

**EXAMINING THE DESIGN AND IMPLEMENTATION OF A PROFESSIONAL
DEVELOPMENT PROGRAM ON THE USE OF WRITING SOFTWARE IN A
SCHOOL FOR THE DEAF**

by

Kristen A. Ferrari

An executive position paper submitted to the Faculty of the University of Delaware
in partial fulfillment of the requirements for the degree of Doctor of Education in
Educational Leadership

Fall 2016

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ACKNOWLEDGMENTS

I would like to thank my husband and children for their support, understanding, and patience during this process. I also want to acknowledge my professors and advisors at the University of Delaware who provided me with guidance and encouragement. I am very grateful for the support and assistance of my committee members; Dr. Chrystalla Mouza, Dr. Fred Hofstetter, and Dr. Laura Eisenman. I also wish to thank Marja Bradon for being such an inspiration. I have enjoyed every minute of working alongside of her.

TABLE OF CONTENTS

LIST OF TABLES	vii
LIST OF FIGURES	viii
ABSTRACT.....	ix

Chapter

1	THE IMPORTANCE OF TECHNOLOGY IN EDUCATION.....	1
	Introduction.....	1
	Background	4
	Problem	5
	Theoretical Framework for the Project	11
	Deaf Learners.....	12
	Educational Technology in Special Education	14
	Professional Development	17
	Technology Integration	20
2	METHODOLOGY AND DATA COLLECTION.....	24
	Researcher Perspective	25
	Clicker6 Professional Development Program.....	26
	Data Collection and Data Analysis	41
	Teacher Surveys.....	41
	Teacher Observations.....	43
	Teacher Interviews.....	44
	Data Analysis	45
	Teacher Surveys.....	45
	Teacher Observations.....	45
	Teacher Interviews.....	46
3	FINDINGS AND RECOMMENDATIONS FOR TECHNOLOGY PROFESSIONAL DEVELOPMENT.....	49
	Findings.....	49
	Key Question 1	49
	Key Question 2	55
	Key Question 3	64
	Discussion	70

Recommendations	72
Limitations	76
Conclusion	77
REFERENCES	78
Appendix	
A TEACHER TECHNOLOGY TRAINING SURVEY ADMINISTERED IN FALL OF 2014	88
B TEACHER SURVEY	90
C OBERSERVATION RUBRIC	87
D TEACHER INTERVIEW QUESTIONS.....	88
E IRB APROVAL	90

LIST OF TABLES

Table 1	Teacher Survey Results.....	10
Table 2	Clicker6 Professional Development Program Session 1	27
Table 3	Clicker6 Professional Development Program Session 2	28
Table 4	Clicker6 Professional Development Program Session 3	29
Table 5	Clicker6 Professional Development Program Session 4	30
Table 6	Clicker6 Professional Development Program Teachers	42
Table 7	Interview Responses Notes Coding Scheme.....	46
Table 8	Teacher Technological Content Knowledge Pre and Post Survey Results	50
Table 9	Teacher Technological Pedagogical Content Knowledge Pre and Post Survey Results	56
Table 10	Teacher Rubric Scores	58
Table 11	Teacher Observation Means and Standard Deviations	61

LIST OF FIGURES

Figure 1	Writing Grids. This figure illustrates the forced writing grids that can be modified for sentence structure.....	6
Figure 2	Word Predictor. This figure illustrates the picture supported word predictor.	7
Figure 3	Picture and ASL Video Support. This figure illustrates the feature that allows picture and ASL video support for differentiated instruction	7
Figure 4	Sentence Building Activity. This figure illustrates and example of a tool used for sentence structure comprehension	8
Figure 5	TPACK Model (Mishra & Koehler, 2010)	21
Figure 6	PCK Collaborative Activity	32
Figure 7	Clicker6 Direction Sheet.....	33
Figure 8	TPACK Collaborative Activity.....	35
Figure 9	Teacher Created Clicker6 Diary Activity	36
Figure 10	Video ASL support	37
Figure 11	Clicker6 Tutorial Sheet	39
Figure 12	Collaborative Communication via Google Docs	41
Figure 13	Technological Pre/Post Mean Scores.....	52
Figure 14	Technological Pedagogical Content Knowledge Pre/Post Mean Scores.	57
Figure 15	Student Writing Activity in Clicker6	60

ABSTRACT

Nikolarazi, Verkiri and Easterbrooks (2013) documented how deaf learners can benefit from the use of visual supports in the classroom. Technology provides the tools to create a robust visual learning environment (Smith & Okolo, 2010). For teachers to facilitate learning in a technology rich environment, they themselves must be comfortable with the tools and understand how to effectively integrate their use into curricular delivery.

This project examines the design, implementation and evaluation of a professional development program that was created to educate deaf education teachers about the use of the educational software, Clicker6. The Clicker6 Professional Development program was designed specifically to integrate the use of technology with the newly adapted bilingual curricular approach to teaching English Language Arts (ELA).

The Clicker6 Professional Development Program consists of four teacher improvement goals: (1) to build competency in the use of the Clicker6 software; (2) to promote understanding of the connection among Clicker6 software, literacy content and pedagogy; (3) to provide time to create instructional classroom materials in Clicker6 directly aligned to teachers' curriculum goal; (4) to support teachers' continuing training as they implement Clicker6 in the classroom.

Following teacher participation in the program, an investigation was conducted to understand and characterize the impact of the program on teacher learning. Specifically, this effort focused on three key questions: (1) What impact did the Clicker6 professional

development program have on the teachers' technical ability to operate the software?; (2) How did participation in the Clicker6 training influence teachers' use of the software in relation to English Language Arts (ELA) curricular content in the classroom?; and (3) What were the teachers' perceptions of the Clicker6 professional development program?

Fifteen English language arts (ELA) teachers participated in the Clicker6 professional development program. Four sessions of training were offered during a single in-service day, and focused upon use of Clicker6 software as a classroom instructional tool. The program continued the following week with an in-class support session in which the facilitator offered assistance while the teacher used the technology in the classroom. Approximately two weeks after the initial professional development sessions, the teachers met together with the facilitator for 45 minutes of support follow-up.

Data were collected through surveys, observations, and interviews. Survey data examined changes in Technological Pedagogical Content Knowledge (TPACK) among teachers before and after their participation in the professional development. Observation rubrics were used to assess the teachers' demonstrated ability in the use of the software as a result of the professional development. Finally, interviews were used to collect qualitative data regarding teachers' perceptions of the professional development program.

Findings indicated that teachers were positive regarding the Clicker6 professional development offering. Further, findings suggested an increase in teachers' capacity to technically operate the Clicker6 software and integrate it into their curriculum following the training.

Recommendations were made in regard to planning and design of future technology-related professional development with the goal of improving its effectiveness. These include: (a) provide multiple sections of training based on teachers' technology competency; (b) schedule sessions over the course of a school year; (c) provide monthly email communication with tips and tutorials; (d) schedule teacher-to-teacher observations of the use of Clicker6 in the classroom setting; (e) expand professional development for other subject areas; (f) add a session on managing student use of the software; and (g) add a session on technical trouble shooting.

Chapter 1

THE IMPORTANCE OF TECHNOLOGY IN EDUCATION

Introduction

Technology is being recognized in education as a solution to enhance learning for special education students. It can be a diversified strategy of delivering curriculum to learning disabled students in a meaningful way (Smith & Okolo, 2010). The benefit of using technology with struggling learners is further acknowledged by Hasselbring, Lott & Zydeny (2006). Through computerized activities, children with disabilities are given more access to lessons via print displays, highlighting features, push buttons, and other elements that are not available through traditional printed text (Parett, Hourcade, Dinelli & Boeckmann, 2008).

Because educational technology is advancing rapidly, teachers have difficulty staying current with new tools designed to support their instruction. Many teachers give up and abandon these tools when confronted with technical challenges. They are unwilling to try new technologies they do not feel comfortable with for fear of failing in front of their students. Even when teachers know the fundamentals of various technologies, they often lack ideas about how to implement them effectively into their curriculum.

Teachers are unsure about how to use technology in their classrooms. They understand its goal yet lack ideas about implementation. Many teachers want to see technology demonstrated before they risk adoption in their classrooms. They need to be convinced of its benefits.

The “Teachers’ Perceptions of Integration Information and Communication Technologies into Literacy Instruction: A National Survey in the United States” identified why teachers are not integrating technology into their classrooms. Among the reasons cited were lack of time during a class period, technical support, adequate preparation, and a need to teach students basic computer skills required for more complex tasks (Hutchison & Reinking, 2011). Similarly, the “2013 NMC Horizon Report,” identified implementation challenges for educational technology in K-12 settings. Key among the challenges reported was teacher professional development. Teachers feel unprepared to integrate new technologies into the classroom due to lack of ongoing professional development, training, and support. They also believe it is outside of their job description to spend time experimenting with technology (Nagel, 2012). Thus, it is crucial that an effective professional development plan be in place when preparing teachers to use new technologies.

This project examines the design and implementation of the Clicker6 Professional Development program at the Philadelphia School for the Deaf (PSFD) and may serve as a model for future technology professional development planning. The program was guided by the following four goals aimed at supporting teacher learning and practice in the use of the Clicker6 software:

- 1) Build teacher knowledge of technology (TK) in the use of Clicker6 software;
- 2) Build an understanding of the connection between Clicker6 software, literacy content, and pedagogy (i.e., TPACK);
- 3) Provide time to create instructional classroom materials in Clicker6 directly aligned to their curriculum goals; and
- 4) Support teacher continuous needs as they implement Clicker6 in their classroom.

The paper consists of three chapters:

Chapter one outlines the role and importance of Clicker6 software and the professional development program. The discussion of role and importance is grounded in a review of relevant scholarly literature. This chapter also describes the design and delivery of the Clicker6 Professional Development Program.

Chapter two details the methodology employed in exploring the design and implementation of the Clicker6 Professional Development Program at PSFD. The description of methodology includes data sources and the data analysis.

Chapter three reports and evaluates the findings with respect to the applicability to PSFD and beyond to similar circumstances.

The following questions guided this project and informed the recommendations:

- 1) What impact did the Clicker6 Professional Development Program have on the teachers' technical ability to operate the software?

- 2) How did participation in the Clicker6 Professional Development Program influence teacher use of the software in relation to ELA curricular content in the classroom?
- 3) What were the teachers' perceptions of the Clicker6 Professional Development Program?

Background

The Philadelphia School for the Deaf (PSFD) is a small, chartered school for the deaf and hard of hearing in Philadelphia, Pennsylvania. PSFD enrolls approximately 175 students from ages 3 through 21 who are deaf or hard of hearing. The PSFD student body has a diverse mix of American Sign Language (ASL) proficiency. Some students have a strong knowledge of ASL while many others come from homes where ASL is not present. These students have less access to the ASL language and are less proficient than their peers and teachers. In addition, as depicted in the research, the students at PSFD are also far below grade level in English language literacy. Thus, a primary goal of PSFD is to increase students' English language literacy.

The author of this study serves as the Director of Educational Technology at PSFD. The PSFD staff is familiar with her as she regularly assists them in their use of educational technology. She also serves as the curriculum coordinator which provides her with in-depth knowledge of the curriculum implemented in the school.

Problem

PSFD recognized that deaf students can benefit from visual supports in the learning environment. To better support students' learning needs, the school invested in the purchase of Crick Software's Clicker6 technology. As summarized on their website, "Clicker6 is the child-friendly writing tool that enables students of all abilities to significantly develop their literacy skills" (www.cricksoft.com).

Among the many features of Clicker6 technology are word processing capabilities with various support functions, as well as visual support clicker grids to assist students in creating written documents. Students can also create books, presentations, and various other learning activities. Clicker6 has an interactive feature allowing teachers to create differentiated Clicker sets for continued literary practice. All of the Clicker6 features have the ability to be adjusted to accommodate a student's level of need and support.

Furthermore, Clicker6 provides PSFD students with the visual support they need and permits teachers to make modifications based on individual student needs. Through the Clicker6 writing grids, students are supplied with a grid of words. These grids enable them to build simple sentences, allowing students to write independently. Based on the modification, writing grids also support the left-to-right reading and writing conventions. This feature is essential to ASL language learners. The English language syntax is very different from ASL syntax. For example, "What is your name?" is translated to ASL as "name what". Teachers can force the order of the writing activity for students needing extra support. As shown in Figure 1, grids are color-coded to enhance the visual construction of the sentence. This can continue to be modified for the lowest level of

learner, gradually decreasing the amount of support provided. Sentence lengths may also be modified to range from simple sentences to more complex sentences as the children grow.



Figure 1 Writing Grids. This figure illustrates the forced writing grids that can be modified for sentence structure.

Depicted in Figure 2, Clicker6 also provides students with a picture supported word predictor. As teachers are encouraging their students to write independently, Clicker6 will display a word predictor with a picture to aide students in their writing. This allows the students to write independently without having to stop for constant support from their teacher. The level of word prediction and picture support can also be modified to meet the diverse learners in the class.

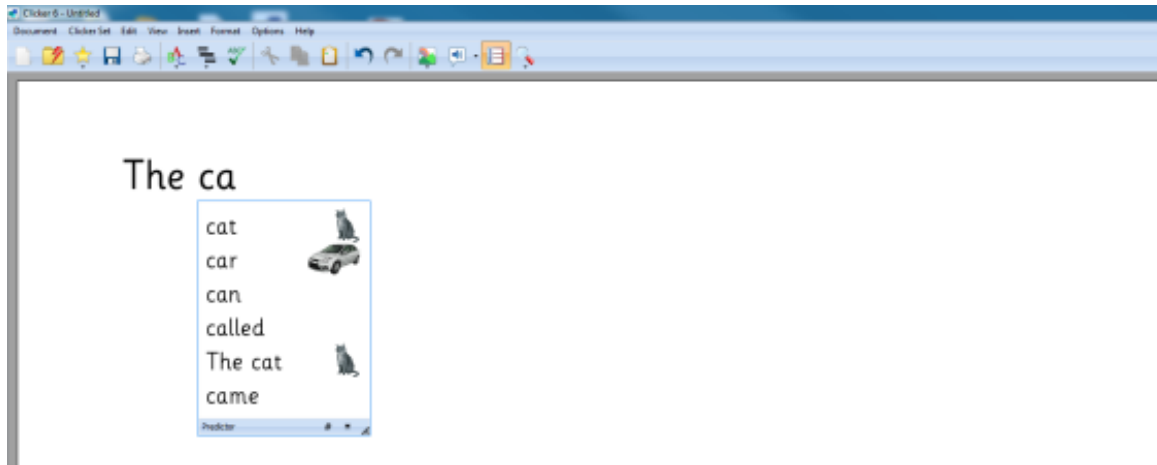


Figure 2 Word Predictor. This figure illustrates the picture supported word predictor.

