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How Does the Use of Phonemic Awareness Skill-Building Software in Conjunction with an In-School Literacy Program Benefit Students' Literacy Skills?

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Abstract

This study examined how phonemic awareness skill building software benefited the literacy skills of school age children. Research was conducted through observation of two students, a kindergartener and third grader, using Earobics software. In addition to observation, informal interviews were also used to determine the necessity of the software and its possible benefits. The students demonstrated an increase in literacy skills, but not phonemic awareness skills specifically. The benefits of this software allow for students to develop their literacy skills more fully by providing a strong skill base when used as a supplement to a complete literacy program.

How Does the Use of Phonemic Awareness Skill-Building Software in Conjunction with an In-School Literacy Program Benefit Students' Literacy Skills?

Phonemic awareness is one of the building blocks of reading. Phonemic awareness is recognizing and working with the smallest unit of speech, the individual phonemes (Yeh & Connel, 2008). Children must understand the idea that phonemes, or speech sounds, correlate to written letters and words. Many scholars agree that “children who have phonemic awareness skills have an easier time learning to read and decode unfamiliar words than those who lack these skills” (Cheesman, McGuire, Shankweiler & Coyne, 2009). Some children need extra assistance in grasping this concept, even after they are enrolled in school. Torgessen, Wagner, Roshotte, Herron and Lindammod (2009) state that adding computer technology to traditional teaching methods may also be a part of the long-term solution for at-risk students because of its ability to provide specialized instruction to everyone at a relatively low cost to the school.

Students that have poor phonemic awareness skills and lack disconnect may need a program to supplement the day to day literacy program that us taught in school. Phonemic awareness skill building software, like Earobics, can be used in conjunction with a literacy program to help improve literacy skills. Earobics is an interactive software program that focuses on different skills that are associated with phonemic awareness development: auditory processing and memory, segmenting and blending phonemes. This programs consists of six games that focus on each of these skills, each game is divided into skill levels and automatically gets progressively more advanced with each correct response. Programs like Earobics can be used in the home or in school during times outside of the literacy instruction. Emerging readers

and students reading on grade level can benefit from more exclusive phonemic awareness instruction.

Research done by Koutasoftas, Harmon, and Gray (2009) states that phonemic awareness allows children to learn how to blend and segment words, thus leading to better literacy skills. Emergent readers need a program implemented in their classroom in order to have a solid knowledge base of phonemic awareness. Technology in today's society is accessible for students of all ages. The Earobics program helps students to use their technology skills. The technology used during the program helps to build phonemic awareness skills, such as auditory processing skills. Loeb (2009) states that frequency and different sounds can help to build phonemic awareness skills. The software uses an automated voice that does not emphasize any part of the words so the student has to learn to differentiate the individual sounds, or phonemes, on his or her own. Karemaker, Pitchford and O'Malley (2010) say that using software that can develop phonemic awareness skills to supplement traditional teaching is better than traditional teaching alone.

How does phonemic awareness skills building software in conjunction with an in-school literacy program benefit students' literacy skills? Two students, a kindergarten female and a third grade male, received eight 20 minute sessions of phonemic awareness skill-building software in addition to their in school literacy instruction for four consecutive weeks. Each student was assessed using the Fountas and Pinnell benchmark assessment at the beginning and the end of the four weeks. The Earobics software program was used with these children during the sessions. At the end of the four weeks, it will be shown if supplementing a literacy program with more intense phonemic awareness instruction through the use of technology could benefit students' literacy skills. Although the students both increased their reading level, there have been

no definite conclusions as to if the Earobics program was the reason for the improvement. The kindergarten student did not increase her reading level, but through observation it was seen that she did begin to use her decoding strategies more frequently during reading. The third grade student did improve his reading level, based on the Fountas and Pinnell benchmark assessment, and he did show an increased use of predicting and questioning skills. Through interviews, the students shared that they thought the Earobics program was boring and the purpose of the software was unclear. Parents and Speech and Language Pathologists had mixed feelings about using Earobics specifically as a supplement to a literacy program, but all agreed that including technology based programs into a traditional instruction classroom can benefit a student's learning and development. This study was conducted at the very end of the school year and completed during the first few weeks of summer vacation. Using the information that was found, it can be stated that there are benefits to using phonemic awareness skill-building software with students.

Theoretical Framework

Freebody and Luke (1990) and Gee (2001) stated that literacy is multifaceted and can be described as the acquisition and learning of oral language and written text in order to communicate. Literacy is ever changing and is first acquired through one's primary discourse, where communication through speech is first established as well as values and beliefs (Gee, 2001). Participation in literacy events is key to one's acquisition of literacy (Goodman, 2001). When a child is immersed in a literacy rich environment, he or she is able to develop the skills necessary to communicate through oral language, symbols and written text. Larson and Marsh (2005) point out that literacy is not just one act of a cognitive processing, but a combination of different forms of communication to connect different social groups with different rules.

Children learn many concepts of print in their primary discourse, direction of print and ability to mimic writing are two ways this can be seen (Kucer, 2009). A child's secondary discourse requires him or her to communicate with people outside of their family and close friends. In the secondary discourse, the child is exposed to a larger community where he or she can develop meta-level skills and knowledge (Gee, 2001). Phonemic awareness can be acquired through both the primary and secondary discourse. Learning that individual sounds correspond to written letters and numbers is very important for a child to learn before entering a secondary discourse. The building of strong communication and literacy skills can be inhibited if a child is not able to acquire a substantial base of oral and written language in his or her primary discourse. A student's primary discourse can determine his or her interest level in literacy and this can impact how literacy is looked at. Furthermore, when students are exposed to texts in their secondary discourse that can be connected to their primary discourse, they are more engaged (Meier, 2003).

The study that I will be conducting will determine how important it is to supplement a technology-based phonemic awareness program to a traditional literacy program. Technology-based programs can be implemented only when the resources are available to the students and teachers to do so; resources including finances to afford the program and the knowledge to be able to work with the new technology. The sociocultural theory can be summed up in the knowledge students gained from home and from this knowledge what they bring to the classroom. Sociocultural theory is the theory that students bring knowledge that they have learned and acquired from their primary discourse, their home and community, and bring that knowledge to their secondary discourse, school. The knowledge that is brought to the secondary discourse can shape how a student acquires and learns information. When a student comes to school with strong phonemic awareness their ability to gain literacy skills is benefited because

the student is able to understand the letter-sound correspondence which enable him or her to blend and segment words accordingly. If a student does not come to school with this phonemic awareness knowledge base his or her chances of being able to build strong literacy skills can be inhibited. Meier (2003) believes it is the belief that children and adults learn through social interaction and through social practices. Each child, even those growing up in the same household, gain different knowledge and values from their home and social life outside of the classroom. Children come to school with rich linguistic abilities acquired through their social interactions in their primary discourses, homes and communities. Sociocultural theory considers a student an active member of a community that is constantly changing. Knowledge is constructed by many larger cultural systems. Literacy learning takes place through participation in formal and informal learning settings in everyday life (Larson & Marsh, 2005). Meier (2005) created a classroom ideal to reach each child's needs in respect to the many backgrounds they bring to class with them. She first established a sense of community sharing details of her life with them and asking questions about theirs. She gets to know each student on a personal level, and while this information can easily be gained by talking to them she instead uses a journal and writes to them every day. This approach allows them to practice their letter writing skills in an informal setting and to show her what their home life has taught them in terms of literacy thus far (Larson & Marsh, 2005). Children acquire and learn language in different ways, although all are complex and can provide a strong foundation for literacy learning. Before a child enters school, it is likely that he or she has learned most of the sounds and some grammatical systems used in his/her primary discourse. Students' literacy knowledge can be determined by their primary discourse, but because a student's home life does not support strong literacy skills it does not mean that they are unable to learn strong literacy skills in their secondary discourse. The use of

literacy skills appropriately depends on the situation or setting a person may be in. Lankshear and Knobel (2003) feel that “In all cases, however, being literate means being able to use the ‘right’ language in the ‘right’ ways within a discourse”. Children who are socialized in different cultural backgrounds that utilize different linguistic skills can still be provided opportunities to use language in powerful ways (Meier, 2003).

A student’s primary discourse can determine the skills that a child brings to his or her secondary discourse. The knowledge to use tools of technology is an example of skills that can be brought from home into the secondary discourse. Tools, such as computers, can be used during literacy learning. Larson and Marsh (2005) states “that literacy knowledge is constructed through tools teachers and students use in everyday life, in and out of school.” New literacies and technologies are simply the application of new technologies into the classroom and the new literacies that are formed from these technologies. The Earobics program that I used with the students was new to both of them. The students both had to adapt to the program and the methods in which the program utilized. The technology could be easily implemented into the classroom if teachers wanted to learn the information. This technology can supplement a regular literacy program and it can help students to learn phonemic awareness in different ways. The perpetual development of technology is difficult to keep up with, especially when you note everything that influences new technologies such as popular culture. As Williams (2008) noted, new technologies and literacies can be intimidating and frustrating to teachers. This especially goes for teachers who have found a particular approach that is successful with students and follows the state standards. These approaches are necessary to learn and use in teaching practices, but new practices and approaches can benefit students as well. Lankshear and Knobel (2003) state that many of these new approaches involve “producing, distributing, exchanging and

receiving texts by electronic means”. For new literacies to be useful, they must be meaningful to the student. Learning must be understood and in order to do this it should be necessary to a student’s literacy learning so he or she is able to connect and relate to the material (Lankshear & Knobel, 2003). A student that needs additional instruction on phonemic awareness can relate to the use of a software program because computers are so essential to today’s society. Larson and Marsh (2005) have found that “new literacy studies addresses the need to re-frame theory and methodology through the use of an ethnographic perspective to view variation in the communicative practices required in contemporary society”. Supplementing a literacy program with phonemic awareness skill-building software programs can further strengthen literacy skills using means that are provided by today’s society. Events and communicative practices can include oral, visual and written forms of making meaning, therefore providing a student with yet another way to form meaning in his or her own discourse can help to build phonemic awareness. Integrated learning should be used within primary and secondary discourses to build string literacy skills in students (Larson & Marsh, 2005). The use of a software program to continue to build upon phonemic awareness skills already acquired in one’s primary and secondary discourse can benefit a student’s further literacy learning and acquisition.

Research Question

Given that literacy is affected by both our social interactions and technology, this action research project asks, how does the use of phonemic awareness skill-building software in conjunction with an in-school literacy program benefit students’ literacy skills?

