UTILIZING THE CONCERNS-BASED ADOPTION MODEL IN A PROFESSIONAL DEVELOPMENT SERIES FOR TEACHERS IMPLEMENTING NEW TECHNOLOGIES

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The Supervisory Committee certifies that this ***disquisition*** complies with North Dakota State University's regulations and meets the accepted standards for the degree of

DOCTOR OF EDUCATION

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ABSTRACT

A growing number of school districts are adopting mobile electronic devices as replacements for textbooks and to improve test scores. Yet questions remain regarding staff preparedness, instructional and pedagogical transformation, and impact on student achievement with this increased use of mobile technologies in primary and secondary classrooms. This evaluation was part of a professional development series that was implemented with K-6 teachers in the process of implementing new mobile technologies into classroom instruction.

This professional development series provided a number of formal, informal, and impromptu opportunities for staff to learn new tools and practices for technology integration, as well as provide occasions to share and reflect upon technology employment practices. A key component to the series was the use of the concerns-based adoption model to track teachers' questions and concerns and to adjust the training accordingly.

This evaluation report was prepared to provide an overview of the variety of training sessions that were implemented, to document changes that were made based on feedback from staff, and to recommend appropriate modifications and goals for continuation of the professional development series. The overall evaluation data collected indicated evidence supporting the success of this model. Furthermore, there was strong evidence that participants had positive perceptions of the workshops, activities, and support provided through this model.

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DEDICATION

This dissertation is dedicated to my late mother,

Virginia Saathoff,

for instilling in me a love of learning and dedication to education.

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CHAPTER 1: INTRODUCTION

The purpose of this dissertation of practice was to carry out a professional development (PD) series to prepare the K-6 teachers in a small Minnesota public school to implement newly purchased mobile device technologies using transformational classroom instruction. Formative evaluation was conducted throughout the PD series for the purposes of informing ongoing refinement of PD offerings resulting in a summative evaluation report. This report details the findings of those evaluation efforts. It was prepared after six months of implementation to determine changes that were warranted as the district continued to use the PD series for ongoing technology integration training and support. The report encompassed formative and summative components that provided ongoing refinement of the PD program, as well as an indication of overall efficacy of the program.

Dissertation of Practice

A dissertation of practice involves identifying problems of practice that are concrete, significant, solvable, and tied to the mission and priorities of an organization; central to the methodology of a dissertation of practice is the task of framing an approach for investigation, informing solutions, and determining implications for the organization. Practical research and applied theories are the tools used for developing solutions to organizational problems of practice. Collaboration with key stakeholders, including the organization, the community, and individuals provides input to the resolution process.

Problem of Practice. In the fall of 2013, the Breckenridge (Minnesota) School District, which had a K-12 enrollment of 690 students, initiated a referendum campaign to increase the availability of technology in the district. The referendum included a tax increase that would fund the addition of new learning technology as well as a technology integrationist to assist the district

in training teachers to implement the technology. The goal of the referendum was to better prepare students for a 21st century workforce and to increase the focus on 21st century learning skills through improved instructional and pedagogical practices. The district defined 21st century learning skills as creativity, critical thinking, problem solving, communication, and collaboration. The problem of practice in this district was the need to assist and support teachers to integrate new technology devices into the teaching and learning process in order to transform instructional practices, as opposed to focusing solely on learning how to operate technology devices used in the classroom.

To accomplish this goal, a PD model was designed to empower teachers by providing opportunities to discuss the use of technology in their instructional practice, share curricular and instructional ideas with colleagues (increasing the variety of teaching strategies used in the classroom), and by providing encouragement and support for creative approaches to technology integration and pedagogical practices. The intention was to provide the district with a PD model based on research and applied adult learning theory that would support teachers in their efforts to explore and implement new instructional practices while taking advantage of new technological tools. It is believed this model, and the processes detailed within this evaluation report, benefit the district, as well as any district in the process of implementing new technologies and other initiatives.

This project was developed through inquiry and application of adult learning theories, allowing for consultation with established district administration and teacher leaders, responding appropriately to an authentic research need to impact and set the stage for this district in regards to this initiative, as well as for all districts when facing new initiatives moving forward. This evaluation points to the use of established theories to address problems of practice in order to

understand and manage the change process. Chapter 2 provides the complete evaluation report that was provided to the district. This report outlines the PD model and objectives; provides a review of the formative and summative assessments implemented as part of this evaluation; outlines the compete evaluation using Guskey's five levels of evaluation (2002); and provides recommendations for the continuation of this PD model.

Appendix A provides the conceptual frameworks for professional development and evaluation. It includes an outline of key theories surrounding the adoption of new innovations, as well as, current theories surrounding technology integration and pedagogical change. Appendix B outlines the complete PD series including how each session was conducted and outlines any changes that were made throughout the process. Appendix C provides additional observations that were made throughout the series implementation and during the completion of the evaluation report.

Appendix D outlines the results and comments from the mobile technology (LearnPad™) PD questionnaire given to staff approximately six months into the technology implementation process. Appendix E details the parameters of the PD model and the district providing a snapshot of district specific details for those looking to replicate this model in another district. Appendix F provides an overview of the authors' perspectives and biases and Appendix G provides the IRB approval from the granting institution.

CHAPTER 2: EVALUATION REPORT

Executive Summary

Introduction. This report was conducted by a participant observer, and was designed to analyze and evaluate the professional development model conducted for elementary school teachers working towards implementing new technologies in their classrooms. The professional development model was conducted between August 2014 and February 2015. This evaluation aimed to identify which parts of the professional development were most effective in supporting teachers' concerns and helping them to use technology with higher levels of usage as indicated by the Concerns-Based Adoption Model.

Overview. The participant observer collected data through formative and summative assessments throughout a professional development series provided to K-6 teachers. The series consisted of formal, informal, and impromptu workshops. The methods of analysis included thematic coding of written responses to formative feedback provided at the conclusion of each formal and informal training opportunity, analyses of impromptu observations and conversations (electronically and face-to-face), and analyses of a summative survey provided after six months of implementation.

Summary of Results.

- Results showed strong evidence that participants had positive perceptions of the workshops, activities, and support provided through this model.
- Workshop time set aside for reflection and sharing was viewed positively by participants.
- Teacher participants accepted and embraced the technology, however, survey results indicated teachers felt they did not have time to fully master the technology and did not feel they had all the resources needed to accomplish mastery.

- Time was a central issue for many of the participants.

Recommendations.

- Continue use of the Concerns-Based Adoption Model for technology integration, as well as for all initiatives being introduced to the district, in order to create a responsive and collaborative teaching and learning community.
- Explore options to better utilize the expertise of individual staff to provide training and support, thus building capacity within the teacher pool. Build partnerships within and between the staff members to provide a vehicle for shared cultural and professional values, ethics, and dispositions essential to professional educators.
- Be deliberate in targeting the overlap between curriculum, instruction, and technology in staff development opportunities. Use research-based approaches to transform the educational efforts of the district.
- Ensure long-term sustainability of this PD model through the utilization of knowledge and skills recognized within the teaching staff. Establish a dynamic learning community to provide support for and contribute to the district mission and values of providing a world-class education focused on the 21st century skills of creativity, collaboration, communication, critical thinking and problem solving.
- Identify a set of goals to evaluate the impact of technology integration on student learning outcomes, as well as addressing issues of equality and access for students of all socioeconomic backgrounds.

Sustainability of Model. Creation of a mentorship program would provide the amount of individualized support needed for this model. Paring teachers with more experience using technology with those seeking additional assistance would ensure a continuation of exploration

and encouragement of effective practices. Additionally, continued support from administration will ensure a focus on higher-level learning objectives that take advantage of contemporary teaching practices and technology integration. Several favorable factors point to strong public and administrative endorsement of ongoing technology implementation and professional development efforts, including:

- Support for an elementary teacher who wrote and received a $10,000 grant to purchase a classroom set of technology devices.
- A private donation of $35,000 given to the district earmarked for educational technology.
- Endorsement for a second teacher to apply for a $10,000 grant for classroom technology.
- Administrative encouragement and financial support for several teachers to attend a regional technology conference.
- Endorsement from administration for several teachers who applied and received an in-house grant, which provided financial support to attend a national technology conference.

Conclusions. Results indicated the professional development (PD) model was successful. Despite teachers not receiving a device or training until two weeks prior to the beginning of the school year, the majority of the teachers did move up the Levels of Use in accordance with the Concerns-Based Adoption Model and at the time that this evaluation was compiled those teachers were at the management level of use or above.

CHAPTER 3: EVALUATION FOR DEVELOPING TEACHER INNOVATION: A PROFESSIONAL DEVELOPMENT MODEL FOR TECHNOLOGY INTEGRATION

This evaluation report focuses on the PD training provided for implementation of LearnPads™ at the elementary school level and was conducted to assist the Breckenridge Schools staff and stakeholders with determining the impact and effectiveness of said PD on implementation practices. In addition to being a record for this district, this evaluation also serves as a reference for informing future PD practices and implementation for continued LearnPad™ deployment, as well as future technology implementation involving diverse technologies.

The objectives of the PD model for LearnPad™ implementation were to:

1. Transform instructional practices to effectively integrate mobile devices into the classroom.
    a. Advance understanding of the Substitution Augmentation Modification Redefinition (SAMR) model for technology integration and implementation of mobile devices.
2. Actively engage teachers in reflection on the development and implementation of new instructional practices.
3. Support teachers in developing lessons that present meaningful integration of mobile technology.
    a. Promote the creation and implementation of lessons/units integrating mobile technologies that target the upper levels of the SAMR model.

1) Promote the identification of one lesson to share/model/demonstrate to the staff during a mini tech camp at the conclusion of the professional development.

b. Encourage the use of mobile technologies for teaching 21st century skills, including creativity, critical-thinking, and problem solving.

In seeking to accomplish these outcomes, an ongoing PD program was implemented that sought to support and empower teachers involved in the process of implementing new technologies. Although this plan remained the essential roadmap for the program, ongoing, formative evaluation informed changes to the original plan for workshops, activities, and the technology showcase throughout the implementation period allowing for program improvements to be made to better fit the needs and time frame of the district and participant teachers. (See Appendix B).

Background

The school district facilities in which this study took place consist of two buildings in a small, agricultural community in the upper Midwest region of the United States. One building houses students, staff, and administrators for pre-kindergarten through grade eight, and is referred to as the elementary and middle school (EMS). This building includes offices for the superintendent, one principal, four administrative support staff, and the district technology integration specialist. The second building is several blocks away and houses classrooms, staff, and administrators for grades nine through 12, and is referred to as the high school (HS). The HS includes offices for one principal, two administrative support staff, and the district technology coordinator. The school district buildings also serve as a center for local initiatives, including community education classes, an after school child care program, and a thriving preschool.

According to the Minnesota Department of Education (2014), the district had a K-12 enrollment of 690 students in the fall of 2013. The student population was 4.3% Hispanic, 90.7% Caucasian, 1.5% Black, 0.1% Asian, and 3.4% American Indian/Alaskan. This district comprises 343.68 square miles surrounding an agricultural community that is situated on a state border. Directly across the border is a similar size community with a comparably sized public school system and a small K-8 parochial school. The school district buildings also serve as a center for local initiatives, including community education classes, an after school child care program, and a thriving preschool. There are 65 teachers employed for the district, 35 at the HS and 30 at the EMS. Twenty-percent of the teachers have five or less years of experience, and 46% have 15 or more years of experience. A majority (96%) of the teachers are Caucasian, with 54% being female.

In the fall of 2013, the school launched a campaign focused on three referendum questions. The first question asked for a renewal of an existing $700 per pupil levy for a continued operational budget. The second question asked voters to approve an additional $150 per pupil to provide educational technology services that would allow for age-appropriate educational technology to integrate with cutting edge curriculum. The additional technology levy was promoted as a need to accommodate "The World's Best Workforce"; a statewide initiative that mandates all state schools create a curriculum/technology integration plan. The third question on the referendum asked voters to approve $333 per pupil for maintenance and safety upgrades to the existing buildings within the district. On December 10, 2013, voters approved all three questions on the referendum. The district proceeded to purchase mobile devices and began the process of hiring a technology integration specialist to assist in the use of those devices.

At the time of the referendum, the school district already had computer labs for the elementary, middle school, and high school. In addition, the district had purchased tablet devices (iPads) in the summer of 2013 for six classrooms as a pilot program for the purpose of determining the advantages and disadvantages of incorporating mobile devices into the classroom. The pilot program was put into place at the beginning of the 2013 school year with limited goals or benchmarks for determining success of implementation. In addition, the district was unclear as to a specific PD plan for teachers participating in the pilot. After several months, the pilot teachers reported the advantages of using mobile devices in the classroom included the immediacy of accessing information on-the-fly and the use of mobile technologies for classroom management, including keeping track of attendance, grades, and using the device as an incentive for appropriate behavior.

This report offers an evaluation of the PD model implemented in the district after the passing of this referendum, specifically to meet expectations put in place by referendum question number two, which required a district technology/curriculum integration plan. The referendum question included a tax increase that funded a technology integrationist position to assist the district with training teachers to implement newly acquired technology. The goal of the referendum question was to better prepare students for a 21st century workforce and to increase the focus on 21st century learning skills through improved instructional and pedagogical practice. The district defined 21st century learning skills as creativity, critical thinking, problem solving, communication, and collaboration.