These grids may also be modified to include pictures or ASL video support to the printed text. If a student is unfamiliar with the printed word, a picture can be placed next to that word or the student can right click on the word to receive the ASL video support.

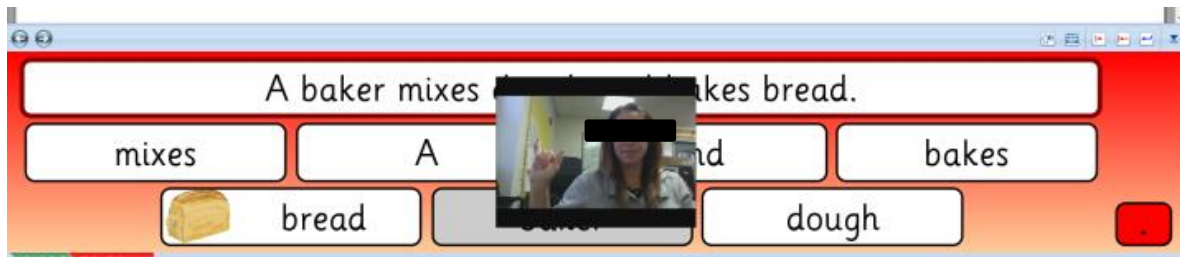


Figure 3 Picture and ASL Video Support. This figure illustrates the feature that allows picture and ASL video support for differentiated instruction

Clicker6 also has an interactivity feature. Teachers are able to make activities such as picture banks, sentence building, matching, and word banks. Teachers can create

these activities to support the writing and reading in their classroom. Students have the option to match the text word to the ASL sign video or an image. The sentence building activity, summarized in Figure 4, provides the students with visual activity of how to construct an English sentence.

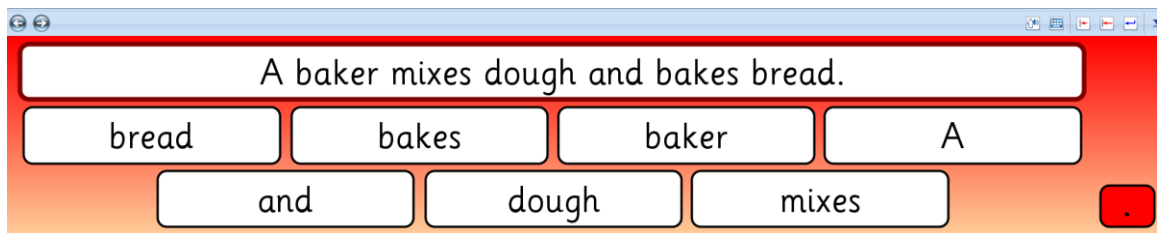


Figure 4 Sentence Building Activity. This figure illustrates an example of a tool used for sentence structure comprehension

The PSFD has classrooms with a wide-range of intellectual abilities. Every lesson needs to be adapted to meet the needs of each individual student in the room. With the use of Clicker6, teachers are able to modify each grid to the appropriate level of each student. Grids can be adjusted to give additional support to some students or modified to give less support to those who need to be challenged. As supported by Nikolarazi, Vekiri, & Easterbrooks (2013), Clicker6 gives teachers the ability to differentiate instruction based on student needs.

In the past, technology had been purchased by PSFD, but was accompanied by little to no professional development support. Observations, discussion, and a school survey revealed that the lack of technology integration was due to the absence of staff

professional development and support. Teachers were expected to learn the technology on their own and were not prepared to apply technology effectively to their instruction.

The survey (Appendix A) was distributed to teachers in the fall of 2014. Results, shown in Table 1, indicate that teachers believed the technology professional development trainings¹ at the school did not support their use of technology in the classroom. The trainings lacked integration of content and pedagogy, and did not directly relate to their curricular content. Approximately three fourths of the teachers responded that technology trainings did not include instruction to promote confidence in their use of the technology. Furthermore, 76% of teachers perceived that they were given a piece of technology to learn on their own, and 87% reported no continuing support after initial training. In response to the purchase of the Clicker6 software, teachers expressed a desire for an effective professional development plan that would properly prepare them on using and integrating the technology into their curriculum.

¹ The term “trainings” is used in place of professional development in the survey as a result of previously used common language among deaf and hearing staff members.

Table 1 Teacher Survey Results

Item	SA (4)		A(3)		D (2)		SD(1)		Mean	SD
	n		n		n		n			
	%		%			%	%			
1. I feel that this school has provided training in support of using educational technology	2	4.00	20	43.00	21	46.00	3	7.00	2.46	.69
2. I have been trained on the pieces of technology that have been provided for my classroom use	2	4.00	13	29.00	24	53.00	6	13.00	2.24	.74
3. I have received follow up trainings for continued support in the technology that has been placed in my classroom	1	2.00	5	11.00	32	73.00	6	14.00	2.02	.59
4. I often am given a piece of technology and have to learn how to use it on my own.	8	18.00	26	58.00	9	20.00	2	4.00	2.89	.75
5. Technology trainings at this school have focused on the use of technology in relation to curricular content.	7	16.00	20	47.00	13	30.00	3	7.00	2.28	.83
6. As a result of technology trainings, I have felt confident in using that technology.	1	2.00	11	24.00	30	67.00	3	7.00	2.22	.60
7. Half day technology trainings are an appropriate length of time.	1	2.00	14	31.00	17	60.00	3	7.00	2.29	.63
8. I prefer full day technology trainings.	4	9.00	25	56.00	10	22.00	6	13.00	2.60	.84
9. I prefer the shorter technology trainings that are approximately 1 hour and 30 minutes.	2	4.00	16	36.00	25	56.00	2	4.00	2.40	.65
10. In the past, I have changed my teaching practices to include technology as a result of the trainings.	3	7.00	15	33.00	22	49.00	5	11.00	2.36	.77
11. As technology has updated, I have received follow up support and training.	0	0.00	9	20.00	28	64.00	7	16.00	2.05	.61
12. When this school implements new technology, the staff is provided with complete training.	0	0.00	11	24.00	28	62.00	6	13.00	2.11	.61
13. I prefer to focus on one piece of technology per tech day as opposed to multiple tools in one day.	8	18.00	32	73.00	4	9.00	0	0.00	3.09	.52
14. It is important to have time to create class related materials with the new technology during training sessions.	19	43.00	23	52.00	2	5.00	0	0.00	3.39	.58
15. In the past technology trainings, we have been given time to create class related materials.	1	2.00	11	24.00	27	60.00	6	13.00	2.16	.67
16. In the past technology trainings, we have been given time to collaborate.	0	0.00	14	32.00	27	61.00	3	7.00	2.25	.58

Theoretical Framework for the Project

In the exploration of literature related to education for the deaf and hard of hearing, scholarly writings address reading and writing comprehension as a challenge (Harris & Marschark, 2011). “One of the major concerns and challenging tasks of educators of deaf and hard of hearing students is to enhance the reading comprehension performance of their students, which, despite the application of years’ worth of research, appears to remain very poor” (Nikolarazi, et al., 2013, p. 458). Research reveals that typical deaf students in high school have a reading level of 4th grade (Easterbrooks & Beal-Alvarez, 2012).

“In order to respond to the reading comprehension needs of deaf and hard of hearing students, enhance their access to the curriculum, and maximize their learning capacity, teachers need to design and differentiate instruction according to these students” (Nikolarazi, et al., 2013, p. 459). An important element in creating differentiated learning environments is the use of visual aids. Students who are deaf and hard of hearing benefit from full access to visual information. They thrive through the use of visual lessons, visual materials, and multimedia visual teaching strategies and techniques (Cannon, Easterbrooks, Gagné & Beal-Alvarez, 2001; Dowaliby & Lang, 1999; Easterbrooks & Baker, 2002; Luckner, Bowen & Carter, 2001; Marschark, 2005; Paul, 1998; Schirmer, 2000). Text, for instance, can be enhanced with visuals such as color, animation, graphics, videos, and more. It can be produced digitally and altered to fit the needs of the individual students to learn at their own pace (Boone & Higgins, 2007; Hitchcock, Meyer, Rose & Jackson, 2002; Rose, Hasselbring, Stahl & Zabala, 2005).

Loeterman, Paul and Donahue (2002) developed media software that included captioning, hypertext, video ASL support, and images. Studies have shown that the students' knowledge of the vocabulary words increased with this multimedia technology supported approach. Lang and Steely (2003) also completed a study of deaf students who participated in a science class that used multimedia lessons. Results indicated that students who received the multimedia visual support gained a greater knowledge of the subject area than the students who received the traditional teacher led instruction. A third study was completed by Gentry, Chinn and Moulton (2004). This study found that students developed a better reading comprehension of printed stories that were supported by visual pictures than those who were only given print only (Nikolarazi, et al., 2013).

Deaf Learners

Students who are deaf typically struggle with English reading and writing skills. They also struggle with acquiring literacy and reading comprehension skills beyond elementary school level (Wilson & Hyde, 1997). One in five deaf students - approximately 2,000 students annually - leaves school with a reading level at or below second grade. Another 3,500 deaf students leave school with reading levels between second and fourth grade (Drew, 1999). Cannon and Kirby (2013) identified several reasons why the English language is difficult for deaf learners. First, American Sign Language (ASL) has a very different syntactic structure than English (Kilma & Belugi, 1979). Second, the English alphabet corresponds to sound in which deaf or hard of hearing people have little to no access. Third, the number of vocabulary words in ASL

differs from the number of English words. The Oxford English Dictionary defines more than 200,000 words while the Canadian Dictionary of ASL only contains about 8,000 (Bailey & Dolby, 2008). Cannon and Kirby (1997) assert that this creates the task for the ASL native language user of translating one ASL sign to multiple meaning English words.

In addition to deafness, most of the deaf student population has a learning disability. Nearly half of all K-12 learners who are deaf or hard of hearing have an additional disability (Guardino & Cannon 2015). These students, deaf with a disability (DWD), have difficulties with achievement resulting from a processing problem. Learning disabilities can occur when the brain does not process or organize the incoming information sufficiently (Stewart & Kluwin, 2001). As a result of deafness and learning disabilities, these students have a greater impairment to achieve academically (Pollack, 1997). Teachers of deaf students with disabilities are challenged to create an education plan that includes appropriate instructional tools, curriculum and assessment instruments (Soukup & Feinstein, 2007). Kimmel (2000) reports that teachers can incorporate technology into their instruction to assist their students who have learning disabilities.

Deaf learners benefit from visual support. One of the key factors in the education of deaf students is the creation of a visual learning environment (Nikolarazi et al., 2013). Deaf and hard of hearing students benefit from full access to visual information and the use of visual techniques, strategies, and educational materials (Cannon, Easterbrooks, Gagné & Beal-Alvarez, 2001; Dowaliby & Lang, 1999; Easterbrooks & Baker, 2002; Luckner, Bowen & Carter, 2001; Marschark, 2005; Paul, 1998; Schirmer, 2000).

Reynolds and Rosen (1973) documented the benefits of visual resources in the reading comprehension of deaf and hard of hearing students. They found that students were able to effectively comprehend and retain the information presented through pictorial instruction.

Educational Technology in Special Education

Education or instructional technology is the integration of technology that is applied to teaching and learning (Eddyburn, 2013). It is the careful selection of appropriate tools and techniques that enhances instruction to encourage student learning and improve outcomes (Aziz, 2010). The use of technology has transformed the special education classroom by providing students with disabilities an opportunity to complete tasks that may otherwise have been unattainable.

Judy Heumann, Assistant Secretary of the Office of Special Education Programs at the U.S. Department of Education, stated that technology is used to make things easier. She further asserts that for a person with a disability, technology can make things possible (Edyburn, Higgins & Boone, 2005). Her statement encompasses five essential variables that are rooted in special education technology: the person, the task, the context/environment, the technology tool, and the outcome (Cook, Polgar & Hussey, 2008). When selecting an appropriate piece of technology for students, teachers are faced with the challenge of considering all variables. When chosen correctly, students are able to complete tasks in which they either could not or struggled to complete with poor outcomes (Edyburn, 2013).

Technology can offer assistance to learners visually. Presenting information visually allows the students to process, memorize, and recall critical information. And, through the use of different shapes and colors, information can be separated and organized in a way that assists appropriately. Technology based programs offer teachers the ability to create these visual representations. It also provides the teacher with the flexibility and interactivity to quickly change and individualize material for each student's need (Smith & Okolo, 2010).

Students with disabilities also struggle with writing. When comparing writing samples of students with learning disabilities to their normally-developed peers, students with learning disabilities showed lower quality writing with less organization, vocabulary, and increased spelling and grammatical errors (Mason & Graham, 2008). Troai and colleagues (Troai, Shankland, & Heintz, 2010) described areas in which struggling learners lacked writing knowledge: text structure organization; fewer strategies for task completion; knowledge content for topics; impoverished linguist knowledge; and perspective of their audience. They also found the following skill deficits: difficulty producing age-appropriate spelling; little meaningful planning and revising; and failure to demonstrate thoughts, feelings and actions through the writing process. Their further study identified a lower ability to correctly spell words and use of proper punctuation and capitalization.