Literature Review

The following literature review explores the research examining phonemic awareness and the different programs that are instituted into classrooms to build phonemic awareness skills. In

the first section, there will be an exploration of the research supporting phonemic awareness as one of the first stages of building proficient literacy skills. Secondly, there will be an examination of how the different barriers, like disabilities, socioeconomic disadvantages and teacher ability to teach and knowledge of the basic skill of phonemic awareness, play a part in phonemic awareness skill building. Finally, there will be an explanation of how implementing technology into the classroom can help the process of learning phonemic awareness. The research indicates that the skill of phonemic awareness is very important to the development of literacy skills, and the teachers and methods used during instruction may not be substantial enough to create a good base for literacy learning.

Phonemic Awareness is a Building Block of Literacy

Students need to have a general understanding of oral language and the sounds that make up words before they can begin to make the connections between phonemes and graphemes, which is the first step to building literacy skills. When a child is able to change phonemes to graphemes, it becomes easier to blend those phonemes into words. Doing this helps children to learn to decode unfamiliar words (Iacono & Cupples, 2000; Koutasoftas, Harmon & Gray, 2009; Spencer, Schuele, Guillot, & Lee, 2008). Phonemic awareness is the skill that allows children to differentiate between the sounds of oral language and the meaning, as well as manipulate phonemes to create words (Koutasoftas, Harmon, & Gray, 2009; Tengesdal & Tonnessen, 2010). When students have a solid knowledge base of phonemic awareness and are able to understand the connection between oral and written language, they can improve their ability to become proficient readers. Therefore, implementation of phonemic awareness skill programs is important to the education of emergent readers.

Developing strong literacy skills in emergent readers, with a focus on phonemic awareness, can determine reading accomplishment in their future academic careers. In the study by Tengesdal and Tonnessen (2010), it was shown that phonological and phonemic awareness related to reading skills in later grades; the skills of kindergarteners were successfully used to predict reading and spelling skills in early childhood education. In fact, The National Reading Panel (NICHD) also has reported that children who master phonemic awareness skills are able to learn to read more easily than children who are not proficient in these skills, and when children do have strong phonemic awareness skills, it is shown to predict strong literacy development later in life (Isakson, Marchand-Martella & Martella, 2011). In contrast, children who enter school who lack the skills necessary to segment and blend phonemes will most likely be poor readers later on in their academic career (Yeh & Connell, 2007; Loeb, Gillam, Hoffman, Brandel & Marquis, 2009). Phonemic awareness skills are also important to the development of other aspects of reading. Fluency and reading comprehension are affected by the ability to automatically recognize words, which is made possible when strong phonemic awareness skills are learned.

Loeb et al (2009) state that processing sounds and frequency changes can determine the ability to segment, thus affecting letter to sound correspondence. If letter to sound correspondence does not develop normally, reading skills will be inhibited. The National Reading Panel (2011) has concluded that explicit phonemic awareness instruction improves word reading and reading comprehension. Different skills relating to phonemic awareness, such as blending and segmenting, help to increase reading comprehension. The earlier in a child's academic career that phonemic awareness instruction is given, the better able that child is to build blending and segmenting skills when learning how to read. As per Ferraz, Pocinho,

Pereira & Soares (2012), the goal of some programs is to put literacy instruction into place that helps to develop phonological awareness and improves reading. It is important that preschool students have a well-developed phonological awareness so they are able to recognize that different letters, or graphemes, can have different sounds, or phonemes, and that different phonemes can be represented by different graphemes. The ability to identify sounds as “distinct and separate units” (p. 947) has been directly connected to a child’s success in reading and writing (Ferraz, Pocinho, Pereira & Soares, 2012). The development of phonological awareness has been shown to be directly connected to the acquisition of letter-sound knowledge and reading development (Karemaker, Pitchford & O’Malley, 2008). The Portuguese Ministry of Education (1997) says:

It is not intended that preschool is organized in order to work as preparation for the compulsory education, but that it is planned for lifelong education, however the child must be able to address successfully the next step in her education journey. (p. 948).

Mastering these skills is a predictor of a student’s future reading skills (Yeh & Connell).

Adversely, the lack of the phonemic awareness instruction in a students’ early education can inhibit their literacy skills later on in their academic career.

Isakson et al (2011) stated that children who are not provided instruction in phonemic awareness run the risk of falling further behind their classmates during the first few years of their education so it is crucial that appropriate instruction be provided at the early years of development. Instruction should be explicit and systematic. Today, instruction of phonological awareness is more explicit and extensive than it ever has been before (Spencer, Scuele, Guillot & Lee, 2008). McGraw-Hill Phonemic Awareness program falls under this category with 15 minute

phonemic awareness instruction included in the program. The study that was conducted using this program showed an improvement in each preschool aged participant after five months of using the program (Isakson et al., 2011). McGraw-Hill's program focused specifically on phonemic awareness skills, therefore, even though only part of the program was given, it had a positive impact on the five students' phonemic awareness skills. The length and intensity of the program can have effects on the skills that are acquired as well. Another study by Ukrainetz, Ross and Harm (2009) researched how phonemic awareness was best learned, low intensity over long periods of time or short-term, intense instruction. This study determined that phonemic awareness instruction given to "at-risk" kindergarteners was beneficial at all intensities. There was not a significant difference between whether the students received instruction one time a week and the students who received instruction three times a week. Phonemic awareness instruction is important to all emergent readers at any point in development because the students need to have a base of knowledge of the different sounds that make up words and the skills that lead to reading proficiently. The idea that more is better was not shown in this study by proving that four hours of treatment was just as effective as eleven hours of treatment (Ukrainetz, Ross & Harm). Research done by Loeb, Gillam, Hoffman, Brandel & Marquis (2009) is consistent with this claim. During the study performed using Fast ForWord software, it was shown that the time spent on phonemic awareness instruction did not affect the outcome or the skills gained by the participants. It was found that programs that contained five to eighteen hours of instruction were more effective than programs that contained less than five or more than eighteen hours. As long as the program instruction is specified and explicit, the duration of the program does not affect the outcome.

Ferraz et al. (2012) state the hours of treatment should be planned and organized. Activities that are taught periodically do not always allow full potential in phonemic awareness skills to be achieved. Students need to be able to discriminate between the different sounds, and it must be done gradually, through oral activities that allow the children to understand and become experts in the relationship between oral language and literacy.

Barriers to Learning Phonemic Awareness

There are many barriers that can interfere with the learning of phonemic awareness skills. Some obstacles that can inhibit competent phonemic awareness skills are a student's cultural background, a student's need for special education services and even the instructor's ability to teach his or her knowledge of phonemic awareness. A student's cultural background or primary discourse can inhibit the acquisition of phonemic awareness by not having access to appropriate tools, games, or parents involved in literacy development. Not having a solid phonemic awareness background can also affect a child's attitude towards literacy learning. While in school a student requires high quality and engaging instruction. Sometimes general literacy instruction is not enough and the student may need more intense intervention to improve literacy development. Teachers can also inhibit literacy instruction if they do not have an appropriate attitude or sufficient knowledge to provide literacy instruction. The learning of phonemic awareness skills is dependent on many factors and a student may not be able to form a good knowledge base if they are presented with these barriers.

Cultural Barriers. Phonemic awareness can be acquired many different ways depending on a child's cultural background. Home literacy can make a difference in a student's acquisition of literacy skills as well. The tools (books, computers etc.), activities (games, library

visits etc.) parent involvement (like reading aloud and parent interest in schooling) can make a difference in a child's attitude and literacy development. There are many different methods that educators are using in order to help decrease the difference of literacy skills between students from a low socio-economic status and those who come from a better socio-economic background before entering schools (Korat & Blau, 2010).

Heath (1983) and Korat and Blau (2010) state that a child's literacy development is directly related to socio-economic status. There are significant differences in phonological awareness and other important skills that pertain to literacy development among students with low socio-economic status and middle socio-economic status (Korat & Blau, 2010). Through targeted intervention in the classroom, low-income students and students with disabilities can increase phonological skills. Korat & Blau (2010) discuss the idea of leveling the playing field for students with low socio-economic status by providing methods that will help to minimize the gap and help the students overcome their challenges. This study also showed how kindergarten students with low socio-economic status progressed compared to pre-kindergarten students with medium socio-economic status. The pre-kindergarten students of medium socio-economic status improved their literacy skills more than the kindergarten students of low socio-economic status. Even though the improvement was slight in the low socio-economic kindergarten group and they required as much intervention as the pre-kindergarten group did, it does show that the students are able to make gains in literacy learning through a short intervention program even when they begin the program with low knowledge of literacy skills. The study also showed that students from a low socio-economic background who read less than their peers from higher socio-economic statuses can benefit from e-books to enrich their literacy learning. In addition to socio-

economic status, a student's cultural background and customs can impact literacy acquisition and learning.

Korean children learn the phonemic characteristics differently from how American children learn them (Kim, 2008). The onset, or the initial consonant in a word, and rime, the final vowel-consonant syllable in a word, are the "accessible intrasyllabic phonological unit in English" (Kim, p. 360). Children who speak Korean learn words through the body and the coda; the body is the initial consonant-vowel cluster in a word and the coda is the final consonant. The Korean language provides a frequent use of Consonant-Vowel "syllable type" (Kim, p. 362), the form of the language may cause the children to pick up on certain phonological patterns in speech that help them to develop representations of the body-coda unit instead of the onset-rime unit (Kim, 2008). A study conducted in South Korea by Kim (2008) demonstrated that Korean children learn phonemic awareness using different syllable units. This study showed that a child's phonemic awareness development is related to the oral language skills that he or she is acquiring. Language acquisition is important to any child's phonemic awareness skills and then later, their literacy skills.

In addition, research done by Koutsoftas, Harmon, and Gray (2009) shows that interventions that focus on phonological and phonemic awareness, which are "critical components of emergent literacy" (p. 117), can promote school readiness in students who speak either English or Spanish in their primary discourse. This study shows that when there is intervention in a classroom, there is no significant difference in the learning of phonemic awareness skills when the primary language is not English. No matter what language that a child speaks, phonemic awareness is important to the building of literacy skills.