The participants for this study included all of the kindergarten through grade six classroom teachers, as well as special education, music, and physical education teachers for a total of 22 participants. This participant group was 95.5% Caucasian, with 83% female.

Participants were determined by the district decision to implement new tablet devices within the elementary grades, thus all teachers working with elementary grade level children participated in this PD. The PD activities were designed specifically to address individual and group concerns regarding these new devices and to assist with the challenges of adopting and implementing the tablets into classroom instruction. The participant group was informed of the study per the instructions approved by the university's Institutional Review Board (Appendix G).

Professional Development Model

The PD plan implemented in this district was generated through a review of literature and the development of a conceptual framework surrounding PD in education (see Appendix A). The focus throughout this PD implementation was to recognize and support participant teachers through a series of group and individualized seminars thus meeting present needs, by addressing current concerns, in order to empower teachers to make innovative pedagogical transformations as they implement mobile technologies in their own classrooms. Over the months in which this model was implemented, monthly trainings/workshops were provided in a formal setting. Through the workshops, teachers learned tools and pedagogical approaches for technology integration. Each of these workshops focused on a concern or particular implementation as indicated by a majority of participants through feedback supplied via two sources: exit slips from the previous workshop and face-to-face dialogue. During these workshops, the teachers participated in activities and completed tasks similar to that of students in order to better understand how their students would experience these activities while at the same time addressing the concern or implementation question at hand. After completing the activity, group discussion focused on how the activity could be changed to better fit various grade level and

instructional needs. This provided opportunities for teachers to develop plans to implement the new ideas into their particular context.

In the weeks between the formal workshops, informal "Let's Get Appy" sessions were offered on Wednesdays after school. These sessions provided opportunities for individuals and small groups to meet to share tips and tricks, delve into implementation questions, and explore additional resources available on the device. The purpose of these sessions was to support individuals and small groups so as to avoid frustration with technology implementation and mitigate the danger of rejection.

To further personalize support for implementation, a concerted effort was made to provide time with teachers on an individual basis, seen as impromptu opportunities. These occasions were delivered via face-to-face interactions, opportunities for classroom modeling and co-teaching, and by way of learning resources posted to a district technology blog. The personal interactions and classroom support presented occasions to target individual concerns in order to demonstrate and clarify meaningful solutions to meet those concerns and further each individuals trajectory forward on the Concerns-Based Adoption Model (CBAM). The district technology blog provided additional resources for those seeking examples of learning activities and instructional practices utilizing technology integration. Each consecutive workshop, whether formal, informal, or individualized built upon earlier workshops, thus giving teachers the opportunity to share classroom successes and collaboratively problem-solve challenges related to the integration of technology into their classrooms. A detailed summary and overview of the various workshops and opportunities that were provided to staff can be found in Appendix B.

Methodology

This section describes the evaluation of the elementary technology integration PD sequence implemented during the 2014 - 2015 school year. The plan for assessing the effectiveness of this PD model used Guskey's (2002) five levels of evaluation. Guskey's levels were chosen due to their grounding as an evaluation method specifically for professional development in education. This model is also particularly useful in its elegance; it provides a clear, focused, thoughtful, and intentional process for appraisal across various context and training delivery methods. Table 1 outlines the relationship between the levels of evaluation, PD goals, and data sources utilized throughout the evaluation.

The PD was presented through a series of formal workshops, informal question and answer sessions, and impromptu personal learning opportunities via one-to-one interactions and through distribution of informational material via a district blog. This cycle of PD took place over the first six months of the 2014-2015 school year. To evaluate whether the objectives for this model were met, a number of formative and summative assessment mechanisms were employed throughout the PD series.

Formative assessments. A detailed researcher journal was kept to document all portions of the PD implementation, emails, phone calls, face-to-face conversations, and classroom observations. The journal allowed for the recognition of themes relevant to the current utilization of technology and informed recommended PD practices. In addition, data were collected via exit slips (a short, three-question formative survey) that were collected following each of the formal PD workshops. This allowed for tracking the concerns and questions of participants and allowed the researcher to make adjustments for training and individualized support in order to best respond to participants' needs in the moment.

Table 1. Relationship between Evaluation Levels, PD Goals, and Data Sources.

Evaluation Level (Guskey, 2002)	PD Goals	Data Sources
1. Participants reactions to training	Engage in reflection on the development and implementation of new instructional practices.	• Exit slips • Researcher journal • Final feedback discussion • PD questionnaire
2. Participants' learning of material	Transform instructional practices to effectively integrate mobile devices into the classroom b. Understand the SAMR model for technology integration and implementation of mobile devices	• Exit slips • Classroom observations • Researcher journal • Review of LearnPad™ lesson portal • PD questionnaire
3. Organizational support and change	Place educational technology services into district classrooms for the purpose of integrating cutting edge curriculum and technology*	• Exit slips • Researcher journal • PD questionnaire
4. Participants' use of new knowledge and skills	Develop lessons that present meaningful integration of mobile technology c. Create and implement lessons/units integrating mobile technologies that target the upper levels of the SAMR model d. Identify one lesson to share/model/demonstrate to the staff during a mini tech camp at the conclusion of the professional development. Use mobile technologies for teaching 21st century skills, including creativity, critical-thinking, and problem solving.	• Exit slips • Classroom observations • Researcher journal • Review of LearnPad™ lesson portal • PD questionnaire
5. Student learning outcomes	N/A	• Researcher journal • Final feedback discussion

A specific PD goal was not articulated for the "Organizational support and change" level of this evaluation. This level of evaluation was omitted because it fell outside the purview of the technology integration position. The wording for the goals listed for "Organizational support and change" taken directly from the public referendum developed by the district.

Summative assessment. A final survey was conducted with the teachers at the conclusion of the first six months of technology implementation. Results of this survey provided evidence to the success and/or failure of the various components of the PD model to that point in time. The results informed the analysis and recommendations brought forth in this evaluation. This evaluation report serves as a summative assessment of this PD model and implementation, and it discusses the findings brought forth by the various data sources and the themes found therein. In addition, recommendations will be made for possible changes to be made for the continuation of this model. A detailed description of data methods and analysis can be found in Appendix D.

This PD model focused on providing support for teachers at critical junctures throughout the implementation of mobile devices in the classroom. From the start, district administration understood that technology utilization would not be accomplished simply through the act of putting devices into the hands of teachers and students. It was clear that preparation for implementation would require not only an understanding of how to use the technology, but must include knowledge of best practices for technology integrated instruction. See Appendix B for an overview of the intended implementation timetable as proposed prior to the start of the school year and a detailed summary of changes made to the original PD model.

Evaluation Using Guskey's Framework

Analysis of the PD program focused on four of the five levels of evaluation established by Guskey (2002). Specifically, these four levels are participants' reactions to training; participants' learning of material; organizational support and change; and participants' use of new knowledge and skills were the focus of this evaluation. The fifth level — student learning outcome goals — was not addressed in this study because it was apparent that appropriately

equipping teachers was prerequisite to measuring the impact of that training. However, some data and findings did convey possible avenues to target with regard to student learning outcomes as the district moves forward.

Participants' reactions to the training. This is the first of Guskey's evaluative framework, and it addresses the affective response to the PD program. Overall, participants' reactions to the PD training were positive. This was indicated through the questionnaire given six months after implementation of the PD series, where the majority of responses for positively worded statements (e.g., "I am excited about implementing LearnPads") were in the "agree" or "strongly agree" categories. Additionally, the majority of responses for negatively worded statements (e.g., The training workshops were too long) were in either the "disagree" or "strongly disagree" categories. This suggests that participants had positive perceptions of this PD model (see Appendix D). Staff, when asked for feedback on the formal training regimen, responded positively to the series. Comments focused on the enjoyment of working hands-on with the devices during training and working collaboratively with peers. Several participants expressed appreciation for individualized support and follow-up.

A critical objective in the structure of this PD series was to actively engage teachers in reflection on the development and implementation of new instructional practices. Exit slip responses indicated an appreciation for time that was provided for reflection and sharing. Responses to workshop exit slips, emails, and face-to-face interactions included the following statements:

- "The quick discussion today about what was working for everyone and what was not working was helpful."
- "I love sharing what we know."

- "Love the opportunity to collaborate with my peers."

In addition, several comments focused on suggestions for capturing additional opportunities for reflection and sharing. Those comments included:

- "Can you have us bring our stuff and create a lesson to 'take and go' back with us?"
- "It would be great to have a 'show and tell' time."
- "I would love to see what other teachers are doing with these in their classroom."

Participants' learning of intended material. This is the second of Guskey's evaluative levels, and it addresses the degree to which participants achieve mastery of the appropriate material; since the focus of this PD was on improving instructional practice, and not primarily on device use, the broader focus on pedagogical improvement was addressed. On the questionnaire administered at the end of the PD program, participants positive reactions to understanding the philosophy behind lessons designed for technology implementation (item #2) and how to integrate the technology (item #11) indicated an affirmative response to the goals set for this model (see Appendix D). This included the "Substitution, Augmentation, Modification and Redefinition" (SAMR) model that was used with the teachers throughout the training. The purpose of the SAMR model is to reinforce the notion that the purpose of technology integration is not simply to serve as "substitution" for existing classroom materials, but to enable "redefinition" of learning tasks and outcomes. Thus, teachers were encouraged to move forward through the S-A-M-R levels, always seeking to move from Substitution-Augmentation use of technology, which simply enhances curriculum, to Modification-Redefinition levels, which have a transformative impact on instruction. Although SAMR was not specifically discussed at every training session, it was clear that staff understood what the levels of the SAMR model might entail. One respondent wrote, "I liked the SAMR model!" and suggested additional discussion of

this model at the “Let’s Get Appy” workshops. Observations and exit slip responses also indicated many teachers often used the activities and applications taught during the formal workshops within their classrooms. Some of the exit slip responses included the following statements:

- “I’m going to try this today with my students!”
- “I felt this activity was something very relevant to the classroom. It was very easy to see how this could be used in the classroom.”
- “I would like to use this to review science vocabulary.”
- “I will try a lesson very similar to what we did today.”

It should be pointed out that classroom observation revealed that while teachers are utilizing the devices on a daily basis, a majority of this time was spent using the device for subscription “drill-and-practice” websites and applications (see table 2). In many cases, these websites and applications are focused on preparation for state-mandated testing. Although these “drill–and–practice” sites do not necessarily focus on the modification or redefinition of classroom activities with the use of technology, they are readily available and easily implemented when staff members are feeling under pressure to increase test scores and add instructional activities when already pressed to find time in a limited schedule. In spite of this reliance on non-transformative uses of technology, there is promising evidence of a general trend towards the higher levels (modification and redefinition) of SAMR and it is anticipated that with continued PD staff will implement technology with a focus on modification and redefinition of their instructional units on a regular basis and a greater focus on the higher order thinking skills will become more evident.

Table 2. Overview of Observations and Use of Device Apps.

Date	Observations	Apps added to student devices
Aug. 12, 2014 Tierney Bros. Trainer		Reading Eggs* Spelling City* Crafting Sentences Math Blaster Math Pack Flash Cards
Aug. 27, 2014 Teacher contracts start Review of management portal		Starfall* IXL*
Sept. 15, 2014 LearnPads rollout	• Majority of teachers have removed camera access on student devices	
Sept. 23, 2014 Management portal tips/tricks		Study Island* AR* Accel. Math* Math game app
Late Sept.	• Teacher builds document camera stand • Several teachers request tech resources for reading comprehension • A few teachers are taking pictures of classroom activities with teacher device • Grade level teachers start sharing resources or plan/create in joint portal	
Oct. 1, 2014	• Upper level elem. continue using computer labs almost daily • 3-4 teachers are using their teacher LP for personal email, etc. (also take it home) • Late Adopter #1 requests assistance with introducing the devices to the class	
Oct. 15, 2014	• 4-5 teachers comment positively re: management portal; esp. the dashboard • One teacher using the hand-in folder on a regular basis (daily) • 2 teachers have not entered the management portal since August	**October apps:** Awesum Math Igloo Shopping Know Your Math Facts Venn Diagram Read Naturally* States & Capitals Game Photosynthesis Math Playground Kindergarten Kids Words

Table 2. Overview of Observations and Use of Device Apps (continued).