Technology-based tools provide enhanced features that support effective interventions in writing. Graham and Perin (2007) found that the use of word processing can be helpful for struggling writers. Furthermore, Smith and Okolo (2010) reported that

applications like *Clicker5*, *Picture It*, and *Writing with Symbols* utilized picture support by displaying images above the words as they are typed. Outcomes suggest that using picture prompts during writing enhanced vocabulary, promoted better spelling and grammar, improved writing fluency, and produced an increase in the quantity of written text (Graham & Perin, 2007).

Technology also assists special education students with basic skills practice. Because students with learning disabilities tend to master these skills at a slower rate, technological support serves as an important foundation for promoting higher-order thinking and academic performance (Bransford, Brown & Cocking, 2000). These technology tools provide students with drill and practice exercises to enhance memorization (Smith & Okolo, 2010). Although drill and practice can seem monotonous, it is important for students to spend time on these basic skills. Reports show that students choose to use technology for instructional purposes outside of school (Lenhart, Madden, MacGill & Smith, 2007). “Most technology- based applications, particularly those designed to provide practice in basic skills, can be used independently and increasing the opportunities for students to gain additional instructional time throughout the day” (Smith & Okolo, 2010, p. 269).

The use of technology during instruction has a positive effect on the learning of students who are deaf or hard of hearing (Mander, Wilton, Townsend & Thomson, 1995). Among the benefits are increased memorization and motivation. Multimedia applications that incorporate the use of visual information aid in memorization. Printed words with pictures were recalled at a higher rate than words that were printed alone (Bell, 1991).

Cannon, Easterbrooks, Gagne and Beal-Alvarez (2011) found that the use of technology led to increased motivation in students who are deaf or hard of hearing. Moreover, students who use technology have a more positive attitude toward their classes and higher test scores than their peers who do not use technology (Kulik, 1994; Sivin-Kachala, 1998).

Professional Development

Koehler and Mishra (2009) describe teaching with technology as challenging, and others document that teachers continue to struggle when incorporating technology (Kramer, Walker & Brill, 2007; Mardis, 2007; Recker, Dorward, Dawson, Halioris, Liu, Mao, Palmer & Park, 2005). Equally challenging is knowledge of the technology, as well as an ability to design pedagogically sound activities (Walker, 2012). Borko (2004) and Hirsch (2001) report that professional development is key to improving teachers' skills, knowledge and attitude in ways that support student achievement. As Borko put it, "teachers' professional development is essential to efforts to improve our schools (p.3)".

There are benefits of professional development to keep teachers up to date with new and effective practices in teaching and learning. However, Mouza (2002) identifies reasons why professional development is ineffective. These include (a) the development of activities away from the school site, (b) the irrelevance of activities to teacher classroom practices, (c) conducting one-shot workshops without follow-up support, and (d) the inability to address individual needs and concerns of the teachers (Fullan, 1991; Miller, 1998). A survey conducted by The National Center for Education Statistics

(NCES) revealed that teachers felt they had not received enough technology training necessary to incorporate technology in their classrooms. They expressed the need for more time and assistance in incorporating the technology and developing lessons.

“Training, preparation, and work environments also play roles in a teacher’s readiness to use technology. Research shows that traditional professional development activities are often short term, devoid of adequate follow up, and do not address school contexts”

(Jones, 2001, p. 36).

Adequate teacher preparation and training is important to successful classroom technology integration. Vontz and Leming (2005) outline characteristics of a study conducted by Birman, Desimone, Porter and Garet, in 2000, which focused on designing effective professional development. These characteristics include:

- Content Focus: To what extent did the activity focus on improving and deepening teachers’ content knowledge?
- Active Learning: To what extent did the activity include opportunities for teachers to actively learn new materials by engaging in meaningful discussion, planning, using new ideas in simulated conditions, developing lesson plans, demonstrating new knowledge, or other forms of active learning?
- Coherence: To what extent did the activity connect to a wider set of opportunities or challenges for teachers such as connections to other professional development experiences, to content and performance standards, or to other school or district-wide initiatives?

- Form: To what extent did the form of the activity-workshop, institute, or collaboration with other teachers-allow for sufficient content focus, duration, active learning by teachers, and coherence?
- Duration: To what extent did the duration of the activity allow enough time for meaningful content focus, active participation, and coherence?
- Collective Participation: To what extent did the activity include teachers from the same department, school, grade, or subject? (Vontz, 2005)

Along with design characteristics, several professional development models were examined. One promising model was a three-phase technology integration program that was conducted at the United States Military Academy at West Point (Efaw, 2005). The three phases consisted of learning, practice and feedback, and continued development.

The first phase was learning. This phase incorporates training on available technology, with the goal of developing the faculty member's comfort level with the technology. One strategy employed was modeling. Experienced facilitators served as classroom teachers while the teachers acted as the "students." The facilitators taught each lesson using technology, just as they would if they were teaching their own students. Having the teachers act as students forced participation and engagement. Debriefing allowed for opportunity to discuss the strengths and weakness of the lesson (Efaw, 2005).

Practice and Feedback was the second phase of this program. This phase focused on lesson design. Teachers worked with the experienced facilitators to create lessons and incorporate technology. They then videotaped these practice sessions and received feedback from the facilitators (Efaw, 2005). The final phase of this program was

Continued Development. This approach modeled Cradler and Cradler's (1995) finding that continued development, training, and mentorship are essential to the effectiveness of technology integration.

Technology Integration

Mishra and Koehler's (2006) Technology, Pedagogy, and Content Knowledge (TPACK) framework describes teacher knowledge and skills required for effective technology integration. Depicted in Figure 5, TPACK "is an understanding that emerges from interactions among content, pedagogy and technology knowledge" (Koehler & Mishra, 2009, p.16). It supports teaching with technology, using the technology in constructive way to teach content, make information assessable, and build upon students' prior knowledge.

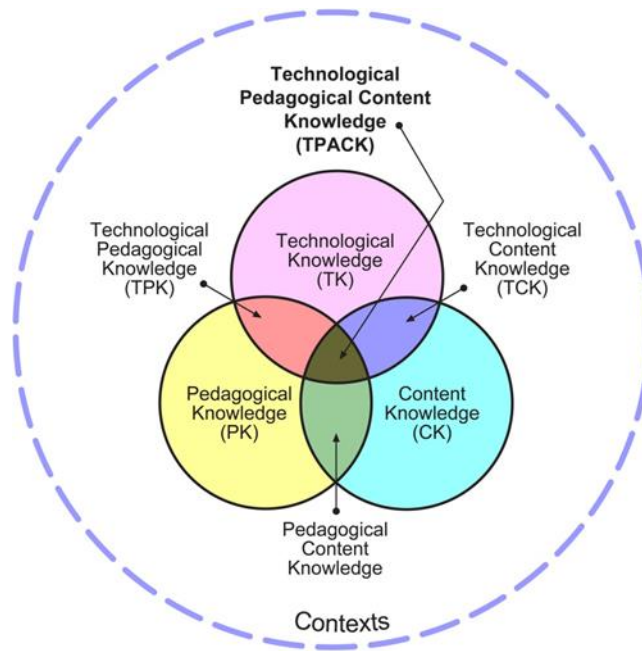


Figure 5 TPACK Model (Mishra & Koehler, 2010)

The TPACK framework is comprised of six components.

1) Content Knowledge (CK) is teacher's knowledge about the subject being taught at the appropriate level. This knowledge includes concepts, theories, ideas, frameworks, evidence and proof, practices, and strategies to develop this knowledge (Koehler & Mishra, 2009).

2) Pedagogical Knowledge (PK) is knowledge about the practice, processes, or methods of teaching and learning. It also includes teachers' knowledge of overall educational purposes, values, and aims. It applies to classroom management skills, lesson planning, assessments and how students learn. It includes techniques and methods used in the classroom along with strategies for evaluating student understanding. "As such, pedagogical knowledge requires an understanding of cognitive, social, and

developmental theories of learning and how they apply to students in the classroom” (Koehler & Mishra, 2009, p.15).

3) Pedagogical Content Knowledge (PCK) is similar to Shulman’s (1986) idea that knowledge of pedagogy is applied to the teaching of a specific content. Teachers interpret the content, find multiple strategies for teaching it, and then adapt the information to meet the students’ needs (Koehler & Mishra, 2009).

4) Technology Knowledge (TK) is the knowledge in which a person understands and applies technology productively at work or in their everyday life. TK is when a person can identify technology as a way to assist or to achieve a goal. It is a deeper understanding for the use and assistance of accomplishing tasks. TK is an ever-evolving knowledge that is consistently developing (Koehler & Mishra, 2009).

5) Technology Content Knowledge (TCK) is the relationship in which technology and content work with one another. Teachers must have a deep understanding of the content and how the use of a particular technology can enhance the manner in which it is taught (Koehler & Mishra, 2009).

6) Technology Pedagogical Knowledge (TPK) “is an understanding of how teaching and learning can change when particular technologies are used in particular ways” (Koehler & Mishra, 2009, p.16). TPK requires teachers to look and find ways to use technology as a tool to advance student learning and understanding.

This framework has emerged as a reference to the knowledge required for teachers to integrate technology appropriately. Although it is not a professional

development model, planners use it to focus on what teachers need to know about technology, pedagogy and content and how they relate to each other (Engida, 2014).

Chapter 2

METHODOLOGY AND DATA COLLECTION

Chapter two describes the design and implementation of a professional development program grounded in TPACK, to help teachers acquire knowledge and skills related to the effective integration of the Clicker6 software into classroom practice. While TPACK is a framework for thinking about teacher learning in technology integration, it does not provide guidelines about how to develop this body of knowledge among practicing teachers.

Data were collected through surveys, observations and interviews. Survey data quantitatively measured TPACK changes before and after teacher participation in the professional development. Observation rubrics assessed teachers' ability to use the software as a result of their participation in the professional development. Interviews were conducted to collect qualitative data regarding participants' perceptions of the professional development program.

The following questions guided the inquiry and informed the recommended response strategies reported in chapter three:

- 1) What impact did the Clicker6 professional development program have on the teachers' technical ability to operate the software?
- 2) How did participation in the Clicker6 professional development program influence teacher use of the software in relation to ELA curricular content in the classroom?

3) What were the teachers' perceptions of the Clicker6 professional development program?

Researcher Perspective

I currently serve as the Director of Educational Technology and Academic Learning at PSFD. This role oversees educational technology, curriculum design and development and professional development. I have extensive experience in the field of education in P-12 settings as well as teaching undergraduate and graduate level classes at the college setting.

I began my career as a computer teacher teaching middle school students 21st century learning skills such as the Microsoft Suite, Photoshop, Web Design, and other technology related software. During this time, I presented at many educational conferences the importance of integrating technology into the academic classroom. I then began to develop and deliver workshops at these conferences to give the participants a hands-on experience.

I have a graduate degree in educational technology with a specific focus of technology integration. It was during this time I began a more in depth study of educational technology. After graduation, I began to serve as an adjunct instructor at a university in the area. As I taught college courses, my skills and passion grew stronger. As a result, I often served on educational technology committees and delivered many professional development sessions within the school district for which I was employed at the time.

As my educational technology skills became more evident throughout the school district, I was offered a position as the Educational Technology Trainer. It was my job to provide staff professional development to 240 middle school teachers. I addressed topics that focused on the use of technology in relation to their curricular objectives.

In my current role of Director of Educational Technology and Academic Learning, I am responsible for the design and development of professional development in relation to curricular goals and technology initiatives. Although my experience and role at PFSD has provided me with the skills to design, implement and evaluate this professional development program, I am also aware that it could influence the project and its findings.

Clicker6 Professional Development Program

A daylong in-service program focused on the use of Clicker6 technology. The Clicker6 Professional Development Program was guided by key principles of effective professional development. These principles included: (1) focus on content and pedagogical knowledge, (2) relevance of activities to teacher needs, and (3) collective participation. Below is the description of the Clicker6 professional development program.

1. Content and Pedagogical Knowledge

To help teachers build their TPACK, it was imperative for them to acquire both technology skills and an understanding of how these technologies could be integrated with existing curricular materials used at PSFD. All sessions, summarized in Tables 2

through 5, focused on helping teachers build their TPACK. Session content centered on the current English literacy goals as per PSFD’s newly adopted Bedrock Literacy Curriculum. The Bedrock Literacy Curriculum is a beginning course of study for deaf and hard of hearing children that takes into account their language/literacy levels and needs (DiPerri, 2013). This curriculum focuses on a bilingual approach to teaching to develop both the ASL and English languages. Teaching strategies and methods provided in the Bedrock Literacy Curriculum professional development were reviewed and most of the focus was centered on PCK. Sessions also included TK from the Clicker6 software. Although teachers may understand how to technically use the technology tools, they were sometimes unsure about how to integrate them into the classroom. These sessions were designed to address this challenge and help teachers build connections among Clicker6 technology, content, and pedagogy (i.e., TPACK).

Table 2 Clicker6 Professional Development Program Session 1

Session 1: Introduction	ELA and Technology Overview
Pedagogical Content Knowledge (PCK) Objectives	To review ELA learning objectives as defined in our newly adopted Bedrock Literacy Curriculum To discuss teaching strategies provided in Bedrock Curriculum Literacy Training To discuss benefits of visuals in deaf education
Technological Knowledge (TK) Objectives	Discuss technology that has the ability to insert pictures and videos.
Technological Pedagogical Content Knowledge (TPACK) Objective	Through the use of technology, teachers are able to provide image and video to support our students.