Special Education Services. The response to intervention (RTI) model that has been implemented in 2004 by Individuals with Disabilities Education Act (IDEA) has been put in place to help these students who are not getting enough explicit instruction in the mainstream classroom. This program requires teachers to use explicit and authentic teaching methods in the classroom. If these methods do not work for some students, they are given extra assistance outside of the classroom where the intensity gradually increases from tier to tier. Tier one instruction takes place in the classroom where the teachers are expected to engage children in meaningful instruction of the components of the curriculum. If a student is not making appropriate gains, he or she is recommended for tier two services: short term explicit instruction given in small groups by teachers or specialists. If a student still does not make any progress with more instruction, he or she is referred to tier three instruction, where he or she will receive individualized instruction. Koutsoftas et al. (2009) performed a study to test the effectiveness of tier two instruction for low income preschoolers who were not making any progress in the mainstream classroom. The study showed that even though some students were receiving tier one instruction in their primary language, the students who received tier two instruction really were having a difficult time developing phonemic awareness skills. This study has inconclusive findings on whether or not students receiving special education services prior to this study were more likely to need tier two services in the area of phonemic awareness. This information was inconclusive because there were only six students in the study's participants who were classified as students with disabilities and more in depth information on the six children was unattainable. Out of the six children who were receiving special education services, three qualified for tier two instruction. Only half of these students needing additional intervention shows that more explicit tier one instruction was sufficient and effective in improving some children's phonemic

awareness skills (Koutsoftas et al., 2009). A study conducted by Iacono and Cupples (2004) also looked at the phonemic awareness acquisition of people with complex communication needs. This study had a similar conclusion of the Koutsoftas et al. (2009) stating that people with and without disabilities both are capable of building phonemic awareness skills when the appropriate instruction and support are provided for the students. Language and communication impairments can cause a disadvantage of learning phonemic awareness. Even adult learners with disabilities can struggle with learning phonemic awareness, but it still is possible for them to make gains in order to improve literacy skills.

Children and adults with disabilities or disadvantages have the ability to learn phonemic awareness: phoneme segmentation, blending, and letter-sound relationships (Yeh & Connell, 2008). Phonemic awareness instruction may need to be modified or be more intense than for the general education population, but progress towards proficient skills can be made. The positive effects on literacy skills caused by having strong phonemic awareness skills are consistent with people with communication needs that require augmentative and alternative communication (AAC) (Iacono & Cupples, 2004). Students with disabilities are given accommodations and modifications to help them to learn the core curriculum. Augmentative and alternative forms of communication can fall under this category. When modifications are made to phonemic awareness instruction, any interventions can be successful. Torgesen, Wagner, Rashotte, Herron & Lindamood (2010) state that when effective interventions are put into place for all students, early reading difficulties can be reduced. A program that is implemented successfully should have explicit instruction and different levels of intervention to accommodate every student's needs.

According to Loeb, Gillam, Hoffman, Brandel and Marquis (2009), there have only been a few studies that show that students with reading and language impairments can improve reading skills. The study that was conducted gave evidence of programs that can help to improve the phonological skills of children with reading and language impairments. The evidence of improvement was shown by using software called FastForWord Language that “acoustically modified speech” (p. 383). However, it was not necessarily the software that attributed to the gains in sound perception (Loeb et al., 2009).

Literacy skills are needed in all aspects of life. Students with disabilities, both children and adult, when given appropriate instruction and support can learn to develop phonemic awareness skills. When the right skills are learned and a good knowledge base is formed anyone can develop literacy skills. Students with disabilities can improve their life skills and their ability to function in the work world when they have competent literacy skills.

Instructor’s Knowledge and Ability. There has been an increase in the importance of phonological awareness instruction during the early years of a child’s education, particularly during preschool and kindergarten. Some researchers are asking if today’s teachers are knowledgeable and skilled enough to instruct effectively reach all students (Spencer, Schuele, Guillot & Lee, 2008). With the increasing focus on phonics and phonological instruction, teacher training has been changed to ensure that teachers are getting a solid background in phonological instruction. Surveys of preservice teachers have stated that new teachers are not confident enough to teach phonemic awareness. They are not equipped with sufficient strategies to improve literacy standards, and having poor literacy skills themselves it can inhibit instruction to students (Fielding-Barnsley, 2010). When teachers are not equipped with the knowledge or the appropriate skills to teach phonemic awareness, the students in their early stages of literacy

development are already at a loss. When insufficient instruction is provided, it can lead to poor literacy skills as the students continue their academic careers. It has been stated that it is apparent when a teacher has limited knowledge and skill to teach phonological awareness because there is less instructional time spent on word sound activities, time that is shown to improve student reading and writing performance (Spencer et al., 2008). There are a few reasons for the lack of knowledge and ability to teach phonemic awareness skills.

One reason given for the lack of knowledge and confidence is that new teachers feel that they are given “insufficient training” (Fielding-Barnsley, 2010, p. 105) during their schooling to become elementary and primary teachers. The studies showed that preservice teachers have a “rudimentary” (p. 106) knowledge of phonemic awareness, but these teachers must be given opportunities to demonstrate their knowledge in order to make the information that they have learned more authentic and concrete. In addition to practical experience, it has been noted that the information in textbooks that teachers are reading during their studies does not have up to date or reliable information in them. Teacher certification programs need to include more current information, as well as more practical experiences, in order to ensure that upon graduation the teachers will have confidence in their knowledge and ability to instruct students on phonemic awareness. Research by Melby-Larvag, Lyster and Hulme (2012) claim that teacher education programs are just the beginning of forming proficient teachers who are able to provide high quality instruction. Teachers also learn through instruction itself, as well as the support of their colleagues. If a new teacher is not provided with the guidance and support from the veteran teachers, than he or she could very well not be able to become a teacher who is able to provide engaging instruction to students. This research continues to confirm that there are many factors that can inhibit the skills of new teachers. Due to these factors, the new teachers coming out of

colleges and universities are unprepared to teach today's students about phonics and phonemic awareness (Barnsley, 2010).

Not everyone feels that teachers are insufficient in their education of phonemic awareness. Some feel that teachers that finish education programs have the knowledge and the ability to teach phonemic awareness skills. These opposing viewpoints are represented in a study by Spencer, Schuele, Guillot and Lee (2008) who ask which teachers have more knowledge and skill, the more experienced teachers or the new teachers. It was shown that more experienced teachers were more "proficient in phonological awareness" (p. 513), and new teachers did not quite grasp the concept. This idea was based on the fact that the more experienced teacher had more practical knowledge than the newer teachers. The veteran teachers had a good knowledge base of what phonemic awareness was and knew how to implement the instruction in their classrooms. However, another study by Fielding-Barnsley (2010) showed that because new teachers have received more in-depth training on phonological awareness, they have a greater ability to teach phonological awareness than most teachers with fifteen or more years of teaching. The discrepancies of the findings could be attributed to the different assessments used, but the findings do prove that educators as a whole group were not able to demonstrate a substantial knowledge or phonological competency that is necessary to the teaching of reading skills (Spencer, Schuele, Guillot & Lee, 2008). Studies that have assessed preservice and experienced teachers have demonstrated that in both groups there is a percentage of teachers that performed below the expectations for an educator whose focus on instruction is teaching the skills necessary to learn to read. Both young and old teachers alike lack the skills to teach phonemic awareness skills, but it is discussed that specialists could have the skills necessary to fill in the gaps of instruction.

It has been questioned whether or not specialists, such as special education teachers and speech and language pathologists, outperform classroom teachers in the area of phonological awareness. During the study by Fielding-Barnsley (2010), phoneme segmentation, identification and isolation were the three main tasks that teachers and specialists were asked to perform. Spencer et al. (2008) proved that speech and language pathologists scored significantly higher than both classroom teachers and special educators when assessed on their knowledge and skill regarding phonemic awareness. However, special education teachers and reading specialists performed very similarly to classroom teachers. Education of specialists should be more explicit and specified to their specific field. Special educators should have a more in-depth knowledge of the basis of literacy skills because there is so much focus to build the skills that students need to reach curriculum expectations when a student is receiving services. The study also showed that even though speech and language pathologists performed higher than special educators, reading specialists and classroom teachers, they are still performing well under what standards claim their knowledge and instruction level should be. Evidence showed that speech and language pathologists were unable to show expert levels to teach phonemic awareness explicitly. There still is room for a lot of improvement in the area of phonemic instruction and knowledge (Spencer et al., 2008).

Teacher attitude towards the importance of phonemic awareness can attribute to the reading instruction provided in their classroom (Fielding-Barnsley, 2010). A study conducted in Australia asked preservice teachers, who were completing their degree to become either elementary or primary teachers, how important they viewed phonemic awareness and phonics to be in the development of literacy skills. The majority of teachers surveyed in this study felt that phonemic awareness is very important to children learning how to read. When asked how

prepared they felt they were to teach this skill that had been deemed very important and necessary to teach reading preservice teachers did not feel that they were very prepared at all. Teachers' attitudes and ideas about the material that they are learning and teaching in schools can determine how well they are able to deliver lessons about phonemic awareness. Attitude towards utilizing technology in the classroom to accompany traditional teaching methods will also determine the availability and usage of phonemic awareness software.

Technology Benefitting Phonemic Awareness Instruction

There are many different types of technology that have been implemented into the curriculum of classrooms because it has been shown to improve developing literacy skills more so than traditional classroom instruction (Karemaker, Pitchford & O'Malley, 2010). Teachers have used a variety of technological tools in classrooms to improve literacy instruction, such as computers with software programs, televisions, iPads and other hand held devices , as well as interactive display methods like Smartboards. Computers have been considered to be a very good tool to use for literacy instruction and can be seen as a long term solution for students who are at risk for reading disabilities (Torgesen, Wagner, Rashotte, Herron & Lindamood, 2010). Computer technology can provide explicit and highly specialized instruction for relatively low cost to the schools. Some types of technology have been said to help children with their phonemic awareness and the ability to recognize sounds, but some research does not support these findings (Karemaker, Pitchford & O'Malley, 2008). Some phonemeic awareness software programs are more sufficient as a supplement to traditional teaching methods than others.

Fast ForWord Learning is one of these programs that have been created by Loeb, Gillam, Hoffman, Brandel & Marquis (2009) to help improve the auditory attention, sequencing,

discrimination and memory. This software was formed on two different theories: one that students with language impairments are unable to form proficient phonemic awareness skills, the other is that rigorous training can help improve phonemic awareness skills. Using computerized exercises with modified speech sounds and automatic skill adjustment this software works well with students that have language impairments. Other multimedia literacy software programs might support development of phonemic awareness and visual word recognition skills better than others. Programs such as Earobics or Lindamood Phoneme Sequencing (LIPS) are two programs that have better results of improving phonemic awareness skills. Even though there is evidence that technology does support literacy skill development, there are a lot factors that affect the rate in which these skills are learned. These factors include intensity, the aspects that the software does support and even the level of the child prior to exposure to the program. The study by Karemaker et al.(2008) has shown that word recognition had improved more in the group using multimedia software compared to the group who were receiving traditional instruction, but this study also showed that the students who progressed during the study were children with a high level of alphabet knowledge and/or reading level. There are some advantages as well as disadvantages to utilizing multimedia software in the classroom.