Date	Observations	Apps added to student devices
Oct. 15, 2014 (continued)		**October apps (continued)** Reading Phonics Phonics Spelling Preschool Rhymes Numbers & Addition Kindergarten Math Class Counting Robot Kindergarten Math Bingo Study Island* Math Playground Spelling Island* CNN Student News
Oct. 22, 2014	• 1 teacher using Lensoo Create for students to demo & record their understandings • The same teacher is using Socrative for formative assessment	
Oct. 27, 2014	• Referendum update public meeting (approx. 30 attendees) • Volunteer teacher demos the management portal for those in attendance • Principal states that she observes LP utilization on a daily basis	
Oct. 28, 2014 Vocabulary activity with Pic Collage app (collaboration, creation)	• K, 1, 2 teachers report difficulty with dragging items on scree, skipping when drawing, etc. • Majority of teachers have added access to the camera	Pic Collage added to student devices by majority of teachers immediately after PD lesson
November – all month	• Pic Collage being used by several teachers (nouns, plural words, prepositions, defining science terms, etc.)	
Nov. 12, 2014	*Let's Get Appy* has 10 attendees (covered Words w/Bees, Mathead)	**November apps:** My Storybuilder Skitch Grammar Blast Third Grade Learning Doodle Toy Kids Draw Naviance* Place Value Abacus Safari Units Pic Collage
Nov. 17, 2014	• Late Adopter #2 introduces Pic Collage & CNN Student News to students • Questions arising about app store: how to purchase, purchasing disabled apps, finding apps from Google store but not in LP store	

Table 2. Overview of Observations and Use of Device Apps (continued).

Date	Observations	Apps added to student devices
Nov. 25, 2014 Math word problems using Comic Strip It app (collaboration, creation)	IXL* (daily usage) Study Island* (daily usage) AR* (weekly usage)	Comic Strip It added to student devices by majority of teachers after PD lesson
December – all month	• Gr. 5 using 13 Colonies webquest • Early elem. using a number of storybook apps (stories are read to student, words highlight so they can follow along)	**December apps:** ABC Geoboard Picture Match Vowels Family Word Sort Write Scholastic Videos KidRex Mission US Thinkfast CNN Student News Comic Strip It Tumblebooks Hour of Code Light Bot Shordor Interactive Pic Collage Comic Strip It
Dec. 5, 2014	• Late Adopter #3 introduces CNN Student News to students	
Dec. 17, 2014	*Let's Get Appy* has 4 attendees (introduced resources from Read/Write/Think)	
Dec. 23, 2014 Teacher-led demos Using LPs as a document camera Socrative & Kahoot for formative assessment	IXL * (twice daily) Study Island* (daily) AR8 (every other week) CNN Student News (weekly)	
Christmas break (Dec. 24 – Jan. 4)		
Jan. 12, 2015	• A second teacher has built her own document camera stand, "very excited to start using it (LP) this way"	**January apps:** Kahoot Facts for Me Multiplication Two Ways Times Table Games Jefferson Lab Gr. 4 Test Prep Broken Calculator A Plus Math Alternative Energy Kids Energy in Motion Little Alchemy NPR News Read/Write/Think Socrative
Jan. 13, 2015	Principal announces staff goals for remainder of year, including: - By the end of the 2014-15 school year, teachers and student will maintain the amount of time they use LearnPads for instructional purposes as indicated by random weekly check that include number of minutes used per week - By the end of the 2014-15 school year, teachers and students will increase their use of LearnPad applications for instructional purposes from substitution type applications to creative/productive applications as indicated by random weekly checks indicating what applications the students have used	

Table 2. Overview of Observations and Use of Device Apps (continued).

Date	Observations	Apps added to student devices
Jan. 20, 2015	• Third grade teacher presented Socrative and Kahoot to MS staff (very excited & has additional ideas to share)	
Jan. 21, 2015	Email re: LearnPad app store, "At this time we are not adding apps to our content store. Due to issues in licensing apps across multiple devices in a school district, we can only assist users who have contacted developers and have obtained permission to use that app in their school. It really comes down to permissions, which is why we have given that decision to each school. If they get the permission and the apk file, we can help them load it – but unfortunately that's the extent of it right now according to policy."	
Jan. 27, 2015 Reading fluency using Tellagami & Audioboo (creation)	• Teachers ask about using Audioboo in conjunction with coursework to display for parent/teacher conferences	
Jan. 28, 2015	*Let's Get Appy* has 2 attendees (explored ways that Tellagami & Audioboo have been used in the classroom – videos examples)	
Jan. 29, 2015	• Teacher set up a Twitter acct • Planning on students "writing sentences for an authentic audience"	
Feb. 2, 2015	• Two teachers have finished recording student work (Audioboos) & have it posted in the hallway	**February apps:** Tellagami Audioboo Earth or Mars Natural Resources Broken Calculator Animoto Discovery Education Haiku Deck MathStudio MindMeister Happy Numbers Highlights for Kids School House Rock SimpleMind
Feb. 3, 2015	• Another teacher has students recording work on Audioboo for hallway displays	
Feb. 24, 2015	• Evaluation survey given to staff; Discussion about what has been done & suggestions for moving forward	

Organizational support and change. This is the third of Guskey's evaluative levels, and it addresses the impact the PD program had on group behavior and the resources used. The organizational support and change that took place in this model was evidenced by support in budget, policy, and practice. The PD that surrounded the implementation of mobile devices in the elementary classrooms involved a commitment to instructional change and to build capacity for staff leadership. Administration provided the time and space to provide ongoing PD to staff, allowing for an environment of collegial support and encouraged experimentation and risk-taking within the staff. In addition, resources and time where dedicated to providing the opportunity for a small contingency of elementary staff to attend a regional technology conference. This opportunity opened the door for these individuals to recognize the leadership abilities within themselves. This resulted in the individuals seeking to share their new knowledge and excitement for technology integration at one of the formal workshop trainings. These individuals also applied for and receive grant monies to attend an international technology and learning conference, with the intention of creating a learning seminar for staff upon their return.

Soon after purchasing the mobile devices, one of the elementary teachers approached administration for approval to write a $10,000 grant to purchase a classroom set of the devices that had been chosen. District leadership encouraged her to complete the grant application and asked for local support to encourage representatives from the grant-approving entity to consider this teacher's proposal. She was awarded the grant and when the nation-wide grant was made available again, administration encouraged and supported a second teacher to submit a proposal.

Overall, survey results indicated the majority of staff felt respected by district leadership when it came to their contributions and input regarding technology integration (item 16 in Appendix D). Survey responses from teacher participants regarding this input included:

- "We were consulted about how to organize the technology showcase with parents."
- "We were part of the decision process for choosing the LearnPads™."
- "We gave input for using technology with the Books & Breakfast morning."
- "I was asked to be part of the community referendum showcase."
- "I was asked to present to the staff on how to use Socrative and Kahoot for assessment."
- "I was asked to go to the TIES conference."

It should be noted that throughout the implementation of this model, teachers spoke positively of receiving support from peers, community members, and the school's administration. This helped establish a beneficial cultural of camaraderie and learning amongst the teacher participants.

Participants' use of new knowledge and skills. This is the fourth of Guskey's evaluative levels, and it addresses the impact the PD program had participant adoption of the innovations introduced in training. Evaluation of what and how well participants learned new content and skills were evident through comments provided in the exit slips and through classroom observation. It is clear from both the quantitative and qualitative data that participant teachers took activity ideas from the PD workshops and applied them to create new and engaging lessons in their curriculum. Responses from the exit slips indicate an enthusiasm for implementing lessons and activities from workshop into the classroom. Teacher responses included:

- "I used it [the activity] right away this morning."
- "I would like to use this [activity] to review science vocabulary."
- "I will try a lesson very similar to what we did today."

- "I would use this [activity] to initiate a unit. Also to review."
- "I used that activity with my students and they just loved it! I definitely think we will be using that again soon."

It was observed that when the devices were first introduced to the classrooms, all of the grade levels except one removed access to the device camera during student use. Yet, after the second workshop at which an activity using the camera was introduced to the staff, all of the grade levels returned access to the camera on all student devices. Since that time, many lessons and activities have used the camera as a tool for completing an activity or to document understanding of lesson objectives. Allowing camera access opens the door for more creative approaches to demonstrating learning objectives for students. In addition to allowing access to the camera, it was observed that the resources initially used in technology-enhanced lessons focused solely on subscription websites used for drill-and-practice routines. After each of the workshops, resources and applications used in the workshop activity were added to classroom lessons and the majority of teachers also found additional resources and applications that targeted higher-order thinking skills.

This, unfortunately, does not mean the use of subscription "drill-and-practice" resources decreased. These resources remained and their use increased over several months. Discussion with staff regarding this phenomenon was explained as the need to practice for upcoming state assessments. District goals moving forward are the hopes of seeing a noticeable shift in pedagogy as new instructional patterns emerge. It is anticipated that over time and with continued support, staff will incorporate more team teaching, project-based instruction, and individually-paced instruction with a greater focus on the higher-order thinking skills and a decrease in the focus on electronic drill-and-practice instruction focused solely on preparation for

state testing. In tracking the use of applications and websites incorporated into lessons and added to the student devices over the initial six months of implementation, it was established that teachers increased the utilization of applications requiring creation and problem solving on the part of the students. The use of these types of applications continues to be explored and remains a focus for continued PD.

Student learning outcomes. This is the fifth of Guskey's evaluative levels, and as noted earlier it is not explicitly addressed in this evaluation. Because this was the initial implementation of this PD model, it was determined that evaluating student learning outcomes at this time would not provide useful evaluation data. Administration and district leaders recognized the importance of improving instructional practices and establishing instructor fluency with 21st century learning approaches prior to evaluating student learning outcomes. However, in light of observations and discussion with participants regarding their thoughts about how student learning outcomes might look in terms of criteria and possible data sources did provide recommendations for future evaluation. Potential outcomes in this area are discussed along with recommendations in the next section of this evaluation.

Discussion and Recommendations

The implementation of this PD model was successful on a number of fronts. In particular, the increase in affirmative exit slip responses and the percentage of participant teachers who demonstrated a move forward in the level of technology use indicate readiness to adopt new technologies and modify instructional practices (See Figure 1). The use of the CBAM in identifying the level of concern for individual teachers and the effects these concerns have on the level of use of the technology within the classroom was key in providing support for these individuals and promoting greater success for instructional practices with technology. The

evaluation data collected during the six months of implementing new mobile devices indicate a positive experience for participants. The percentage of affirmative comments gathered from formal workshop exit slips increased throughout the evaluation period.

It should be noted that approximately 34% of the staff indicated concern or discontent with implementing mobile devices when asked for feedback following the initial August training prior to the start of the school year. An outside trainer hired through the company from which the technology was purchased provided this particular session. The level of discontent declared by the teaching staff was likely due to the hired trainer simply showing the teachers how to use the technology. This person did not necessarily take into consideration or address any of the concerns present at this time. It may have been advantageous for the district to recognize and support early concerns prior to this initial training, prior to any technology use in order to assuage any barriers due to negative perceptions regarding technology attributes.

Yet, the exit slip provided on the first day of school indicated only 14% of respondents remained frustrated at that point. This may indicate that even the preliminary interactions with teachers to address some immediate concerns had a significant impact on the efficacy of the PD program. The percentage of affirmative responses continued to rise throughout the fall semester of school. There was a slight dip in the number of affirmative responses at the December workshop. This is likely due to the timing of the event just before the holiday break. Figure 1 demonstrates the percentage of affirmative responses given at the completion of each formal PD session during the first several months of the model implementation.

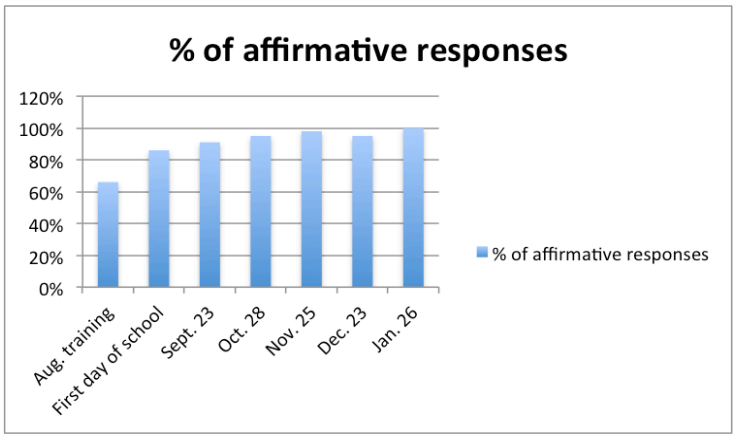

Figure 1. Percentage of Affirmative Responses to Technology Integration as Provided by PD Exit Slips.

The rise in affirmative comments is significant in the fact that Loucks-Horsley (1996) points out, "If a person's needs are addressed at the stage they are at, then they can move to new levels of practice. If their professional development needs remain unmet, they can easily become stuck at some lower level of development, perhaps even for the rest of their career" (p. 7).

Throughout the implementation, tracing participant comments and actions of implementation within instructional practices were monitored. The goal of this research was to recognize the concerns of participants and to provide support and resources allowing them to move to the higher levels of the CBAM. To accomplish this, comments from exit slips, emails, and conversations were analyzed for themes using an open coding methodology. These comments were tracked by date to trace when any changes to the identified themes. The coded themes were compared to an analysis of key words from previous CBAM research. By positioning key comments from the exit slips and classroom observations within the conceptual framework established using the CBAM, one is able to delineate where individual staff are situated in regards to this model (See Table 3). The concerns and behaviors indicated in the following chart are specific to this particular organization and specific to the device being used by this institution for classroom implementation.

Table 3. District Concerns and Behaviors within CBAM.

