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Technology and Literacy in Early Childhood Education

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Introduction

The Early Learning Community (ELC), at Pacific University, is a school for preschool to kindergarten-aged children. It is a unique learning environment where the community and teachers are involved in shaping all aspects of childhood development. The curriculum at the ELC is special because the instructors frequently incorporate new technologies. Class sizes are relatively small, averaging about 20 students per a class, led by a teacher and two assistants. Children are split up into different classroom based on their age. Preschool-aged children are placed in the Dolphins and Sharks classroom, while kindergarten-aged children are placed in the Whales classroom.

We decided to conduct our study on the technology use by children aged three to six in the ELC program. The critical question for our study was: How is technology used in the Early Learning Community to support early childhood literacy? For nine weeks, we documented the different types of technology used in the classrooms, and how these technologies might affect literacy learning. We collected data on both traditional and technology-supported literacy learning. Field notes, photos, videos, surveys, and informal interviews were used to collect data on the students in the Dolphins, Sharks, and Whales classrooms.

The data was triangulated with 3,752 minutes of observations. We collected artifacts which included photos, videos, and work samples. Our team checked the data interpretations with the interesting images and catchy melody. However, some students were just sitting and watching the video quietly. We were able to determine that the level of interaction naturally contributed to a much higher level of the children’s engagement in the activities. As they followed the song, they tried to pronounce the phonics and specific word examples. The children were more impressed through the engaging learning process of the Alphabet Song.
The first three weeks of data gathering were difficult for the team because we were unable to observe many technological tools being used in the classrooms. Students used many trial-version applications instead of full-version applications on the iPad®. This limited both the students’ and the observers’ usage of the programs in acquiring and documenting literacy skills. As guests in the classroom, data was difficult to collect because we were unable to be present for each class. This made observation impossible throughout each day, and limited our times for data collection.

We believe our study to be trustworthy because we offer multiple perspectives from the teachers, critical colleagues, students, and parents.¹ We also have a strong sense of connection within the community at ELC with our literature. Our research shows self-reflexivity and we produced meaningful results that can act as guidance to the ELC staff and other schools who integrate technology into their curriculum.

Engagement, Motivation, and Literacy Learning

During our studies, we found that engagement and motivation are critical in both traditional and technological ways of literacy learning. We noticed that the children’s understanding of the task plays an important role in their level of engagement. The more the child understands the tasks and what is expected of them, the longer he or she focuses on the task. Many students had a tendency to change from application to application on the iPads when they could not figure out what they had to do with the assigned program. In another case, some of the eBooks, which contain a lot of complex words and need a higher level of understanding and reading skills, were frustrating for the students and would cause them to disengage from the application.

As stated before, the level of understanding in a task is important in literacy learning. For example, we saw that when it was time for the children to read their traditional phonics-based books by themselves, they were asked to find their “best individual reading spots.” The children would then proceed to read the traditional books in a sequence from easy to more difficult levels. As we noticed, the students understood that they should be able to read through the book fluently before going on to the next level. We saw that this kept the students well engaged in the task. Overall, we saw that the children benefitted from understanding the task at hand because it led to a higher level of engagement.

Despite the level of the children’s understanding, we found that when using technology, the children did not become frustrated, even if they lacked the technological skills. We saw that they were eager to explore the technology that they were using, which kept them engaged. Many times, the animation or interesting sound effects

¹ Phillips and Carr, 2010
served as a reward to motivate children to continue exploring the program on the iPad. From this, one can see that technology can bridge the gap between a child’s growing skills with traditional literacy methods, and what they want to express. We found that with the technology, the children were able to better express themselves and were not restricted by their level of writing ability. With the technology available, the children were able to become more descriptive when creating stories. We really see the technology shine in the Whales’ classroom, where the children used an application called Story Kit. Story Kit allowed the children to take photos, draw pictures, type or write out text, and even record their voices. The variety of storytelling tools offered to the children allowed them to become more descriptive when expressing themselves, and has allowed them to surpass their lack of writing skills.

Finally, we discovered that the children’s engagement is related to their interaction levels. The best example is the Alphabet Song video we took in the Whales’ classroom. While watching the video, we found that some children interacted with most of the elements very well, such as the interesting images and the catchy melody. However, some students were just sitting and watching the video quietly. We were able to determine that the level of interaction naturally contributes to a much higher level of the children’s engagement. As they followed the song, trying to pronounce the phonics and specific word examples, they were more impressed through the engaging learning process of the Alphabet Song. We also see that student and teacher interaction plays a huge role in level of engagement. The teachers at the ELC make use of snack time as a time to read aloud together with the children. During the reading time, the children can ask questions or discuss what they noticed in the story, which encourages student-teacher interaction in the learning process.

