) the use of oral language to talk about written language, and; (5) generalizing skills across situations and understanding that language is a process used to communicate. Whitehurst and Lonigan (1998) added that literacy environments play a key role

in emergent literacy. Reading is a process that is motivated by the extraction of the meaning. If a child has never heard or seen a specific word they will not understand what it means.

Beschorner and Hutchison (2013) discussed the importance of understanding the different types of digital literacy children of the 21st century encounter beyond print-based text. The roots of literacy for a child of the 21st century would also include digital forms of reading and writing. When children observe those around them using digital technologies to read, write, and communicate the definition of traditional literacy changes—both in terms of a child’s expectations for learning and needs for future success. Once young children enter early childhood programs, their observations of and access to technology use has influenced a child’s awareness of print.

Whitehurst and Lonigan (1998) discussed “reading readiness” that preceded emergent literacy is what is used in most conventional education settings currently. Reading readiness perspective is focused on what skills children need to have mastered before formal reading instruction can begin. An emergent literacy perspective is skills, knowledge, and attitudes that are presumed to be developmental precursors to conventional forms of reading and writing. Researchers argue the importance of social interactions in literacy-rich environments in order to succeed later on. Whitehurst and Lonigan (1998) recognized children’s exposure to social contexts of literacy at a young age play a role in later literacy development.

Touch screen tablets offer many features that enable emergent literacy development. Children are able to interact with a range of single and multi-touch gestures (Neumann & Neumann, 2014). Michael Cohen Group and United States Department of Education (USDOE) (2011) observed the interaction with touch screen tablets of 60 children between the ages of 2-8 years old. They found that children as young as 2 years old were able to interact with a tablet. It was found that 2- to 3-year-olds experimented mostly with cause and effect behaviors such as

dragging, swiping, or tapping. Four- to 5-year-olds used more advanced skills and were able to generalize their actions to win different games. The 6- to 8-year-olds developed skills to master applications (apps) and apply those skills to other apps. The researchers' results indicated that children learn an understanding of a device in stages of development beginning with a sensory experience (i.e., touch, repeat, trial and error) and developing to a more independent operation. The table below described benefits and drawbacks of integrating technology into literacy instruction.

Table 1

Advantages and Considerations of Using iPads for Literacy Instruction

Helpful aspects of iPads for instruction	Special considerations for using iPads in instruction
Students were able to apply their prior knowledge of other digital literacy tools to figure out how to navigate the iPad without a lot of instruction from the teacher.	Manipulation was difficult within some of the apps. For example, it was sometimes difficult to resize text and images.
When they encountered problems, students worked collaboratively to figure out how to navigate the iPad. This collaboration led to increased and improved conversations about the assignments during the learning experiences.	The teacher had to rethink how she wanted students to save and share their work. Although not difficult, the teacher had to adjust to a new way of receiving and reviewing student work.
The availability of many different apps, as well as the many features of each app, made it easy to differentiate assignments for students.	
iPads power on and off quickly, so it was quick and easy to restart iPads when needed without disrupting the learning experience.	The sensitive touchscreen caused students to engage functions unintentionally. For example, a student accidentally engaged the highlighting function in iBooks when using his finger to track along with the text he was reading.
Because individual apps perform specific functions, and because iPads are easily stored in student desks, it was common for the teacher to spontaneously think of ways to integrate the iPads.	As with any digital technology, teachers had to troubleshoot at times. This reality required the teacher to have a willingness to explore the potential causes of problems that arose.
The iPad can be programmed to display in many different languages.	Creating word documents is possible, but the apps that make it possible have limited features. For example, there is no app that allows the user to track changes within a document. Many iPad apps do not allow the user to edit work once it has been saved.

Integrating technology in a significant way can change literacy instruction (Hutchison & Reinking, 2011). In early childhood programs, technology needs to be easily accessible and user-friendly for 3- to 5-year-olds to be able to independently operate. Interactive interfaces are the most suitable for children because it gives them opportunities to discover, make choices, explore, imagine, and problem-solve while physically manipulating something (Beschoner & Hutchison, 2013). Giving technology to students steers them to more self-directed learning allowing the teacher to become the facilitator (Lynch & Redpath, 2014).

Laptops and iPads provide mobility and ease, which allow children to incorporate them into other areas of play (Neumann & Neumann, 2013). Children are able to learn in a variety of settings instead of the traditional desk and chair. It is important to ensure teachers are able to meet curricular goals while implementing digital technology. Many early childhood curricula are play-based which makes implementing technology into the curriculum activities easier for classroom teachers.

Howard, Miles, and Rees-Davies (2012) researched how computer use is integrated into an early year's play-based curriculum. Children are motivated by play and have increased motivation and engagement when they approach an activity as though it is play. No adult presence is how children perceive activities as play. When children are allowed to explore information and communication technologies (ICTs) on their own, they feel as though they are playing. Researchers explored children's level of engagement while using a computer in a classroom. They videotaped a full day of children's computer use in 12 different classrooms. Children's level of engagement was measured on a 1 (lowest level) to 5 (highest level) scale. It was found that on average children had medium to high levels of engagement during computer use activities.

Teachers involved in the study described having successful integration of computer use throughout the school day in a variety of ways. These included continuous, enhanced, and focused activity types. Continuous is described as activity that was available freely throughout the way choose and directed by the child and only involved adults on request by the child. Focused activities involved teacher directed teaching of a specific skill with planned learning outcomes. Enhanced included a combination of continuous and focused activities where the child and/or teacher directed activities. Researchers found that a mixture of these three teaching techniques were most effective for integrating technology into a play-based curriculum.

Hutchison and Reinking (2011) discussed the importance of curricular integration as opposed to technological integration. Researchers found that a “majority of technology use in classrooms occurs as technology integration rather than curricular integration” (p. 17). Technology is less likely to be integrated if teachers view that technology as being separate from the curriculum. An educator’s goal is to enhance learning by giving students opportunities to learn with 21st century technologies, while still focusing on the curriculum reading goals.

Integrating technology into the classroom is not left exclusively for the classroom teacher. Administration must be involved in staff development opportunities to support these teaching endeavors. Defining technology integration and explaining procedures for implementation within a classroom setting is an obstacle many educators face when discussing technology use (Hutchison & Reinking, 2011). Hutchison et al. (2012) found that educators view ICTs as separate from the curriculum. This study also discussed the importance of curricular integration and how to change the view of ICTs to become integral to the curriculum. Many educators find technology to be a nuisance instead of incorporating it into their existing plans (Morrow, Barnhart, & Rooyakkers, 2002).

Hutchison et al. (2012) examined an educator who implemented iPads into her literacy instruction for 3 weeks. There were 23 students in the classroom so independent and small group work was used. The following instructional activities were used: independent reading, sequencing, retelling, visualization, cause and effect, and main idea and details. The children had access to books from the bookshelf or their iPad to read on their own for independent reading time. While they worked in small groups, the children sequenced stories in the order of events that occurred and also drew pictures of sentences to help visualize the story. The children used the app Doodle Buddy to retell stories by drawing pictures of the beginning, middle, and end. Researchers found that the students learned to digitally communicate with each other via applications while also meeting curriculum literacy goals. It was also found that incorporating iPads improved student engagement and gave them a unique way to show creativity. Students easily navigated the iPad and were able to work independently and cooperatively with peers (Hutchison et al., 2012).