Level of CBAM	Concerns/Behaviors Demonstrated at Breckenridge During Implementation
Non-use: No interest shown for the innovation, no action is taken	• Teacher of elective course did not check out device for teacher use and did not use device with students in class.
Awareness: Expresses no interest in learning about the innovation	• "I really don't see how I would use this device in my discipline. I don't think I should spend any more time on training if I'm not going to use it."
Oriented: Seeks information about the innovation or makes plans to gather information	• Emails technology integrationist questions accessing teacher portal and finding discipline-specific resources.
Informational: Expresses interest in learning and understanding more about the innovation	• "How do we request to get more apps in certain areas?" • "I want a refresher of the basics (using the device)."
Preparation: Prepares to use innovation (not just information seeking)	• Creates resources and lessons within the teacher portal.
Personal: Expresses concerns about the effects of the innovation on them as an individual	• "I'm feeling overwhelmed." • "Once school gets going, I'll need help." • "I need to do it 2, 3, or more times to get it." • "I feel like I need a refresher because it's more complicated than I thought it would be."
Mechanical use: Attempts to make changes to innovation to better organize time and materials	• Creates lessons using all resources for a day or week rather than by individual lessons (reducing number of times a lessons needs to change on the device)
Management/Consequence: Concerned about materials, time, and organizational practices; related to how use impacts client (students)	• "I don't have time to look for resources that would work." • "Worried about down time with students when the device freezes up or isn't working in some way."
Routine/Refinement: Satisfied with implementation, uses innovation in current context; begins to explore client (students) benefits	• Using device on a daily basis for a morning opening activity, for students to access current events, or to access test preparation sites.
Collaboration: Expresses concerns related to what colleagues are doing with the innovation	• "Is it possible for teachers to have a joint portal so we can create lessons together?" • "Would like to see what other teachers are doing in their classrooms with the LearnPads."
Integration: Begins collaborating with other users to increase client (student) outcomes	• Grade level teachers create joint lessons in a shared portal. • Teachers share resources with staff at all levels, particularly resources focused on assessment.
Refocusing: Expresses concerns around improvements to innovation or the implementation process	• Not observed
Renewal: Begins exploring major modification; explores alternatives to innovation	• Not observed

At the conclusion of this study, a careful analysis of where each of the teachers were positioned on the CBAM based on face-to-face discussions, classroom observations, and analysis of classroom lessons implementing technology integration found that two teachers remained at the Awareness level (for this particular device), three at Preparation, four at Management, four at Routine, four at Refinement, two at Collaboration, and three at Integration. Ongoing support for all of these individuals remains a focus in order to influence the success of mobile technology integration in the classroom.

It is important to note that the two instructors who remained at the Awareness level for implementation for this particular device did integrate a different device (iPads) into their instruction. The iPad was better suited to their instructional needs within the disciplines that they were teaching: physical education and speech pathology. In this case, the teachers were not resistant to the technology (LearnPads™) it was simply that the technology was not able to fulfill their instructional needs. Thus, if the technology does not fit the teacher's instructional needs, then moving forward on the Concerns-Based Adoption Model would be difficult, if not impossible, for those individuals.

The importance of training and support for individuals in the process of change is evident in the many comments collected from workshop exit slips, emails, and face-to-face interactions. This is not to say that individual training was the only portion of the program that was well received by teachers; there were also positive responses from the PD questionnaire for the formal workshops, informal trainings, impromptu one-on-one support and the availability of the technology blog. This district, similar to other districts across the nation, is experiencing significant changes in the way it approaches education as a whole. The constant influx of new curricula, strategies, and theories naturally leads to feelings of uncertainty, anxiety, and self-

doubt for individuals. The importance of addressing individual concerns when adopting new initiatives is key to facilitating adoption. Through recognition of individual concerns and anxieties and providing support to ameliorate negative feelings, districts can plan for greater success and acceptance during times of change.

Early indications of success for this PD model warrants its ongoing utilization as the district continues to implement technology across all grade levels. Coupled with deliberate technology investments by the district, and a responsive approach that is sensitive to the concerns and insights of teachers, this model does provide a viable template for additional initiatives throughout the district. Indeed, the CBAM lends itself to use with any initiative within the district, whether technology-based or not.

Recommendation: Continuation of the CBAM to recognize and support individuals in the process of change when introducing new initiatives within the district.

- This PD Model provides a template for continuation of technology integration and for implementation of any other future initiatives within the district.
- Continued use of the CBAM will promote a responsive and collaborative teaching and learning community.

When introducing new technologies for classroom integration, staff members need time prior to implementation of devices within the classroom to work with the device. The advantage of providing this orientation period prior to implementation is that it allows for training to begin and early concerns to be adequately addressed. In this case, it would have been helpful for staff to receive a device and training on using the teacher portal in the spring prior to implementation. Training through the spring would have allowed teachers to begin developing a comfort with using the online site where they collect resources for use with the LearnPad™ and begin

developing appropriate lessons for technology integration. By starting the training several months in advance of classroom implementation, teachers would also have the summer months to experiment and explore possible lesson plans and develop a better understanding of classroom instruction involving technology integration during a period free of the daily classroom stress. In addition, the teaching staff has a plethora of skills and expertise that can be shared within the district. The district could take advantage of this expertise to grow its pool of resources to strengthen the pedagogical skills and knowledge within house.

There are many alternatives available for small group and individualized instruction for adults. It could be conducive to improved professional development for the district to look towards technology as a way of furthering its staff development agenda. Options for differentiated adult learning that harness the use of technology might include providing access to a library of online training videos relevant to staff needs; providing a series of staff development seminars (webinars) via Google Hangouts or Skype so that staff can participate from home or anywhere with an Internet connection.

Recommendation: Explore additional options for staff development to better meet the individual needs of staff. This should include taking advantage of the knowledge and skills available within the district, continuing to build capacity within its teacher pool. Building partnerships within and between the staff members will provide a vehicle for shared cultural and professional values, ethics, and dispositions essential to professional educators.

- Provide dedicated time for teacher collaboration, planning, and learning.

- Examine the timeline for roll out of future technologies with considerations to providing training and support for a minimum of one semester to staff prior to implementation with students.
- Examine alternatives for small group and individualized support; could technology play a greater role in providing support?

A greater focus regarding the purpose of technology in instruction should be addressed early in the PD model and continue as an integral part of the school culture. The introduction and use of the SAMR model within this district provided teachers with a target when thinking about how they can improve their practice through the use of technology. It is essential to constantly look at how technology can make learning more transparent, relevant, shareable, and accessible if we are to take full advantage of what technological tools bring to the table.

Such a framework can assist with avoiding the common mistake of integrating new tools or apps for the sake of using something new. Teachers often become enamored of new apps or websites and attempt to start lesson planning with the technology first, endeavoring to find some way of using the "latest and greatest" in instruction. It must be made clear from the start that technology is simply a tool and the prime focus must remain on learning. Assisting staff on lesson creation by focusing on the learning objectives first in order to be thoughtful and deliberate about the use of technology for meeting those objectives is essential for the long-term success of any technology initiative.

Currently, staff development remains compartmentalized between curriculum, instruction and technology. This conveys the message that technology is separate from curriculum and instruction, adding to the misconception that technology is "one more thing to add" to the educational routine. Through staff development practices that integrate curriculum, instruction,

and technology, teachers would gain a broader perspective of how technology can support their efforts in curriculum and instruction. It would drive home the idea that technology is simply a tool and through appropriate integration of that tool, students can become more engaged in the curriculum and instructional practices can target higher level thinking skills in new ways.

Ways of targeting the overlap between curriculum, instruction, and technology could include the inclusion of technology integration goals into instructional goals for PLCs (professional learning communities) or inclusion of similar goals in individual yearly evaluation goals for teachers. Remaining cognizant of this intertwined perspective when planning staff development opportunities would promote a district cultural perspective regarding the importance of all three areas and help target the upper levels (modification and redefinition) of the SAMR model in regards to technology integration.

Recommendation: Continue to build on technology integration growth with regard to the SAMR model. Be deliberate in incorporating this model into future PD.

- Present staff development in a format that combines curriculum, instruction and technology as integrated components of effective pedagogy, using research-based approaches to transform the educational efforts of the district.

Currently, the district involves teachers in various committees to share in the planning and decision-making surrounding PD opportunities, curriculum purchases, and grant opportunities. Those efforts have helped create a sense of ownership within the district. In addition, two of the current elementary staff members were asked to provide training at one of the formal PD sessions for technology implementation. Both commented on the sense of pride, not only in their own work, but also in the work of others on staff after this opportunity was presented. As stated earlier, the district can take advantage of skills and expertise that the

teaching staff can offer. Through strategic coordination, the district can increase its pool of in-house resources and reduce its need to bring in outside expertise. A key factor in this type of arrangement will be the need to reduce other duties for those teachers in order to provide time for preparing and sharing their expertise. By identifying those who are competent with a skill, highlighting their successes, and providing supportive and collaborative assistance between colleagues provides opportunities for teachers to be recognized for their ongoing efforts. Through these types of efforts teacher collegial mentoring can ensure a continuation of exploration and encouragement into effective teaching practices and not just maintain the status quo.

Recommendation: Build capacity through the use of high-performing teachers as peer mentors, particularly for less experience teachers and for those who exhibit reluctance in integrating technology into their instructional practices. Establish a dynamic learning community to provide support for and contribute to the district mission and values of providing a world-class education focused on the 21st century skills of creativity, collaboration, communication, critical thinking and problem solving.

- Provide time for teacher preparation and sharing by reducing other duties for those teachers identified as mentors.
- Ensure long-term sustainability of this PD model by capitalizing on the expertise and enthusiasm of high-performing teachers. This will require formalized acknowledgment and procedures for directing and utilizing the efforts of these educators.

During discussions with staff regarding current implementations and future goals for continuation of this PD model, conversation touched on possible student learning outcomes.

Suggestions from staff on this topic included measuring improvements in math and reading scores through the use of scores attained on test preparation websites such as Accelerated Reader and IXL (a site for test preparation in math and language arts at K-12 levels). Another suggestion was to implement a student digital portfolio, which would allow students to post superior work that meets or exceeds required learning outcomes. These portfolios could follow a student throughout his or her K-12 education career and provide a clearer picture of what was learned.

Although outside the scope of this evaluation, the field of affective learning may provide a useful frame for evaluating the success of future integration efforts as it addresses issues of student engagement and positive emotional connection to courses, topics, and instructors. Affective learning theory addresses the emotional facet of learning (emotional responses to learning environments), which has been shown to be a strong indicator of future students success. The development of positive student affect for learning in the elementary grades can impact learning well beyond schooling and into their adult lives. Raver and Knitzer (2002) wrote that a link has been established between social/emotional development and behavior of young students and school success. The authors noted that, "The first line of defense in promoting school readiness across all developmental domains (including social, emotional, cognitive, and physical) should be to ensure that every child… has access to a quality early care and learning experience, marked by classrooms with warm teachers and a predictable, stimulating atmosphere" (p. 12).

Additionally, a 2013 study exploring positive affect with the implementation of educational technologies found, "Emotional and affective aspects… need to be explicitly accounted during the design of technology for educational purposes" (Hayashi & Baranauskas, p. 66). Examples of this type of learning include the use of collaborative exercises so students can

develop the skills for empathizing and discussing alternative solutions. Additionally, the development and exploration of hypotheses and drawing conclusions can challenge students to take independent risks and defend their propositions, thereby increasing their self-confidence and therefore increasing positive affect for the topics they are studying. Supplemental research exploring this field includes, but is not limited to, Jones and Issroff (2005), Hamre and Pianta, (2013), and Weissberg and Cascarino (2013), and Farmer, Hamm, Lane, Lee, Sutherland, Hall, and Murray (2013).

Recommendation: Identify a set of goals to evaluate the impact of technology integration on student learning outcomes, as well as addressing issues of equality and access for students of all socioeconomic backgrounds.

- Evaluate the pragmatic impact of technology on teaching and learning. Will the intended impact on achievement involve efficiency, effectiveness, or productivity? What will the role of technology play in learning and equality in terms of access for all socioeconomic backgrounds? How should that role be identified?
- Document the effect of technology on instructional practices. Will there be an expectation that technology supplant certain classroom instruction? Will technology be a supplement to classroom instruction? What might teachers and learners stop doing as a result of the use of technology?

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APPENDIX A: REVIEW OF LITERATURE

It is expected that the numbers of districts adopting some type of mobile (electronic) device will continue to grow as schools use the devices as a replacement for textbooks and laptops (Chou, Block, & Jesness, 2012). The increase in adoption and use of mobile devices (e.g., smart phones, tablets, e-readers) in primary and secondary education is rapidly altering the educational scene in America and the world, yet questions abound regarding staff preparedness, instructional and pedagogical transformation, and impact on student achievement (Chou, Block, & Jesness, 2012). The authors cite a 2010 Ed-Tech Statistics survey, which found that 88% of public schools have written policies regarding acceptable use for student cell phones. The authors also cite sources indicating 2000 school districts in the United States have adopted electronic devices.

For more than 30 years, educators have discussed technology integration in teaching and learning (Lowther, Strahl, Inan, & Ross, 2008). With a strong focus on teaching 21st century skills, the focus on teaching standards, and the increase in technology integration in public schools, the need for professional development (PD) is recognized as a key component in preparing teachers to implement new criteria into their classroom instruction (Borthwick & Pierson, 2008).

