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# The Impact of Technology Selection on Student Literacy Achievement

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**Abstract**

The purpose of this action research project was to determine if prekindergarten students could increase literacy achievement and motivation when the educator selects the technology based on learning goals and the Iowa Early Learning Standards. High quality technology applications were provided during whole group, small group, and learning centers. Data was collected through quantitative means using Teaching Strategies GOLD and the Individual Growth and Development Indicators (IGDI) test scores. Analysis of the data collected suggests that the prekindergarten student's GOLD and IGDI scores increased as specific technology integration was implemented in the classroom.

**The Impact of Technology Selection on Student Literacy Achievement**

Early literacy skills build upon a child's use of language and understanding of letter sound relationships and the written word. Providing quality, developmentally appropriate activities, and instruction in early childhood will greatly affect the development of reading skills for all children. Preschool students' knowledge of the alphabet, phonological awareness, and emergent writing are predictors of early reading skills. With a strong foundation of early literacy skills in prekindergarten students will have the ability to read and meet learning goals.

The preschool years are a time when children are exploring and learning through authentic experiences. Students are using creativity in art, movement, music, and expressing through manipulatives (dramatic play, crayons, paint, blocks, and STEM). The use of technology, interactive whiteboards, iPads apps, computers, and digital media, allow children another way to explore, learn, and express creativity. Technology is an effective tool to support learning when it is used in the classroom intentionally and with developmentally appropriate practice.

Okoboji prekindergarten, part of the Statewide Voluntary Preschool Program, is required to use the Individual Growth and Development Indicators (IGDI) literacy assessment three times per school year and Teaching Strategies GOLD assessment three times a year with ongoing observations. The IGDIs literacy test is designed to measure the student's ability to identify a variety of literacy skills. These skills include picture naming (oral language), which one does not belong (comprehension), sound identification, alliteration, and rhyming (phonological awareness). The IGDI literacy assessment is designed for the teacher, or technology, to ask the question and verbalize the answer choices. The student uses the IGDIs iPad app to select the answer. For example, the teacher asks the student, what letter makes the sound /s/? The student

selects from three options B, S, or C on the iPad. Teaching Strategies GOLD is designed to look at a student's development as a whole focusing on social/emotional, physical, language, cognitive, literacy, mathematics, social studies, science and technology, and the arts. The GOLD assessments are based on teacher observation and the student knowledge of the content. It was determined, from the assessments, that students required multiple daily activities and interventions of letter sound correspondences in order to meet the 15 plus letter sound identification for the end of the year pre-kindergarten expectations. The teacher will focus instruction on the student's motivation and literacy development, more specifically sound identification, and provide interventions to those students who know less than five sounds, along with intentional technology integration within instruction and daily activities (see Appendix A and B).

## Literature Review

Kleiman, Peterson, and Sherman (2004) focus their research on technology and helping elementary children learn to read. Kleiman et al. (2004) maintain the importance of knowledgeable teachers being the critical element in successful reading instruction with technology supporting the teacher's instruction. The report finds four general areas where technology can support student learning: presenting information and activities, assessment of student work, response to student work, and providing scaffolds to help students read successfully (Kleiman et al., 2004). The researchers emphasize technology can present a variety of phonemic awareness and phonics practice activities to support student learning, address different learning styles, and engage students in learning. The report found a variety of research studies that support positive results of using technology to help students develop phonemic awareness and phonics abilities (Kleiman et al., 2014). The researchers note another benefit of

technology integration to be an effective way to motivate students to learn and read (Kleiman et al., 2014). The researchers conclude, “Technology can help make a good reading program more effective, but its value depends upon the quality of the overall reading program and the thoughtful implementation of technology to enhance reading instruction” (Kleiman et al., 2014, p. 20).

Mattoon, Bates, Shifflet, Latham, and Ennis (2015) focus their study on the benefits of using digital technology during instruction in comparison to the traditional methods used in preschoolers development and learning. In the early learning environment, Mattoon et al. (2015) concluded that digital manipulatives, electronic manipulation of objects, could be used for a variety of purposes, including storytelling and drawing to meet individual learner needs. Mattoon et al. (2015) indicated that digital technology, when used appropriately, might assist or enhance the learning experience for students. The researchers state the importance of educators using technology intentionally in the early childhood environment as well as being proficient in the technology they are using (Mattoon et al., 2015). Specifically, it was found by Mattoon et al. (2015) that both the traditional teaching methods and digital technologies are effective tools for enhancing student learning, especially “when digital technology is integrated intentionally and purposefully” (para 34).