Beschorner and Hutchison (2013) conducted a study in two pre-school classrooms where teachers received iPads to implement into their teaching. The researchers selected the apps used while the teachers decided how they would be used in instruction. Children used the iPads during individual, small-group and large group activities. Different apps were introduced each week varying from writing, speaking and listening apps. There was very limited teacher assistance during individual work time to encourage independence. Results were obtained through observations, children's digital work samples, teacher interviews, and parent feedback. Beschorner and Hutchison (2013) found that the iPad, or similar tablets, is a tool that can be used for instruction of early literacy skills in a variety of ways.

The results from Beschorner and Hutchison (2013) discovered six major themes related to the use of iPads in the classroom. Children became familiar with digital environmental print by being able to choose the app based on the image and words without even knowing they were reading the app name. Due to the mobility of the iPad, children were able to carry it around their environment and find letters or words that matched what was on their screen. The on-screen keyboard provided children with access to type words or letters. Teachers in this study shared the children's work via email with the parents. The children became excited about writing to or for someone else and understanding the functions of writing. When they listen to a book on the iPad they are able to follow along with the words on the page and see the pictures. Listening to books provided children with the ability to connect reading, writing and speaking to listening. According to both teachers' testimonial findings, social learning between the students was among the greatest differences. There was often conversations between the children about what they were doing or what app they were using.

Teacher Perceptions of Technology Use in Their Classrooms

With technological advances continually emerging teacher training and staff development must be continuous as well (Morrow et al., 2002). Teachers have an important influence on technology use within their classrooms; only with the proper training will technology be used appropriately. Yet, there are barriers that prevent teachers from successfully integrating technology into their classroom. These barriers include teaching beliefs, attitudes toward the educational value of technology and comfort with technology (Blackwell, Lauricella, & Wartella, 2014).

Researchers Howard et al. (2012) gathered information from 12 schools using the Welsh Foundation Phase play-based curriculum for children ages 3-7 years of age. Teachers were interviewed about their perception of ICT use within the curriculum. Overall, they felt able and supported to integrate computer use into the curriculum. Results indicated teachers found benefits across developmental domains with emphasis on numeracy and literacy. Teachers also highlighted the contribution to social and emotional development. Children were cooperating, taking turns, explaining directions to one another, and enhancing their communication skills with peers.

The purpose of the study conducted by Hutchison and Reinking (2011) was to characterize teacher perceptions about integrating technology, extend previous research pertaining to integration of technology, assist those involved in professional development for integration and to create a benchmark for evolving trends. There is not current data addressing questions related to integration of ICTs. Researchers developed a survey for teachers in the United States who belonged to the International Reading Association (IRA) due to the fact that these teachers focused predominately on literacy. Participants were sent an online survey with questions using various response formats such as likert scale, checklist, yes/no and open-ended questions. The researchers received 1,441 back for data analysis and a hypothesized path model was developed to examine the results.

It was found that less than one-third of the participants had access to relevant technologies, making it difficult to fully incorporate technology into their classroom instruction. All teachers reported having technical support available. Many of the literacy teachers who participated in this study reported that they see integration as more supplemental to instruction (technological) rather than curricular (part of the curriculum). Participants indicated how

obstacles they encounter effected integration. Lack of time during a class period, lack of access to technology, and lack of professional development on how to integrate technology were among the top three identified obstacles to implementing technology in their instructional delivery.

Based on the databased findings from this study, the information proposes that educators are not utilizing ICTs to connect with 21st century learning (Hutchison & Reinking, 2011).

Blackwell et al. (2014) conducted a survey study of 1243 early childhood educators to explore factors influencing their use of technology. The participants were asked how often they used various technologies within their instruction. On average, teachers reported they used technology 8.5 days per month. The researchers demonstrated that support and attitude were not a good fit for the final model. Instead, support for children's learning from technology and attitudes toward children's learning were used (Blackwell et al., 2014). It was found that attitude had the greatest effect on technology use. The researchers initially hypothesized that student socio-economic status (SES) and teaching experience would not be predictive factors, which was correct.

The survey results showed that teachers who received proper training on how to use technology to enhance student learning, had better attitudes toward using technology tools in their teaching. The participants' teaching experiences showed that with more technological experience, the more technology was used in their classroom. Teaching experience of the participants showed the more experience, the more use in those classrooms. Teachers with more experience have an advantage on newer teachers because they typically have a better foundation of teaching young children, which helps them incorporate technology into their current teaching strategies.

According to Blackwell et al. (2014), teachers with more experience were found to have less positive attitudes toward technology but were more likely to use technology. A teacher with more teaching experience was most likely trained in traditional classroom techniques such as paper and pencil work. These skills provided them with solid foundational knowledge of early childhood that helps them incorporate new teaching approaches such as technology. Teachers with less teaching experience have more personal use with technology, which could make it more difficult for them to effectively incorporate technology into their teaching. Russell, Bebell, O'Dwyer, and O'Connor (2003) discovered that younger teachers had higher levels of comfort with technology but older teachers use technology more often (Blackwell et al., 2014).

Chapter 3: Summary and Conclusions

The introduction of technology as instructional tools has prompted many discussions in the field of education. School districts choose various curricula year to year, and with the advances in technology; educators are now choosing the technology that best fits their students and staff. In this paper, I reviewed the literature that examined the use of in early childhood classrooms with a specific focus on the effects on literacy skill development.

The Use of iPads in Literacy Instruction

I reviewed five articles pertaining to the use of interactive technology use in literacy instruction. Many studies used iPads or interactive whiteboards as their technology focus. Lynch and Redpath (2014) found that children enjoy using iPads. Children are often familiar with iPads as many families have one of their own at home. These researchers found that the impact of iPad use depends on how iPads are used within the classroom. This study also found that learners as young as 2 years old can use iPads independently. Further, study findings indicated that many apps are created specifically for early literacy learning. Teachers felt a bit “naughty” using technology within their classroom as they felt the technology was taking the place of their teaching (Lynch & Redpath, 2014). Specifically, it was noted that teachers felt guilty allowing their students to explore technology without adult guidance at all times.

Beschorner and Hutchison (2013) also demonstrated that young learners are able to navigate the iPad on their own. To paraphrase their thinking, it was stated that children of the 21st century are immersed in interactive media daily that in turn influences their literacy development. Some children use environmental print to navigate their world, including being able to navigate an iPad independently. These children were able to use situational print to help other children find specific apps. Children too favored certain apps and were able to visit them

often. This was possible because children acquired an understanding of the meaning for the image and print on the screen. In addition, children supported personal-social skill development when helping peers while simultaneously learning literacy skills--without even being aware that they were learning.