Technology helps the teachers to focus the instruction on explicit parts of the text while keeping notes and providing feedback (Karemaker et al., 2008). Another advantage of multimedia software usage in the classroom would be the individualized instruction that it can provide. During whole-group instruction using a big book, students are asked to follow along at the teacher's pace, and many times the student may have questions that he or she is embarrassed to ask in front of the class. If software is used, it progresses at the student's individual rate and level, providing "more personalized reading support" (p. 35). In addition, some multimedia

approaches can give students aspects of literacy that can be overlooked during traditional teaching (Karemaker et al., 2008). Some downfalls of using multimedia software for literacy instruction is that there are certain aspects of literacy that some literacy programs may not address. McGraw-Hill's traditional program follows specific lesson plans that meet the curriculum standards, but it does not necessarily meet each individual child's needs (Isakson et al., 2011). Also, depending on the specific program used it may not contain educational advantages. This problem is not easy to address and remediate because there are many different benefits of different programs and it can be difficult to assess the effectiveness of each program using the same measure of assessment. There are many different programs that have their benefits and drawbacks to the education system, all with different assessment procedures testing different aspects of phonemic awareness.

Earobics is a software program that is interactive, providing students in pre-kindergarten through third grade instruction in early literacy skills. These skills focus on phonemic awareness and auditory processing, but helps to develop cognitive and language skills that increase comprehension. In a study, that was cited by the United States Department of Education (2009), including two kindergarten and first grade classrooms, it was found that in addition to the regular classroom literacy instruction there were significant positive effects in phonemic awareness, blending, segmenting and rhyming when Earobics software was used. Compared to the group that did not receive specialized phonemic awareness instruction provided through Earobics software the experimental group made considerable progress (US Department of Education, 2009). Another study by Loeb et al (2009) compared the Earobics software and its benefits to the FastForWord Language program. It was shown that even though some subjects found the program to be repetitive it was more interactive and had positive effects on phonological

awareness. According to this research, the program helps build phonemic awareness skill, but there are other studies that point out the benefits of different phonemic awareness skill building software.

Waterford early Reading Program is another software program for kindergarten through second grade students that can be implemented in addition to a classroom literacy program. It focuses on basic literacy skills, such as letter recognition, spelling, writing, reading and comprehension. There are lessons, take home materials including the software that make up the program (US Department of Education, 2007). A study was conducted by the department of education (2007) that looked at four different kindergarten classrooms that received the intervention and the progress made compared to a few schools who did not receive supplemental instruction. When the study was completed, there were positive effects in the classrooms that utilized the software programs in the areas of phonemic awareness, print awareness, phonics and spelling. However, these results were concluded as statistically insignificant. This study had mixed effects, saying the program had potentially positive effects, but nothing was concluded. This shows that not all programs using technology can benefit the education of students learning phonemic awareness skills.

The introduction of computers and other technology into kindergarten classrooms, or earlier, helps the children to learn in various ways outside of the traditional teaching method while being engaged. Electronic storybooks, “e-books” or “CD-ROM storybooks”, can help to be a factor in literacy acquisition, more specifically phonological awareness (Korat & Blau, 2010). A study conducted by Korat & Blau (2010) compared the progress of students with low socio-economic status and middle socio-economic status after using multimedia software. This software was used as a supplement to traditional pre-kindergarten and kindergarten teaching. An

important factor of this study is that the students had experience using computers before the study began, so after the directions were given no adult assistance was given. The research done in these pre-kindergarten and kindergarten classes shows that children who read the e-book repeatedly showed more progress than the control group who received only traditional classroom instruction. The main finding of this study showed that no matter what a student's socio-economic status is that if they are provided with appropriate software and instruction that focuses on emergent literacy with a repetitive nature their literacy skills will improve more than just with traditional classroom instruction. A study conducted by Karemaker et al. (2008) showed that a multimedia literacy program can be more effective than traditional literacy instruction when it is used as a supplement. This study also discussed other reasons why interactive software utilized in a classroom literacy program can have a positive effect on the development of literacy skills. Intensity and duration are also a factor, but ensuring that the programs are both explicit and succinct supplements to a literacy program taught in the classroom is the most important way to instruct strong literacy skills. Some programs are taught in the home by parents who have been trained in the materials.

Another study, performed by Watson & Hempenstall (2008), used a CD-ROM software program called Funnix. This program "provides explicit training in phonological awareness and the alphabetic principle" (p. 260). The parents learned how to teach these concepts using the CD-ROM instructions and taught their children in addition to them receiving instruction in a traditional classroom. After a six month period there was a significant change in phonemic awareness skills in kindergarteners, but not in first grade students. Even though it was shown that kindergarteners using the program made significant progress it was also shown that the control group of kindergarteners made improvement as well. Despite the lack of significant

improvement in the first grade experimental group, there were better outcomes than the first grade control group. There are some reasons why this program might not have had the success that the researchers hypothesized. The program was given to the students after a long day of school so the students might have been tired. Another barrier to the success of this program is that some parents reported that the program was repetitive and their children were getting bored of the material of the CD-ROM program. A supplemental literacy program that relies on technology can have significant benefits to a student's literacy development when it is implemented in the correct way. The studies by Karemaker et al. (2008) and Korat and Blau (2010) were both implemented during the school day by educators while the study that was conducted by Watson and Hemenstall (2008) was implemented in the home by parents.

The Lindamood Phoneme Sequencing, or LIPS, software program helps to teach students how to decode while identifying individual sounds and blends within words. This program has been used mostly with students with disabilities (US Government, 2010). A three year study by McIntyre, Protz and McQuarrie (2008) was conducted including fifty students with learning disabilities between the ages of eight and ten years of age comparing the effectiveness of Lindamood Phoneme Sequencing and the effectiveness of a program called Embedded Phonics. After the post test was given, it was shown that the LIPS program was favored significantly over the Embedded Phonics Program in the areas of phonological awareness, word attack and word attack. The Lindamood Phoneme Sequencing was deemed as a program that had positive effects in literacy instruction for students with disabilities when used in conjunction with a typical classroom program (US Government, 2010). McIntyre et al. (2008) states that the Lindamood Phoneme Sequencing Program is put into practice to "promote higher level thinking for metalinguistic analysis" (p. 24). When students are given this program in addition to their normal

literacy curriculum, research done by McIntyre et al. (2008) has shown that beginning readers made progress in their gains to identify, segment and blend phonemes which impacted their reading skills positively. McIntyre, Protz and McQuarrie (2008) conducted a study of their own in order to compare their findings with the existing research. This study was used to determine the benefits of the Lindamood Phonemic Sequencing Program on typical learning students and students that are considered to be students at-risk for reading disabilities or failure. The study was conducted over a period of five years and consisted of kindergarteners and first graders. The post test found that the program does provide significant benefits for both typical learners and learners who are seen as being at-risk for reading disabilities or failure. For the typical learners, there was an increased knowledge of upper and lower case letter identification and letter/sound relationships. The students who were deemed at-risk before the study were considered to be no longer at-risk when the study was concluded. Their mean scores showed significant benefits for these students (McIntyre, Protz & McQuarrie, 2008). The benefits of this program have been compared to different programs with similar outcomes.

McIntyre, Protz and McQuarrie (2008) noted that Lindamood Phoneme Sequencing Program has been compared to other Literacy programs, such as Earobics, Fast ForWord and Embedded Phonics. During the first study between Earobics, Fast ForWord and Lindamood Phoneme Sequencing Program, it was hypothesized that each program increased phonemic awareness, language and reading skills. According to the findings, each experimental group had gains in phonemic awareness, but Lindamood Phoneme Sequencing Program did a better job to teach the students how to blend phonemes (McIntyre et al., 2008). In that same article, it was written that Lindamood Phoneme Sequencing Program was also compared to the Embedded Phonics program. This study wanted to address the idea that the instructional program could

prevent reading difficulties. There were three groups, one group received the Lindamood Phoneme Sequencing Program, one the Embedded Phonics program, and the third group was the control group only receiving classroom literacy instruction. The differences of the programs were the delivery methods and instruction. This study showed that the students in the Lindamood Phoneme Sequencing Program group had stronger literacy skills after the post test was given than the group who received the Embedded Phonics Program. Even so, both programs showed that when a literacy program like Lindamood Phoneme Sequencing and Embedded Phonics we added to the current literacy curriculum there were positive gains in children's literacy and language skills each program showed that their methods were "more similar than different" (p. 22).

A study done by Karemaker et al. (2010) in 2008 compared two different literacy software programs, *Read, Write and Type* and *The Lindamood Phoneme Sequencing Program for Reading, Spelling and Speech (LIPS)*, asked whether the technology programs were contributing to student success when they were continuing to receive classroom instruction more than students who were only receiving the classroom instruction (Torgesen et al., 2010). This study, indeed, did prove that students who were involved in the literacy intervention programs did learn phonological awareness better than the control group and even a year after the intervention took place the students involved were still succeeding at a higher rate than the students who were not involved in the intervention. Torgesen et al. stated that this study must take into consideration that the program "was offered as a supplement, rather than as a replacement for teacher-led instruction" (p. 53). Programs that are used in a classroom can be very expensive, when adding a supplement to the program administrators can become wary due

to the extensive costs. If a technology-based program is added to the current program it can add very few expenses to the initial cost.

There is a need for cost effective instruction to help provide effective literacy instruction, but there are quite a few questions about how effective the technology can be when the factors surrounding the usage in classrooms and homes can change the outcomes substantially. There continues to be a need to research the effectiveness of software programs as a supplement to traditional classroom literacy instruction (Torgesen et al., 2010).

Conclusion

In conclusion, the above studies have shown that there are many factors that affect phonemic awareness and literacy skill acquisition. Educators' knowledge and instruction can hinder or help a child's literacy learning. These educators are claiming that the education programs that are being attended are not providing a very good background of phonemic awareness or phonics knowledge. Going into the classroom, the teachers are not confident enough to provide in depth instruction on phonemic awareness or phonics. Another factor that can inhibit phonemic awareness learning is socio-economic status. If a student does not have a very strong background of literacy knowledge because of his or her parents and the home life, it can severely impact how well the student learns the basics of phonological awareness and other literacy skills that lead to becoming a good reader. Students who are at-risk for reading disabilities or students with disabilities may need more explicit and intense instruction on phonemic awareness in order to become proficient readers later on in their reading career. One way to minimize the gap between the students who are able to achieve good reading habits and skills and those who are not is to implement technology into the existing literacy curriculum.