According to the position statement of the National Association for the Education of Young Children (NAEYC) and Fred Rogers Center for Early Learning and Children’s Media at Saint Vincent College (2012), the effectiveness of technology is in direct correlation with the teachers developmentally appropriate practices that guide the use of materials and tools used in teaching young children. The NAEYC and Rogers (2012) hold the position that “Technology and interactive media are tools that can promote effective learning and development when they are

used intentionally by early childhood educators, within the framework of developmentally appropriate practice" (p. 5). NAEYC and Rogers (2012) go on to explain that appropriate technology should be used to support learning along with daily activities such as creative play, real life authentic experiences, physical activity, and social interactions. Effective use of technology, according to NAEYC and Rogers (2012), will be active, hands on, engaging experience that provides adaptive scaffolds to help with activities and support student learning.

McKenna (2014) presents insights into the idea that technology should be integrated into the language arts curriculum as it is with other content areas by referencing the Common Core and 21st century skills that are expected for students to be career and college ready and able to function in a digital environment. Technology integration into language arts has been slow and tentative according to McKenna, (2014) acquainting educators with how technology can be integrated into instruction is essential for the future literacy. McKenna (2014) points out that technology can be a supportive tool for all students, but especially for diverse learners in literacy instruction by providing digital scaffolding to help a child read independently when print reading would have been difficult to accomplish. The research article also indicates that students can be motivated to learn through digital instruction. "For example, when texts are equipped with digital supports, struggling students are more likely to see themselves as readers" (McKenna, 2014, para 16). With the support of technology into literacy instruction, educators will meet the Common Core and 21st Century expectations.

The authors, Cviko, Mckenney, and Voogt (2012), explore explicit technology integration along with connections between teachers' technology integration, student engagement in technology supported activities, and student learning. The research study, according to Cviko et al. (2012), was conducted under the assumption that a technology-rich

curriculum depends on how teachers utilize technology during instruction. The authors found integrating technology into literacy instruction has a positive effect in supporting emergent literacy development (Cviko et al., 2012). The NAEYC and the International Reading Association (IRA), according to Cviko et al. (2012), have endorsed the integration of literacy instruction along with meaningful literacy experiences with four to six year old children. Cviko et al. (2012) emphasizes " that technology use in kindergartens should not be isolated but rather integrated with classroom routines and activities for a learning environment to offer meaningful experiences for children" (p. 32). The study concluded that a moderate implementation of technology integration along with direct instruction led to significant student learning gains (Cviko et al., 2012).

According to the journal article written by Kennedy and Deshler titled, *Literacy Instruction, Technology, and Students with Learning Disabilities: Research We Have, Research We Need*, technology can be useful in literacy learning when teachers combine effective practice with a technology based solution to their instruction. Kennedy and Deshler (2010) emphasize three effective recommendations to teachers integrating technology to support literacy instruction: select explicit technology to build student's skills, select technology that fosters active learning, and incorporate research-based instruction with technology implementation to support learning. The researchers concluded, "Developments in technology-based supports, especially in the area of literacy instruction for students with a learning disability, have promising implications for instruction and learning" (Kennedy & Deshler, 2010, p. 289). The authors indicate that more research is needed to determine effective professional development to prepare educators and to determine the most effective learning scenario to implement technology instruction.

# Methods

## Participants

The action research was conducted in a prekindergarten general education classroom. There are 20 students 10 males and 10 females that attend the all day program running Tuesday through Friday during the school year. The age range of students is four to five years of age. Two students are receiving tier three interventions for behavior; three students are receiving tier two interventions for behavior. Seven children, 35% are considered low socioeconomic status. There are no English language learners in the classroom. One student is on an Individualized Education Plan (IEP) for behavior and one student is on an IEP for speech. The 1:1 technology classroom environment consists of one general education teacher, one para, and available school counselor and behavior specialist.