With the recent release of touch screen tablets, Neumann and Neumann (2013) showed that studies on this topic are gaining momentum. Through early experiences with these interfaces there is potential to enhance emergent literacy skills (Neumann & Neumann, 2013). Nevertheless, the availability of these tablets and the quality of apps is limited. Even so, it continues to be important for parent and teachers to interact with children using traditional and digital tools to develop literacy skills. In 2012, the National Association for the Education of Young Children (NAEYC) stated that they encourage children from birth to 8 years of age to use tablets and age appropriate educational apps to support early literacy development.

Hutchison et al. (2012) focused mainly on integrating iPad use into the curriculum to extend beyond usage within the general classroom environment. This study found that the teacher was able to meet the instructional goals when introducing literacy skills through technology-supported instruction. In other words, the teacher successfully achieved curricular integration. It was also found that iPads not only supported learning goals by student engagement as well. Thus, when school districts are selecting curricula, researchers stressed the importance of teachers and leaders considering how the tool can be used for curricular integration rather than more general technological integration within a classroom setting. In summary, the use of technology can stimulate creativity among students providing them unique ways to absorb information. There are specific recommendations that researchers suggest for

leaders of learning as technological tools are selected for teachers to use in their classroom instruction.

The study conducted by Howard et al. (2012) concentrated on early childhood teachers' perception of computer use within their play-based curriculum. Teachers felt confident in integrating technology and felt well supported by technology coordinators within their schools. Children perceived play as being without adult guidance. When teachers allowed children to explore technology on their own children felt they were playing rather than learning. Incorporating ICTs into the play-based curriculum enriched all developmental domains of children's learning. A challenge noted in this study was how teachers with less experiences in technology provide support to children who are learning to use these tools. As with many other studies that I reviewed, participants mentioned budget issues causing problems of access to the latest available technology.

Ultimately, young children in educational settings are able to use an iPad independently as well as in an interactive manner with their peers. Children and their teachers benefit from the variety of different apps that enrich literacy skills. As long as teachers are aware of how they are integrating technology within their instructional delivery, research has demonstrated that teachers can successfully meet instructional goals when curriculum and technology are integrated within the learning process.

Teacher Perceptions of Technology Use in Their Classrooms

I reviewed four articles that investigated teacher perceptions of technology use in their classrooms. Blackwell et al. (2014) found that teachers with more teaching experience were more likely to use technology in their classroom. They were also better able to integrate it best

into their traditional teaching techniques due to experience with young learners. This study also found that teachers with support and training from administration were more likely to embrace the use of technology.

There were limitations noted in this study. One limitation is that teachers with more traditional teaching beliefs had a negative view of technology while teachers with a student-centered approach have a more positive attitude toward technology use. Another limitation noted was that all study participants were NAEYC members. There may be differences among various populations of educators. Thirdly, some participants used many different forms of technology less often while others used one main form of technology more frequently. Finally, these findings are a cross-sectional look at participants' technology usage in their classrooms. A longitudinal study might yield more representative results.

Using online survey methods, Hutchison and Reinking (2011) discovered that the more teachers perceive interactive technology use as important, the more likely they were to have positive perceptions of technology use. Only 43% of teachers in this study said they had an interactive whiteboard available for use. This is one of the obstacles observed throughout the study. Other obstacles mentioned were: lack of time during class, lack of access to technology, lack of training, lack of time to prepare, and lack of time to integrate. If teachers find technology to be a nuisance or extra work, they will not be as willing to integrate it into their daily teaching. Although teachers who participated in this survey stated that there are obstacles to integration, they noted that it is not overwhelming or unmanageable to do so. Despite their expressed need for professional development, they were confident in their ability to integrate successfully. An online survey does not always guarantee random sampling or valid and reliable findings when

response rates are low. Researchers stated that observational data would be helpful in addition to the survey results to obtain a more accurate picture of teachers' technology perceptions and use.

As a final summary statement, Morrow et al. (2002) recommended that schools address the literacy needs and demands of a changing society when children are very young. They also stressed the importance of professional development for teachers. Providing ongoing training and support for teachers will lead to more positive attitudes towards technology use in classrooms. In this way, classrooms of the future can provide children with a wide array of exciting learning opportunities. Students will be able to work cooperatively on projects within the classroom and virtually outside of the classroom allowing students and educators alike to learn collaboratively across the globe.

Chapter 4: Position Statement

I am currently an Early Childhood Special Education (ECSE) teacher, both as a home visit early interventionist and in a center-based self-contained preschool classroom. Throughout my last 5 years of teaching, there have been many advances in technology for both staff and student use. The shift from whiteboards to interactive whiteboards to a 1:1 initiative using iPads or chrome books has been fascinating changes in educational practice. Throughout the remainder of my career, I expect to see many changes with technology use. I am hoping that my research in this paper will provide insight and knowledge into how to best integrate technology use in early childhood settings.

My review of research has practical implications for educators and administrators when thinking about technology use in preschool programs. As an educator I think proper training and knowledge of technology is vital to the development of student learning. Throughout the research I discovered that teachers with more training and support were more likely to use technology (Hutchison & Reinking, 2011). I believe teachers must have trust in the product they are using and are willing to integrate. If we, as teachers, do not believe technology to be a useful tool for learning, we will not be able to convince our students to believe in technology.

Further, I believe administrators need to recognize that teachers and students are the best critics when deciding which technology fits their district. They must value a teacher's opinion when making decisions that affect classroom curricula. A teacher also needs to feel supported by superiors to feel confident enough to integrate technology into everyday lessons. Having supportive administration is a key factor for integrating technology.

The results of these articles reviewed in the previous chapter all pointed out the importance of teacher training and support (Hutchison & Reinking, 2011). If a teacher is

supported with using technology within the classroom they are more comfortable integrating into the curriculum. Children are able to independently use interactive technology leaving the teacher to guide them in the direction toward classroom goals.

As with most new trends in education, there are obstacles. Cost, training, willingness to utilize, technical assistance, and software compatibility are just a few obstacles that districts face with the biggest obstacle being cost. Technology can be an expensive initiative to implement into a district. Research into various technologies as well as how other districts are using them should be done before making a final decision. Being able to prove the significance and importance of technology use integration is crucial to obtaining the funding needed.

Literacy skills are a fundamental stepping stone to all areas of development. All individuals need literacy skills in order to function effectively in a variety of environments. Human beings are immersed into language from the day we are born. We are constantly taking in information and processing it. Children as young as 2 years old are able to read the moment they name a picture in a book, recognize a restaurant sign, or choose an app on a technology device. Technology is not needed to learn literacy skills but using it enriches the growth of these skills.

With technology around us in our environments, it is difficult not to use it in the classroom. My teaching philosophy is based off of Ignacio Estrada's quote: "If a child can't learn the way we teach, maybe we should teach the way they learn." This is especially true for technology use. Research shows that children can learn a variety skills using technology throughout their school day. During this review, I became more aware that not all children would thrive using traditional teaching techniques; therefore, we as educators should teach to children's learning styles.