Activities:	Teachers will participate in a collaborative writing activity where they can provide a list of the ELA objectives extracted from the Bedrock Literacy Curriculum. Teachers will then read a Journal article that details the benefits of visual supports to deaf learners. Teachers will be expected to comment on the article supporting the use of visuals for deaf students in collaborative documents using Google Docs. Teachers will then comment on ideas of how technology can be used to support visuals during our lessons.
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Table 3 Clicker6 Professional Development Program Session 2

Session 2: Documents	Inserting Images into Documents, Instant Images, and Word Prediction
Pedagogical Content Knowledge (PCK) Objectives specific to literacy	Teaching Strategies: Vocabulary word lists Spell words Write independently Differentiate instruction Teaching methods/activities as defined in the Bedrock Literacy Curriculum professional development
Technological Knowledge (TK) Objectives	Teachers will be able to: Successfully insert picture or clipart into document Successfully insert drawing into document Successfully edit preferences to show instant pictures in documents and in word predictor Successfully edit preferences in word predictor to show only specific “topic” words.
Technological Pedagogical Content Knowledge (TPACK) Objective	Use of visual images in Clicker6 documents and word predictors to support students’ word recognition Picture support provided by Clicker6 in documents and word prediction give students instant feedback of spelling to assist students in becoming independent writers. They do not have to stop for constant support.

	Through the use of the draw feature, students are able to create a drawing as a place holder as defined in Bedrock Literacy Curriculum Through the use of the topic words preference, teachers are able to modify instruction to give students their level of support.
Activities:	Teachers will create a document in Clicker6 for their upcoming vocabulary words that include English Print and picture support Teachers will edit preferences to have word predictor appear with images Teachers will create a lesson plan for an upcoming project that they will have their students create in Clicker6. This will include a direction sheet to hand out to students. Teachers will comment on the Google Docs sheet with ideas of how they can use Clicker6 to meet the curricular goals included in the Bedrock Literacy Curriculum. They will also offer suggestions of how to use Clicker6 to demonstrate the teaching strategies/ methods provided in the Bedrock Literacy Curriculum training.

Table 4 Clicker6 Professional Development Program Session 3

Session 3: Quick Wizards	Matching Activities, Sentence Building, Picture Bank, Book Creation
Pedagogical Content Knowledge (PCK) Objectives	Teaching strategies: American Sign Language (ASL) to English Vocabulary building Spelling Objectives Alphabet Objectives Orientation and Marking Thoughts objectives Sentence Structure-strategies to teach basic concepts
Technological Knowledge (TK) Objectives	Teachers will be able to: Create a matching activity that matches words to ASL sign and other matching activities Provide an ASL support video to add to printed words

	Create a learning grid for simple sentence structure with different settings Create a picture bank activity that matches words to pictures Create a clicker book with ability to provide American Sign Language (ASL) translation video
Technological Pedagogical Content Knowledge (TPACK) Objective	Clicker6 has the ability to create matching games that can include ASL support. Students can see the printed word in English, but also have the visual ASL support video and image to enhance word recognition. It also allows students to create books in English, but also convert it to a signed ASL video. This demonstrates the student's ability to read for meaning.
Activities:	Teachers will create a matching activity, a sentence building activity, and a learning grid for their upcoming vocabulary words. They will also add different levels of support videos and images. Teachers will create a lesson plan for an upcoming project that they will have their students create in Clicker6. This will include a direction sheet to hand out to students. Teachers will comment on the Google Docs sheet with ideas of how they can use Clicker6 to meet the curricular goals included in the Bedrock Literacy Curriculum. They will also offer suggestions of how to use Clicker6 to demonstrate the teaching strategies/ methods provided in the Bedrock Literacy Curriculum training.

Table 5 Clicker6 Professional Development Program Session 4

Session 4: Settings	Analysis, Preferences, and Profiles
Pedagogical Content Knowledge (PCK) Objectives	Assessing Student Learning Checking for Understanding Differentiating Instruction

Technological Knowledge (TK) Objectives	Teachers will be able to: Successfully edit preferences for different levels of support Save edited preferences profiles to individual students Edit Preferences to allow video, picture, or text support Use Document Analysis to see student data
Technological Pedagogical Content Knowledge (TPACK) Objective	Clicker6 allows teachers to use technology to differentiate the levels of support provided to each individual student. These supports include: forced word order in sentence building, video support pop-ups, and image support Through the use of the document analysis, teachers can see what students have corrected. They can check for patterns of continually misspelled words. It also provides the sentence so teachers can take an in-depth look. These words can then be used for extra practice activities.
Activities:	Teachers will be given a document that previously had corrections made. Teachers will use the document analysis feature to see where these errors were made. Teachers will create individual student profiles with individual levels of support.

The professional development program took place in the school's media lab, which is centrally located for all staff and was facilitated by PSFD's Director of Educational Technology. The lab has tables arranged in a "U-shape" configuration to facilitate communication for both the hearing and deaf staff. The lab also features a wall-mounted SMART Board and an overhead projector at the front and center of the table arrangement. Teachers had laptops with the Clicker6 software installed.

To address PCK, all sessions began with group discussion of the newly adopted Bedrock Literacy Curriculum. These conversations included curricular learning

objectives that focused on what was to be taught and which strategies were applicable to teaching the content. Teachers accessed weekly word lists, reading fluency sentences, and other materials related to curricular goals. Teachers also had access to a Google Doc and collaboratively created a list of curricular objectives and teaching strategies that are shown in Figure 6. Overall, teachers appeared to be engaged in the discussion of classroom objectives and seemed eager to have input as evidenced by their willingness to contribute to the Google Doc.



ELA Objective	Strategy
When given target word, students will match the word to a sign, and/or picture	use of ASL picture images memory matching flashcards Powerpoint
The student will correctly sequence noun/verb pairs in logical order and provide original, appropriate examples	give examples of possible verbs that go with possible nouns examples of verbs that don't make sense students picks verb/nouns
students will read, spell, define, and provide original sentences for a specific number of English words per week	sequence letters in correct order increase speed of recall match picture to finger spelled word missing letters in spelling words

Figure 6 PCK Collaborative Activity

Next, the session focused on teachers' TK. The facilitator demonstrated a variety of Clicker6 software functions. Each feature was accompanied by a printed direction sheet, and an example is illustrated in Figure 7. For each Clicker6 function demonstrated, the facilitator asked teachers to model that task on their own computers. One TK feature of Clicker6 was to create a Matching Activity from the Quick Wizard.

The facilitator, on the SMART Board, demonstrated the steps to follow to create the matching activity. It was then supported by a tutorial about how to insert text and pictures. Teachers were then asked to create a matching activity in Clicker6. They received a printed direction sheet and had facilitator support, if needed.

As the teachers practiced the function, the facilitator walked around and offered assistance as needed. The facilitator also surveyed the comfort level of those in the room by checking-in with teachers individually. Before moving on to another function, the facilitator asked teachers, by a show of hands, if they were comfortable and confident to proceed.

Using pictures in a Document

Using pictures in a Document

To add a picture to your Document, click where you would like the picture to go and click the

 **Picture** icon on the [Document Toolbar](#), to display the following tools:



- To add a picture from a [Media Library](#), the current Clicker Set, your computer, or another device, click the  **Browse** icon to open a [Picture Browser](#). When you have browsed to your desired picture, select **Insert**.
- To paint a picture, click the  **Paint** icon. For further help, see [Painting a picture](#)
- To take a photo with a webcam, click the  **Take Photo** icon. For further help, see [Taking a photo](#)

You can also drag pictures into your Document from Windows Explorer, or from a web page - see [Adding pictures via "drag and drop"](#) for more information.

Figure 7 Clicker6 Direction Sheet

During this session, teachers were also introduced to how the technical features of Clicker6 mapped to PCK. As an example, one feature of Clicker6 allows pictures to appear in a word predictor. As students are independently writing, the software provides them with the needed visual support. When designing lessons, teachers used their knowledge of TK to provide that support.

Next, the sessions focused on TPACK. With the PCK identified, and the technology introduced, the next part of the session facilitated the integration of technology with literacy content and pedagogy. Through the use of the Google doc and discussion, teachers reflected on the learning objective, teaching strategies, and newly learned features of Clicker6. Collaboratively, they combined the functions of Clicker6 that met the learning goals and pedagogy. Ideas were inserted into the Google doc and are shown in Figure 8.

ELA Objective	Strategy	Clicker 6 Technology
When given target word, students will match the word to a sign, and/or picture	use of ASL picture images memory matching flashcards repetition of word to image, image to word, word to sign, sign to image	Create clicker 6 matching activity create clicker 6 story with pictures of vocab words Create clicker grid with vocab words only, add picture support in word predictor
The student will correctly sequence noun/verb pairs in logical order and provide original, appropriate examples	give examples of possible verbs that go with possible nouns examples of verbs that don't make sense students picks verb/nouns	Create <u>clicker6</u> sentence grid with guided setting. <u>Clicker6</u> matching activity of verbs to nouns (some that don't make sense) Create clicker grid with nouns and verbs that go together, have students write independently with <u>clicker6</u> grid/prediction.

Figure 8 TPACK Collaborative Activity

2. Relevance of Activities to Teacher Needs

All activities in the Clicker6 Professional Development Program were directly related to the newly adopted Bedrock Literacy Curriculum. They included teaching strategies and lessons that were previously presented in their curriculum professional development. The delivery of the instructional materials through an in class session provided teachers with time to create materials for their upcoming lessons. This also provided an opportunity for teachers to create their own instructional materials that directly related to the new curriculum.

At the end of the sessions, teachers were given time to create lessons in Clicker6 that applied directly to their classroom teaching. They looked at their upcoming lesson plans and created specific activities that could be integrated into their classrooms.

Teachers used the TPACK collaborative activity to help them decide which Clicker6 activity would be appropriate to the learning objective. They appeared to be grateful for an opportunity to create activities that could be utilized for instruction. An example of a teacher-created Clicker6 activity is shown in Figure 9. This particular teacher focused on the noun/verb objective found in the Bedrock Literacy Curriculum. Additionally, this activity guides the student in creating a daily diary entry. With the use of the features and tools in Clicker6, students can write independently or use the pop-up grids to assist them in adding nouns and verbs. The teacher also incorporated the use of video ASL to support students' reading. This is illustrated in Figure 10.

Diary									
		Today		ate		played		Dad	My teacher
		In the morning		called		read		He	She
		In the afternoon		cleaned		rode		I	The boy
		In the evening		cooked		saw		John	The girl
		First	Then	did		walked		Mary	The man
		After that	Later	got		washed		Mom	My sister
				helped		watched		My brother	The nurse
				listened		went		My class	The principal
				made		worked		My family	The woman
				painted		wrote		My friends	We
		Verbs	Nouns	Extra Words					

Figure 9 Teacher Created Clicker6 Diary Activity



Figure 10 Video ASL support

The Clicker6 Professional Development program also took into account teachers' feedback. The daylong session took place during a scheduled in-service day. The day was organized into four sessions, with a lunch break between sessions two and three. Teachers were given five-minute breaks between the back-to-back sessions. Teachers were observed to be focused on the software all day. Since many of the features of Clicker6 are used throughout the software, teachers were able to apply their previous learned knowledge to each new session. This repetitive recall of technology knowledge helped teachers practice the feature multiple times.

In addition to the full day in-service, teachers were provided in-class support as they implemented the software. The facilitator contacted each teacher to establish a time for support while implementing a Clicker6 lesson. The facilitator reported to the class and assisted the teacher and students in using the software. As the teachers and students used Clicker6, the facilitator was on-site to provide assistance and reminders about the capabilities and features of the software. The facilitator also offered suggestions about enhancing the lesson with additional features from the software.

Teachers then participated in one follow-up session two weeks from the initial meeting. This session was scheduled on a regular professional development Monday and lasted for 45 minutes. This session served as a time for the teachers to reflect on their learning and use of the technology. Teachers came to the meeting excited and ready to share their experiences with the software. They discussed how they used the technology, how they felt about the connection to their ELA objectives, and their overall opinions. They also came with many technical questions. Teachers each went around the room and gave a brief overview of the Clicker6 activity they integrated into their classrooms. They stated content objectives and relayed how they used Clicker6 to reach their goals. They also discussed problems they encountered with technology and how they overcome the issues. The facilitator offered additional ideas about how to use Clicker6 in the classroom.

In support of the discussion, the facilitator shared access to a tutorial sheet, which was sent via email to all teachers. The sheet included additional features of Clicker6 with links to video and printed tutorials to support their TK. Figure 11 is an example of the tutorial sheet.