Knowing that technology can benefit literacy skills does not necessarily mean that the technology or computer program takes the place of the classroom teacher and the instruction that he or she is providing, rather it means that the literacy programs should be given in addition to in order to ensure that literacy skills are being built upon to increase a student's literacy knowledge and skills.

Method

Context

Research for this study will occur in the two family's homes located in the suburbs of Hennford and Pittsietta, both pseudonyms. Both families' socioeconomic status is middle class. The families both live in quiet neighborhoods with many children who are in the same age ranges of the two participants. Pittsietta's median household income is higher than the New York Average at \$82,261 in 2009. Ninety four percent of Pittsietta's population is white-non Hispanic. There are four public elementary schools and one private elementary school within the town of Pittsietta. Hennford's median income is a bit closer to the state average at \$57,196 in 2009. As of 2009 this town's population had grown by 16.9% since 2000. Although there is more of a minority population in Hennford white- non Hispanic is still the majority with eighty two percent. There are four elementary schools in the town.

Participants

Aaron and Joelle (both pseudonyms) are the two school age participants of this study. The children live with both of their parents. Both sets of parents work during the week and hire a nanny for in home childcare. Aaron, a pseudonym, is a Caucasian nine year and two month old male. He is a very active boy who enjoys playing soccer, video games, swimming, snowboarding and playing the guitar. He is currently in the third grade going into fourth in the

fall. He does not have any learning disabilities or struggles. Aaron is an average student who is reading on grade level. His final report card showed that he gets mostly threes on a four point scale and mathematics is his strongest subject.

Joelle is a Caucasian six year and two month old female. She is enrolled in half-day kindergarten, going into first grade in the fall. Joelle is a very observant and mature child. She enjoys doing arts and crafts, camping, playing tee-ball, swimming at her great grandmother's house and playing with Legos. Joelle does not seem to have any learning difficulties while in school, but she often states that she does not know how to read. On her report card she consistently is given threes and fours, out of a four point scale.

Joelle's mother Allison, who was interviewed before and after the study, is a part time speech and language pathologist. She works as an itinerant teacher, travelling from location to location, with students birth through school age. Joelle lives with her, her husband, and her three year old son, Adam. Allison has her Masters degree in speech and language pathology from Nazareth and is certified in speech and language pathology, birth to death. She is looking into getting a position in a nursing home.

Marie, Aaron's mother, is a stylist who works three days a week. She lives in a quiet neighborhood with her husband and he only son, Aaron. She is very involved in her child's education and is always looking for ways to improve her ability to help Aaron with his school work. She remains in constant contact with his teachers and makes sure that he gets the instruction that he needs.

Lauren, a speech and language pathologist, works with Joelle's mother and is also Joelle's younger brother's speech pathologist. She is very involved and up to date with a lot of information about how literacy development and speech and language development are

connected. She has a lot of good insight about how phonemic awareness and literacy skills interrelate.

Researcher Stance

During this study, I acted as an active observer. I worked directly with the subjects and observed them during their work with the software program. Mills (2011) says that this is the most common form of observation. I will be able to be, what Mills (2011) calls, a privileged active observer. I was able to observe the students during the activity, but did not have to do the majority of the instruction. Through observation, I was able to determine how the independent work with the software benefits phonemic awareness. As a researcher, I worked one on one with each student in their homes and I am currently a graduate student at St. John Fisher College. I am working on obtaining a Master's Degree in Literacy and have a current bachelor's degree in Elementary and Special education. While also working towards certification in Literacy, I presently have a certification in Elementary and Special Education.

Method

During this study, I worked with Earobics computer software that focuses on building phonemic awareness skills in beginning and struggling readers. This study focused on how learning the sounds of different letters and how those letters blend to make words can help a young reader decode unfamiliar words more efficiently. The software increases in difficulty as each task is mastered. During each session, I observed each student and how they interacted with the software and how they reacted to their success and/or failure.

There was eight sessions, each lasted twenty to thirty minutes. During each session, the student had time to play one level of each of the six games: memory matrix, sound check, get rhythm, connectivity, rhyme time, and same-different. Each game focuses on a different

phonemic awareness skill. Memory matrix focuses on auditory attention and memory. Sound check helps to develop sound-symbol correspondence, phoneme discrimination and phonological sequencing. The game Get Rhythm asks the student to segment phonemes. Connectivity works on phonological blending and continues to access auditory memory. Rhyme time continues to build auditory attention, memory and sequencing as well as building the skill of rhyming. Same-different asks students to focus on the most amount of skills in the program: phoneme discrimination, auditory attention and memory, sequencing, pattern recognition, and temporal ordering. There are three ability levels for each game: beginner, intermediate, and advanced. Each ability level focuses on the same skill but more in depth. The game memory matrix which focuses mainly on auditory attention and auditory memory changes the sounds that are being heard. The beginning tasks focus on auditory memory for sound effects, while the intermediate task focuses on auditory memory of words and digits between one and nine and lastly the advanced task require the student to is auditory memory for speech sounds.

All of these skills are important to build and master when developing proficient phonemic awareness skills and decoding unfamiliar words. The software program determines what levels the students will be at based on the amount that they answered correctly or incorrectly. The program keeps track of the progress that the students make while they are playing the games. Over the course of the sessions, this information helped me discover whether or not Earobics software benefits literacy learning, but it also helped me to find activities that help develop the areas of weaknesses for both students.

In addition to using the software program with the two child participants and interviewing them, I interviewed three adults. One adult is a speech and language pathologist with no academic or family ties to either one of the child participants. She works as a travelling

speech pathologist in the Rochester Area, working with young children who are not school age yet. The second participant is a speech and language pathologist in addition to being the mother of Joelle, one of the child participants. She also works with young pre-school children, but works more in a classroom setting in small groups. The final adult participant is Aaron's mother, she is very engaged in her child's education and actively tries to help improve his literacy skills. All of the interviews, including those given to the students, ask questions about individual opinions about reading programs, technology and about student progress and interest.

Quality and Credibility of Research

The quality of a study is based on four different aspects: credibility, transferability, dependability and confirmability. Each of these aspects ensures the validity of a study. Credibility, or the ability to take into account the complexities within a study and be able to deal with the issues that arise (Mills, 2011), is very important in doing an action research study. To ensure the credibility of this study, I was able to extend the study to eight sessions per participant, thus being able to make sure that the study showed results. I was also able to use triangulation. I interviewed the two students that are actually performing in the study as well as their mothers and a speech pathologist. The students are entering two different grades, first and fourth, and are able to give two different perspectives. One of the student's mother is also a speech and language pathologist, so she has input as a mother and a professional. The other mother does not have a lot of educational background and she is able to provide her stand point of how she feels about the study. Also, I was able to get the perspective of a speech and language pathologist. In addition to the interviews, I used anecdotal notes and observation to determine the success of the study. I collected information about the students and video recordings of the interviews and sessions.

The researcher's belief that everything being studied is context bound and does not intend to make statements that can be generalized to larger groups with quantitative data is called transferability (Mills, 2011). I collected data that is specific to the study being conducted. This data can be compared to data within other contexts. Descriptions of the context must be detailed in order for judgments and views to be made with other contexts. The data that I have collected describes the settings and the subjects in which I am studying. When I observed the students, I observed them as I would if I were observing them in a classroom. The data that is to be collected in a transferable study needs to be detailed so people are able to see the findings on their own (Mills, 2011).

The stability of the data, or dependability of data, is also important to ensure during the study (Mills, 2011). I used both interviews and the observations during the sessions to be sure that the study was producing the same results throughout or if there were weaknesses in a part of the data the other data was able to compensate for it. I kept very detailed records of the sessions and the interviews. This information would help someone who is not familiar with the study to understand the processes of the study. I had a critical colleague look at my notes and other data that was kept. She gave her feedback and comments on my data collection and study to give insight or ideas to continue to shape my research.

In this study, I used confirmability, the neutrality or objectivity of the data that has been collected (Mills, 2011). Once again, triangulation process was used to help ensure confirmability because the methods were compared with each other. Using triangulation allowed me to compare the data and find the strengths and weaknesses of the study. Reflexivity was also practiced. I often referred to my research questions and was also able to add to those questions

as the study progressed. Journals and anecdotal notes helped me to reflect on the study and its success.

Informed Consent and Protecting the Right of the Participants

Before beginning my research process, I needed to collect informed consent and protect the rights of the participants. The study I conducted was a qualitative study in which I worked one on one with both Aaron and Joelle. I gave an assent form to both of them that discussed the study and asked for their permission and signature to confirm authorization to perform research. In addition, I also gave their mothers a permission form to explain the purpose of the study and asked permission to include their child in this study. The mothers were also given a consent form to acknowledge that they are both participants of the study as well. It is also important to note that the parents knew that, for this study, all names were anonymous and that identifying marks were removed from all the artifacts used during the study. All participants' names were replaced with pseudonyms and confidentiality was guaranteed.

Data Collection

As discussed earlier, there were multiple forms of data collected. I performed active observation while both students worked with the software program. Here I was able to see how they interacted with the software and how the software benefited their literacy skills. In addition, during each observation, I wrote field notes that helped me to remember how each session went and how the students' skills progressed throughout the study, using the information to assess and analyze the efficiency of the software program. I interviewed both students throughout the study to keep track of their feelings about their progression as well as their feelings towards the software program itself. There were two interviews: one before the study and one after the study was completed. I also conducted interviews with both students' mothers before the study was

conducted. To find out where in the program to start the children, I used the Fountas and Pinnell Benchmark reading assessment to find their reading level. I reassessed the students after the eight sessions to evaluate how the software benefited the children's literacy skills.

There were many steps that went into collecting the data for this study. Before beginning the study, I interviewed all participants, both students and their parents as well as a speech and language pathologist. After the interviews, I typed up the interviews and used the Fountas and Pinnell Benchmark assessment to find both students' reading levels. I started to use the software with both of the students. Over the eight sessions, I kept records of their scores and any comments either the student or I had. At the conclusion of the eight sessions I interviewed both students again and reassessed the students' reading level to document any changes.

Data Analysis

After collecting the data, I organized the interviews and scores. I read through each participant interviews and looked at the different comments that were made about literacy development, phonemic awareness, technology, and the Earobics software that was used during the study. I also noted that the students talked about how technology made learning how to read more enjoyable and how using technology is a motivation factor for them. The mothers of the students also discussed how they felt that technology is beneficial to literacy development.