In summary, I feel that support from administration is crucial to integration of technology into any classroom setting. Teachers should be allowed to voice opinions and suggestions during the decision-making process. Choosing technology should be driven by data rather than best intentions in updating learning resources. I feel that cost typically plays the biggest role in determining which technology will be purchased, but I believe strongly that administration needs to look past that and rely on the teachers' input instead. One must remember that technology is not necessary to learn although it can enrich all areas of development.

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Appendix A: Literature Review Grid

Author(s), Year	Research Questions	Participants	Key Findings
Blackwell, C. K., Lauricella, A. R., & Wartella, E. (2014)	What factors contribute to early childhood educators' technology use in the classroom?	1243 Early Childhood Educators	Educators with a positive attitude toward use and those who had support were more likely to use technology in their classroom.
Jennings, N. A., Hooker, S. D., & Linebarger, D. L. (2009)	Skills and behaviors observed of preschoolers who have viewed an educational TV program, <i>Between The Lions (BTL)</i>	Four children, two boys and two girls were observed over a 4-week period	Content demonstrated both inside-out and outside-in literacy skills and enhanced those skills for the viewers.
Guo, Y., Sawyer, B. E., Justice, L. M., & Kaderavek, J. N. (2013)	*Structural and instructional quality of the literacy environ. *Examine the contribution of teacher and classroom-level factors to the quality of the literacy environment	Fifty-four preschool teachers working in ECSE classrooms 439 children from the 54 classrooms	*structural literacy environment = low to moderate quality * instructional literacy environment was associated with teachers who had higher education
Burnett, C. (2010)	Exploring both digital literacy and the use of new technologies to support print-based literacy	Technology and literacy for children age 0-8	More research is needed in the area of young children's engagement with digital texts.
Lynch, J., & Redpath, T. (2014)	Use of portable personal computing devices in early years of schooling	Teacher, principal, 22 students	Tensions between print-based traditions and new digital literacies. Teacher's intentions to transform learning through technology use is at odds with curriculum context of early literacy.

Early Literacy Development for Children with Cochlear Implants

by

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A Starred Paper

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Chapter 1: Introduction

With significant advances in the quality of hearing aids, and especially cochlear implants, children have opportunities that people could have never imagined. Cochlear implants have given many otherwise deaf children the chance to live a life as equivalent as possible to their typical hearing peers. The first implant was introduced in 1972 and since then the implant has developed into a technologically advanced device. According to Discolo and Hirose (2002), the Food and Drug Administration (FDA) approved cochlear implants for children ages 2-17 years. It soon became obvious that the earlier a child was implanted, the better their language skills would develop (Tomblin, Barker, Spencer, Zhang, & Gantz, 2005). The age has since been lowered to children as young as 12 months old with the youngest possible age being 6 months old (Discolo & Hirose, 2002).

Age of receiving a cochlear implant can affect later developing skills. Research has shown that the age of implantation has an effect on language skills including literacy, especially phonological awareness. Tomblin et al. (2005) found that there was a beneficial effect of earlier implantation on expressive language development. The study found that the development was faster in individuals having the surgery as infants than those having the surgery as toddlers. Infants who were implanted as young as 12 months of age showed more rapid expressive language gains in increased vocabulary and earlier words than those children having the surgery at 15 months of age. This study also found that the auditory information provided by cochlear implants seems to increase the rate of spoken language development in individuals with severe to profound hearing loss (Tomblin et al., 2005).

In addition to language development, literacy skills are also essential for young children's success in today's technological environments. (Luckner, Sebald, Cooney, Young, & Muir,

2005). A lack of well-developed literacy skills makes it difficult to participate in classroom learning. Children with or without hearing difficulties can struggle with literacy skills. It is important to immerse children early into literacy in their environments. A child with a cochlear implant will require extra caregiver effort to ensure they are engaged in early literacy opportunities (Luckner et al., 2005).

Importance and Purpose of Study

The importance of this review of literature is to give educators and professionals the knowledge needed when working with children with cochlear implants. For all children in an educational setting to be successful, adaptations and modifications may be needed. Children with cochlear implants must be accommodated in order to receive education in a mainstream setting. Understanding the literature available will provide educators the knowledge as to how and when adaptations are needed to literacy development. Parents of children with or without cochlear implants (CIs) could benefit from the information in this literature review. Having an understanding of their own child plus a child who may be receiving extra help can provide an appreciative outlook for children who may be different from their own. Educators will hopefully be able to find this review beneficial for implementing evidence-based interventions in various educational settings.

The overarching purpose of my research project is to determine if children with cochlear implants differ from typical hearing peers in developing early literacy skills. Ultimately, this study will provide resources and information regarding how children with cochlear implants develop early literacy skills and what, if any instructional approaches, need to be changed from teaching these skills to young children with typical hearing abilities.

Research Question

In this Starred Paper, I look at the effects of cochlear implant on learning. Specifically, the main focus is to better understand the similarities and differences between young children with and without cochlear implants in acquiring literacy skills. I also examine whether or not the age of implantation affects the development of literacy skills. Thus, the research questions for this literature review project are:

1. How is early literacy skill development affected when young children's hearing is supported by cochlear implants?
2. What is the optimal age for cochlear implantation for young deaf children to best acquire literacy skills?

Literature Search Description

As I was searching ERIC database I was finding common authors among many of the articles. This was extremely helpful so I began to search for those specific authors to determine what other studies they had conducted. A few people who stood out when it comes to cochlear implant and early literacy are Jean DesJardin, Sophie Ambrose, Ann Geers, and Laurie Eisenberg. When I would get stuck using keywords alone, I would add one of the author names and my search would expand. I was then able to tease through various studies conducted to determine which ones would pertain to early literacy development in children with cochlear implants.

I found that ERIC was not the only successful search engine. Google Scholar and PsychInfo were very helpful as well. Some of the search terms used were "pediatric cochlear implants," "deaf-hard of-hearing (DHH)," "early literacy and cochlear implants," "DHH and literacy," and "preschoolers and cochlear implants." There were quite a few medical journal

articles to sift through that did not necessarily pertain to my literature review. The more articles I read, the more search terms I would find. I began also searching for “age of implantation and literacy.”

Definition of Terms

Cochlear Implant (CI): A cochlear implant is a device that allows people with severe hearing loss to recognize speech sounds. It consists of a microphone and receiver, a processor that converts speech into electronic signals and an array of electrodes that transmit the signals to the cochlear nerve in the inner ear (American Heritage Dictionary, 2011).

Deaf: Having a hearing loss of such severity that communication and learning is primarily by visual methods (i.e., manual communication, writing, speechreading, and gestures) (Minnesota Department of Human Services, 2015).

Dialogic Reading: Caregiver provides dialog after what is read to better explain it to the child (DesJardin, Ambrose, & Eisenberg, 2009).

Early Literacy: Early literacy is what children know about reading and writing before they actually read or write. Six pre-reading skills get children ready to learn how to read. Knowing the ABC's is only one of the six skills (Cedar Mill Community Library, 2015).

Expansion: Caregiver repeats the child’s utterance by maintaining the child’s word order with or without adding new information or words (DesJardin et al., 2008).