## Data Collection

The focus of the action research project was to determine if specific technology, selected by the teacher, made an impact on student sound identification achievement during instruction and learning centers. Quantitative data was integrated to determine if student literacy achievement increased by using the IGDI universal screener sound identification test score and Teaching Strategies GOLD letter-sound correspondence. The purpose for using quantitative data was to gather concrete, objective data of the research question and to ensure personal bias did not affect the data. Quantitative data was analyzed using percentages of growth in student literacy sound identification.

The quantitative data was collected through the IGDI literacy assessment and Teaching Strategies GOLD to provide more validity with the data. The IGDI literacy assessment was administered to the students three times throughout the school year to assess growth and

development of oral language, comprehension, and phonological awareness. The IGDI literacy assessment is administered to four-year-old children in Iowa in the Statewide Voluntary Preschool Program to ensure they are learning emergent literacy skills. The assessment is a "data-based approach to screening that has shown to provide a new level of effectiveness in evaluating young children on their way towards becoming successful readers" (Early Learning Labs, INC, 2017, para. 1). The IGDIs are administered using a universal screener at the beginning of the school year (fall) followed by a winter and spring screening. The fall universal screener consists of picture naming, rhyming, sound identification, and which one does not belong. The winter and spring screeners evaluate picture naming, rhyming, sound identification, which one does not belong, and alliteration. The picture-naming test involves the student naming one picture. The rhyming section consist of the teacher naming three pictures and asking the student which two pictures rhyme. The sound identification test shows the student three or four letters while the teacher asks the student "What letter makes the sound I say?" The one does not belong assessment shows the student three pictures. While the teacher names each picture, the child points or verbalizes to the picture that does not belong with the other two pictures. The alliteration section shows two pictures to the student while the teacher asks which picture starts with the sound I make? The student points or verbally expresses the answer to the teacher.

The Teaching Strategies GOLD assessments are ongoing observations conducted by the teacher. The teacher collects data on student development and growth from 38 developmental objectives and levels the student based on the development and growth three times a school year (fall, winter, and spring). The teacher uses a progress journal for each student to collect literacy data and then enters the data in Teaching Strategies GOLD documentation section. The letter-sound correspondence assessment score is determined by the teacher asking the student to name

the letter and the corresponding sound in random order. Along with the progress journal, the teacher makes observational notes, pictures, and videos during daily instruction and learning centers of each student's knowledge of letters and sounds.

After each, the teacher will analyze the data collected from the IGDIs and Teaching Strategies GOLD assessment results. Upon completion of the winter IGDI screening, it was determined that four students were developmentally at-risk and nine students were considered in the cut-range, more data needs to be gathered to determine benchmark in sound identification. The students whose letter-sound correspondence were below benchmark in the Teaching Strategies GOLD and below benchmark in the IGDI sound identification were provided with tri-weekly progress monitoring assessments.

The data collection and instruction started in the month of February 2018. The IGDIs assessment was conducted on February 1, 2018 and the Teaching Strategies GOLD data was collected on February 9, 2018. Following both of the assessments, the teacher started a review of the letters and sounds by instructing the students with the knowledge of lowercase letter formations. The teacher implemented Visual Phonics, a system of hand signals and symbols that represent the English language (ICLI, 2011), along with pre-determined technology implementation into daily instruction and activities for all students (see Appendix A and B). Using a SMARTboard and iPads, the teacher provided the selected technology of interactive sound identification programs to students during whole group and small group instruction and learning center time (see Appendix A and B). After implementing literacy specific technology programs for five weeks the IGDI assessment for sound identification was administered along with the Teaching Strategies GOLD observations for letter-sound correspondence.

## Findings

## Data Analysis

A minimal amount of researcher bias was included during the data collection and implementation of the technology period of the research even though the researcher was the teacher of the students that the technology was integrated with. The school district goals and the literacy goals of the elementary building support the belief that technology integration can and do benefit 21st century literacy skills. The researchers strong interest in building emergent literacy skills, technology integration to support learning, the support from the instructional coach, early childhood team, and the hypothesis that technology integration does improve student's literacy achievement played an important role in the activities that were planned during the research period.