At the beginning and end of the study, I assessed both children's reading level based on their grade level using the Fountas and Pinnell Benchmark Reading Assessment. For the pre-assessment Aaron was given the level "P" fiction book titled "Plenty of Pets" and Joelle was given the level "D" fiction book titled "The Nice Little House". The students were given a level higher for the post assessment. Aaron read the level "Q" nonfiction book titled "Not Too Cold for a Polar Bear" and Joelle read the nonfiction, level "E" book titled "The Zoo". After the

assessments with both of the students I gathered the data on their accuracy rate, fluency score and comprehension score.

During the study, I created a chart that included their scores on each of the six games that were played during each session and short comments, either by observation or student comments. The six games assessed student knowledge on various aspects of phonemic awareness. Memory matrix focuses on auditory attention and memory. Sound check helps to develop sound-symbol correspondence, phoneme discrimination and phonological sequencing. The game Get Rhythm asks the student to segment phonemes. Connectivity works on phonological blending and continues to access auditory memory. Rhyme time continues to build auditory attention, memory and sequencing as well as building the skill of rhyming. Same-different asks students to focus on the most amount of skills in the program: phoneme discrimination, auditory attention and memory, sequencing, pattern recognition, and temporal ordering. All of the scores are based on a ten point scale. After collecting the data I made notes about the students' engagement, the progression of the software and how difficult it got and the different literacy aspects that were assessed during the games.

I found that there were three major themes in the data: the different uses of technology for literacy development, how technology can discourage literacy development, and the importance of the aspects of literacy to the development of literacy skills.

Findings and Discussion

After collection and thorough examination of the interviews, notes, and scores three themes emerged. These themes emerged based on the different categories that were determined by the codes found repeatedly throughout the data. These three themes are how the different

forms and uses of technology that encourage literacy development, how technology discourages literacy development and how important the aspects of literacy are to the development of literacy skills.

The Different Technology and Uses that Encourage Literacy Development

Literacy development can be benefited by the use of technology. There are many different software programs, applications and devices that can increase literacy development and knowledge. Student and parent interviews, in addition to the data collected during the eight sessions using the Earobics software, show how technology can maintain attention and help develop literacy skills. Aaron and Joelle both agreed that once in a while they like to use technology, like a kindle or book on CD, to read. The students might like learning how to read using technology because it is different from the traditional reading done in school. In our interview, Aaron stated: “I really like playing the games and stuff on my DSi or your iPad” (Interview, June 13, 2012). Joelle also pointed out that “Playing on your iPad and listening to more books” (Interview, June 13, 2012) would help her to become a better reader. She could have made this comment because she feels that more practice reading will help her to develop her literacy skills. Both children also have hand held devices, like a Leap Frog Leap Pad and Nintendo DSi, with games that develop vocabulary, spelling and decoding skills. When doing the Earobics program, the students both were engaged for the majority of the time. They completed the games with no complaint and during the post interview Aaron mentioned about how he continued to work because he thought it was going to become more difficult: “I was hoping that the games would get harder, so I kept working” (Interview, July 11, 2012). This information presented the fact that the chance of a challenge could have been a motivation factor for Aaron. The software began to get repetitive and boring, but both children continued to work.

As shown in Table one in appendix A, Joelle Commented on June 14, 2012 that she was bored during the “Get Rhythm” game, but two games later on the “Rhyme Time” game she got excited when the game got more difficult. The game tended to be repetitive and spent more than ample time on each level of difficulty. This could be why Joelle got bored of the game and why it was exciting that the difficulty increased.

Interactive technology seems to work the best to maintain attention and interest. Using technology can also make reading practice fun and interesting to children. When children are playing games that involve literacy, they do not look at literacy development as a chore (Watson & Hempenstall, 2008). In Aaron’s pre interview he stated: “I think I learn a lot of words on those” (Interview, June 13, 2012) when asked about the different reading and writing games that he plays on his Nintendo DSi, and an iPad. Joelle stated in her post interview “doing sight words on the computer is more fun than just using the cards my teacher gives me” (Interview, July 11, 2012). These comments made by the students show that when technology is involved in their learning they are more encouraged to do the learning activities.

With more practice with different programs, applications and devices a child can increase their literacy skills, like phonemic awareness and decoding. The Fountas and Pinnell Benchmark Assessment was used as a pre and post assessment for both students to get a baseline of accuracy rate, fluency and comprehension scores. Aaron was assessed as instructional at a level “P” during the pre assessment and a level “Q” during the post assessment. Table one shows how his accuracy rate stayed a consistent 97% reading both levels of books before and after the study.

Table I

Fountas and Pinnell Benchmark Assessment Scores

Date	Level	Aaron			Joelle			
		Accuracy	Fluency	Understanding	Level	Accuracy	Fluency	Understanding
6/13/12	P	97%	3/3	8/10	D	<90%	1/3	6/7
7/11/12	Q	97%	2/3	8/10	E	<90%	2/3	5/7

This table shows the progress that the students made over the course of the study. Aaron started reading at a level “P” at 97% on June 13, 2012 with eight out of 10 for the comprehension conversation and finished the study reading instructionally at a level “Q” with 97% on July 11, 2012 with again eight out of 10 for comprehension. These scores show that over the course of the study Aaron made progress in his reading. These improvements could have been made due to the phonemic awareness practice Earobics software or they could have been increased because of the increased practice reading. Joelle had different results over the course of the study. She started on June 13, 2012 reading at a level “D” with less than 90% accuracy. At the end of the study on July 11, 2012, I assessed her at a level “E” still reading below 90% accuracy. This lack of improvement could be because she did not benefit from the software, but it also could be the lack of motivation factors that inhibited her skill level.

This data can be attributed to the extra work that was being done during our sessions or it could be attributed to Aaron’s development seeing that he was only in school for two weeks of this study. During the two weeks that Aaron was in school, he commented and said “I like the extra practice when I don’t have homework”(Table 1 on June 20, 2012). He may like the practice because he enjoys the challenge and wants to become a better reader.

The Different Forms and Uses of Technology that Discourage Literacy Development

Aaron and Joelle's mother both agree that even though there are a lot of benefits to using technology to increase literacy there are also some drawbacks. Aaron's mother sees technology as a downfall because Aaron is easily distracted from his traditional school work. She states that she likes "the idea of technology being incorporated into school work because he will more likely be interested in finishing it" (Interview, June 14, 2012). This statement shows that Aaron's mother wants technology to be incorporated into his curriculum in school. However she also noted that if technology was the entire curriculum it would cause Aaron to be "desensitized to the interesting idea of having technology incorporated into his school work and he would get bored, like he is now" (Interview, June 14, 2012). I think that this comment is generalized to mean that there is too much technology in his life, but it could also mean that she wants him to also learn traditionally as well. Loeb, Gillam, Hoffman and Brandel (2009) state that when a student is overloaded with information and instruction the student will no longer be interested so he or she will not be able to learn the material. There has to be a balance, so technology should be used as a supplement in traditional instruction (Yeh, 2003; Karemaker, Pitchford & O'Malley, 2010; Torgesen, Wagner, Rashotte, Herron & Lindamood, 2010).

Joelle's mother took a less subjective stand point on the issue. She answered a lot of the general questions in the interview as a speech and language pathologist and wrote about what she sees in her professional life instead of her home life. She noted that phonemic awareness software could improve literacy skills among new readers "if it is used consistently with a baseline taken and sporadic documenting of progress is done" (Interview, June 14, 2012). Joelle's mother could mean that this program could benefit students if teachers implement it more often on a consistent basis. Lauren, a speech pathologist, says: "I am 100% sure that this

software would help literacy skills. I am 100% sure that preteaching of vocabulary and lots of visual supports would help as well” (Interview, June 14, 2012). Lauren could be saying that although she feels that this program could be beneficial to student learning and phonemic awareness skill building, effective quality teaching could also help to develop the appropriate skills. Both professionals feel that even though this software can help improve literacy skills that traditional instruction and therapy “can tailor what skills a student needs extra help with” (Interview, June 14, 2012). Lauren may have made this comment because she feels that individual intervention is more effective than a generalized education program.

Access to technology can be limited to children who come from a low socio economic background. Joelle’s mother noted this as one of the drawbacks of using technology with a student “Some students do not have access to the technology and because of this they may not have the knowledge to use technology in the classroom” (Interview, June 14, 2012). Being a travelling speech and language therapist she sees a lot of different home situations of all different socioeconomic statuses. This comment could mean that she understands why implementing technology into instruction. Also, Korat and Blau (2010) stated that when students do not have access to technology it can impact their learning. There can be too much access sometimes too. Students need supervision when it comes to using technology.

Joelle’s mother and Lauren, the other speech and language pathologist that was interviewed, have used Earobics software with their students before and noticed that along with the benefits of using phonemic awareness software with students there are some problems with it as well. Joelle’s mother states: “when a student is playing the games he or she needs to be supervised by an adult because it can sometimes be difficult to follow the directions” (Interview, June 14, 2012). This comment could mean that she understands that some children have a

difficult time following directions and this software is too independent for some students. A student’s age and ability level could also determine whether or not the software is appropriate for them. Joelle’s mother states another drawback to using the earobics software is that “older students at pre-primmer regain levels find the program ‘baby-ish’” (Interview, June 14, 2012). The software is redundant and does cater to the younger students, kindergarten through second grade, so Joelle’s mother could be stating that her older students need software that is more appropriate for their age group. Lauren points out that she would never use this software with her students because she believes “the activity is too passive and not individualized” (Interview, June 14, 2012). Lauren does not feel that this program could tailor to the individual needs of her students and could be implying that better instruction could be given using more traditional, differentiated methods. Lauren is not the only professional that feels that some literacy programs are not individualized for students’ needs. Iacono and Cupples (2004) state that children are able to learn to read when they are provided with individualized phonemic awareness instruction.

Joelle, however, did not make any progress during this study. The data collected from the Fountas and Pinnell Benchmark Assessment is somewhat incomplete. She read the level “D” nonfiction book at the beginning of the study, but refused to read any other book.