Expressive Language: Expressive language is a broad term that describes how a person communicates their wants and needs. It encompasses verbal and nonverbal communication skills and how an individual uses language. Expressive language skills include: facial expressions, gestures, intentionality, vocabulary, semantics (word/sentence meaning), morphology, and syntax (grammar rules) (American Heritage Dictionary, 2015).

Hard of Hearing: Having some degree of hearing loss ranging from mild to profound. People who are hard of hearing may benefit from the use of hearing aids or other assistive listening devices. They depend primarily upon spoken English in communicating with others (Minnesota Department of Human Services, 2015).

Implantation: Implantation is the act of surgically placing a device inside the body. In the case of cochlear implants, it is when an artificial hearing device is put into a person's cochlear (American Heritage Dictionary, 2015).

Linguistic: Linguistic means of or relating to language (American Heritage Dictionary, 2015).

Parallel Talk: Parallel talk is when a caregiver gives a description about what the child is directly looking at in the storybook (DesJardin et al., 2009).

Phonological Awareness: Phonological awareness is an individual's understanding that speech is made up of abstract units, including syllables, onset and rime units, and individual phonemes (Ambrose, Fey, & Eisenberg, 2012).

Postlingual Deafness: Deafness that occurs after the age at which spoken English is normally acquired, about age three (Minnesota Department of Human Services, 2015).

Prelingual Deafness: Deafness that occurs before the age at which spoken English is normally acquired. This loss usually exists at birth or occurs shortly afterwards up to age 3 (Minnesota Department of Human Services, 2015).

Print Knowledge/Awareness: Print knowledge/awareness is noticing print everywhere, knowing how a book works (front/back, top/bottom, left/right), knowing how to follow words on a page and that words are separated by white spaces, and understanding that print has meaning and is useful (Cedar Mill Community Library, 2015).

Open-ended Question/Phrase: Caregiver provides a question in which the child can answer using more than one word (DesJardin et al., 2009).

Recast: Caregiver restates the child's utterance into a question format (DesJardin et al., 2009).

Total Communication (TC): Total Communication (TC) is a rationality used in instructive settings and in the home, that children will utilize sight and sound as helpful sources of information (Spencer & Bass-Ringdahl, 2004).

Closing

Cochlear implants were at one time a controversial issue for many people. Currently, implants have become more as research has shown the benefits for children with severe to profound hearing losses. Over the last decade, when many technologically advances have grown in use both in homes and schools, cochlear implants have provided children with hearing losses the opportunities to attend mainstream classrooms (Vermeulen, De Raeve, Langereis, & Snik, 2012). Literacy skills development is an integral part of the mainstream educational experience for children both with and without hearing losses.

The following chapter is a literature review that discusses how children with cochlear implants are affected in their literacy development. It also looks at how age of implantation affects development as well. The research provides professionals with techniques to use to help children with cochlear implants succeed to their fullest potential without falling behind their typically developing peers.

Chapter 2: Literature Review

This chapter reviews the literature related to literacy development and cochlear implants. In order to answer the research question of how cochlear implants affect literacy skill development, I discovered three general categories of information throughout the literature review. These two categories are: 1) the foundational skills for literacy development in children with cochlear implants, 2) the influence of age of implantation and social environment on language development, and 3) the effects of parental involvement in children with cochlear implants and literacy skill development. It was noted in many of the studies included in this review of the literature that there is little research in the area of early childhood literacy learning in young children with cochlear implants.

Foundational Skills for Literacy Development

The National Early Literacy Panel (NELP, 2008) concluded from previous research that all preschoolers must have foundational early literacy skills prior to elementary school (Lederberg, Miller, Easterbrooks, & Connor, 2014). Two types of foundational skills were identified; code-based skills for decoding words (e.g., phonological awareness, alphabetic knowledge, and print concepts) and meaning-based skills to understand decoded words (e.g., vocabulary and language comprehension (Lederberg et al., 2014). Lederberg, Schick, and Spencer (2013) found that the majority of deaf or hard-of-hearing children who enter kindergarten are behind their peers in both code-based and meaning-based literacy skills.

Unfortunately, children with cochlear implants (CIs) on average have a 3-year delay in reading skills. But children with CIs are closer to the reading skills of typical hearing peers than deaf or hard-of-hearing (DHH) children at elementary school entrance (Lederberg, et al., 2013).

Researchers have discovered that phonological awareness skills are correlated with reading skills (Ambrose et al., 2012). Children with CIs show a more severe deficit in auditory-only phonological awareness compared to typical hearing peers, which is logical given their hearing challenges. These children “may rely on visual and kinesthetic cues to phonology as they learn to read” (Lederberg et al., 2013, p. 440). Yet, even the use of visual and kinesthetic cues can be problematic for children with CIs. Language delays in children with CIs are common, so these children may not know the words that they are learning to read. In addition, sign language is not a direct translation to English. American Sign Language (ASL) uses different phonological, grammatical, and lexical structure than English uses (Schick, Marschark, & Spencer, 2006). A child with a CI may not be able to use their language learning experience to support literacy skill acquisition, as a child with typical hearing may be able to do.

Children with typical hearing as young as three years old demonstrate early phonological awareness skills and as they enter school these skills continue to improve. On the other hand, there are three reasons why children with CIs have weak phonological awareness skills. First, children with CIs have delays in vocabulary development, which helps to drive the development of phonological awareness. Second, it is known that children with CIs have delays in speech perception and production, meaning they have difficulties understanding and producing spoken words. Even children with deficits in speech development only display difficulty with phonological awareness. Third, even the most sophisticated technologically advanced CIs cannot fully represent all aspects of the speech signal. Thus, it is imperative that children with CIs who are at risk for literacy struggles be identified as early as possible so that educational interventions can begin (Ambrose et al., 2012).

Print knowledge is a child's ability to understand the functions of written language and letters and their corresponding sounds. Mason (1980) argued that exposure to print is everywhere in a child's environment. It can be as simple as showing them a label on a cereal box, reading a book, or through educational television. Alphabet knowledge may be easier to teach directly versus phonological awareness skills, indicating print knowledge is more accessible to children with language delays than phonological awareness (Ambrose et al., 2012). Through explicit instruction and practice with the alphabet a child's knowledge of letter names and sounds is further developed (Ehri, 1987).

Ambrose et al. (2012) implemented a study to determine if pre-school children with cochlear implants develop age-appropriate phonological awareness and print knowledge skills as compared to their typically hearing peers. The researchers also examined the relationship of these skills with speech and language abilities. This study was designed as a causal-comparative study that involved comparing two groups, children with CIs (CI group) and typically hearing children (NH group). One or two testing sessions lasting a total of about 2 hours were conducted at the HRI CARE center. Breaks were given during the sessions if needed and reinforcers were used to encourage the children to participate.