**Supervision and Guidance**

During our time in the classroom, we had an opportunity to observe one-on-one iPad time with students at the ELC. For two of our observations, we watched the same group of students for two days. The first day, we guided students in choosing appropriate programs and monitored their focus on the task. On the second day, we had a hands-off approach and let the students choose which programs they wanted to use and how they interacted with these programs. During our observations, we asked ourselves such questions as: Did the students stay focused? How long were they using a specific program? From our observations, we found that students gravitated toward applications such as iDraw and Magic Piano, which focused more on art rather than literacy skills. However, when the literacy activity was teacher-guided, the students remained engaged and focused on the task. From this experience, we began to observe how supervision and guidance plays a role in learning supplement with technology.
We found in some instances that the technology itself can serve as a supervisor. For example, in traditional Montessori letter learning, sandpaper letters are used to help the child feel with their fingers. The child can feel the boundaries of the letters, and learns how to properly recreate it. With the iPad, the same concept is applied in the application, *Intro to Letters*, which focuses on teaching letter writing. The application gives haptic feedback, or touch feedback, in the form of vibration. This feedback is meant to replace the sandpaper used in Montessori letter learning, since the student is unable to feel texture through an iPad. The feedback allows the student to feel when they go out of bounds. The application also provides an interactive arrow on the letter that the student follows with their finger, which shows them the correct way to write the letter. This program also allows the teacher to be able to work with another student, while the program guides the first student. *(see pictures on the following page)*
Traditional Montessori Letter Writing

Intro to Letters Application on the iPad
We also found that the children themselves provided a form of supervision in the form of peer guidance and collaboration. A study done by the Department of Education in 2000 concluded that students who struggle with traditional methods of literacy were more confident when using technology. In addition to this finding, the Department of Education found that technology led to an increase in peer collaboration in the classroom. During our research, we worked with two struggling students on the iPads during our observations. One student was working on the Animal Encyclopedia application and the other student wanted to do what the first student was doing. So together, they figured out how to get the other student onto the same page as the first student so that the two could use the program together, but on two separate iPads.

After a couple weeks of observing, we noticed the use of “iPad Plans” in the classroom. The iPad Plans acted as another kind of supervision, providing additional guidance for children by keeping the children focused on their goals when the teacher wasn’t able to work with them one-on-one.

The Process of Integrating Technology Into Curriculum

iPad Plan

1. Which app will you be using?

2. What will you be learning, practicing, or researching?

3. Will you be collaborating with a partner?

4. Partners: How do you plan to share the iPad?

The iPad Plan

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3 Note that the image has been modified from the original to increase clarity
The iPad Plan demonstrates the process of integrating technologies into classroom curriculum. The iPad Plan began in January after iPad usage had begun in the Whales classroom. This plan was needed because the teachers realized that students were not sticking with their original program choice and were not able to stay focused on the task at hand. As the picture on the left shows, the plan asks for the name of the application, what skills the child will be using, and if the child is collaborating with a partner or not. The Literacy Application Directory was also created, which allows the students to choose their application and know what the program will teach them before they use the iPad. This plan came about after the implementation of the iPads in the classroom, and demonstrates how the integration of technology requires a process of trial and error with exploration by both teachers and students alike.

The ELC uses many different forms of technology including: digital cameras, desktop computers, iPads, iPods, CD players, and the Smart Board. We have seen from our research that the integration of such technology is one that is based on experimenting and figuring out what works best for both the students and the teachers in supporting literacy learning. This is however not always obvious. For examples, in the Sharks classroom, the students were using an iPod to listen to the story *Chicka Chicka Boom Boom* for the first time. The teacher was explaining to the students how to handle their iPods and put them away when they were finished. This was the first time an iPod had been used for story reading, so we saw firsthand how technologies have to be tried out and then adjusted before they can be incorporated in the curriculum on a regular basis.

As seen with the previous example, oftentimes the way technology is incorporated is born out of necessity. Ms. Rachelle, the lead teacher of the Sharks classroom, was asked if it was hard to incorporate technology into her curriculum. She stated, “No, I don’t try to necessarily fit what we’re going to do around technology. If technology will make it easier, technology will be used. It’s ‘How can kids see seeds?’ not, ‘How can the proscope be used in class?’ With literacy, I didn’t think of the iPod at first, but, ‘twenty kids, three teachers...how can we make this happen?’ They can hear the story with iPods and books. I prefer them having a story read by adults. [However], it’s good for them to hear different voices. They attend to it better than hearing our voices.”

Much like in the case with the Sharks classroom, teachers have to find a supporting role for technology, which is another important aspect of integrating it into the classroom. A great example of this incorporation occurred on Dr. Seuss Day when the teachers had six stations of activities for the three classes to attend. In the Sharks classroom, there were also two computers set up with Dr. Seuss themed programs.
Not many children were using it, but we observed two students playing interactive games of *The Sneetches* and *Green Eggs and Ham*. The technology from the computer program was supporting what they were learning from the Dr. Seuss books. In order for it to be as beneficial as some of the other stations, teachers had to make sure if it would hold a child's interest, which can only happen through trial and error.