Documents	Video Link	Document Link
How to add a picture, painting or photograph to a Document	http://www.cricksoft.com/us/training/clicker-6-training/90-second/documents.aspx	http://www.cricksoft.com/Files/UK-Clicker-Sheets/Documents/1-How-to-add-a-picture-painting-or-photograph-to-a-document.pdf
How to show instant pictures in a Document	http://www.cricksoft.com/us/training/clicker-6-training/90-second/documents.aspx	http://www.cricksoft.com/Files/UK-Clicker-Sheets/Documents/2-How-to-show-instant-pictures-in-a-document.pdf
How to open, change and personalize the on-screen keyboard	http://www.cricksoft.com/us/training/clicker-6-training/90-second/documents.aspx	http://www.cricksoft.com/Files/UK-Clicker-Sheets/Documents/3-How-to-open-change-and-personalize-the-on-screen-keyboard.pdf
How to Open and Save Word Documents	http://www.cricksoft.com/us/training/clicker-6-training/90-second/documents.aspx	http://www.cricksoft.com/Files/UK-Clicker-Sheets/Documents/4-How-to-open-and-save-Word-documents.pdf
How to use the Document Analysis Tool	http://www.cricksoft.com/us/training/clicker-6-training/90-second/documents.aspx	http://www.cricksoft.com/Files/UK-Clicker-Sheets/Documents/5-How-to-use-the-document-analysis-tools.pdf
Word Predictor		
How to personalize the word predictor settings	http://www.cricksoft.com/us/training/clicker-6-training/90-second/word-predictor.aspx	http://www.cricksoft.com/Files/Us-Clicker-Sheets/word-predictor/1-How-to-personalize-the-word-predictor-settings.pdf
How to show pictures or symbols in the word predictor	http://www.cricksoft.com/us/training/clicker-6-training/90-second/word-predictor.aspx	http://www.cricksoft.com/Files/Us-Clicker-Sheets/word-predictor/2-How-to-show-pictures-or-symbols-in-the-word-predictor.pdf
Quick Wizards		
How to create a quick matching activity	http://www.cricksoft.com/us/training/clicker-6-training/90-second/quick-wizards.aspx	http://www.cricksoft.com/Files/Us-Clicker-Sheets/quick-wizards/1-How-to-create-a-matching-activity.pdf
How to create a quick picture bank	http://www.cricksoft.com/us/training/clicker-6-training/90-second/quick-wizards.aspx	http://www.cricksoft.com/Files/Us-Clicker-Sheets/quick-wizards/2-How-to-create-a-quick-picture-bank.pdf
How to create a quick sentence building activity	http://www.cricksoft.com/us/training/clicker-6-training/90-second/quick-wizards.aspx	http://www.cricksoft.com/Files/Us-Clicker-Sheets/quick-wizards/3-How-to-create-a-quick-sentence-building-activity.pdf
How to create a quick word bank	http://www.cricksoft.com/us/training/clicker-6-training/90-second/quick-wizards.aspx	http://www.cricksoft.com/Files/Us-Clicker-Sheets/quick-wizards/4-How-to-create-a-quick-word-bank.pdf
How to create a quick writing book activity	http://www.cricksoft.com/us/training/clicker-6-training/90-second/quick-wizards.aspx	http://www.cricksoft.com/Files/Us-Clicker-Sheets/quick-wizards/8-How-to-create-a-quick-writing-book-activity.pdf
Preferences		
How to personalize and save Clicker6's user preferences	http://www.cricksoft.com/us/training/clicker-6-training/90-second/preferences.aspx	http://www.cricksoft.com/Files/Us-Clicker-Sheets/preferences/1-How-to-personalize-and-save-Clicker-6%27s-user-preferences.pdf
How to register your own Media Library	http://www.cricksoft.com/us/training/clicker-6-training/90-second/preferences.aspx	http://www.cricksoft.com/Files/Us-Clicker-Sheets/preferences/2-How-to-register-your-own-media-library.pdf

Figure 11 Clicker6 Tutorial Sheet

3. Collective Participation

It is imperative to support collective participation across PSFD. Oftentimes teachers are in class and have little time to collaborate with their colleagues. Through the specifically designed in-class professional development time and a Google Doc, teachers discussed ways in which this specific technology could be integrated into their

curriculum. Given the lack of time and interaction among teachers in a typical day, this professional development program promoted collective participation by providing a venue in which teachers could exchange ideas with one another. A benefit of Clicker6 is that it permits all activities to be shared. Through this feature, teachers are able to create a curriculum of aligned activities that is accessible by their colleagues.

Each session began with a discussion, which gave teachers an opportunity to share their ideas and thoughts. Many teachers were eager to offer opinions, help, and other ideas that they used in their classrooms. There was an on-going conversation about teaching content whereby teachers discussed what they were teaching and how best to deliver the content. Since all of the teachers are teaching ELA, this led to meaningful conversation about the topic. The discussions provided a forum for generating new ideas. Because the conversations took place via a Google Doc, teachers were able to share ideas and work in groups in real-time. An example of this collaborative communication stream is illustrated in Figure 12.

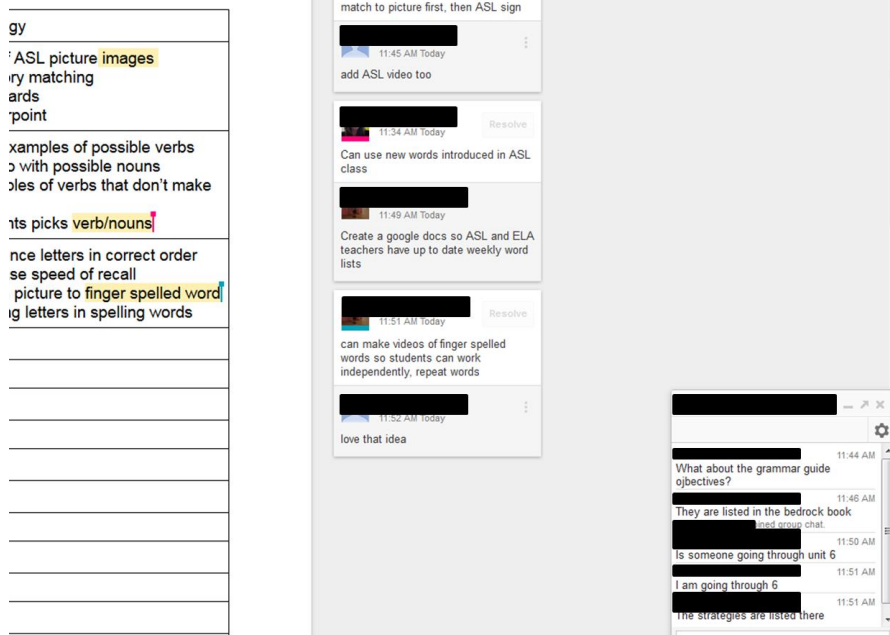


Figure 12 Collaborative Communication via Google Docs

Teachers were also given the opportunity to share the materials they created. At the end of the sessions, they presented their Clicker6 resources and explained the connection between classroom objectives. They also demonstrated how they would teach with this technology tool as if it were one of their classes. After each presentation, Clicker6 files were placed into a shared folder for everyone to access.

Data Collection and Data Analysis

Teacher Surveys

The first data collection activity was a Qualtrics survey administered to 15 English Language Arts teachers. The teachers represented grades K-12, had between 3

and 16 years of experience and were known to either consistently use or struggle with technology.

Table 6 Clicker6 Professional Development Program Teachers

Teacher Name	Yeas Experience	Grade Level
Tara	3	K
Liz	9	1
Shannon	16	1
Jill	6	2
Katie	5	3
Robin	5	3
Kelly	11	4
Melissa	16	5
Diane	7	5
Christine	4	6, 7, and 8
Joanne	3	6, 7, and 8
Lori	9	9 and 10
Mary	3	10 and 11
Erin	4	11 and 12
Edward	3	10, 11, and 12

One of the goals of the Clicker6 Professional Development Program was to provide teachers with training to increase their TK about the use of the Clicker6 software in the classroom. Prior to the program, teachers were asked to complete a 12-question survey (Appendix B). The purpose of the survey was to evaluate teachers' level of comfort with the Clicker6 software, as well as their perceptions about whether the professional development met their needs. Survey questions centered on TK and TPACK

and were focused on the professional development program and enhanced instruction through the use of Clicker6 technology.

At the conclusion of the Clicker6 Professional Development Program, teachers were asked to complete the same 12-question survey to assess the difference in comfort level and knowledge about the use of Clicker6 software. The desired outcome of the professional development was that teachers would be able to use the specific features in Clicker6 appropriately. The Qualtrics survey link was sent via an email message with specific instruction to click the link labeled “Clicker6 Professional Development Survey.” Teachers were informed that the survey was anonymous and asked to answer the questions honestly.

Teacher Observations

The second data collection activity consisted of teacher observations. A key goal of the Clicker6 Professional Development Program was to help teachers improve their knowledge and practice of meaningful Clicker6 software integration into the ELA curriculum. Following the Clicker6 Professional Development Program, all teachers were observed to identify how they translated their new knowledge into their teaching practice. Specifically, they were observed for how participation in the program influenced their use of Clicker6 in relation to their ELA curricular content. The observations were scheduled the week following the final professional development session. Observations took place in the teachers’ classrooms during their ELA classes and lasted approximately 45 minutes. A rubric (Appendix C) was used during the observations. The main purpose

of the observations was to examine how teachers were integrating the software to support their ELA curriculum.

Teacher Interviews

The third data collection method consisted of teacher interviews at the conclusion of the Clicker6 Professional Development Program. Interviews were guided by a protocol (Appendix D) which allowed the investigator to learn about participants' perceptions of the Clicker6 software and supporting professional development. Specifically, participants were asked about the ways in which they were using the software, as well as the most and least helpful aspects of the professional development. Finally, they were asked to offer suggestions for improvement.

The interviews yielded valuable information regarding teachers' perceptions of the professional development and how they intended to use the Clicker6 software in their classrooms. Teachers were provided with an explanation of the interview, assured confidentiality, and asked for their consent to being recorded. They were also given the opportunity to ask questions. The interviews were approximately one week after their scheduled observation. The interviews took approximately 10 minutes each and were then promptly transcribed.

Data Analysis

Teacher Surveys

To analyze the survey data, Likert-scale numerical data was entered into an Excel spreadsheet. Within Excel, item means and standard deviations were calculated. The survey was developed using a four-point Likert Scale, with 2.5 identified as a competency score. The competency score was set to 2.5 because the threshold reflected teacher agreement of confidence in using the Clicker6 software as a result of the professional development. If a teacher's overall score was above 2.5, an assumption was made that the teacher was very confident in using the software. If the score was below 2.5, an assumption was made that the teacher may have reservations about using the software. The pre-survey and post-survey results were compared to examine potential changes in teachers' confidence levels, as a result of the professional development.

Teacher Observations

Observations were analyzed by reviewing the score of each item for the teacher's observation based on the rubric (Appendix C). A minimum competency score of 3 or above was set, and the total rubric mean was calculated for each observed teacher. Next, the total rubric mean was compared to the competency score of 3 to determine if teachers were meeting a minimum competency. Teachers who fell below this score required additional professional development or support. Means were calculated for all teachers to see how well they performed overall.

Teacher Interviews

Qualitative data is used to understand teacher perspectives (Basit, 2003). To gain an understanding of the teachers' perspectives, the interviews were first transcribed. Answers to the questions were then grouped by similar meaningful responses. The purpose of analyzing the qualitative data was to determine the categories, relationships and themes that emerged (McCracken, 1988). The reoccurring categories were used to develop codes, and these specific codes were further developed to establish their connection to one another to organize the data for analysis (Dey, 1993). The reoccurring categories, related to the coding scheme, are shown in Table 7. All teachers made significant comments regarding these main themes.

Table 7 Interview Responses Notes Coding Scheme

Impact of PD on teacher learning	
Code	Examples
TK Operational Knowledge of Clicker6	"I am able to create learning grids."
	"I am still unsure how to share my grids with my students."
TPACK Clicker6 for ELA instruction	"I have created activities that align with my weekly vocabulary words."
	"I am using the Clicker6 grids to assist my students in developing sentence structure just as in the Bedrock book."
Advantages of using software	"Students were engaged, they liked using the technology."
	"With the share feature, there are always backup activities that we could do in class."

Disadvantages of using software	"It is hard to get around to students who have questions with using the software." "It is hard to find time to input the weekly words each week into the software."
Confidence Level on use of software	"I feel confident that I can create activities and grids for my students." "I am worried to try some of the advanced activities. If it doesn't go right, the class gets disrupted."
Future Use of Software	"I plan to use the matching activities every week for vocab." "I am going to try and use the writing grids for daily journal activities."

Strength/Weakness of the PD Program

Delivery of PD	"I really like that there was a follow up session where we could discuss the software and any issues." "I felt like a full day was too much. I would have rather had two half days."
Facilitator/Teacher Interaction	"Having the facilitator walking around to answer questions while we worked was helpful in learning the software."
Design of the PD	"Having time to create assignments was beneficial." "Aligning the Clicker6 activities to Bedrock helped make a connection of how to use the software in the classroom."
Collaboration	"Having a Google doc to share ideas was helpful. I could go back to it later to see what others had added." "It felt like some people dominated the discussion portion of the professional development."
Support	"It was extremely helpful to have the facilitator in the room while we used the software. She was there when I would get stuck."

“I felt like the facilitator was there to help me. I knew that we would be meeting again to go over any issues I may have. I didn’t feel like I was just on my own after the first day.”

Chapter 3

FINDINGS AND RECOMMENDATIONS FOR TECHNOLOGY PROFESSIONAL DEVELOPMENT

Findings

Several findings emerged from the data collection activities that followed the TPACK professional development program. They are described as per the three key questions that guide this work.

Key Question 1

What impact did the Clicker6 Professional Development Program have on the teachers' technical ability to operate the software?

The results of the self-assessed pre and post teacher technological knowledge survey are shown in Table 8. As illustrated in Figure 13, all teachers demonstrated improvement in the areas of technological knowledge related to the Clicker6 software.