As early as 2001, the National Staff Development Council (NSDC) noted that central to making improvements in the classroom is the execution of effective ongoing learning for the educators themselves. The updated NSDC Standards for Professional Learning report (Learning Forward, 2011) noted, “Leaders throughout the pre-K-12 education community recognize effective profession learning as a key strategy for supporting significant school and school system improvements to increase results for all students” (p. 28). In his article on evaluating PD,

Guskey (2000) echoed this sentiment, in emphasizing the importance for high-quality PD in all areas of educational reform and school improvement.

Constructs

Defining mobile devices. Chou et al. (2012) define mobile devices as iPads, iPods, netbooks, laptops, and cell phones with Internet capabilities. Traxler (2005) describes mobile devices as handheld computers and mobile phones that are personalized, connected, and interactive. El-Hussein and Cronje (2010) characterize these devices as those that can be pocketed and utilized anywhere a learner can receive transmission signals. The authors provide some specifics regarding these devices in naming cellular telephones, "smart" phones, iPods, and personal digital assistance devices (PDAs) as mobile digital devices.

For the purposes of this discussion, Traxler's definition of mobile devices will be used, as it provides less brand specificity (i.e. iPads) and a more general description. Issues can be taken with of his use of the term "personalized" when it comes to mobile devices. Arguments can be made that personalization to a specific user's needs or preferences is not necessarily a key feature of the mobile devices used in education, particularly in educational environments where shared devices are common.

Traxler (2005) warns that focusing definitions on the hardware and the readily apparent capabilities and deficiencies of that hardware, we are unable to recognize the "unique pedagogic advantages and characteristics" that these technologies bring to education (p. 263). This underscores the idea that education is not about the device; it is about the learning (Borthwick & Pierson, 2008; Lawless & Pellegrino, 2007; Hord & Roussin, 2013). Therefore, Traxler (2005) focuses on the terms mobile learning (m-learning) and electronic learning (e-learning) rather than focusing on specific device implementation.

Several characteristics separate m-learning from e-learning, the key difference being e-learning is "tethered," meaning it has to be connected to the Internet in order to be functional, either physically or wirelessly. M-learning is characterized as spontaneous, portable, informal, personalized, and interactive. It has also been described as bite-sized, lightweight, situated, and context aware (Traxler, 2005).

Defining professional development. Learning Forward (formerly the National Staff Development Council) (2011) defined professional learning as "the means by which educators acquire or enhance the knowledge, skills, attitudes, and beliefs necessary to create high levels of learning for all students" (p. 12).

Loucks-Horsley (1987) defined PD in education as the engagement of teachers in a variety of opportunities for growth in knowledge and skills. The author was clear that the terms "staff development" and "PD" can be used interchangeably. Sparks and Loucks-Horsley (1989) recapitulated this definition when describing staff development as "those processes that improve the job-related knowledge, skills, or attitudes of school employees" (p. 41).

PD activities, synonymously referred to as inservice education, teacher training, or staff development (National Academy of Sciences, 2006) have been the focus of school districts across the nation since a study by Carpenter, Fennema, Peterson, Chiang, and Loef (1989) found that teacher PD could improve student achievement. Since then, policy makers have worked towards improving the quality of teaching and raising student achievement through the use of PD (Wayne, Yoon, Zhu, Cronen, & Garet, 2008).

For the purposes of this discussion, the terms "staff development" and "PD" will be used interchangeably and apply the definition provided by Learning Forward (formerly the National Staff Development Council) as it provides the broadest definition of the term.

Technology in Education

The No Child Left Behind Act of 2001 has placed an emphasis on schools to recruit and retain high-quality teachers, which have been defined as individuals possessing content and pedagogical knowledge with the ability to make data-driven decisions in order to differentiate instruction (Ertmer & Ottenbreit-Leftwich, 2010). The use of technology tools to accomplish the tasks of differentiated instruction and data-driven decision making is beneficial (Ertmer & Ottenbreit-Leftwich, 2010), allowing for the possibility to "adopt new and arguably better approaches to instruction and/or change the content or context of learning, instruction, and assessment" (Lawless & Pellegrino, 2007, p. 581).

Current approaches to using technology in schools are most often viewed as simply a means to increase the effectiveness of traditional instructional approaches, such as improving productivity through tools such as word processors, increasing communication through the use of email and threaded asynchronous discussions, and expanding access to information via Web browsers (Dede, 2010). Yet, these practices still reflect a 20th century pedagogy of teacher-centric instruction focused on direct instruction and lecture following the order of the textbook chapters. To implement technology with a focus on 21st century teaching and learning, teachers will need help in understanding how to use that technology to "facilitate meaningful learning, defined as that which enables students to construct deep and connected knowledge, which can be applied to real situations" (Ertmer & Ottenbreit-Leftwich, 2010, p. 257).

Borthwick and Pierson (2008) referenced a 2006 study by Sparks that found only 7% of school teachers are technologically advanced enough to integrate technology effectively into their instruction, raising concerns as to the preparedness of teachers to implement technology. Lawless and Pellegrino (2007) echoed this concern when they wrote it is unclear if students will

"have access to teachers who know how to use that technology well to support 21st-century learning and teaching" (p. 578). Borthwick and Pierson (2008) quoted Former Secretary of Education, William Bennett, "[when] teachers aren't trained to teach differently with the help of [computer] equipment, all too often they end up forgetting its latent benefit allowing students to play games or roam the Web" (p. 12).

Booth (2013) writes that schools find the adoption of mobile devices important for a several reasons, including:

- Allowing for collaborative learning and teaching
- Allowing for curricula adaptation to make learning interactive and engaging for students
- Enabling a learning environment where students act as authors and doers, no longer passive consumers of educational materials
- Supporting differentiated learning
- Providing access to types of devices students will be using in the future
- Providing access to Internet and Web 2.0 tools for all economic backgrounds (equalization)
- Integrating the classroom environment with students lives
- Increasing ability to take advantage of new learning materials (e.g. E-textbooks, apps)
- Supporting project-based learning
- Making learning accessible anytime, anyplace
- Presenting school as technologically savvy to all stakeholders

Despite all the positive beliefs surrounding the implementation of mobile technology into classrooms, the road to integration is not always smooth or easily attained. Lawless and

Pellegrino (2007) wrote, “evidence suggests that technology is often poorly integrated with other classroom instructional activities” (p. 580). Chou et al. (2012) point to specific challenges to mobile technology integration, including app selection, technology support, device management, and PD. The term app is short for application, which refers to a self-contained program or piece of software designed to fulfill a particular purpose and is generally downloaded by a user to a mobile device.

Potter and Rockinson-Szapkiw (2012) discuss that with classroom technology, teachers will be required to shift their thinking from “dispenser of all knowledge” to that of facilitator. The authors point out that “teachers who believe strongly in teacher-delivered, lecture-based instruction will be highly unlikely to consider technology for student learning activities” (p. 25).

Booth (2013) reports that districts who have found success with mobile device adoption and integration report pedagogical changes resulting in student-centered classrooms where the teacher has become a facilitator or coach. The successful schools also reported that decisions regarding technology adoption were focused on devices in relation to teaching and learning. These successful schools recognize the importance of teacher preparation and planning time to adoption program success. Adoption success was attained through sustained PD, which was viewed as fundamental to the transformation of teaching and learning. Strong, ongoing leadership was also viewed as important for developing expectations for new pedagogical practices.

Professional development as an enabler of technology integration. Ertmer, Ottenbreit-Leftwich, Sadik, Sendurur, and Sendurur (2012) wrote the lack of implementing new technology is most often due to lack of effective PD. A 2008 National Education Association study found only 43% of survey participants found technology-related PD useful, the remaining participants

felt PD was too focused on learning how to use the software versus integrating it into the teaching and learning process. In any PD targeting technology integration, it is important to recognize that change is an ongoing process requiring time investment and ongoing support in order to gain success with individuals undertaking change (Borthwick & Pierson, 2008). Essentially, individuals need to "unlearn" previous practices, which can only be done through intellectual, emotional, and social support in order for a transformational relearning of new practices can result in deep behavioral changes that will shape 21st century educational practices (Dede, 2010). Teachers need to be convinced that new technologies will actually improve student learning outcomes before they will change their instructional practices (Borthwick & Pierson, 2008; Ertmer et al., 2012). Borthwick and Pierson (2008) wrote, "Learning new technical skills is one thing, but learning how to effectively integrate technology into teaching is something entirely different" (p. 11).

Regulatory aspects of professional development. Borko (2004) wrote, "the No Child Left Behind (NCLB) Act of 2001 requires that states ensure the availability of 'high-quality' PD for all teachers" (p. 3). Yet, NCLB provided no clear definition of high-quality PD, only stating that scientifically-based research should be used as the determinant. The only stipulations NCLB put in place regarding PD stated that activities must include the following (National Coalition for Parent Involvement in Education, n.d.):

- State standards, assessments, and be grounded in scientifically-based research.
- Focus on core subjects.
- Determined by local needs for PD, teacher and administrative recruitment, and hiring should be decided through needs assessment.

- Designed for teachers to meet qualification requirements and retain "highly qualified" status.
- Integrate teacher technology training to help teachers better meet the learning styles and needs of students.
- Designed to help teachers improve student behaviors, use data for instructional improvement, and improve communications with parents.

With the advent of No Child Left Behind and Common Core standards, it is obvious that educational reform has become a primary concern in the U.S. educational system. And central to educational reform is teacher PD (Guskey, 2002; Lawless & Pelligrino, 2007; Wayne, et al., 2008; Jenkins & Agamba, 2013).

Criticisms of professional development. Questions surrounding what constitutes effective, "high quality" PD have led to an ongoing search for the most effectual staff development format. Such considerations have lead to a great disparity in the value of development activities provided. "The quality of staff development experienced by many teachers and administrators varies considerably from year to year and even from teacher to teacher in the same school" (National Staff Development Council, 2001, p. 5). Traditional formats for PD have been strongly criticized for being mundane and unengaging. Many PD days consist of single training days that often offer topics unrelated to each other. Borthwick and Pierson (2008) wrote, "This single-day, one-size-fits-all model assumes that the audience of teachers use similar teaching methods with identical groups of students. As a result, there is very little change to overall teacher attitudes or skill levels with regard to the use of technology" (p. 10). "For many educators, staff development has traditionally been synonymous with workshops, courses, and presentations by 'experts'" (National Staff Development Council, 2001, p. 7).

Guskey and Yoon (2009) echoed the views of many when they wrote, "Criticized as the epitome of ineffective practice, many education leaders regard workshops as a waste of both time and money" (p. 496). The criticism of traditional PD formats have focused on lack of time, activities, and content necessary for increasing teacher knowledge and advancing relevant change in classroom practice (Birman et al., 2000).

Guskey (2000) wrote, "Educators themselves frequently regard PD as having little impact on their day-to-day responsibilities. Some even consider it a waste of their professional time" (p. 4). This sentiment about PD seems to indicate that educators have difficulty envisioning the purpose of PD that does not focus specifically to individual teaching disciplines or needs. Many districts have struggled with finding appropriate avenues for delivering effective PD that would result in increased student achievement. "Staff development… is often subject to the fad du jour and does not live up to its promise of improved teaching and higher student achievement" (National Staff Development Council, 2001, p. 20). Guskey and Yoon (2009) explored the connection between PD and student learning improvement. The authors discussed the findings of a comprehensive analysis of 1,300 studies on the correlation between PD and student achievement. In a dismal result, only nine of the original 1,300 studies "met the standards of credible evidence set by the What Works Clearinghouse, an arm of the U.S. Department of Education" (Guskey & Yoon, 2009, p. 496).

In many cases, verifying the effectiveness of PD models on improving classroom practices has proven to be problematic (Jenkins & Agamba, 2013). Desimone (2011) points out that many studies on PD focus on teacher satisfaction, attitude change, or teacher commitment to innovation rather than looking at the particular processes that make PD effective. The author also states that measuring the effectiveness of PD is also precarious due to the variety of experiences

and interactions that can qualify as learning experiences (e.g. informal hallway discussions with peers, structured seminars, personal learning networks).

Lack of effectiveness may be due to the way PD is conducted by school leaders. Darling-Hammond, Chung Wei, Andree, Richardson, and Orphanus (2009) wrote that many districts employ the occasional, one-shot workshop, which typically last less than a day, focusing on discrete topics with little connection to the district or school philosophy or educational goals. In many cases, the disconnect between the workshop topics and actual classroom practice are left to the imagination of the teachers and leave little or no time for serious consideration of the topic, in addition to providing little time for classroom implementation or reflection on impact of student learning (Darling-Hammond et al., 2009).

Guskey (2002) wrote that teacher change through PD will happen after teachers see desired student learning outcomes after classroom implementation. Yoon, Duncan, Lee, Scarloss, and Shapley (2007) countered that teacher change occurs during, and directly following, PD and therefore is evidenced prior to seeing desired student learning outcomes. Loucks-Horsley (1987) points to the issue of PD leaders designing activities pertinent to their own concerns, rather than seeking to focus on the concerns of teachers, as a common error in PD. Hence, the author recommends that teachers' concerns be resolved and answers provided as they emerge. This can be accomplished through understanding "where people are" during the change process so that staff developers can tailor support and help for teachers (Hall & Loucks, 1978). Loucks-Horsley (1987) suggests the Concerns-Based Adoption Model (CBAM) as a beneficial framework in understanding the feelings and skills of individuals as they are introduced to and implement new ideas, practices, or innovations.