Despite the minimal amount of researcher bias, specific measures were implemented to provide quantitative unbiased data. Collecting quantitative data contributed to the understanding and awareness about the benefits of technology integration to support student learning, increase literacy skills, and improving student's sound identification.

## Quantitative Data Analysis

The quantitative data was assessed using the IGDIs literacy assessment. The quantitative data collected through two assessment periods provided objective results for sound identification skills.

Table 1

*IGDIs Sound Identification*

| Student | Winter Score | Spring Score | Point Gain | Increased Literacy Achievement |
|---|---|---|---|---|
| 1 | 46 | 52 | 6 | 13% |

| | | | | |
|---|---|---|---|---|
| 2 | 49 | 51 | 2 | 4% |
| 3 | 53 | 57 | 4 | 7% |
| 4 | 54 | 55 | 1 | 2% |
| 5 | 56 | 53 | -3 | -5% |
| 6 | 56 | 57 | 1 | 1% |
| 7 | 49 | 49 | 0 | 0% |
| 8 | 54 | 57 | 3 | 6% |
| 9 | 52 | 53 | 1 | 2% |
| 10 | 50 | 50 | 0 | 0% |
| 11 | 49 | 48 | -1 | -2% |
| 12 | 49 | 49 | 0 | 0% |
| 13 | 49 | 51 | 2 | 4% |
| 14 | 50 | 52 | 2 | 4% |
| 15 | 51 | 51 | 0 | 0% |
| 16 | 49 | 51 | 2 | 4% |
| 17 | 49 | 48 | -1 | -2% |

| | | | | |
|---|---|---|---|---|
| 18 | 50 | 49 | -1 | -2% |
| 19 | 54 | 57 | 3 | 6% |
| 20 | 51 | 50 | -1 | -2% |

The quantitative data was assessed using Teaching Strategies GOLD. The quantitative data collected through two assessment periods provided objective results for letter-sound correspondence.

Table 2

*GOLD Letter-Sound Correspondence*

| **Student** | **Winter Score # Identified** | **Spring Score # Identified** | **Point Gain** | **Increased Literacy Achievement** |
|---|---|---|---|---|
| 1 | 2 | 6 | 4 | 200% |
| 2 | 8 | 15 | 7 | 88% |
| 3 | 20 | 22 | 2 | 10% |
| 4 | 14 | 18 | 4 | 29% |
| 5 | 17 | 21 | 4 | 24% |
| 6 | 26 | 26 | 0 | 0% |
| 7 | 10 | 11 | 1 | 10% |
| 8 | 22 | 24 | 2 | 10% |

| | | | | |
|---|---|---|---|---|
| 9 | 9 | 19 | 10 | 111% |
| 10 | 5 | 8 | 3 | 60% |
| 11 | 1 | 0 | -1 | -100% |
| 12 | 9 | 17 | 8 | 89% |
| 13 | 12 | 16 | 4 | 33% |
| 14 | 3 | 13 | 10 | 333% |
| 15 | 16 | 20 | 4 | 25% |
| 16 | 7 | 13 | 5 | 71% |
| 17 | 2 | 5 | 3 | 150% |
| 18 | 11 | 19 | 8 | 73% |
| 19 | 22 | 26 | 4 | 18% |
| 20 | 11 | 19 | 8 | 73% |

The initial sound identification scores from the winter universal IGDI screener period revealed that 35% of the students were at the Tier 1 instructional benchmark in sound identification skills. The winter screener revealed that 45% of students were at the cut range, more data needs to be gathered to determine Tier status. Additional data was gathered through Teaching Strategies GOLD to determine Tier status of all students. The winter screener of Teaching Strategies GOLD along with the IGDIs winter screener determined that 55% of

students were at Tier 1 benchmark. This number indicates that sound identification skills for these students are above average. The screeners revealed that 45% of students were developmentally at-risk for sound identification and further intervention/instruction support is needed.