Table 8 Teacher Technological Content Knowledge
Pre and Post Survey Results

	Pre		Post		Pre		Post		Pre		Post		Pre		Post		Pre	Post	Pre	Post
Item	SA (4)				A(3)				D(2)				SD(1)				Mean		SD	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%				
Technology Knowledge																				
1. I know how to insert images/ pictures/ drawings into Clicker6	0	0.00	11	73.33	3	20.00	4	26.67	6	40.00	0	0.00	6	40.00	0	0.00	1.80	3.73	.77	.46
2. I can edit preferences to show instant pictures in documents and in the word predictor in Clicker6	0	0.00	7	46.67	0	0.00	7	46.67	1	6.67	1	6.67	14	93.00	0	0.00	1.07	3.40	.26	.63
3. I can successfully create matching activities in Clicker6 wizards	0	0.00	7	46.67	0	0.00	7	46.67	1	6.67	1	6.67	14	93.00	0	0.00	1.07	3.40	.26	.63
4. I can create learning grids for simple sentence activities in Clicker6	0	0.00	6	42.86	0	0.00	6	42.86	1	7.14	2	14.29	13	92.86	0	0.00	1.07	3.29	.27	.73

5. I know how to add video support to Clicker6	0	0.00	8	57.14	2	13.33	6	42.86	6	40.00	0	0.00	7	46.67	0	0.00	1.67	3.57	.72	.51
6. I know how to change preferences to increase/decrease the levels of support in Clicker6	0	0.00	4	28.57	0	0.00	7	50.00	1	6.67	3	21.43	14	93.00	0	0.00	1.07	3.07	.26	.73
7. I know how to save preferences to individual student profiles in Clicker6	0	0.00	4	26.67	0	0.00	8	53.33	1	6.67	3	20.00	14	93.00	0	0.00	1.07	3.07	.26	.70

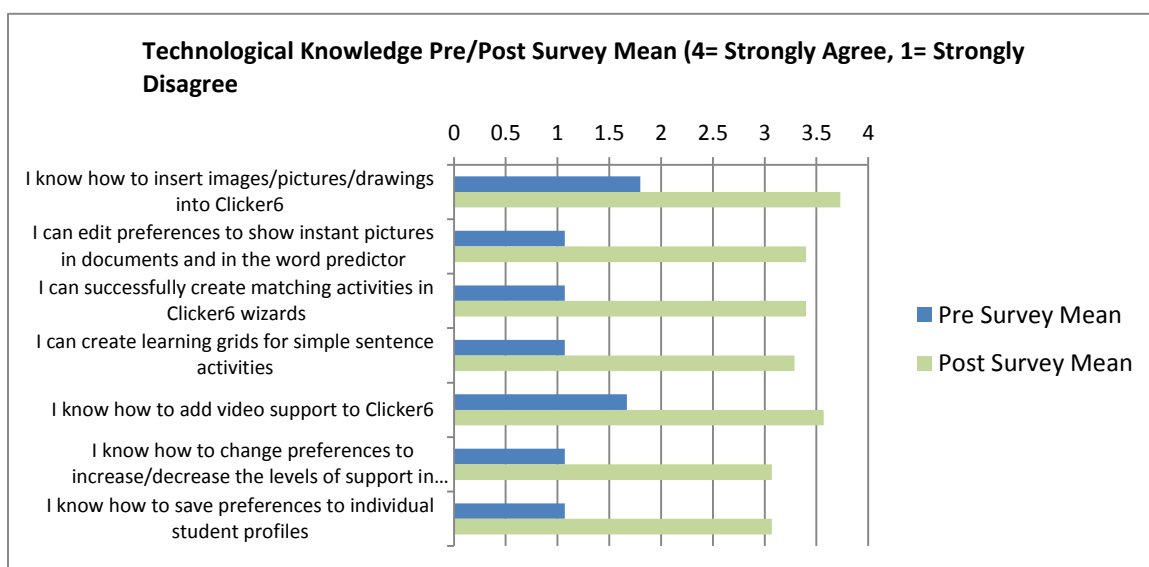


Figure 13 Technological Pre/Post Mean Scores

The self-assessment of technological knowledge showed improvement in all seven items. Teachers' initial responses to the self-assessed pre-survey revealed that they did not possess the technical knowledge needed to operate the Clicker6 software in the classroom. Nearly all teachers responded that they did not know how to technically operate the Click6 survey. All teachers responded that they did not have the technical ability to edit preferences, create activities, create learning grids, or modify student preferences. Additionally, more than three-fourths of the teachers responded that they could not insert pictures, drawings, and video supports in the Clicker6 software prior to the professional development program. A few teachers believed that they would be able to insert images and videos prior to training. They are most likely the more technical-savvy teachers who felt they could problem solve this function on their own.

The post-survey results indicated that teachers gained increased technological knowledge. Most were confident that they could operate the software as a result of the professional development program. All teachers stated that they could successfully insert pictures, images and videos. Approximately 85% of the teachers felt they could edit preferences, create clicker activities, and create learning grids. However, about 20% of the teachers were unsure about how to operate, change, or save individual support level preferences. A few teachers - 3 out of the 15- did not feel confident changing the settings and preferences in Clicker6. This is a function that is not repetitive, so teachers may fear they will lose that knowledge.

Results from the observations provided evidence of increased technical knowledge of the Clicker6 software. Overall, teachers scored a mean of 3.20, with 3.0 being the competent level. Most teachers demonstrated the ability to navigate the Clicker6 software with ease and comfort. They were able to start their activities and could continue to operate the software through the lesson. Many also demonstrated the ability to share files with their students and support them in using the software, but 4 of the 15 teachers scored below the competency score of 2 for effective technology operation. Those specific teachers struggled with opening their activities and sharing files with their students.

Teachers' responses from the interviews demonstrated an understanding of technological knowledge when operating the Clicker6 software. Overall, teachers were confident about using the Clicker6 software at the completion of the professional development. As evidenced by the following comments, many teachers expressed satisfaction in their ability to technically operate the programs:

“I was able to learn how to successfully use the clicker6 software. There were mini lessons throughout the day, which taught me the functions of the software. I can easily create grids and activities. I know how to add pictures and videos for support.”

“I had never used clicker6 before so I had no clue how to use it all. After the PD I am able to create grids and activities that my students can use.”

“After the PD, I have used clicker6 in my class with my students without facilitator support. Before the PD, I would not have been able to figure this out.”

“This is a piece of software that is beneficial to my students. This PD showed me how to use it in my classroom.”

“I learned how to customize the program to fit the individual needs of the student.”

“In the training, I learned how to use the software. I learned how to make grids for writing and activities that I can use with my students.”

Although all felt that they could successfully operate the software, they described different comfort levels. Approximately 50% of the teachers stated that they were fully confident and already exploring new features on their own. About 40% of the teachers articulated that they were comfortable operating the software as learned in the professional development, but would like to learn new features in an additional professional development.

Although most of the teachers expressed their confidence in using the software, some did articulate concerns when asked about their reservations. Approximately 10% of the teachers said they still struggled with some of the features and referred back to their notes or instructional sheets. Out of the 15 teachers, 4 expressed concerns with the setting and profile set up. They felt unsure that they would remember how to continue to do it since it was not a function that takes place regularly. In addition, a few also

expressed a concern about the shared space. They were worried that they could accidentally alter another teacher's file.

Key Question 2

How did participation in the Clicker6 Professional Development Program influence teacher use of the software in relation to ELA curricular content in the classroom?

Teachers' demonstrated improvements in the ability to use the software in relation to their curricular goals and teaching strategies. This improvement was measured by the pre and post means of the self-assessment survey data and individual observation rubrics. It was further confirmed by teachers' responses during the interview.

The results of the self-assessed pre and post teacher Technological Pedagogical Content Knowledge surveys are presented in Table 9. The results show that all teachers demonstrated improvement in the areas of technological pedagogical content knowledge as depicted in Figure 14.

Table 9 Teacher Technological Pedagogical Content Knowledge Pre and Post Survey Results

	Pre		Post		Pre		Post		Pre		Post		Pre		Post		Pre	Post	Pre	Post
Item	SA (4)				A(3)				D(2)				SD(1)				Mean		SD	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%				
Technological Pedagogical Content Knowledge																				
1. I can teach lessons that combines ELA curriculum content with visuals support found in Clicker6	0	0.00	11	73.33	0	0.00	4	26.67	1	6.67	0	0.00	14	93.00	0	0.00	1.07	3.73	.26	.46
2. I can select the different activities in Clicker6 and integrate it into the appropriate curricular content	0	0.00	11	73.33	0	0.00	4	26.67	1	6.67	0	0.00	14	93.00	0	0.00	1.07	3.73	.26	.46
3. I can use strategies that combine curricular content, Clicker6, and Bedrock Literacy Curriculum teaching approaches in my classroom	0	0.00	12	80.00	0	0.00	3	20.00	1	6.67	0	0.00	14	93.00	0	0.00	1.07	3.80	.26	.41
4. I can participate in collaborative work with my colleagues in designing lessons which focus on the use of Clicker6, ELA curriculum, and Bedrock teaching strategies	0	0.00	14	93.00	2	13.33	1	6.67	6	40.00	0	0.00	7	46.67	0	0.00	1.67	3.93	.72	.26
5. I have instructional materials created in Clicker6 that I can use in my classroom for ELA lessons.	0	0.00	15	100.0	0	0.00	0	0.00	1	6.67	0	0.00	14	93.00	0	0.00	1.07	4.00	.26	.00

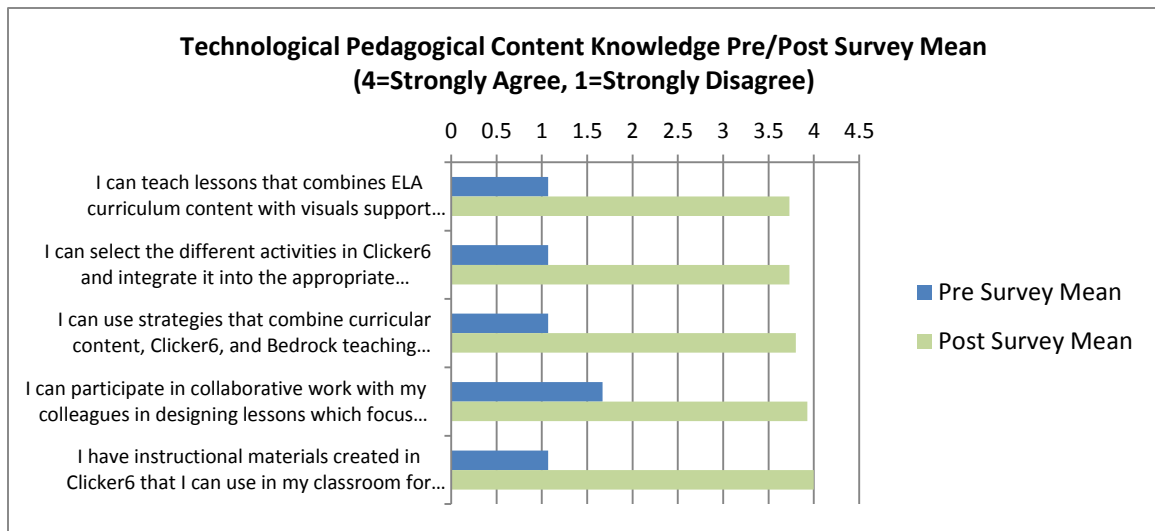


Figure 14 Technological Pedagogical Content Knowledge Pre/Post Mean Scores

As indicated in the pre and post self-assessment surveys, all teachers felt that they could integrate Clicker6 software in relation to their curricular objectives and teaching strategies. The self-assessment of the technological pedagogical content knowledge shows improvement in all five items. Prior to the professional development, all teachers felt that they did not have the ability to integrate Clicker6 into their ELA curriculum. They also felt that they did not know how to apply the Bedrock Literacy Curriculum teaching strategies to the software. Only 2 of the 15 teachers believed they could collaboratively work with colleagues in designing lessons that focused on the use of Clicker6, ELA curriculum, and Bedrock Literacy Curriculum teaching strategies. The post-survey results revealed growth in the area of teachers' perception of their technological pedagogical content knowledge after the professional development program. All of the staff agreed that they could teach lessons that combined ELA curriculum content with the visual supports found in Clicker6. They were unanimous in

their agreement that they could select appropriate Clicker6 activities to pair with curricular content and then use those strategies to combine curricular content, Clicker6, and Bedrock Literacy Curriculum teaching.

Teachers were also observed using the software as another instrument to provide evidence of their technological knowledge. Table 10 displays the teacher scores per the observation rubric.

Table 10 Teacher Rubric Scores

Teachers	Technology Logistics (Operating Technologies effectively)	Instructional Strategies & Technology (Matching technology to instructional strategies)	Curriculum Goals& Technology (Matching Technology to Curriculum)	Technology Selection (Matching technology to both curriculum and instructional strategies)	Teacher Rubric Mean
Teacher 1	4	3	4	2	3.25
Teacher 2	3	4	4	3	3.50
Teacher 3	2	3	4	2	2.75
Teacher 4	2	3	4	2	2.75
Teacher 5	3	3	3	3	3.00
Teacher 6	4	4	3	3	3.50
Teacher 7	2	2	3	2	2.25
Teacher 8	4	4	4	4	4.00
Teacher 9	4	4	4	3	3.75
Teacher 10	4	3	4	3	3.50
Teacher 11	3	3	3	3	3.00

Teacher 12	3	3	3	3	3.00
Teacher 13	4	3	3	3	3.25
Teacher 14	4	4	2	2	3.00
Teacher 15	2	3	2	2	2.25

The rubric scores show that the majority of the staff demonstrated competence in the area of technological knowledge. Only 4 of the 15 teachers struggled with operating the software during their observation. Teachers also demonstrated the ability to technologically use the software with their students. Many teachers were observed launching the software and using all of the features that were introduced in the professional development program. Even though some teachers only used a few of the features, they still operated the software successfully.

Teachers were observed to gather information as to whether they were using Clicker6 in relation to their ELA curriculum. Table 10 also displays the scores that teachers received on their ability to integrate their ELA content with Clicker6 software. Most teachers could successfully match the technological capabilities to the instructional strategies found in the Bedrock Literacy Curriculum. All but one teacher demonstrated the ability to use the ASL and picture support instructional strategy. Further observation demonstrated that teachers were able to successfully match technology to curricular goals. Many teachers used the Clicker6 matching activities directly related to their curricular weekly vocabulary and spelling words. They also used Clicker6 to accomplish writing tasks as defined in the Bedrock Literacy Curriculum. Figure 15 provides an example of a student's writing journal in Clicker6.



Figure 15 Student Writing Activity in Clicker6

Although the majority of the teachers could successfully match instructional strategies to technology and technology to curriculum, many encountered difficulty in matching technology to both curriculum and instructional strategies in a singular Clicker6 lesson. For example, some teachers demonstrated the ability to use the Clicker6 activity to match visual pictures to curricular words, but did not include the instructional strategy of including the ASL video.

Teachers demonstrated the greatest improvement in using the Clicker6 technically and combining it with curricular content. All teachers observed used the Clicker6 software in direct connection with the Bedrock Literacy Curriculum. Clicker6 grids and activities were created in connection with ELA curricular objectives, and this level of confidence was apparent during the rubric observation. As shown below in Table 11, the overall mean for matching technology to curriculum was a 3.33. This was the highest mean score for all of the categories.