In addition, Ham (2010) wrote evaluating technology-related PD is particularly problematic when thinking in terms of measurable student outcomes. Due to the combination of varied learning outcomes, the varied nature of technology tools, classroom contexts, and more, it becomes difficult to assign specific learning outcomes to specific technologies used in a particular way (Ham, 2010). Overall, even with the availability of technology tools, most classrooms have yet to fully integrate these technologies into instructional practices or transform educational practice (Levin & Wadmany, 2008; Harris, Hofer, Blanchard, Grandgenett, Schmidt, Van Olphen, & Young, 2010).

Looking at PD focused exclusively on mobile devices, Chou et al. (2012) contend that student engagement or productivity will not change simply with the use of mobile devices. The authors cite a Pepperdine University 2012 study that found challenges and benefits to mobile devices in the classroom focused on the areas of support, compatibility, and integration. Potter and Rockinson-Szapkiw (2012) reiterate these concerns in stating that PD is needed to assist teachers with learning how to use a technology device, yet learning how to operate the technology cannot be the primary focus. "Typically, the training teachers are offered has little effect on pedagogical classroom practices and allows insufficient time to increase or sustain new methods. It is targeted only at operating equipment rather than instructional techniques for integration." (Potter & Rockinson-Szapkiw, 2012, p. 23).

Defining effective professional development. Guiding teachers, policymakers, and local communities towards rethinking the beliefs, values, assumptions, and cultures that have traditionally been fundamental to schools' industrial-era operating practices is a major, often unrecognized challenge in PD. An example would be 50-minute class periods that present insufficient time for deep inquiry and active learning by students (Dede, 2010). If advancing

student learning outcomes is the primary purpose of PD, then the first goal of any PD model should be to change the way each teacher actually teaches (Guskey, 2002).

PD should provide teachers time to experiment, permission to change the way they do things, and the opportunity to make mistakes along the way (Sparks, 1997). Lawless & Pelligrino (2007) wrote that PD of the highest quality must include "longer duration (contact hours plus follow-up), provide access to new technologies for teaching and learning, actively engage teachers in meaningful and relevant activities for their individual contexts, promote peer collaboration and community building, and have a clearly articulated and a common vision for student achievement" (p. 579). A number of characteristics for successful staff development programs were outlined by Loucks-Horsley (1987). These characteristics include:

- Collegiality and collaboration
- Allowing for experimentation and risk-taking
- Promoting disciplined inquiry into teaching practices and effective practices
- Participant involvement in goal setting, implementation, evaluation, and decision-making
- Time for staff development and for incorporating new knowledge
- Administrative support
- Appropriate incentives and rewards
- Understanding of adult learning principles and the change process
- Integrating teachers' personal goals with school/district goals
- Embedding staff development into the philosophical and organizational district/school structure

Recent research articles have explored these characteristics in greater depth and have reduced the number of key characteristics for best practices in teacher PD to six key features (Desimone, 2009; Guskey & Yoon, 2009; Birman, Desimone, Porter, & Garet, 2000; Jenkins, 2013). Those six features include:

- Active Learning: participants engaged in interactive activities (e.g., Observations, planning, practicing, feedback)
- Content Focus: subject matter content to improve instructional practice and student achievement within the classroom
- Coherence: the connection and continuity between existing and previous knowledge; new knowledge; teacher learning
- Duration: the number of hours, weeks, or months of training activities
- Format: activities integrated into daily instructional practices
- Alignment: Aligning PD with standards, other school initiatives, teacher goals, and assessments.

Active learning. Borthwick and Pierson (2008) state that contemporary models of PD are becoming more personalized for teachers with just-in-time instructions and ongoing support and through encouragement to self-reflect and exchange ideas as a collaborative learning group, new teaching strategies are emerging. The authors write that interactive PD is the most effective tool for inspiring pedagogical and instructional change. Darling-Hammond (1998) discussed two common scenarios in which formal PD takes place in education: demonstration by a presenter or hands-on training. The author argues that one scenario provides a better learning opportunity compared to the other. In one scenario, the assumption is that workshops in which participants are led step-by-step by imitating the hands-on process provided by the presenter will result in a

successful start for the participants. However, when people are simply asked to follow directions, they are doing very little to internalize the learning experience. One the other hand, if the training requires the participants to watch a demonstration first, followed immediately with hands-on time, then the responsibility and desire to complete the task, thus actively participate in the learning, is turned back to the participant (Darling-Hammond, 1998).

Content focus / subject matter. Guskey and Yoon (2009) wrote that PD focused on specific subject-related content or pedagogic practices would be most likely to lead to student learning improvements. Wayne et al (2008) reiterated this understanding when they wrote that PD focused on teachers' behaviors demonstrated limited results on student learning, whereas program content directed at teachers' knowledge of their subject, curriculum, or on how students learn demonstrated greater results on student learning. PD focused on improving technology integration should target content and performance improvement (Chou et al., 2012). Content comprises the pedagogical and technological contents that facilitate student learning advancements. Performance improvement comprises a teachers' ability to "do the job well" (Chou et al., 2012, p. 15).

Coherence. Birman et al (2000) discussed coherence as consistency between PD activities and state, "activities that are consistent with teacher goals, build on earlier activities, are followed by additional activities, and involve teachers in discussing their experiences with other teachers and administrators in the school" prove to be effective in improving teacher learning and development (p. 31).

Duration. Extensive research has expand on the description of suitable PD as intensive, sustained over a period of time, and job-embedded with a focus on subject content (Wayne et al., 2008; Darling-Hammond, Chung Wei, Andree, Richardson, & Orphanos, 2009). Darling-

Hammond et al. (2009) state U.S. teachers do not receive the intensity and duration of PD necessary to impact instruction and student learning, supporting research that found "PD of 14 hours or less has no effect on student learning, while longer-duration programs show positive and significant effects on student achievement" (p. 20).

Format / job-embedded. PD that is formatted to include job-embedded activities is not common in many schools (Darling-Hammond et al., 2009). DeMonte (2013) wrote that job-embedded activities might include teachers working collaboratively with a teaching coach, an instructional facilitator modeling a specific instructional strategy before teachers try the strategy within their classrooms, or a teacher sharing a video clip of her teaching with colleagues for feedback and suggestions. Job-embedded activities are authentically related to teacher instruction and are aligned to what a teacher does or should be doing (DeMonte, 2013).

Alignment. PD activities that are supported by national, state, and district goals and standards provide an additional level of consistency for teacher learning (Birman et al., 2000). DeMonte (2013) wrote, "the work of improving instruction to help students achieve deserves our attention, particularly now when it is an important part of powerful reforms" (p. 3). A recognition of this need to improve instruction through the development of appropriate PD designs can be seen in the number of PD models focused on creating high-quality professional learning opportunities (DeMonte, 2013).

Professional Development Models

Sparks and Loucks-Horsley (1989) discuss two conceptualizations of the term "model" in reference to staff development. Both of these conceptualizations stem from earlier research regarding adult learning and staff development.

The first comes from the work of Ingvarson (1987), whose use of the term model as a design for adult learning incorporating assumptions related to how knowledge about instructional practices should attained and how teacher knowledge should be acquired and/or extended. The second conceptualization comes from Joyce and Weil's (2008) interpretation of the term "model," in which the authors describe a staff development model as a plan or sequence that becomes a guide for the design of a staff development program.

In either case, a staff development model incorporates a number of critical attributes, including (but not limited to) collegiality, experimentation, time to assimilate new learning, designs based on adult learning principles, appropriate and relevant implementation and evaluation (Loucks-Horsley, 1987; Sparks & Loucks-Horsley, 1989; Guskey, 2002).

These attributes are discussed in the context of five staff development models analyzed by Sparks and Loucks-Horsley (1989). These models included individually-guided staff development, observation/assessment, development/improvement process, training, and inquiry. The training model is often seen as synonymous with staff development for most educators (Sparks & Loucks-Horsley, 1989).

The training model. Sparks and Loucks-Horsley (1989) describe the typical learning outcomes in a training model as those focused on knowledge (e.g. participants will be able to explain the principles of adult education), as well as skill development (e.g. participants will demonstrate the appropriate use of presentation tools in the classroom). The authors claim the fundamental assumption of the training model is that certain teacher behaviors and classroom techniques are worthy of replication. They continue that teacher behavior can change and new classroom techniques learned through training.

Depending on the intended PD outcome, training may include demonstrations or modeling of skills, simulations, performance feedback, or workplace coaching. Discussion and peer observation are cited as important activities as a part of training (Sparks, 1983). Discussion is a useful sharing and problem-solving tool when presenting new concepts or techniques and after participants have had the opportunity to try new techniques (Sparks & Loucks-Horsley, 1989).

The important attributes of the training model include the power to alter teachers' knowledge, attitudes, and pedagogical skills (Sparks & Loucks-Horsley, 1989). Essential aspects to consider in designing a training model include who will make decisions regarding the substance of the training (e.g. content, objectives, schedule), who will provide the training, what classroom assistance will be provided and how after the conclusion of the training (Joyce & Weil, 2008). Classroom assistance after training is critical to the transfer of new knowledge, attitudes, and skills. This can be accomplished through modeling new skills, peer observation, and/or coaching (Joyce & Showers, 2003).

A framework for designing professional development. Originally designed as a PD framework for math and science educators, the PD design framework introduced by Loucks-Horsley in the 1998 book, Designing PD for Teachers of Science and Mathematics, has been repurposed for implementation in a number of disciplines (Sun, Heath, Byrom, Phlegar, & Dimrock, 2000). Sun et al. (2000) describe this model as transforming a detached PD design with restricted offerings into a design that is a "systematic and systemic approach" (p. 124). These authors note that the Loucks-Horsley design depicts key elements and processes used for PD that are applicable to a variety of content and process applications. (Sun et al., 2000; Mundry & Loucks-Horsley, 1999).

The Loucks-Horsley framework suggests a sequence of generic planning phases: setting goals, planning, doing, and reflection. These planning phases are surrounded by a set of inputs that inform the planning process: understanding of the PD context, critical issues common to the content or process, knowledge base and beliefs, a range of PD strategies (Sun et al., 2000; Mundry & Loucks-Horsley, 1999). The framework is meant to be an reflexive process where each input informs a particular planning phase, indicating when that input is most important for PD developer consideration, yet the inputs will continue to inform the remaining sequences throughout the planning process. Reflection by the PD leader at the end of the sequence will inform the inputs, as well as the goal setting and planning for the PD design (Sun et al., 2000; Mundry & Loucks-Horsley, 1999).

An update to the Loucks-Horsley model was made in recent years to reflect new understandings of PD design and evaluation (Loucks-Horsley, Stiles, Mundry, Love, & Hewson, 2009). The updated version of the framework includes three additions to the planning sequence (Loucks-Horsley et al., 2009). At the beginning of the planning sequence, two new sequences include a commitment to the vision and standards of the district or organization, and an analysis of the student learning and other data relevant to the content or process. The updated approach also adds evaluation as the final sequence to the framework (Loucks-Horsley et al., 2009). The assumption is that evaluation will impact the goals, strategy planning, strategy selection, and strategy implementation going forward, as well as the vision and standards resulting in appropriate changes and modifications to the PD planning process.

Evaluation

Several studies point to the importance of evaluation at the conclusion of PD to provide meaningful feedback regarding the effects and processes of the PD (Loucks-Horsley, 1987;

Sparks & Loucks-Horsley, 1989; Guskey, 2002). Chou et al. (2012) points to formative evaluation throughout technology-related PD as an important element to improving the adoption and integration process, as it provides the opportunity to implement timely assistance to teachers and make just-in-time adjustments to training protocols.

Guskey (2000) described three key characteristics of PD evaluation, noting that it must be intentional, ongoing, and a systematic process. The point being that evaluation should be purposefully or intentionally designed, typically involving a combination of qualitative and quantitative methods to provide thorough and thoughtful information. Thus, data provided through evaluation should be sound, meaningful, and reliable. Ongoing evaluation is provided through formative assessment for the purpose of yielding information regarding whether the activities are going as planned and if expected progress is being made. Finally, the PD process needs to include evaluation that is a systematic part of the PD process, with clear reasons and an explicit intent for the evaluation (Guskey, 2000).

Guskey (2002) describes five levels of information that should be collected and analyzed as a part of the evaluation process for PD. The author explains that with each successive level, the process of gathering the evaluation information becomes more complex.

Level 1: Participants' reactions. This is the most common form of evaluation and the easiest to gather and analyze. This level addresses whether or not participants liked the PD experience. This level of evaluation would explore questions regarding whether the information provided was useful to whether the coffee was ready on time. Evaluation data is most often gathered via a questionnaire at the completion of the PD session or activity.

Level 2: Participants' learning. This level of evaluation focuses on the knowledge and skills that participants gained through the PD experience. The evaluation data can be collected

either thorough a open-ended questionnaire (e.g. Describe the critical attributes of collaborative learning), through a simulation or skill demonstration, or through a personal reflection or portfolio that documents their learning. This level focuses on the attainment of specific learning goals, which must be outlined prior to the PD experience.