The final sound identification scores from the spring IGDI universal screening period revealed that 60% of the students were at Tier 1 benchmark for sound identification. The spring screener revealed that 30% of the students were in the cut range and 10% of the students were developmentally at-risk for sound identification. Additional data was gathered with Teaching Strategies GOLD and combined with the IGDI screener to determine the student's scores from the cut range. The combined assessment scores revealed that 80% of students are at the Tier 1 benchmark for sound identification and 20% of students are developmentally at-risk.

The quantitative data shows that 20% of the students received the maximum score of the IGDI universal screener. The data also shows that 75% of the students made growth for points gained from the winter to spring universal IGDI screener.

The quantitative data reveals that 95% of students made growth in the amount of points gained from the winter to spring Teaching Strategies GOLD assessment period. The data also reveals that 10% of students obtained that maximum score on the letter-sound correspondence assessment.

Student 11 showed negative growth in both the IGDI and Teaching Strategies GOLD screeners. This score needs more research gathered through qualitative data assessments to determine if the student is off task or inattentive during instruction and interventions.

Student 14, who showed the most growth in the letter-sound correspondence on the Teaching Strategies GOLD screener, has been receiving interventions and specialized instruction

in speech articulation. This score may reflect the progress that was gained through the speech interventions and instruction.

Student 1, who showed the most growth in the IGDIs universal screener and exceptional growth in the Teaching Strategies GOLD assessment is receiving tier two interventions for behavior and processing skill concerns. Along with integrated technology to support learning the teacher also implemented visual phonics into daily instruction to help the student learn visually.

It is obvious to the researcher that the general instruction and technology integration along with the visual phonics added intervention was an effective combination to support student learning.

## Discussion

### Summary of Findings

Throughout this study, the findings concluded that based on the amount of exposure the students had with sound identification instruction, their sound identification IGDI score and the letter-sound correspondence GOLD score increased. The data shows that the technology integration to support student learning had a positive effect on the student's spring IGDI and GOLD assessment scores. The greatest area of improvement for student growth was seen with the student's letter-sound correspondence knowledge. Teacher observations showed that the technology integration was motivating to student learning. The teacher also observed the effective value of visual phonics intervention and determined it was beneficial to student achievement.

### Limitation of Study

The limitations of the research included the timeframe in which the data was collected. More time for technology integration and interventions would allow for greater student

achievement, especially for those students who continued to score low in sound identification. The type of technology selected may also have an impact on student achievement. The researcher did not select the technology applications on research-based programs; rather technology was selected based on the applications and resources that were available for the classroom. The researcher must also take into consideration the rate of developmental growth of the young students. Natural development along with additional instruction and activities that focused on phonemic awareness and phonics skills may have affected the results of this study.

### Further Study

Implications for future research suggest that more information about technology integration to support literacy learning needs to be considered. More research needs to be conducted on effective programs and resources to utilize in the classroom setting. With the rate that technology changes, finding current research on specific applications and programs has proven difficult for professionals. In addition, collecting qualitative data to analyze student attendance, behavior, and attention span would allow the researcher to expand on the findings of the study and help explain student achievement with technology integration.

## Conclusion

The findings compiled from the collected data suggest that technology integration, selected by the educator, has a positive impact on student's sound identification skills. The quantitative data shows that sound identification technology integration is beneficial for increasing sound identification skills on the Teaching Strategies GOLD and IGDIs assessments while also improving early literacy skills. The findings theorize students can benefit when technology is implemented to support learning. Technology integration, along with teacher instruction and the developmental growth rate of a student, will help build a strong foundation of

early literacy skills in prekindergarten students, while also being an early predictor of early reading skills. Young children are natural learners, educators can provide students with the technology tools and resources to promote and enhance their learning.