Ambrose et al. (2012) recruited two groups of participants for this study. One group consisted of 24 children with bilateral deafness that had used a cochlear implant for at least 18 months and the other group included 23 typically developing children with normal hearing. Both groups were assessed previously to rule out the possibility of any other disabilities. The children in each group were between the ages of 36-60 months. *The Test of Preschool Emergent Literacy-Phonological Awareness* (TOEPL-PA; Lonigan et al., 2007), which assesses phonological awareness and print knowledge, was conducted. There was also a collection of

speech and language assessments used to examine the children's speech production skills, which included Preschool Language Scales–4th edition, Peabody Picture Vocabulary Test–4th edition and Goldman Fristoe Test of Articulation–2nd edition. Raw and standardized scores were then calculated for each test for each group. Independent-samples *t* tests with the standard scores from the Phonological Awareness and Print Knowledge subtests of the TOEPL were performed to analyze the differences between the group test data.

Ambrose et al. (2012) found that the mean score on the phonological awareness measure for the CI group was slightly more than one standard deviation below the mean score of the normal hearing (NH) group. Only three children in the CI group scored above the NH group. There were no significant between-group differences for print knowledge scores. Over half of the children in the CI group scored above the mean of the NH group. No significant correlations were found between age at CI and length of CI experience and phonological awareness and print knowledge skills. However, relationships between phonological awareness, print knowledge and predictor variables (language comprehension, language expression, receptive vocabulary, speech production, and speech perception) were also examined. Phonological awareness was significantly correlated with all five variables. In other words, print knowledge was not significantly correlated with language comprehension but was significantly correlated with the remaining four variables (language expression, receptive vocabulary, speech production, and speech perception). Phonological awareness and print knowledge were not significantly correlated with one another.

Phonological awareness and print knowledge are strong predictors of later reading abilities. There are factors to be considered that were not part of the study such as frequency and quality of parental teaching, experience with literacy materials, and quality of preschool literacy

experiences. All of these factors play a significant role in the development of phonological awareness. Children with cochlear implants need to be immersed in as much literacy as possible as early as possible. Even though they get their CIs at an early age, they will still be behind their peers in speech and language abilities, which directly affect phonological awareness development. Children with cochlear implants demonstrate age-appropriate print knowledge skills despite delays in speech and language production skills. Studies such as this one give educators the knowledge to use the same teaching materials and strategies with children with cochlear implants and typical hearing children. Prior to introduction of cochlear implants, practices were to not incorporate sound-based instruction to children with cochlear implants (Ambrose et al., 2012).

A similar study conducted by Lederberg et al. (2014) was designed to collect data on phonological awareness, alphabetic knowledge and vocabulary. Researchers developed a curriculum program for DHH preschoolers called *Foundations for Literacy (Foundations)*, which was used in their study. *Foundations* was developed with specific adaptations for DHH children with functional hearing (i.e., children who are able to understand spoken words) for use in literacy interventions. Over the span of 5 years, *Foundations* was evaluated to determine the effectiveness in early literacy skills in Deaf Hard-of-Hearing (DHH) children with functional hearing. The study included two groups of children (intervention group and comparison group.) Each group was comprised of children between the ages of 3 years, 8 months to 5 years, 11 months with no other diagnosed disabilities. The intervention group consisted of 25 children with 76% of those having CIs with an average age of implantation of 29 months. The comparison group was made up of DHH children who were not taught with *Foundations*. There

were 33 children in total with 46% of them having a CI, which meant their hearing loss was less severe and only using a hearing aid.

Certified teachers of DHH children administered a series of language and literacy assessments in the fall and spring of each year (Appendix A). *Foundations* was implemented to the intervention group that consisted of 25-week-long instructional units. The units are organized to be an integrated curriculum with meaning-based objectives. Fung, Chow, McBride-Chang (2005) and Shanahan and Lonigan (2010) claimed daily storybook reading and using dialogic reading (engaging children in conversation about the story) to be the best intervention for enhancing hearing and DHH children's language skills. Teachers using *Foundations* supplemented unit activities with daily storybook-reading as well as dialogic-reading (Lederberg et al., 2014).

The results of children with CIs were compared with children who used hearing aids and there was no difference or gains in phonological awareness. *Foundations* proved to be an effective intervention to improve phonological awareness and alphabetic knowledge as well as vocabulary skills in children who are DHH with functional hearing (Lederberg et al., 2014). Children with CIs perform similarly to children who use hearing aids in early literacy skills. The findings of this study indicated that children developed skills equivalently whether they chose hearing aids or cochlear implants.

Importance of Parental Involvement for Children with Cochlear Implants

Holt (1993) and Traxler (2000) stated that most children who are deaf finish high school reading below a fourth-grade reading level. Literacy skills are imperative to any child's academic success (Golos, 2010). A fundamental activity for later phonological awareness and

reading achievement is parent-child book reading (DesJardin et al., 2008). Joint book reading provides children with the language input needed for expressive language growth. There are techniques that are more advanced than others that challenge children. Higher-level facilitative techniques include open-ended questions, parallel talk, recast, dialogic reading and expansion (DesJardin et al., 2009). Techniques such as these encourage participation and conversation prompting vocabulary and syntax skills. DesJardin and Eisenberg (2007) found to be positively related to language skills in preschool children with CIs.

DesJardin, Ambrose, and Eisenberg (2011) stated, “Current research highlights the home literacy environment as a critical setting for children’s literacy development” (p. 135). Parent literacy practices and beliefs play a crucial role in a child’s literacy development. A significant activity found to be related to later literacy development is joint book reading (reading a book together or sharing the role of reading). Parental view varies as some see themselves as teachers to promote literacy skills and others feel it is the educator’s responsibility. Parents’ quality of joint book reading may not be appropriate based on their child’s learning needs. A parent should understand their children’s learning style and level of learning creating a unique relationship between parent and child, which can enhance learning activities they do together.

DesJardin et al. (2009) aimed at examining the influence mother-child relationships may have on phonological awareness and reading skills 3 years after children received their cochlear implants. The study specifically focused on mothers’ storybook reading and facilitative language techniques of mothers. This longitudinal study focused on 16 mother-child pairs. The children in the beginning were between the ages of 2.7 years and 6.3 years all using cochlear implants. The Reynell Developmental Language Scales-RDLS-III (Appendix A) was used initially with the children as well as videotaped mother-child storybook interactions. After 3

years, children were assessed using the Oral Written Language Scales–OWLS, Phonological Awareness Test–PAT, and Woodcock-Johnson-III-Diagnostic Reading Battery (Appendix A). Results indicated mothers’ use of language interactions early in a child’s life positively impacted that child’s later development of phonological awareness and reading abilities. The use of open-ended questions was shown as influential to children’s phonological awareness skills as well. Children with CIs learning to read are reliant on their early language abilities in order to be successful and stay near their typically hearing peers (DesJardin et al., 2009).

Three years later, DesJardin et al. (2011) also conducted a study to explore home literacy environment and developing literacy skills in a group of children with cochlear implants (CIs). The study included 16 mothers and their children with cochlear implants ranged in age from 5-9 years old. Mothers’ perceptions about home literacy activities were measured using a questionnaire. Children and mothers were taped during a joint book reading activity when mothers engaged their child during the story. The children were assessed using the OWLS, PAT and WJ-III DRB (Appendix A).