Level 3: Organization support and change. This level of evaluation targets the characteristics and attributes of the organization that are necessary for success of the PD activities. Guskey (2002) explains that if organizational policies or practices are not aligned with the activities that are promoted through PD, then the implementation of those activities will be sabotaged. Evaluation data at this level can be gathered via questions focusing on the support and level of encouragement provided by the organization.

Level 4: Participants' use of new knowledge and skills. Evaluation data at this level is generally gathered after some time has passed to allow participants time to adapt to new ideas and practice within the context of their classrooms. Gathering the data can be done through questionnaire, interviews, personal reflections, or participant journals or portfolios. It is important that clear indicators regarding the degree and quality of implementation are made clear at the start of the PD experience.

Level 5: Student learning outcomes. This level of evaluation focuses on whether the PD activity had an affect on students. Data at this level is gathered through measurements of student learning, including portfolio evaluations, grades, and scores from standardized tests. Information from Level 5 data provides guidance for the improvement of PD program design, implementation, and follow-up.

Stages of Instructional Evolution

The Apple Classrooms of Tomorrow (ACOT) was a long-term research project that began in 1986 (Dwyer, 1994; Borthwick & Pierson, 2008). Four years into the project, Dwyer, Ringstaff, and Sandholtz (n.d.) documented the outcome and reported on the Stages of Instructional Evolution. This was, essentially, a set of five stages of pedagogical changes that participating teachers moved through as they implemented new technologies into their instruction. Dwyer et al. (n.d.) described these stages as:

1) *Entry*. Teachers with little or no technology experience feel a sense of trepidation about their own ability to use new technology in their classrooms. At this stage, teachers began working on creating an understanding of technology and how it could be used in the classroom. As teachers slowly implemented technology, they generally faced issues of classroom discipline, resource management, and personal frustration.
2) *Adoption*. As teachers became more comfortable with technology, they developed skills and strategies to effectively cope with challenges that arose during instruction. Even with classroom and resource management improving, the use of technology continued to be used for drill-and-practice instruction. "Students continued to receive steady diets of whole-group lectures and recitation and individualized seatwork" (p. 4).
3) *Adaptation*. Teachers became comfortable integrating technology resulting in new instructional strategies that improved student productivity. At this stage, the authors reported improvement in student engagement quality.
4) *Appropriation*. Technology became an effortless teaching tool resulting in a salient shift in instruction and collaboration amongst teachers. Along with notable increases in team

teaching and project-based instruction, teachers' roles changed from information dispenser to facilitator as students engaged in improved peer interaction.

5) *Invention*. A new learning environment developed with the use of technological resources. Teachers at this stage viewed learning and instruction as active, creative, and social resulting in fundamental changes to instructional design.

As teachers are exposed to new technologies, they are faced with the decision of whether or not adopt the technology and integrate it into their instruction. The process of deciding whether or not to adopt an innovation was first documented by Rogers in his 1962 book, Diffusion of Innovations. Rogers became interested in exploring the distribution and adoption of new practices and ideas based on personal observations of the agricultural community in which he was raised. His work came out of the perplexity, curiosity, and frustration he felt regarding the delayed adoption of new ideas and practices within the farming community. Rogers' work on the diffusion of innovations has grown to encompass a wide range of topics and disciplines.

Innovation decision process. Rogers (2003) defined innovation as "an idea, practice, or project that is perceived as new by an individual or other unit of adoption" (p. 12). An innovation can be physically concrete, such as a new technology device, or it can be abstract, such as a new pedagogical technique. The innovation decision process describes the steps through which an individual or group (e.g. school district) goes through when deciding whether to adopt a new innovation. Rogers (2003) described the innovation decision process as "an information-seeking and information-processing activity, where an individual is motivated to reduce uncertainty about the advantages and disadvantages of an innovation" (p. 172). This process involves five steps: 1) knowledge, 2) persuasion, 3) decision, 4) implementation, and 5) confirmation.

Knowledge. The knowledge stage of the innovation decision process involves recognition of the existence of an innovation (Rogers, 2003; Borthwick & Pierson, 2008; Sahin, 2006). This recognition is characterized by questions asking how, what, and why. Rogers (2003) wrote that individuals attempt to find out "what the innovation is and how and why it works" (p. 21). Three types of knowledge also characterize this stage: 1) awareness-knowledge, 2) how-to-knowledge, and 3) principles-knowledge (Rogers, 2003; Sahin, 2006). Awareness-knowledge indicates the recognition of an innovation's existence. This knowledge may persuade an individual to extend their understanding of the innovation, may lead to innovation adoption, and may move the individual into one or both of the other knowledge types (Rogers, 2003). How-to-knowledge represents the ability to use an innovation correctly. Rogers (2003) recognized this knowledge type as essential to innovation decision process, as an individual must have a sufficient amount of how-to-knowledge in order to increase the possibility of adoption. Sahin (2006) wrote that even faculty with technical backgrounds may not integrate technology into teaching if they have limited knowledge of how to use the technology correctly.

Lastly, principles-knowledge represents a fundamental understanding of how and why an innovation works. Rogers (2003) wrote that innovations can be adopted without this knowledge, but misuse due to lack of principles-knowledge could eventually result in discontinuance of the innovation. Sprague, Kopfman, and Dorsey (1999) wrote the greatest barrier to using technology in teaching was a lack of understanding why or how to integrate technology into instruction by staff.

Persuasion. The persuasion stage of the innovation decision process occurs when an individual frames his or her attitude toward the innovation after gaining a degree of knowledge regarding the innovation (Sahin, 2006). Rogers (2003) wrote that the knowledge stage is

cognitively centered, whereas the persuasion stage is more affective- (feeling-) centered. At this stage, an individual's opinions and beliefs surrounding the innovation are influenced not only by the innovation's functions, but by social reinforcement from colleagues, peers, and others. "While information about a new innovation is usually available from outside experts and scientific evaluations, teachers usually seek it from trusted friends and colleagues whose subjective opinions of a new innovation are most convincing" (Sherry, 1997, p. 70). A search for evaluation information regarding the innovation takes place during this stage and continues through the decision stage (Rogers, 2003; Sahin, 2006).

Decision. The decision stage is the point at which an individual will choose whether to adopt or reject an innovation (Rogers, 2003, Borthwick & Pierson, 2008; Sahin, 2006). Adoption pertains to "full use of an innovation as the best course of action available," while rejection means "not to adopt an innovation" (Rogers, 2003, p. 177). If individuals are allowed to try an innovation on a trial basis, "it is usually adopted more quickly, since most individuals first want to try the innovation in their own situation and then come to an adoption decision" (Sahin, 2006, p. 16). Rogers (2003) wrote that rejection can occur at any stage of the innovation decision process and can be expressed in one of two ways. Active rejection occurs when an individual tries an innovation, considers adoption, but later decides against adoption; whereas, passive rejection (also referred to as non-adoption) occurs when an individual does not consider adoption from the start (Rogers, 2003).

Implementation. After a decision to adopt has been reached, an innovation is put into practice resulting in the implementation stage (Rogers, 2003; Borthwick & Pierson, 2008; Sahin, 2006). At this stage, the importance of assistance may be needed to reduce the degree of uncertainty regarding outcomes of the innovation (Sahin, 2006). The implementation stage is

also characterized by reinvention. Rogers (2003) wrote, reinvention is "the degree to which an innovation is changed or modified by a user in the process of its adoption and implementation" (p. 180).

Confirmation. The confirmation stage is the point at which the innovation decision had been made, but the adopting individual seeks support for his or her decision and tends to search for positive confirmation (Rogers, 2003; Sahin, 2006). Discontinuance is a factor at this stage and results from one of two types of discontinuance (Rogers, 2003). First, discontinuance can be the result of replacement, in which the innovation is replaced by an improved innovation. Second, discontinuance can be the result of disenchantment, which occurs when an individual is not satisfied with the performance of an innovation.

Rogers (2003) described the innovation decision process as "an uncertainty reduction process" (p. 232), and proposed five attributes of innovations that determine the amount of desirability of an innovation to an adopter. These attributes include: 1) relative advantage, 2) compatibility, 3) complexity, 4) trialability, and 5) observability.

It is important to note that these attributes are not inherent in any new technology/process/practice; they are only inherent in the person adopting the innovation. Thus, Rogers defines each of these attributes using the word "perceived." These are perceived attributes or characteristics, making this a person-centric view and clarifies that enabling adoption means changing the person, not the innovation.

Perceived relative advantage. Perceived relative advantage is defined as "the degree to which an innovation is perceived as being better than the idea it supersedes" (Rogers, 2003, p. 229). Motivational aspects of innovation adoption include, but are not limited to, low cost for implementation, social status, and time savings (Sahin, 2006). Teachers will use technology if

they see the value of that technology in their instruction (Finley, 2003; McKenzie, 2001; Parisot, 1995; Spotts, 1999). To increase the perceived relative advantage, as well as increase its effectiveness, Sahin (2006) suggests the use of financial incentives to support individuals involved in the adoption of an innovation.

Perceived compatibility. A second motivational attribute is perceived compatibility, which Rogers (2003) defined as "the degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of potential adopters" (p. 15). Inconsistency of technology with an individual's needs can negatively affect the use or adoption of that technology (McKenzie, 2001; Sherry, 1997; Sahin, 2006). Teachers' opinions, beliefs, values, and views of teaching are influenced by every new innovation, thus a compatible innovation will decrease uncertainty and increase the rate of adoption (Hoerup, 2001; Sahin, 2006).

Perceived complexity. Perceived complexity is defined as "the degree to which an innovation is perceived as relatively difficult to understand and use" (Rogers, 2003, p. 257) and is the one attribute that is negatively correlated to the rate of adoption or "the relative speed with which an innovation is adopted by members of a social system" (p. 221). An innovation that is perceived to be excessively complex can be a significant obstacle to adoption (Rogers, 2003; Sahin, 2006).

Perceived trialability. Perceived trialability is "the degree to which an innovation may be experimented with on a limited basis" (Rogers, 2003, p. 258) and is positively associated to adoption. When individuals are provided the opportunity to test an innovation on an experimental basis, the potential for adoption increases. It is also through perceived trialability where individuals may explore changing or modifying the innovation to better fit the needs or increases the compatibility of the individual or organization (Rogers, 2003; Sahin, 2006; Kahler,

2009). Perceived trialability is also an important attribute for those individuals who are resistant to or struggle with the adoption process, as this period provides a time to explore a new innovation and work towards increasing buy-in or support (Rogers, 2003; Herbert, 2012).

Perceived observability. The final attribute, perceived observability, Rogers (2003) defines as "the degree to which the results of an innovation are visible to others" (p. 258). Parisot (1997) wrote key motivational factors to adoption and diffusion of technology in education include role modeling and peer observation. Providing opportunities for others to see technology and its use in instruction can positively impact the rate of adoption in education (Sahin, 2006, Kahler, 2009).

Rogers (2003) states that any innovation that demonstrates all five attributes of perceived relative advantage, compatibility, simplicity, trialability, and observability will be adopted more quickly than innovations that miss one or more of these attributes, but the author warns "getting a new idea adopted, even when it has obvious advantages, is difficult" (p. 1). Sahin (2006) states that research has shown all of these attributes will influence the likelihood of staff adopting new technology into their teaching.

Concerns-Based Adoption Model (CBAM)

In addition to the innovation decision process, the personal needs and motivations of individual adopters have been recognized as an important aspect to increasing the likelihood of integrating innovations with high levels of use (Hall, Wallace, & Dossett, 1973). Hall et al. (1973) referred to the growth in use quality of innovations as a process depicted in innovation adoption as the Concerns-Based Adoption Model. The authors wrote that adoption promoters could facilitate the pace of and personalize adoption interventions through sensitivity to the personal needs and motivations of individual adopters. Through recognition and adaptation to the

concerns of users, the adoption promoter can alleviate perceived threats from change and increase the probability of adoption with a high quality level of use (Hall et al., 1973).

Hall et al. (1973) stated the Concerns-Based Adoption Model was constructed to assist individuals engaging in the innovation adoption process through recognition of the individuals concerns of self, task, and impact throughout the adoption process. The authors state, "A change agent who recognizes self-concerns being expressed can initiate consultation or training that will result in resolution of self-concerns and move the person along the developmental sequence toward more effective use of the innovation" (p. 6). This premise was repeated by Borthwick and Pierson (2008) who wrote, "professional developers who understand where each teacher is in the change process are more likely to be successful than those who plunge headlong into the content of a session with little or no attempt to get to know each participant" (p. 13).

Individuals or groups conducting PD sessions are placed in the role of "change agent" (Borthwick & Pierson, 2008), a role that Rogers (2003) described as changing or shifting throughout the adoption process. Hall et al. (1973) refer to the individual or institution that has the capability of working with adopters as the resource system, the change agent, and the adoption agent. "The resource system has more knowledge about the innovation than the user, more experience with the innovation, and a repertoire of materials, strategies, and consultants…who are both knowledgeable about the innovation and skilled in the change process" (Hall et al., 1973, p. 7).