Table I

Fountas and Pinnell Benchmark Assessment Scores

Date	Level	Aaron			Joelle			
		Accuracy	Fluency	Understanding	Level	Accuracy	Fluency	Understanding
6/13/12	P	97%	3/3	8/10	D	<90%	1/3	6/7
7/11/12	Q	97%	2/3	8/10	E	<90%	2/3	5/7

Her accuracy rate was below a 90%, but her comprehension scores were high. Her comprehension level led to the conclusion that the book had been used for previous assessment. Joelle’s mother noted her strengths and has most likely practiced reading with her to know them. Joelle’s mother stated, when asked what her daughter’s strengths were in reading, that “making predictions, use of picture cues and recall skills” (Interview, June 14, 2012) were three of her strengths. When given the post assessment Joelle completed the book, but once again refused to complete another book to get a more accurate assessment of her reading ability. Technology use for instructional purposes has its benefits, but also can have some drawbacks depending on the socioeconomic status and individual needs of the student. Research states that because some students do not have access to technology outside of school due to their low socioeconomic status implementing technology into the classroom can inhibit literacy learning in the primary discourse (Torgesen, Wagner, Rashotte, Herron & Lindamood, 2010).

The Important Aspects of Literacy

Using the Fountas and Pinnell Benchmark Assessment system, I was able to assess both Aaron and Joelle before and after the eight sessions of Earobic software. Both students seemed to make improvements in many areas of literacy, especially blending and segmenting sounds to decode words.

Table I

Fountas and Pinnell Benchmark Assessment Scores

		Aaron			Joelle			
Date	Level	Accuracy	Fluency	Understanding	Level	Accuracy	Fluency	Understanding

6/13/12	P	97%	3/3	8/10	D	<90%	1/3	6/7
7/11/12	Q	97%	2/3	8/10	E	<90%	2/3	5/7

Aaron showed his improvement through the pre and post Fountas and Pinnell Benchmark assessment (Table 1) by reading at a 97% accuracy rate in both the “P” and “Q” leveled books. Through observation, it was seen that before the software program, Joelle used the initial sound of the word or the visuals to determine the words she was reading and she was not always very accurate. After the sessions, she not only took the time to try to decode the word, but with help from the visuals she was able to read more words correctly. The strategies she used while reading was not shown by her Fountas and Pinnell Benchmark scores noted above in table two, but during the reading she took quite a bit more time trying to read the entire word instead of guessing based on the initial sound.

In her interview, Joelle responded “read more and practice my words” (Interview, July 11.2012) when asked what activities could help her to become a better reader. She could possibly feel that these are the ways to become a better reader because this is what she sees in her home by her parents and in school by her teacher. The speech pathologist stated in her interview that one of the purposes behind the Earobics software was to “improve reading, increase attention to words and direction following skills” (Interview, June 14, 2012). This comment is made to define the purpose of the program in a speech and language pathology perspective. It has been stated by Ukrainetz, Ross and Harm (2009) that literacy skills are developed over time with consistent instruction. Joelle should be able to increase her attention on decoding difficult words, based on the improvement she made in such a short time. In the interview, her mother states that “this program is best used when used consistently in conjunction with another literacy program over an extended period of time” (Interview, June 14,

2012). Joelle's mother has used this program before with some of her students and she has seen the most benefits come from using it over an extended period of time using a base program and supplementing Earobics to build phonemic awareness skills. Based on Table two and table eight of the Earobics scores and comments chart it shows that from the beginning of the study to the end she made some improvement on the sound check game that required her differentiate between letter sounds.

Table II

Earobics Data: Progress and Scores for June 18, 2012

Game	Aaron		Joelle	
	Scores	Comments	Scores	Comments
Memory Matrix	10/10		5/10	
Sound Check	10/10		5/10	
Get Rhythm	7/10		9/10	"I'm bored"
Connectivity	10/10		10/10	"Too easy"
Rhyme Time	10/10		8/10	
Same-Different	6/10		8/10	

This table shows the scores and the comments made by both students on June 18, 2012. This was the first day of the students doing the program. The first game memory matrix played sounds, from two to five , in a row and the students had to select those sounds in order after they listened to them. Aaron did well on this game getting 10 out of 10 correct, but Joelle struggled a bit only getting half of the answers correct. Sound check was the next game and this game asked the students to listen to words and choose the sounds they hear. Once again, Aaron got all of the sounds correct and Joelle only got half correct. Between these two games it shows that Joelle's

auditory processing and auditory memory are not very developed. Get Rhythm had the students count the amount of sounds that were heard either in a word or how many sounds were heard in a row, depending on the different level. Aaron got a seven out of 10 and Joelle did well getting a nine out of 10. Connectivity counted the amount of syllables in words starting with two syllable words working up to four and five syllable words. Aaron and Joelle both got all of the answers correct. Joelle even stated that it was “Too easy” (Table 2). Rhyme time gave the students two to five words and the students were asked to click on the words that did not rhyme with the rest of them. Aaron got all of them correct and Joelle only got two of the answers incorrect. Same-different gave the students different sounds and they had to tell if the sounds were different or the same. Aaron had a difficult time with this only getting six out of 10 and Joelle seemed to do better getting an eight out of 10. The difference in scores could be attributed to the different sounds that were given based on level. Aaron was given “rah” and “lah”, the voice of the program made it difficult to decipher. Where Joelle was given long “e” and short “e” to decipher.

Table VIII

Earobics Data: Progress and Scores for July 2, 2012

Game	Aaron		Joelle	
	Scores	Comments	Scores	Comments
Memory Matrix	8/10		9/10	
Sound Check	10/10		7/10	
Get Rhythm	9/10		8/10	
Connectivity	9/10		10/10	
Rhyme Time	9/10		7/10	
Same-Different	8/10		10/10	

Aaron’s skills stayed pretty consistent through the session on July 2, 2012. On every single game he got an eight to 10 out of 10. This shows that he was building on his phonemic awareness skills. Joelle also did well on this day getting scores between seven and 10 out of 10.

She also made gains in the game same/different that focused on the area of once again differentiating between different phonemes. Through observation, it was shown that Joelle was beginning to grasp the concept of listening for the different phonemes. The ability to grasp the concept was especially apparent on June 18, 2012 when she counted the syllable of words on her fingers (Table 2) and on June 22, 2012 when she repeated each word before choosing the correct answer (Table 3).

Table II

Earobics Data: Progress and Scores for June 18, 2012

Game	Aaron		Joelle	
	Scores	Comments	Scores	Comments
Memory Matrix	10/10		5/10	
Sound Check	10/10		5/10	
Get Rhythm	7/10		9/10	“I’m bored”
Connectivity	10/10		10/10	“Too easy”
Rhyme Time	10/10		8/10	
Same-Different	6/10		8/10	

Table III

Earobics Data: Progress and Scores for June 20, 2012

Game	Aaron		Joelle	
	Scores	Comments	Scores	Comments

Memory Matrix	7/10	“I like the extra practice, when I don’t have homework”	5/10	
Sound Check	10/10		6/10	
Get Rhythm	8/10		10/10	“Annoying”
Connectivity	9/10		10/10	
Rhyme Time	10/10		8/10	
Same-Different	7/10	“Do they give different sounds?”	8/10	

This table shows the progress of the session on June 20, 2012. Aaron had more to say this day about the program and was very interested in the progression of the difficulty. During this session he did not get below 70% of the answers incorrect. Joelle stated that the Get Rhythm game was “annoying”. She did not score very high consistently during this session only getting a five out of 10 and a six out of 10 on the first two games.

Aaron’s improvements were not as noticeable on the Earobics chart, but his reading level based on the Fountas and Pinnell pre and post assessments (Table 1) showed improvement.

Table I

Fountas and Pinnell Benchmark Assessment Scores

Date	Level	Aaron			Joelle			
		Accuracy	Fluency	Understanding	Level	Accuracy	Fluency	Understanding
6/13/12	P	97%	3/3	8/10	D	<90%	1/3	6/7
7/11/12	Q	97%	2/3	8/10	E	<90%	2/3	5/7

Being a more experienced reader, he had previously developed the skills to decode unfamiliar words by using initial sounds and context clues. He was more interested in increasing his

vocabulary and fluency (based on his pre study interview). Unfortunately, the Fountas and Pinnell Benchmark Assessment did not show that his vocabulary had increased, but through observation, after the eight sessions of using the Earobics he was more interested in paying attention to details while he was reading. When working with the auditory memory software, he realized that he was very good at remembering sequence of letter sounds. He stated on July 2, 2012: “I’m really good at the sounds” (Table 8).

Table VIII

Earobics Data: Progress and Scores for July 2, 2012

Game	Aaron		Joelle	
	Scores	Comments	Scores	Comments
Memory Matrix	8/10		9/10	
Sound Check	10/10	“I’m really good at the sounds”	7/10	
Get Rhythm	9/10		8/10	
Connectivity	9/10		10/10	
Rhyme Time	9/10		7/10	
Same-Different	8/10		10/10	

This table was the last session that I worked with the students. Both students received high scores, neither one of them scoring below a seven out of 10.

This comment was Aaron’s self realization that he is building skills to recognize phonemes shows that he is building on his literacy skills. I told him it was like remembering what he read in a book. When he was given the final assessment, he was using more questioning and critical thinking skills when he was reading. As shown on Table one, the Fountas and Pinnell

Benchmark Assessment, his comprehension scores did not increase, but he was reading a level higher during the post test.

Table I

Fountas and Pinnell Benchmark Assessment Scores

Date	Level	Aaron			Joelle			
		Accuracy	Fluency	Understanding	Level	Accuracy	Fluency	Understanding
6/13/12	P	97%	3/3	8/10	D	<90%	1/3	6/7
7/11/12	Q	97%	2/3	8/10	E	<90%	2/3	5/7

During the comprehension conversation, Aaron was making a lot more connections from the text to his back ground knowledge. He talked himself through each and every comprehension question. His scores did not seem to improve too much. Based on the Fountas and Pinnell Benchmark assessment his accuracy rate stayed at a 97%, his fluency score decreased by one point and his comprehension score stayed the same seen on table two above, but he was utilizing more comprehension strategies while he was reading. Before reading he used the skill of predicting; he told me that the book was going to be about Polar Bears and how they stay warm. During reading he stopped and asked me a few questions about why Polar Bears do not live in New York, using the comprehension skill of questioning. During the comprehension conversation, he was able to recall a lot more details about Polar Bears and what makes them different than a bear that lives in our climate. This data could show that the practice that Aaron got during this study helped him to improve his comprehension skills. The skills that were improved during the study were not all documented in the Fountas and Pinnell benchmark assessment, but through observation the basic aspects of developing literacy skills were seen.

Implications and Conclusions

This study has helped me to realize the different implications that affect me as a teacher, as well as other teachers who teach literacy skills. Technology can help to develop literacy skills; phonemic awareness software can benefit an emerging readers ability to decode unfamiliar words and increase auditory processing. Although software can help students, the skills that are being learned must be able to be applied to other areas of reading. Students can learn an isolated skill when using specific software, but there needs to be more instruction to teach application skills.