Accommodations may need to be made to technology use once it is integrated into the classes. Besides the iPad Plan, there have been other instances in which the usage of technology has to be changed so that the students benefit the most from the technology they are using. In the Dolphins classroom, there are two desktop computers, a mouse for each computer, a set of headphones, but no keyboards. *(See pictures on right)* Asking Ms. Katie, the Whales teacher, about this, she explained, “The kids were getting out of the programs and surfing the Internet. They are tech savvy kids. They only need a mouse for the games they play.” The same is true with the iPads; there is no Internet access on them. Children are allowed to use the Internet on the desktop computers for research purposes, but they are under the supervision of teachers. The teachers learned that having the Internet would be a distraction to the learning goals. Ms. Katie also mentioned how one has to be mindful of how much time is spent with technology. With the Smartboard, they learned the proper amount of time needed for the children to stay focused on a lesson is through trial and error.

*Keyboardless Computer Station Set-up*
Sometimes technologies are not beneficial in the classroom. This too is discovered through trial and error. Originally, we were supposed to see how the Sifteo Cubes™ would be used in the classroom curriculum. This is a new technology that the ELC is experimenting with to see if it can be used in the classroom for literacy learning. Mr. Eric, a student teacher in the Whales classroom, told us that, “Seeing technology’s hard...it’s hard to know where to place it with curriculum. I’ve only seen them [the Sifteo Cubes] once. You can play Scrabble on them. Mark [the director of ELC], is having a hard time trying to find applications on them that are useful for the class.”

From our observations at the ELC, we have seen the following accommodations and integrations with technology including: the iPad Plan, the iPad Directory, the types of programs and applications that are used for the classroom, the importance of choosing age appropriate applications, and technology as a support for curriculum. With the iPad, the apps used most for literacy were the Word Magic application, I Write Words, and Interactive Alphabet. These programs have been found to be useful by the teachers and students in literacy learning. They were not randomly selected, but were carefully selected through trial and error because they support learning. This relates to the article written by McEntire which stresses the importance of finding subjects that are interesting to students, and that will allow them to learn new vocabulary.4 Plowman’s research also stresses the importance of a child’s comfort level with technology.5

Hernandez-Ramos notes, “When the reform involves technology, we must know the true possibilities for transformation come not from the technologies themselves, but from the deep changes in school organization and in beliefs and pedagogical practices that the introduction of technology may catalyze.”6 This quote defines what Mark Bailey and the teachers have done at the ELC with technology.

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Conclusion

While our critical question was not directly answered, we feel that our themes are very important in demonstrating how technology can support literacy learning. The three themes of student engagement, supervision and guidance, and the process of integration, are used together to most effectively support literacy learning for young children in a setting like the ELC. While each theme by itself is an important process of technology use in the classroom, they appear to be most effective in supporting literacy learning when all three are in place simultaneously in the classroom, as the diagram below demonstrates.

Lingering Questions

While we learned a great deal during this project, we are also left with several unanswered questions. Our first lingering question is: How does technology impact the literacy learning of ESL (English as a Second Language) and Special Education students? Nearly every member of our group has taken a class focusing on working with ESL or Special Education students, and as a result, we are interested in how technology can support their literacy learning. Professor E. Catherine Kim informed us that she is currently conducting research involving ESL students and how using technology can support their literacy learning. Her preliminary results show that ESL students benefit from using technology to support their literacy learning. We hope that this lingering question will be answered with more research in the near future.
Our next lingering question is: How is the process of integrating technology different in a public school or low-income environment? The ELC has a lot of time and freedom that a public school or low-income school might not have. The staff and parents of the ELC are also very supportive of technology use in the classrooms. We wonder if some public schools will face opposition to integrating technology into classrooms or if the teachers will receive the support necessary. Another question we had was if public schools have the money to try “trial and error” to determine which technologies work best in their classrooms. We hope to address this question if our research is continued.

Our final question is: Are academically at-risk students able to benefit more from literacy related technologies than their academically average peers? Research by Hourcade, Parette, Boeckmann, and Blum suggests the use of multiple technologies to support literacy learning in academically at-risk students. This was not something we were able to view in the ELC as we were unaware of the academic level of each student. As future classroom teachers, we are very interested in determining how technology can support our academically at-risk students.

What Did This Research Teach Us?

One of the most important things that we learned throughout this research was how to incorporate technology into our own future classrooms. We were able to view the process that the teachers at the ELC used to make technology work most efficiently in their classrooms. We saw that the teachers had to implement new processes by trial and error into their classrooms to make it work for their students. Some of these new processes included the implementation of the iPad Plans and the iPad Application Directory. This was a necessary step to make technology a useful part of the classroom. We also saw the teachers use technology for everything from math and literacy, to yoga and other daily aspects of the classroom. Because of the research we completed, we have new ideas of how to effectively integrate technology into our own curriculum.

Working in a group of six proved to be both beneficial and frustrating. Our group worked through several tough challenges, and we were able to persevere. Because of the challenges we dealt with, we were able to learn how to work closely with our critical colleagues. We believe that being able to build these types of relationships will help support the education of our future students. As a group, we also feel that it is necessary for other action researchers to be open to changing their critical

question. We found it necessary to change our critical question multiple times throughout the duration of our action research as we learned from our data. We grew as action researchers and critical colleagues during our research, but these are some of the most important things we felt we have learned throughout this process.

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