It was found that a child’s literacy skills were positively affected by mothers’ home literacy activities. Children’s phonological awareness standard scores ranged from 51.7 to 121.3 with the mean at 90.4 with the average range being 85-115. The results indicated that these children’s scores were within the average range. Important activities for parents and teachers to use included playing language and rhyming games, encouraging child questioning, pointing to words on the page, and varying vocal expression while reading aloud. The instructional techniques used by mothers during join book reading were as follows; ignore reading miscue, negative statement, correct speech, teaching cue, and repeat/clarity cue. Of those, the two most popular used were ignore miscue and provide the word. Providing the word for a child

struggling while reading aloud is the most supportive technique. Typical home literacy activities such as checking out books from the library or watching educational television did not provide the child with enough engagement to enhance literacy skills. During such activities, the parent may not even be present which makes the child a passive observer (DesJardin et al., 2011).

Golos (2010) referred to *Sesame Street* in that when children enjoy being able to interact with elements of a program they are watching. Observational data has showed children counting and moving along with characters while watching specific television programs. Fisch, Brown-McCann, and Cohen (2001) studied typically hearing children's comprehension while watching a television program with only nonverbal communication (American Sign Language [ASL]). These children were able to comprehend the message of the story. Golos (2010) decided to conduct a study to determine if preschool children who are deaf would engage in an educational video in ASL. Children aged 3-6 years old were among the 25 used for the study. A majority of the children had hearing parents with limited exposure to ASL, while eight of the children had deaf parents who were all exposed to ASL since birth. Over the course of 3 days, the children were then observed while watching the education video in ASL that the researcher had developed. Golos (2010) found that children who are deaf would engage in literacy-based activities while watching an education television program using ASL and on-screen print (closed captions).

Influence of Age of Implantation and Social Environment

According to the research there are mixed results regarding age of implantation and the effects on linguistic development. Tomblin et al. (2005) examined the effect of age of

implantation on expressive language development. Literacy skills and expressive language are not closely related, but this study provided additional support for early implantation. Tomblin et al. (2010) studied expressive language skills of 29 children implanted between 10 and 40 months of age. It was found that children implanted early on had more rapid language development than children implanted later. Early implantation provides children with early access to spoken language within their environments. Social environment is an important experience in children's language development. Szagun and Stumper (2012) stated that there is a sensitive period of heightened language learning. There is no set end-point but it gradually begins declining around age 4. This supports evidence that children who are implanted by 24 months of age make better language development progress than children implanted later. Children implanted within the sensitive period are immersed in rich linguistic environments earlier on as compared to children who are implanted outside of the sensitive period (Tomblin, Barker, & Hubbs, 2007).

A longitudinal study conducted in Germany involved 25 children who were implanted between 6 months of age to 42 months of age. Researchers measured linguistic progress at 12, 18, 24, and 30 months after implantation using spontaneous speech samples and parental questionnaires. It was found that children implanted by 24 months of age showed growth in vocabulary and grammar skills earlier on as compared to children implanted later. The study concluded that home language environment contributed more crucially to children's linguistic progress than age of implantation (Szogun & Stumper, 2012).

Johnson and Goswami (2010) discovered that age of implantation had a significant effect on reading development for children with cochlear implants. Children who received CIs between the ages of 19 and 109 months of age were involved in the study. These children were

separated into an early CI and late CI group. The early CI group included children implanted prior to the age of 42 months, whereas the late CI group consisted of children implanted after the age of 43 months. Two control groups were also included in the participants (hearing aided (HA) and reading age (RA)). All participants were measured in the areas of reading performance, vocabulary development, memory development, speechreading, auditory discrimination, and phonological awareness.

The results discovered a clear benefit of early cochlear implantation on reading development, receptive vocabulary, and rhyme awareness. Children who were implanted before the age of 3 years had rhyming skills equivalent to those of reading-level matched hearing children. They also had reading skills that were close to being age appropriate and were significantly higher than late-implanted children. The children in the late CI group were also better at speechreading than children in the early CI group (Johnson & Goswami, 2010).

Chapter 3: Summary and Conclusions

Children with varying severities of hearing loss are able to live a life similar to typical hearing peers (Tomblin et al., 2005). Cochlear implants have provided children who are deaf the opportunities to learn alongside their typical hearing peers. As further research accrues on the use of cochlear implants the more knowledge the field has gained on the benefits of implantations. Many researchers have demonstrated the benefits to implanting children as early as possible in order for them to access language in their natural environments. Early training and teaching of phonological awareness enhances and benefits a child's development of reading and vocabulary skills. In this paper I reviewed the literature that examined early implantation and how that affects literacy development.

Foundational Skills for Literacy Development

I reviewed three studies that looked at foundational skills for literacy development. Ambrose et al. (2012) conducted a study that looked at phonological awareness and print knowledge in children with and without cochlear implants. Researchers found that children with CIs can develop age-appropriate early literacy skills but are likely to show a delay in phonological awareness when compared to their typical hearing peers. Based on these results, teachers and parents should focus on phonological awareness skills in preschool aged children with hearing impairments.

Lederberg et al. (2013) discovered that the foundation for literacy skills development is language development. Children with hearing impairments show little to no delay in literacy skills when their environments provide readily accessible language experiences. Researchers found that children can learn language via multiple modalities including spoken and visual

language. It was also noted that children with hearing impairments developed skills when they have access to fluent language in naturally occurring interactions early in life.

A Lederberg et al. (2014) study focused on children with hearing impairments using intervention to develop early literacy skills. Their study design included two groups, a control group using no curriculum and an experimental group using the Foundations Curriculum. It was found that the following foundational early literacy skills contribute to future reading success: phonological awareness, alphabet knowledge, and vocabulary. Researchers found that the Foundations Curriculum improved all of these skills in children who have hearing impairments.

Importance of Parental Involvement for Children with Cochlear Implants

I reviewed three studies that investigated the importance of parental involvement for healthy outcomes in children with cochlear implants. DesJardin et al. (2009) examined the importance of early oral language and joint storybook reading. Researchers found that early oral language skills are directly related to later phonological awareness abilities. It is important for parents and caregivers to be aware of strategies to use to build these skills with their children who are deaf. When children learn words in meaningful contexts, they store these words to be used again. Parents can enhance daily life experiences into learning moments by elaborating on specific spoken word such as providing synonyms or word categories. According to researchers, another important role that parents can play is during book reading. Parents must provide a language rich experience for children with cochlear implants in order to help build literacy skills. Using open-ended questions while reading a story can expand on what is being read and help a young child think at a higher cognitive level.

DesJardin et al. (2011) investigated maternal involvement in home literacy activities with children with cochlear implants. This study also found that an active parental role is crucial to a child's later reading development. Researchers included the importance of literacy-based games and activities to support oral reading attempts. It was also found that the added supplement to school reading instruction, children with CIs would have a better opportunity to reach grade-level reading standards.