The data that I collected after my study had a few implications for me as a teacher. I was brought back to the realization that the building blocks of literacy skills, like phonemic awareness, shape the development of skills in emergent readers. At times, I get ahead of myself and forget what it was like to be a beginning reader. I have to take a step back and break down the steps in order to help the students who still have yet to build their skills. This study and the data I collected through interviews and notes during the sessions, showed that in addition to phonemic awareness, other literacy skills were impacted. Aaron was able to become more conscious about his questioning and connecting skills after he was able to make the connection of how well he remembered the different patterns in one of the games during Earobics. Aaron's use of his comprehension skills shows that Earobics can have positive effects on literacy development, even when the skills that are being improved are beyond phonemic awareness.

Another implication that I have found is that student interest is very important to the development of proficient literacy skills. Technology assists with that as long as the technology is appropriate, by level and interest, for the individual. Earobics software is technology that can be used, but it lacks the ability to individualize to each student's needs. Although, there are

many benefits to the software it can be shown that the skills provided by the software are general and many students can master the beginning levels after playing the games a few times.

Individualization can trigger interest in some students. During this study, it was brought to my attention that there are many different ways to develop the important reading skills that students need to become proficient readers. The Earobics software is a great tool to use for beginning readers, but it can be a bit boring and childish for students who have mastered the basic skills of phonemic awareness. However, there are many software programs and devices that can help to increase literacy skills in students of all ages.

From this research, I have discovered that phonemic awareness and auditory processing skills are very important to building literacy skills. More early elementary teachers should be focusing on the development of phonemic awareness. When a student is able to make the sound to letter connection, it becomes easier to grasp the other concepts that come along with learning to read. These skills seemed to be developing by using the software in the Fountas and Pinnell Benchmark assessment. There could be other factors that affected the improvement, but seeing as school was out for the majority of the sessions and there was little to no instruction given to each child this shows that the Earobics software can be used to supplement a complete literacy program.

This study served the purpose of finding whether or not phonemic awareness skill building software benefited literacy schools when used in conjunction with an in- school literacy program, but to find out what areas of literacy this program benefits specifically the study could be performed in the classroom. A research question that I would be interested in answering would be: does phonemic awareness skill building software benefit student literacy skills when implemented consistently in the classroom with instructor support. Another question would then

be how does implementing different types of technology into a classroom setting benefit a student's fluency or comprehension. These research questions ask how the setting and intensity can affect literacy skills, but they also question different aspects of literacy besides phonemic awareness.

As with any study, there are factors that can inhibit the investigator from reaching every single conclusion that is possible to find from conducting the study. Because of the nature of this class, I feel that time was the biggest limit to this study. During this literacy capstone class, we were only given a few weeks to conduct our research and perform the study. This time was given to us at the end of the regular school year so this made it difficult to have extended time with in the classroom to make extensive observations about the literacy instruction done in the classroom. My question about how phonemic awareness skill building software benefited student literacy development when used as a supplement to everyday literacy instruction would have better been answered if I had ample time in the classroom finding more information about the children as students, the literacy program that was used and the instruction methods that the teacher utilized on a daily basis. These factors have caused me to think of the different ways that I would change my study if I were to conduct the same study over again.

This study was conducted over a period of three weeks and at the very end of the school year. In order to make my findings more complete and more consistent, I think that, not only would I have the study take place over a longer period of time, but I would also do it during the school year so that there are more connections with the school literacy program and the phonemic awareness skill building software. In addition, I think it would be beneficial to the study if I were use emergent readers as participants from the same classroom. If the participants were on the same developmental level and expected to make the same progress throughout the

school year, it would be easier to compare the students and draw more solid conclusions from the research. Having the classroom teacher as a participant would also help to solidify my findings because I would have more information about the school literacy program and the activities that are used in the classroom. To take the study one step further still, I could also get a group of students from two different classrooms which use two different instructional methods. In doing the study in this manner, I would be able to gather more information on how much phonemic awareness skill building software really does benefit students' literacy skills when used in conjunction with an in school literacy program.

From the literature that I have reviewed and the study that I conducted, it can be concluded that phonemic awareness is a very important skill to reading and writing development. Technology can assist with the learning of this skill through various software programs and devices. Although Earobics cannot stand alone as a literacy program or take the place of speech and language therapy, it can benefit students' skills over a period of time when used appropriately and consistently.

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Appendix A***Pre Interview with Aaron on June 13, 2012***

1. Do you like reading?
2. What kinds of books do you like?
3. What do you like about the books on CD?
4. What is your favorite place/time to read?
5. Do mom and dad read to you?
6. Do you think you are a good reader?
7. Do you want to get better as a reader?
8. What do you think you would make you a better reader?
9. Do you play games on the computer sometimes?
10. What kind of games do you play on those?
11. Speaking of spelling, what kinds of things do you think that you need to work on as a reader or writer?
12. Oh that's right! Do you think that playing a video game on the computer can make you a better reader?

Pre Interview Questions with Joelle on June 13, 2012

1. Do you like reading?
2. What kinds of books do you like to read?
3. What is your favorite time/place to read?
4. Do mom and dad read to you?
5. When do they read to you?
6. Do you think you are a good reader?

7. What do you think you need to work on to become a better reader?
8. Do you play games on a computer or on your wii?
9. What kinds of games do you play?
10. Do you think those games helps you to read?
11. What activities on those games do you think help you to read?
12. Do you think that playing reading, writing and spelling games on the T.V., computer or leap pad can help you become a better reader?

Post Interview with Aaron on July 11, 2012:

1. Did you like those games we played on the computer?
2. Why do you think I had you play those games?
3. What parts of those games would make you a better reader? How do you think they would help you?
4. Do you think those game helped you to read better?
5. You said before that you like using the DSi and iPad to play reading games. What other games do you like?
6. Sure, or anything that you play.
7. What could be done differently to make the games that we played more fun?

Post Interview Questions with Joelle on July 11, 2012:

1. Did you like the games we played on the computer?
2. Why do you think I played these games with you?
3. Do you think they could make you a better reader?
4. Why do you think that?

5. What games did you like the best?
6. Why did you like them?
7. What other activities do you think that we could do together to get you to get better at reading?

Table II

Earobics Data: Progress and Scores for June 18, 2012

Game	Aaron		Joelle	
	Scores	Comments	Scores	Comments
Memory Matrix	10/10		5/10	
Sound Check	10/10		5/10	
Get Rhythm	7/10		9/10	“I’m bored”
Connectivity	10/10		10/10	“Too easy”
Rhyme Time	10/10		8/10	
Same-Different	6/10		8/10	

Table III

Earobics Data: Progress and Scores for June 20, 2012

Game	Aaron		Joelle	
	Scores	Comments	Scores	Comments
Memory Matrix	7/10	“I like the extra practice, when I don’t have homework”	5/10	
Sound Check	10/10		6/10	
Get Rhythm	8/10		10/10	“Annoying”
Connectivity	9/10		10/10	

Rhyme Time	10/10		8/10
Same-Different	7/10	“Do they give different sounds?”	8/10

Table IV

Earobics Data: Progress and Scores for June 22, 2012

Game	Aaron		Joelle	
	Scores	Comments	Scores	Comments
Memory Matrix	9/10		6/10	
Sound Check	10/10		8/10	
Get Rhythm	7/10		8/10	
Connectivity	9/10		9/10	
Rhyme Time	9/10		8/10	
Same-Different	9/10		9/10	

Table V

Earobics Data: Progress and Scores for June 25, 2012

Game	Aaron		Joelle	
	Scores	Comments	Scores	Comments
Memory Matrix	8/10		7/10	
Sound Check	10/10		6/10	
Get Rhythm	8/10		8/10	
Connectivity	9/10		9/10	
Rhyme Time	9/10		8/10	
Same-Different	9/10		10/10	

Table VI

Earobics Data: Progress and Scores for June 27, 2012

Game	Aaron		Joelle	
	Scores	Comments	Scores	Comments
Memory Matrix	9/10		6/10	
Sound Check	10/10		6/10	
Get Rhythm	7/10		8/10	
Connectivity	7/10		10/10	
Rhyme Time	10/10		8/10	
Same-Different	8/10		7/10	

Table VII

Earobics Data: Progress and Scores for June 29, 2012

Game	Aaron		Joelle	
	Scores	Comments	Scores	Comments
Memory Matrix	7/10		7/10	
Sound Check	10/10		6/10	
Get Rhythm	9/10		8/10	
Connectivity	7/10		8/10	
Rhyme Time	8/10		7/10	
Same-Different	7/10		8/10	

Table VIII

Earobics Data: Progress and Scores for July 2, 2012

Game	Aaron		Joelle	
	Scores	Comments	Scores	Comments
Memory Matrix	8/10		9/10	
Sound Check	10/10		7/10	

Get Rhythm	9/10	8/10
Connectivity	9/10	10/10
Rhyme Time	9/10	7/10
Same-Different	8/10	10/10

Interview with Aaron's mother received June 14, 2012

1. What strengths and weaknesses does Aaron have as a reader and a writer?
2. What different reading and writing activities do you do at home outside of homework?
3. Are you familiar with the reading program that is used in school?
4. Do you have contact with Aaron's teacher about his progress and what can be worked on?
5. What is your highest education level?
6. Do you read for pleasure? If you do, do you read in front of Aaron?
7. Do you encourage reading for pleasure? Or read with Aaron?
8. Do you think that using technology can help your son improve his reading and writing skills?

Interview with Joelle's mother received June 14, 2012

1. As a speech pathologist, what do you view as the difference between auditory processing and language processing?
2. Do you feel that phonemic awareness software could improve literacy skills among new readers?
3. After using the software do you think there are drawbacks to this software program?
4. What do you think are your child's strengths and weaknesses as a reader?
5. What different types of activities involving literacy do you do in the home?

6. Are you familiar with the reading program that is used in school?
7. Do you have contact with Joelle's teacher about his progress and what can be worked on?
8. What is your highest education level?
9. Do you read for pleasure? If you do, do you read in front of Joelle?
10. Do you encourage reading for pleasure? Or read with Joelle?
11. Do you think that using technology can help improve reading and writing skills?

Interview Questions with Lauren, the Speech and Language Pathologist, received on June 14, 2012

1. When using Earobics software what skills should improve with auditory processing activities?
2. As a speech and language pathologist, what do you see as the differences between auditory processing and language processing?
3. Do you think Earobics software can help improve literacy skills?
4. Do you think this software could replace speech and language therapy?
5. Do you think it could stand alone as a program to teach phonemic awareness?
6. Would you use this software with your students?
7. Why?