Table 11 Teacher Observation Means and Standard Deviations

	Technology Logistics (Operating Technologies effectively)	Instructional Strategies & Technology (Matching technology to instructional strategies)	Curriculum Goals & Technology (Matching Technology to Curriculum)	Technology Selection (Matching technology to both curriculum and instructional strategies)	Teacher Rubric Mean
Question Mean	3.20	3.27	3.33	2.67	3.12
Standard Deviation	0.86	0.59	0.72	0.62	0.50

In contrast, teachers scored the lowest on the observation rubric in the area of matching the technology to both the curriculum and instructional strategies. It was evident that teachers created Clicker6 materials based on their curricular objectives. They also created interactive lessons that were directly related to the Bedrock Literacy Curriculum teaching strategies. Many, however, did not combine them both with the use of the software. For example, one teacher was observed using the writing books feature in Clicker6. The content was directly related to the curricular objective, but the teacher did not use the interactive ASL video teaching strategy to provide students with the visual support during their writing lesson. As represented in the tables above, the overall rubric score for this area was below the competency score of 2.67, with 6 of the 15 teachers receiving a low score of 2.

Responses from the interviews provided evidence regarding the impact of the professional development on the use of Clicker6 and ELA classroom content. Most teachers responded that Clicker6 activities were used almost daily as a way to introduce

and review vocabulary and spelling. More than half of the teachers stated that they are now using Clicker6 to accomplish their Quick Write curricular goal and feel that Clicker6 gives students the support to write independently. Four teachers stated that they could take activities right from their Bedrock Literacy Curriculum Manual and apply them to the Clicker6 software. All teachers relayed that the ability to add ASL videos to the English sentences in Clicker6 was a perfect complement to the Bedrock Literacy Curriculum's instructional strategies. Their responses are summarized below:

“I can use Clicker6 as it ties to my instructional goals. This software helps and assists students in accomplishing the literacy goals that we set in relation to the bedrock curriculum.”

“Assists in the goals of word recognition with use of video ASL, sign and repetitive activities.”

“With students on different levels, they all need individualized materials. Clicker6 lets me individualize the curricular materials so all students are working on the same tasks, but with different levels of support to meet their goals.”

Interview data continued to reveal teachers' ability to use Clicker6 software in relation to their ELA curriculum. When asked “In what ways have you used the Clicker6 software in your classroom to meet your curricular goals?” many teachers described activities and lessons that related directly to their classroom objectives. Of the 15 teachers surveyed, 10 stated that they use Clicker6 activities each week to introduce their new vocabulary words. Some also relayed that they used those activities for students to review independently or for extra practice.

Many of the teachers commented that Clicker6 assists them in reaching their curricular goals. One teacher stated, “The activities in Clicker6 are directly related to our Bedrock objectives. I can take the objective right from the book and build a Clicker6 activity.” Interview responses suggested that teachers see an advantage to using Clicker6 software in their classrooms. When teachers see an advantage to using a piece of technology, they will more likely be willing to use it. Some teachers commented how Clicker6 assisted in the difficulty of teaching in a classroom with so many different academic levels. One teacher stated “With Clicker6, I can work on the same objectives, but change the settings to provide each student with the level of support they need.”

Other common responses to the advantages of Clicker6 included the following:

1. The technology engages the students.
2. The activities in Clicker6 can be used to accomplish ELA objectives.
3. The picture/video features in the software provide students with the support they need to accomplish writing tasks.
4. The software allows students to work independently.
5. Settings/Supports can be adjusted to differentiate instruction to reach the multiple levels in the room.

In relation to the advantages of using Clicker6 software in their instruction, teachers were asked to describe their plans for continued use of the software in the classroom. Many stated that they planned to use the software weekly to introduce new vocabulary, work on spelling, or create weekly books based on vocabulary words. Three teachers planned to use it daily for their quick writing objective.

Although most teachers seemed excited to use the new software with their students, teachers did identify some disadvantages to using the software. These responses include the following:

1. It takes time to create activities/grids.
2. It could be redundant, students lose interest.
3. Amount of time it takes students to set up computers, log in and open software.
4. Trouble-shooting technical issue.
5. Stopping to assist students with technical issues.

Key Question 3

What were the teachers' perceptions of the Clicker6 professional development program?

Overall findings suggest that teachers' perceptions of the professional development program were positive. Answers from the interview protocol indicated that teachers were generally pleased with the structure of the professional development, the content delivered, and the support that was provided.

Following the Clicker6 professional development program, teachers individually participated in interviews. During the interview questions were asked to further investigate their perceptions of the professional development program.

When asked about the impact that professional development had on their learning, common responses included the following themes:

1. I can successfully create a Clicker6 activity.
2. Prior to the PD, I would not have been able to use this software.
3. I can identify ways in which Clicker6 can integrate into my ELA curricular objectives.

Although most comments were positive, teachers did identify reservations with the Clicker6 software after the professional development. These reservations included the following:

1. I am not sure I will have time to create Clicker6 lessons.
2. I do not always have the time to set up for the technology use.
3. I am afraid that I will edit the shared files without creating a copy first.

Teachers were asked to comment about the structure of the professional development designed to enhance their ability to learn the new software. They were split on some aspects of the professional development. Most agreed that they liked that the day was comprised of sessions. They felt each session had a focus, an objective, and resulted in a concrete outcome. They were also in agreement that the hands-on approach was most beneficial. Many teachers commented that they liked having the group restricted to only ELA teachers. They all appreciated having time at the end of the session to collaborate and create instructional materials for their classrooms. All were thankful for the in-class support and follow-up training.

One aspect of the professional development structure that received varying responses was the length of the day. Approximately half of the teachers commented that the day was too long. They felt that they learned too much content in one day and

preferred a half-day session with less content. They also would have preferred to return a week later for an additional half- day session for more content. On the other hand, the other half of the teachers enjoyed the full day of training. They felt they could spend the day focused on the software, and that it gave them just enough time to learn the content and try the technology. They did not feel rushed.

Teachers were then asked about the strength of the professional development program.

The following strengths were identified:

1. Facilitator knowledge
2. Support materials
3. Time to create classroom materials
4. Hands-on
5. Content related to curriculum objectives and teaching strategies
6. Level of support

Teachers enjoyed the structured session with specific objectives and tasks and liked that the feature was taught, demonstrated, and then applied to their curricular objectives. They also appreciated the time they had at the end of the session to create materials for their classes. One teacher stated, “It was beneficial that I was given time to create a learning grid after you had just gone over it. Then we moved onto the next activity, saw the demonstration, and then tried that. I didn’t feel like I had to remember everything all at once then go back and try to use it.” This comment supports Howland and Wedman’s (2004) idea that technology professional development should “include

awareness of what the technology can offer, opportunities to explore technology integration, time to learn the technology, application to teaching, and reflection on teaching (p. 241).”

Teachers were pleased with the structure of the in-class support and follow-up sessions. Many expressed gratitude that it was not “a one-day training.” One teacher said, “it gave me time to work on the software on my own, test it out, then come back to an additional professional development to troubleshoot my issues and ask additional questions.” The benefits of ongoing professional development have also been documented in research. Wei, Andree and Darling-Hammond (2009) stated that professional development has been found successful when programs are ongoing and embedded in teachers’ context.

Many expressed appreciation that training focused on using Clicker6 as it related to their ELA curriculum. One teacher noted that if it had been an outside trainer, he/she would not have known the ELA curricular objectives and Bedrock teaching strategies. The delivery, furthermore, was tailored to specific needs in specific classrooms. The teacher also stated that a connection was made about how to integrate Clicker6 into the classroom. Another teacher mentioned a similar benefit. This individual stated that he/she felt that grouping of ELA teachers kept the professional development centered on their specific goals. Although this software could be used in many subjects, a mixing of subject area teachers in the training would have shifted the focus to a more general use of the software.

Teachers mentioned the time allocated for collaboration, and many of the teachers felt the collaboration documents and time to interact were very beneficial. One teacher stated, “I was able to bounce ideas off of the other teachers. We could discuss the learning objectives and work together to make sure we touched upon all the key elements. Together, we came up with some amazing projects.” Teachers were also excited for the opportunity to share resources. Another teacher stated, “We were able to break up the curricular objectives to each person and make different activities. Then we put them in the shared folder that we all have access to. I feel like I have so many resources for my class.” Collaboration among teachers during professional development has become very popular as a successful technique (Musanti & Pence, 2010).

Many teachers felt the level of support during the professional development program was very beneficial with several acknowledging the expertise of the facilitator in the use of the software. They also commented on the support provided while creating curricular related activities. One teacher stated, “The facilitator was very knowledgeable in the software and was very patient while helping me create my activity.” Teachers additionally commented that they found the printed support materials to be very beneficial.

Teachers were then asked to identify areas of weakness and provide suggestions for improvement. A weakness cited by some teachers was the range of technical ability of the teachers. Nearly half of the 15 teachers commented on the different levels of technical competence. One teacher suggested offering an additional advanced session while others suggested dividing the group into two sessions based on technology

competency level. Some teachers expressed frustration with the lower level technology users. Another teacher commented, “I felt like I had to keep waiting for the same people.” Some teachers felt “held up” by some of the basic questions or the repetition of questions that were already addressed. And, another teacher relayed, “The constant backing up and repeating of a task took time away from those who were on task and could keep up. I felt I was constantly waiting for those few in the room who couldn’t keep up.” These comments are consistent with Whipp, Eckman, and van den Keiboom’s (2005) idea that scaffolding technology professional development to the different users’ ability can create more meaningful instruction.

Teacher feedback was divided regarding the length of the professional development program. Although most teachers liked having a full day of professional development, others believed it was too long. Many teachers commented that they felt there was too much information presented in one day. Even though it was broken into sessions, they preferred a half-day with half of the content. One teacher stated, “I would have preferred a half-day session with less information. I would have liked to have learned half of the features, test them out in my classroom, and then come for an additional half day session to learn more.” Another teacher suggested, “I think that the professional development should have been broken down into one session per week. I would have liked to have learned the first feature, then had time to use that feature in class, master it, become comfortable, and then add additional features one week at a time.” DeSantis (2011) also mentioned this concept, “Professional development designers can help teachers build efficacy by designing deliberate and purposeful training

that introduces new concepts one at a time and provides ample opportunities for teacher reflection (p. 51).”

Another idea offered by the majority of teachers was to have additional days of professional development. Although there was a split among teachers as to whether it should be a full day or a half-day, they were in agreement that additional days of professional development were needed to fully implement all features of the Clicker6 software. Even though there was in-class support and follow up sessions, teachers requested multiple professional development days to cover all of the features of the software. One teacher articulated, “I think this software could use another full day. There seems to be so much that we didn’t get to cover. I think we need at least another full day.” Other teachers suggested multiple days throughout the year to continue the support of the software. They added that they would like to continue to share and show their Clicker6 projects as their comfort levels increased.

Discussion

As previously stated, the purpose of this examination was to investigate the design and implementation of the Clicker6 Professional Development Program, with the goal of potentially adapting it for future technology professional development. The investigation included three key objectives: the impact of the professional development on the teachers’ technical ability; the influence of the professional development program on the teachers’ use of the software in relation to ELA curricular content; and teacher perception of the professional development program.

Findings from the surveys, observations, and interviews suggest that all of the teachers showed an increase in TK as a result of the Clicker6 professional development. While most showed a greater understanding in the area of technological knowledge, there were a few who continued to struggle. It became apparent that there was a gap among teachers regarding their level of technology expertise. Some teachers needed more support during the professional development, while others were eager to learn the next software feature.

Observations revealed that most teachers could successfully match instructional strategies to technology and then the technology to curriculum. However, many teachers experienced difficulty when matching technology to both the curriculum and instructional strategies in a single Clicker6 lesson. Observations also showed that some teachers were stronger in their use of Clicker6 than other teachers. The stronger teachers demonstrated an ability to successfully integrate the use of Clicker6 software into their teaching content and instructional strategies.

Summarized, the findings suggest that teachers were positive with the structure of the professional development, the content delivered, and the support that was provided. Their identified areas of professional development strength included facilitator knowledge, support materials, relation to curricular objectives, and a few miscellaneous others. Ongoing professional development throughout the year, differentiated professional development, and continued support materials were cited as areas in which improvement was needed.

Recommendations

The following recommendations are informed by interviews, observations and survey data, as well as the findings reported by other researchers in the scholarly literature. These recommendations are intended to serve as resources when developing future professional development programs, specifically in relation to technology integration.

Use results from pre-assessment for differentiated teacher professional development.

Multiple sections of technology professional development programs should be offered as a way in which to meet all technology comfort levels. Teachers represent a wide-range of skill and confidence levels with regard to technology. It is unlikely that a professional development program can be implemented as a program that fits all (DeSantis, 2012). Furthermore, professional development programs need to be flexible and scaffolded to provide instruction to build technology efficiency among all of the teachers at their different levels of technical ability (DeSantis, 2012). The interview data supports this, as many teachers suggested having separate professional development tracks according to technology comfort level. Many expressed frustration by those who asked repetitive questions or could not accomplish simple technological tasks, such as opening and navigating files. Professional development programs should also be able to accommodate the range in pace so all teachers are working at their comfort levels. Doing so would accommodate teachers needing a slower-paced, less content heavy program, as well as those who are eager and ready to learn at a faster pace. The facilitator could then

tailor the sessions to provide more support and a hand-over-hand approach for the lower-level competency teachers. Those who have a background and stronger competency level in technology can move through to some of the more advanced features at a quicker pace.

Provide professional development that extends throughout the school year.

Successful professional development is ongoing and spans the entire school year. Often following a professional development, teachers are left on their own with little or no support to integrate newly learned technology. This style of professional development fails to build teachers' technical efficacy (DeSantis, 2012). Quick, Holtzman, and Chaney (2009), support that the more time teachers spend in professional development, the more likely that they will improve in that area. Teachers need several months to a year to transition the newly learned skill into practice (Loucks-Horsely & Stiegelbauer, 1991).

Feedback from the interviews supports teachers' preference to have continued professional development. They expressed concern about successfully learning the many features of Clicker6 and clearly articulated that the training should be offered throughout the school year. Clicker6 has many features that are not easily covered in one, or even two, full day sessions. Professional development should span over the course of the school year to ensure ongoing training and continued use of the Clicker6 program. As a result, teachers would receive a slower paced, more in-depth understanding of the software enabling them to focus on mastering a few functions at a time.