Golos (2010) discovered the importance of parent and teacher involvement during video viewing by children with cochlear implants. The results indicated that children will engage in literacy-related behaviors such as story recall, sequencing, signing and fingerspelling targeted words when adults actively participate with them during viewing. Their comprehension increased the more they watched the video as well. It was also found that children learned more when teachers interacted with them during video viewing and provided supplementary activities.

Influence of Age of Implantation and Social Environment

I reviewed three studies focused on the age of cochlear implantation and the child's social environmental effect on language development. Szagun and Stumper (2012) conducted a parental questionnaire and speech sampling of children with cochlear implants. Researchers were looking to determine the effects of social environment variables and age of implantation on language development. Results indicated that children implanted by the age of 24 months showed greater progress earlier than children implanted after two years of age. Overall language development showed considerable growth when children's home language environment was enriched versus age of implantation.

Tomblin et al. (2005) examined children who received implants in infancy and their expressive language development. They found a beneficial effect of earlier implantation on expressive language growth. Language growth was more rapid for children implanted as infants versus toddlers. Early implantation provides children with earlier access to auditory experiences that play a key role in language development. Researchers stated that both spoken and signed English were acceptable modes of communication used and were equally effective for children with cochlear implants. The results of this study highlighted the importance of early detection of hearing loss so intervention can begin as soon as possible.

Johnson and Goswami (2010) explored how age of implantation affects phonological awareness skills of children with cochlear implants and later reading development. This study included children implanted between the ages of 2-5 years of age. All children were assessed using various phonological assessments. The results indicated that age of implantation had a significant effect on vocabulary and reading outcomes. The benefit of early implantation is crucial to development in oral language, auditory memory and phonological awareness skills necessary for developing efficient literacy skills.

The findings from the studies above demonstrate the complicated and multiple aspects of importance regarding cochlear implantation. A parent or guardian's decision to have their child receive a cochlear implant is a life changing decision for all involved. It has been found that early implantation is key for children with hearing losses in order to live a life similar to typical hearing peers. Parental involvement throughout the development of a child with a CI is important, especially during early years of learning. Parents of children with cochlear implants must be aware of the importance of their involvement and how integral that involvement it is to their child's success. In the final chapter of this Starred Paper, I conclude with how these

findings have influences my personal and professional position on early literacy development in young children with CIs.

Chapter 4: Position Statement

It is my position that early implantation for young children with hearing losses is crucial to many areas of development, especially language development. Parents of children born with hearing loss should explore all the options including cochlear implants. There have been numerous research studies conducted on cochlear implants and the many benefits of implanting a child as early as possible (Johnson & Goswami 2010; Szagun & Stumper, 2012; Tomblin et al., 2005). Language-enriched environments can help develop literacy skills for children with and without hearing impairments.

Studies have shown that children with cochlear implants are equally able to acquire early literacy skills just as their typical hearing peers (Tomblin et al., 2005). Teachers can use this information to guide interventions and lesson plans to better accommodate individual students' needs. Researchers have found the important foundational skills of literacy learning include phonological awareness, vocabulary, and alphabet knowledge (Ambrose et al., 2012). Children with cochlear implants may struggle more with phonological awareness depending on their age of implantation. Teachers can then provide the proper intervention strategies for phonological awareness so children with CIs will not fall behind their peers academically.

The Minnesota Department of Education (MDE) sets state standards that drive what classrooms must focus on. Many schools and educational programs are now emphasizing phonemic awareness and phonics because of state reading benchmarks and standards. Children with cochlear implants are benefiting from this structured method of building sound to symbol relationships. After reading the research and discovering the importance of early implantation, I will strive to educate parents, caregivers and colleagues of this significance.

During this literature review, my initial belief in the importance of early identification for hearing loss has been verified. There is a crucial time period when young children begin to gather information within their environments. If a child has a hearing loss, they are missing out on very important information needed for later developing skills. Early interventionists are now doing hearing checks with children using otoacoustic emissions (OAE). OAEs are sounds given off by the inner ear when the cochlea is stimulated by a sound (Discolo & Hirose, 2002). Being able to identify children at a young age will provide them with the access to the language they need to build literacy skills. It is my opinion that this is helping identify children earlier who may otherwise have gone unnoticed until later on in development.

During my collaboration with Kindergarten teachers, I am learning the importance of phonological awareness and print knowledge needed for my preschoolers to be successful at the next level, especially those children on my caseload with cochlear implants. Being able to provide these children with specific and focused interventions will foster the foundation literacy skills that they need. After reviewing the research, I will find all of this information very useful in my daily routines as an early childhood special education teacher. I will be able to provide colleagues and families better insight into the importance of early intervention.

In summary, I believe it is inevitably a parent's decision to choose implantation, but I feel parents require proper education to make a knowledgeable decision regarding cochlear implants. Throughout my research review, I found that children with hearing losses could live normal lives if provided with the needed supports. Children implanted at a young age are given the chance to learn skills alongside their peers instead of possibly lagging behind. I do look forward to using the information that this Starred Paper offers to parents and teachers alike as we all support literacy skills development in young children with cochlear implants.

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Appendix A: Early Literacy Assessments

TEST	AUTHOR(S)	DESCRIPTION
Test of Preschool Emergent Literacy-Phonological Awareness (TOEPL-PA)	Lonigan, Wagner, Torgerson, & Rashotte (2007)	Assesses 3-5-year-old children's blending and elision of words, syllables, and phonemes.
Phonological Awareness Test 2 nd Edition (PAT)	Robertson & Salter (2007)	Contains four subtests that assess syllable segmentation, rhyme discrimination, initial phoneme isolation, and phoneme blending.
Letter-Sound Identification Task (Letter-Sound ID)	Lederberg, Miller, Easterbrooks, Connor (n.d.)	Children identify the sound(s) associated with the graphemes for 18 consonants, two digraphs, and five vowels for a total of 31 test items.
Woodcock-Johnson Tests of Achievement-III Letter-Word Identification (WJ LWID)	Woodcock, McGrew, & Mather (2001)	Measures children's letter-name knowledge and early word decoding.
Woodcock-Johnson Tests of Achievement-III Picture Vocabulary (WJVocab)	Woodcock, McGrew, & Mather (2001)	Children provide a signed or spoken word to label pictures.
Expressive One Word Picture Vocabulary Test (EOWPVT)	Gardner (2000)	Children provide a signed or spoken word to label pictures.
Peabody Picture Vocabulary Test-III (PPVT)	Dunn & Dunn (1997)	Child must select the correct picture out of four for a spoken word.
Early Speech Perception Test (ESP)	Moog & Geers (1990)	Children must discriminate through hearing alone among single words and/or multi-syllable words with different stress patterns.
Woodcock-Johnson III Diagnostic Reading Battery (WJ-III DRB)	Woodcock, Mather, & Schrank (2004)	Subtests include word attack, letter-word identification, oral vocabulary, reading vocabulary and passage comprehension.
Oral and Written Language Scales (OWLS)	Carrow-Woolfolk (1995)	Assesses oral language abilities.
Reynell Developmental Language Scales – 3 rd Edition (RDLS-III)	Reynell & Gruber (1990)	Tests verbal comprehension and expressive language skills for young children.