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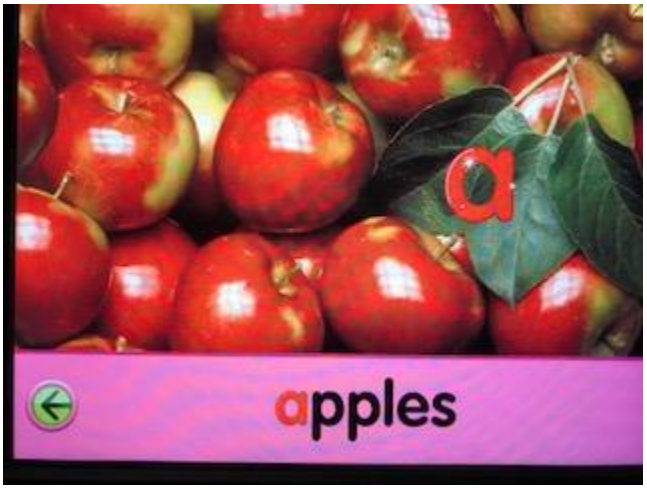
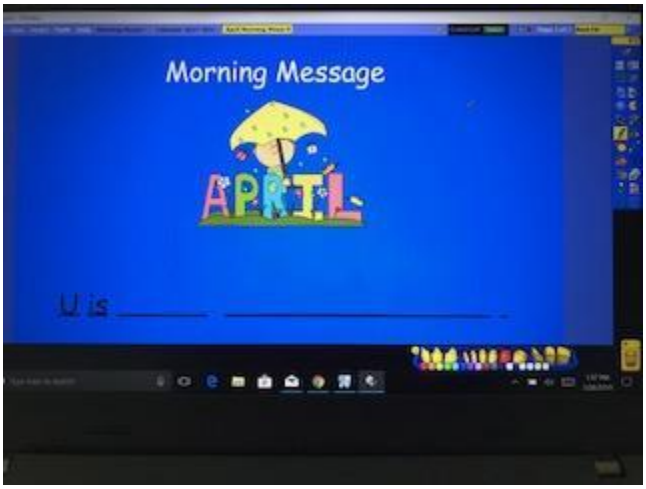
## Appendix A

## Integrated Technology into Daily Instruction

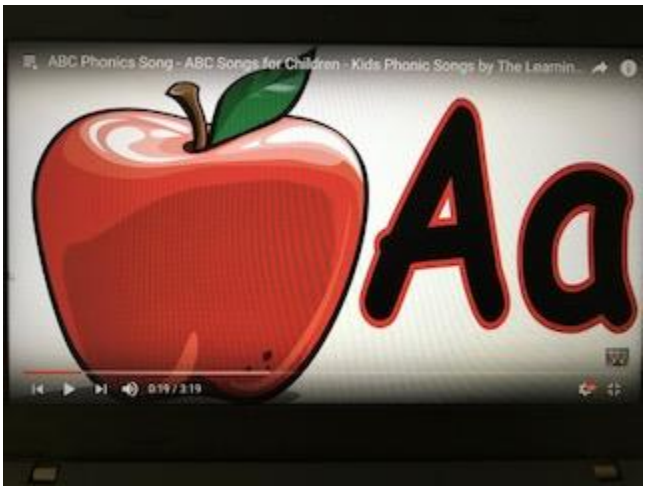
Small group learning: iPad Starfall App

Morning Message Flipchart




Music: ABC Phonics Song for Children

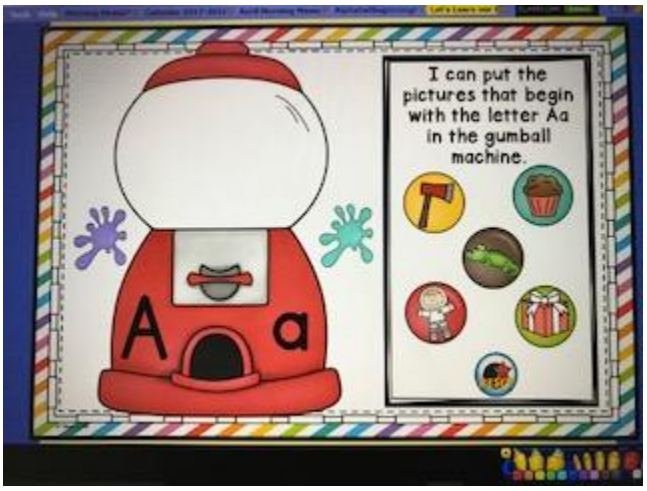


## Appendix B

## Integrated Technology into Learning Centers

Flipchart: Beginning Letter Sounds


Flipchart: Let's Learn our Letters



iPad App: Letter Trace