A monthly email communication with Clicker6 tips and tricks is recommended to accompany the ongoing professional development. This approach supports the hybrid model of professional development. Electronic videos and tutorials are a continued form of professional development, and these online resources and tutorials are a popular way to connect with teachers given their busy schedules (Phu, Vien, Lan & Cepero, 2014). Interview data confirmed teachers' preferences for printed tutorials to support what they had learned. Each month, an email with tutorials and directions about one new feature could be distributed. Teachers would then be able to work at their own pace, using the documentation, to learn the feature. This communication could also include updates and new additions to the software.

Provide opportunities for teachers to observe colleagues.

DeSantis (2012) states that professional development can be effective by pairing higher proficient teachers with struggling teachers. The classroom observations revealed that some of the teachers' use of Clicker6 was stronger than others, as evidenced by the number of teachers not receiving a competent score as per the observation rubric. Teachers can benefit from watching other skilled teachers integrate the software with students. The higher skilled teachers may also serve as models for those teachers needing additional support. A schedule could be created to ensure that teachers see the software being used in different classrooms, by different teachers, and with different students. These observations would give teachers a better understanding about how the software

could be incorporated in a variety of settings. It can also give teachers ideas about how to integrate the software in ways in which they may have not realized.

Provide instruction on management of classroom technology.

Observation data revealed the need for a session on managing student software use. Successful technology integration is directly related to effective classroom management. As a result, teachers may have to alter their established management principles to accommodate the use of technology with their students. With the integration of technology, teachers need to monitor students to make sure they are on task (Lim, Pek & Chai, 2005). It was evident that instructional time was wasted during student setup of the technology, and systems and processes need to be in place to ensure a smooth transition for both student and teacher. This session should focus on suggestions that aid students on using the software. Randolph, Scolari and Bedient (2000) support this idea and further recommend that teachers assign students as helpers to take care of routine tasks. Another suggestion for the teachers is to create shortcut folders on each student station desktop. Doing so would save student time when opening files that are shared by the teacher. Instead of opening the software and taking time to navigate to the files, students can quickly open the file from the shortcut on the desktop.

All subject area teachers could benefit from the use of Clicker6 software. The initial Clicker6 professional development was designed and arranged for ELA teachers only. However, Clicker6 has many features that may be used with any subject content and in any classroom. Interview data revealed that elementary school teachers, who

teach multiple subjects, believed they could use the software in other content areas as well. Additional professional development training should be arranged for those teachers as well. It should be uniquely developed, though, to focus on a specific curriculum. The structure of the sessions could remain the same, provided it is relevant to the curricular objectives of the group.

Provide Technical Troubleshooting Assistance

The final recommendation from the Clicker6 Professional Development Program is to add an additional session to address technical issues. As supported by Haddad and Draxler (2002), technical skills are necessary for teachers to implement technology. Technical training is effective in assisting teachers to feel comfortable using technology. The classroom observations demonstrated that teachers struggled with some of the basic equipment operations. When a technical issue arises, teachers tend to abandon the use of technology and go to “plan B.” While most of these issues have a simple fix, it would be beneficial for technology professional development to incorporate a trouble shooting session. This session could demonstrate tasks, such as trouble shooting the projector, making sure wires are connected properly, and force closing applications when needed.

Limitations

This study was primarily limited by its sample size and varying degrees of teacher technology comfort. The results may have been more consistent with a larger sample and separation of teachers by level of technology expertise. The abbreviated time frame in

which the professional development was administered, and subsequent data collected, is also a limitation. Continued professional development, combined with ongoing observation of Clicker6 integration, may have led to different findings.

The role of the researcher may have also created a limitation in this investigation. At the time of the study, the researcher served as the Director of Educational Technology at the PSFD. This professional relationship may have biased participants' responses out of their desire to please the researcher. The use of multiple data sources, however, was intended to address this limitation as well as safeguard from investigator bias.

Conclusion

“Technology and its applications can change the very ethos of schools as we have known them for more than a century, but, for that change to occur, teachers must have the technology knowledge and skills necessary for a, perhaps, different style of teaching and demonstration of learning” (Howland & Wedman, 2004). Professional development is vital in helping teachers create a classroom environment enriched with technology. In order to be effective, however, professional development needs to provide teachers time to learn new technology, understand the application of technology in classroom practice and reflect on classroom teaching with technology (Howland & Wedman, 2004).

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Appendix A

TEACHER TECHNOLOGY TRAINING SURVEY ADMINISTERED IN FALL OF 2014

PSFD Educational Technology Training				
1.	I feel that this school has provided training in support of using educational technology.			
	<i>Strongly Agree</i>	<i>Agree</i>	<i>Disagree</i>	<i>Strongly Disagree</i>
2.	I have been trained on the pieces of technology that have been provided for my classroom use.			
	<i>Strongly Agree</i>	<i>Agree</i>	<i>Disagree</i>	<i>Strongly Disagree</i>
3.	I have received follow up trainings for continued support in the technology that has been placed in my classroom.			
	<i>Strongly Agree</i>	<i>Agree</i>	<i>Disagree</i>	<i>Strongly Disagree</i>
4.	I often am given a piece of technology and have to learn how to use it on my own.			
	<i>Strongly Agree</i>	<i>Agree</i>	<i>Disagree</i>	<i>Strongly Disagree</i>
5.	Technology trainings at this school have focused on the use of technology in relation to curricular content.			
	<i>Strongly Agree</i>	<i>Agree</i>	<i>Disagree</i>	<i>Strongly Disagree</i>
6.	As a result of technology trainings, I have felt confident in using that technology.			
	<i>Strongly Agree</i>	<i>Agree</i>	<i>Disagree</i>	<i>Strongly Disagree</i>
7.	Half day technology trainings are an appropriate length of time.			
	<i>Strongly Agree</i>	<i>Agree</i>	<i>Disagree</i>	<i>Strongly Disagree</i>
8.	I prefer the shorter technology trainings that are approximately 1 hour and 30 minutes.			
	<i>Strongly Agree</i>	<i>Agree</i>	<i>Disagree</i>	<i>Strongly Disagree</i>
9.	I prefer full day technology trainings.			
	<i>Strongly Agree</i>	<i>Agree</i>	<i>Disagree</i>	<i>Strongly Disagree</i>
10.	In the past, I have changed my teaching practices to include technology as a result of the trainings.			
	<i>Strongly Agree</i>	<i>Agree</i>	<i>Disagree</i>	<i>Strongly Disagree</i>
11.	As technology has updated, I have received follow up support and training.			
	<i>Strongly Agree</i>	<i>Agree</i>	<i>Disagree</i>	<i>Strongly Disagree</i>
12.	When this school implements new technology, the staff is provided with complete training.			
	<i>Strongly Agree</i>	<i>Agree</i>	<i>Disagree</i>	<i>Strongly Disagree</i>
13.	I prefer to focus on one piece of technology per tech day as opposed to multiple tools in one day.			
	<i>Strongly Agree</i>	<i>Agree</i>	<i>Disagree</i>	<i>Strongly Disagree</i>
14.	It is important to have time to create class related materials with the new technology during training sessions.			
	<i>Strongly Agree</i>	<i>Agree</i>	<i>Disagree</i>	<i>Strongly Disagree</i>
15.	In past technology trainings, we have been given time to create class related materials.			
	<i>Strongly Agree</i>	<i>Agree</i>	<i>Disagree</i>	<i>Strongly Disagree</i>
16.	It is important to have time to collaborate with my colleagues during technology trainings.			
	<i>Strongly Agree</i>	<i>Agree</i>	<i>Disagree</i>	<i>Strongly Disagree</i>
17.	In past technology trainings, we have been given time to collaborate.			

<i>Strongly Agree</i>	<i>Agree</i>	<i>Disagree</i>	<i>Strongly Disagree</i>

Appendix B

TEACHER SURVEY

Technology Knowledge

Strongly Disagree = SD Disagree = D Agree = A Strongly Agree = SA

1. I know how to insert images/pictures/drawings into Clicker6	SD	N	A	SA
2. I can edit preferences to show instant pictures in documents and in the word predictor in Clicker6	SD	N	A	SA
3. I can successfully create matching activities in Clicker6 wizards	SD	N	A	SA
4. I can create learning grids for simple sentence activities in Clicker6	SD	N	A	SA
5. I know how to add video support to Clicker6	SD	N	A	SA
6. I know how to change preferences to increase/decrease the levels of support in Clicker6	SD	N	A	SA
7. I know how to save preferences to individual student profiles	SD	N	A	SA

Technological Pedagogical Content Knowledge

Strongly Disagree = SD Disagree = D Agree = A Strongly Agree = SA

1. I can teach lessons that combines ELA curriculum content with visuals support found in Clicker6	SD	N	A	SA
2. I can select the different activities in Clicker6 and integrate it into the appropriate curricular content	SD	N	A	SA
3. I can use strategies that combine curricular content, Clicker6, and Bedrock Literacy Curriculum teaching approaches in my classroom	SD	N	A	SA
4. I can participate in collaborative work with my colleagues in designing lessons which focus on the use of Clicker6, ELA curriculum, and Bedrock Literacy Curriculum teaching strategies	SD	N	A	SA
5. I have instructional materials created in Clicker6 that I can use in my classroom for ELA lessons.	SD	N	A	SA

Appendix C

OBSERVATION RUBRIC²

Clicker6 Implementation Observation Rubric				
Points Possible	4	3	2	1
Technology Logistics (Operating Technologies effectively)	Teachers and/or students operate technologies of Clicker6 were <u>very well</u> in the observed lesson	Teachers and/or students operate technologies of Clicker6 were <u>well</u> in the observed lesson	Teachers and/or students operate technologies of Clicker6 <u>adequately</u> in the observed lesson	Teachers and/or students operate technologies of Clicker6 <u>inadequately</u> in the observed lesson
Instructional Strategies & Technology (Matching technology to instructional strategies)	Use of Clicker6 <u>optimally supports</u> instructional strategies	Use of Clicker6 <u>supports</u> instructional strategies	Use of Clicker6 uses <u>minimally supports</u> instructional strategies	Use of Clicker6 <u>does not support</u> instructional strategies
Curriculum Goals & Technology (Matching Technology to Curriculum)	Use of Clicker6 in the lesson is <u>strongly aligned</u> with one or more curriculum goals	Use of Clicker6 in the lesson is <u>aligned</u> with one or more curriculum goals	Use of Clicker6 in the lesson is <u>partially aligned</u> with one or more curriculum goals	Use of Clicker6 in the lesson is <u>not aligned</u> with one or more curriculum goals
Technology Selection (Matching technology to both curriculum and instructional strategies)	Clicker6 lessons are <u>exemplary</u> , given curriculum goal(s) and instructional strategies	Clicker6 lessons are <u>appropriate but not exemplary</u> , given curriculum goal(s) and instructional strategies	Clicker6 lessons are <u>marginally appropriate</u> , given curriculum goal(s) and instructional strategies	Clicker6 lessons are <u>inappropriate</u> , given curriculum goal(s) and instructional strategies
Total Possible Points: 16 Minimum Competency: 3				

² Adapted from:

Harris, J., Grandgenett, N., & Hofer, M. (2010). Testing a TPACK-based technology integration assessment instrument. In C. D. Maddux, D. Gibson, & B. Dodge (Eds.). Research highlights in technology and teacher education 2010 (pp. 323-331). Chesapeake, VA: Society for Information Technology and Teacher Education (SITE).

Appendix D

TEACHER INTERVIEW QUESTIONS

Introduction

- Thanks for your time
- Explain the reason for interviewing
- Assure confidentiality
- Questions?

Questions

Impact of PD on teacher learning

How has the professional development program helped you acquire the technical skills needed to use the Clicker6 software?

What reservations do you still have about using Clicker6?

In what ways have you used the Clicker6 software in your classroom to meet your curricular goals?

What do you think are the advantages of using the Clicker6 software in your classroom?

What do you think are the disadvantages of using the Clicker6 software in your classroom?

How do you plan to continue using the Clicker6 software in the classroom?

What do you think could be a disadvantage?

Strength of the PD Program

What, if any, aspects of the professional development did you find helpful/beneficial?

How did the structure of the professional development enhance your ability to learn how to use the new software?

Weaknesses/Suggestions for Improvement

What aspects of the professional development could be improved?

Are there suggestions you want to add?

Appendix E

IRB APROVAL



RESEARCH OFFICE

210 Hullihen Hall
University of Delaware
Newark, Delaware 19716-1551
Ph: 302/831-2136
Fax: 302/831-2828

DATE: May 6, 2015

TO: Kristen Ferrari
FROM: University of Delaware IRB

STUDY TITLE: [742676-1] Examining the Design and Implementation of the Clicker6 Professional Development Program

SUBMISSION TYPE: New Project

ACTION: APPROVED
APPROVAL DATE: May 6, 2015
EXPIRATION DATE: May 5, 2016
REVIEW TYPE: Expedited Review

REVIEW CATEGORY: Expedited review category # (6,7)

Thank you for your submission of New Project materials for this research study. The University of Delaware IRB has APPROVED your submission. This approval is based on an appropriate risk/benefit ratio and a study design wherein the risks have been minimized. All research must be conducted in accordance with this approved submission.

This submission has received Expedited Review based on the applicable federal regulation.

Please remember that informed consent is a process beginning with a description of the study and insurance of participant understanding followed by a signed consent form. Informed consent must continue throughout the study via a dialogue between the researcher and research participant. Federal regulations require each participant receive a copy of the signed consent document.

Please note that any revision to previously approved materials must be approved by this office prior to initiation. Please use the appropriate revision forms for this procedure.

All SERIOUS and UNEXPECTED adverse events must be reported to this office. Please use the appropriate adverse event forms for this procedure. All sponsor reporting requirements should also be followed.

Please report all NON-COMPLIANCE issues or COMPLAINTS regarding this study to this office.

Please note that all research records must be retained for a minimum of three years.