In describing the CBAM process, Hall et al. (1973) discuss two types of intervention avenues between adopters and change agents during the process of adoption. These avenues are through information or action. Through the information avenue, a change agent will collect data on adopters' needs, capabilities, concerns, and usage of the innovation. This information will by

analyzed and used to evaluate the adoption preparedness of each individual. This information will also be used to select and recommend actions and treatments appropriate to each adopter that will be instituted by the change agent (Hall et al., 1973).

The action avenue constitutes the change agent actively and continually searching for concerns from the adopters in order to provide orientation, training, and consultation with each of those adopters. Engagement in working with these adopters to resolve their concerns and assist them in implementing strategies that will lead to higher levels of use of the innovation is the key purpose of change agent (Hall et al., 1973).

Throughout the adoption and integration process, a change agent interacts with individual adopters to catalog their concerns and to catalog the demonstrated level of use of the innovation. The stages of concern, together with the level of effective use help determine the readiness of each adopter for innovation participation (Hall et al., 1973).

Levels of Use (LoU). Within the CBAM model, Hall et al. (1973) describe the differences in the definable and observable ways an innovation is implemented by individuals or groups as a hierarchical scale. This scale includes six levels of use and an absence-of-use level. Within each of the levels, the authors have included a knowledge scale and an action scale. The knowledge scale indicates the breadth and depth of knowledge possessed by an individual adopter related to the innovation and can be assessed formally or informally (Hall et al, 1973; Loucks, 1976). The action scale indicates how advanced an individual is with actual use of the innovation and can only be assessed through direct observation of the individual interacting with the innovation (Hall et al., 1973; Loucks, 1976).

Hord and Roussin (2013) described the levels of use (LoU) as a portrayal of the behaviors, or approaches, taken by an individual as part of change. The authors state that through

measurement of participants' LoU, change agents are better able to determine appropriate assistance and support throughout the change process. The LoU have been broken into six levels, including a level zero (Hall et al., 1973; Loucks, 1976; Hord & Roussin, 2013). These levels are broken into broader categories of non-user and user, with levels zero, one, and two falling into the non-user category, while levels three through six fall into the user category. Each of the levels is determined by associated behaviors (Hall et al., 1973; Loucks, 1976; Hord & Roussin, 2013).

In the non-user category we find the following LoU and associated behaviors (Loucks, 1976; Hord & Roussin, 2013):

- Level 0 (Non-use): No interest shown for the innovation, no action is taken by the participant.
- Level I (Orientation): the adopter actively seeks information about innovation or is making plans to gather information.
- Level II (Preparation): the adopter prepares to begin using the innovation. This is different from Level I where the adopter is strictly gathering information to determine whether or not to move forward with implementation, whereas in Level II the participant is preparing for actual use.

In the user category we find the following LoU and associated behaviors (Loucks, 1976; Hord & Roussin, 2013):

- Level III (Mechanical): the adopter attempts to make changes to the innovation implementation to better organize time and materials. Time is seen as the greatest deterrent by adopters at this level, therefore support and assistance is critical at this juncture.

- Level IVA (Routine): the adopter has found ways to provide stability allowing for the innovation to work in its current context. The adopter is satisfied with the implementation and no longer seeks to make changes.
- Level IVB (Refinement): the adopter begins exploring client benefits. Assessment becomes important at this level and the participant begins making small changes to the innovation implementation focused on increasing client outcomes.
- Level V (Integration): the adopter begins collaborating with other users to increase client outcomes.
- Level VI (Renewal): the adopter begins exploring major modifications and changes to the innovation, possibly exploring alternatives to the innovation.

Hord and Roussin (2013) discuss the importance of support and assistance as a participant moves through all levels of use, but is critical at Level III to ensure that the participant will continue to actively integrate the innovation and move along the LoU. Borthwick & Pierson (2003) described the implementation of technology using the LoU as a guide. The authors wrote that "beginning users (Non-Use, Orientation, Preparation) require information and specific plans to use the technology. As they develop more skill and confidence, tool usage becomes the norm (Mechanical, Routine), meaning professional developers may need to combat teachers' beliefs that they have already learned all there is to learn. At latter stages of the process (Refinement, Integration, Renewal), teachers again open up to considering further changes in their own practice" (p. 14).

In addition to the LoU, the CBAM also explores the affective side of change, which includes feelings, reactions, emotions, and attitudes of adopters in relation to innovation change (Hall et al., 1973; Hord & Roussin, 2013). The affective understanding of individuals can be

determined through exploration of comments made by adopters to determine their concern level (Stages of Concern) throughout the implementation process (Hord & Roussin, 2013; Borthwick & Pierson, 2003).

Stages of Concern (SoC). Hall, Wallace, and Dossett (1973) describe the stages of concern (SoC) as a "categorization of expressions stated by the user related to his use of the innovation" (p. 14). Concerns expressed throughout the adoption process will progress from a focus on self, to task, to impact (Fuller, 1969; Hall et at., 1973). The SoC are divided into stages, starting with stage zero and progressing through stage six. These stages are broken into broader categories based on an expansion of Fuller's (1969) division of concerns related to self, task, and impact (Hall et al., 1973; Hord & Roussin, 2013). Stage zero falls into the unrelated category, while stages one and two fall into the self category. Stage three falls into the task category, while stages four through six fall into the impact category. Each of the stages is determined by expressions of concern (Hall et al., 1973; Hord & Roussin, 2013).

In the unrelated category, we find the following stage and expressions of concern (Hord & Roussin, 2013):

- Stage 0 (Unconcerned): the adopter will discuss not knowing about the new innovation or express having no interest in learning about the innovation.

In the self category, we find the following stage and expressions of concern (Hord & Roussin, 2013):

- Stage 1 (Informational): the adopter will express interest in learning and understanding more about the innovation.

- Stage 2 (Personal): the adopter will express concerns about how the innovation will affect them as an individual. Expressions will be self-focused, such as: Can I do it? Will I be comfortable with it?

In the task category, we find the following stage and expressions of concern (Hord & Roussin, 2013):

- Stage 3 (Management): the adopter will express concerns related to materials, time, and organizational practices.

In the impact category, we find the following stage and expressions of concern (Hord & Roussin, 2013):

- Stage 4 (Consequence): the adopter will express concerns related to how use of the innovation will affect clients. These concerns are typically expressed after management issues have been solved and the adopter begins to ask questions, such as how will this affect my students?
- Stage 5 (Collaboration): the adopter will express concerns surrounding how their work with the innovation relates to what their colleagues are doing with the innovation. At this stage, the adopter will express thoughts regarding working with others in the implementation process. The purpose for collaboration at this stage is two-fold; 1) working together adopters can save time through splitting tasks to improve implementation processes, and 2) joint exploration of strategies and activity design to improve results of implementation for student benefit (Hord & Roussin, 2013).
- Stage 6 (Refocusing): the adopter expresses ideas around improvements to the innovation or implementation process. Hord and Roussin (2013) state that many

adopters do not reach this stage due to concerns for self and management keep many adopters working to reduce those concerns.

Borthwick and Pierson (2003) described the SoC in relation to technology adoption. The authors wrote, "teachers at the beginning of a change process ask more self-oriented questions, about how a new technology will help them personally (Awareness, Informational, Personal). Once they have developed a base of initial confidence, teachers' questions become more task-oriented, related to how they use the tool and why they are having particular challenges (Management, Consequence). And, toward the end of the process, teachers tend to alter their perspective to look toward their work with others and the larger impact of the use of the technology on students (Collaboration, Refocusing).

The use of CBAM can be essential to the innovation adoption process. Although, Hord and Roussin (2013) point out that "few change leaders or facilitators are able to use both SoC and LoU to help guide a change effort (primarily because of the time required to do so). Thus, many use one or the other" (p. 108).

Technology Integration Frameworks

Hall, Wallace, and Dossett (1973) discuss adoption with a high quality level of use. Today many schools are exploring the definition of high quality in relation to technology integration. A number of frameworks have been introduced to assist districts in categorizing and evaluating the level to which they use technology in instruction. These include the Levels of Teaching Innovation (LoTI) framework; the Technological Pedagogical Content Knowledge (TPACK) framework; and the Substitution, Augmentation, Modification, and Redefinition (SAMR) model (Johnson, 2013; Brantley-Dias & Ertmer, 2013, Puentedura, 2012; Moersch, 2010).

Levels of Teaching Innovation (LoTI). The LoTI framework was originally introduced as the Levels of Technology Implementation by Moersch in 1994 and provided an effective gauge of technology implementation (Moersch, 2010). The framework was updated in recent years to better meet the needs of new standards created by the Partnership for 21st Century Skills and the National Education Technology Standards for Teachers and was renamed the Levels of Teaching Innovation (Moersch, 2010).

The framework consists of seven levels that can be used to assess authentic technology use within classrooms by assessing a teacher's current instructional practice, as well as his or her personal computer use (Johnson, 2013; Moersch, 2010). Johnson (2013) writes the "levels range from non-use to awareness, exploration, infusion, mechanical integration, routine integration, expansion, and refinement" (p. 84). Moersch (2010) claims that as a teacher increases his or her personal computer use, the instructional practice with technology will rise as well, resulting in an upsurge in teaching innovations as the teacher looks to expand and refine the use of technology in classroom instruction (Moersch, 2010).

Technological Pedagogical Content Knowledge (TPACK). Technological Pedagogical Content Knowledge (TPACK) is a framework that extends Shulman's 1986 concept of Pedagogical Content Knowledge (Brantley-Dias & Ertmer, 2013). This framework focuses on the complex and multifaceted interplay of teachers' knowledge regarding content, pedagogy, and technology. Thompson and Mishra (2007) outlined seven different knowledge constructs that are present in the TPACK model. These constructs include content knowledge, pedagogical knowledge, technological knowledge, pedagogical content knowledge, technological content knowledge, technological pedagogical knowledge, and technological pedagogical content knowledge. The complexities of the model are best explained in the following diagram.

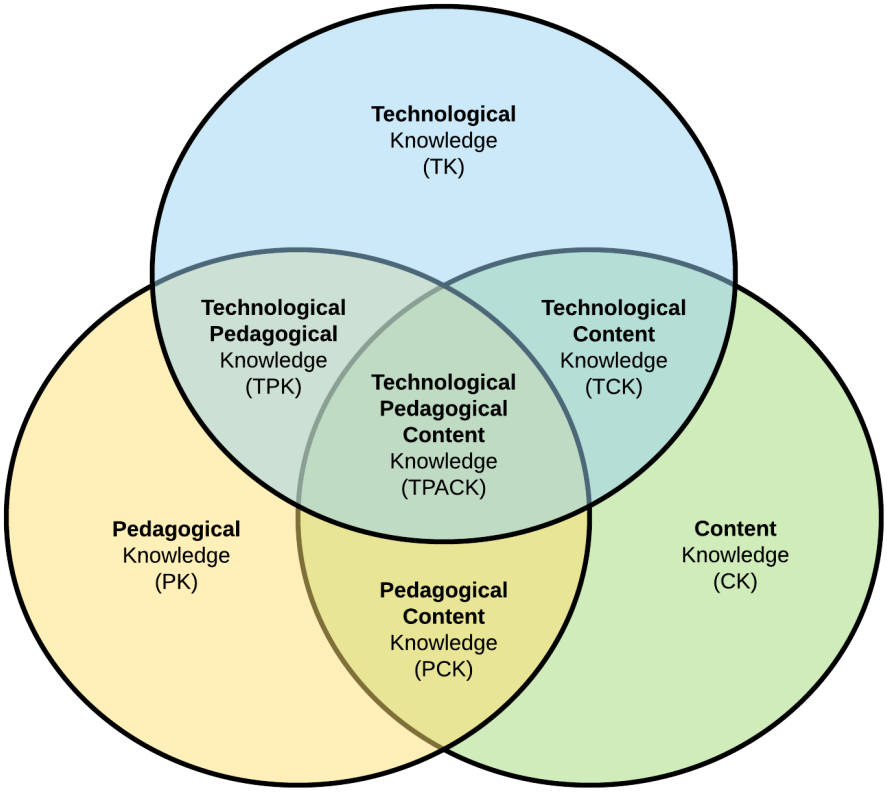


Figure A1. TPACK model diagramming the seven knowledge components.

Brantley-Dias and Ertmer (2013) claims TPACK turns the technology integration concept into a framework that is too large, in that it comprises seven distinct knowledge components, while simultaneously creating small distinct pieces that become difficult to distinguish from one another. The authors question whether this framework works for 21st Century teaching and learning by writing, "Unfortunately, the current TPACK framework is not clear regarding what types of pedagogy or curricula provide a 'best fit' for technology integration" (p. 116). Brantley-Dias and Ertmer (2013) add that lack of thorough descriptions of the TPACK components, what these components look like in action, or what activities or strategies can develop these components increases the ambiguities of this framework.

Substitution Augmentation Modification Redefinition (SAMR). The Substitution Augmentation Modification Redefinition (SAMR) model was introduced by Puentedura in 2006. This model is used to gauge the level at which technology is to be utilized or implemented into classroom instruction. The SAMR model consists of four levels of technology implementation that are divided into two categories to indicate the type of implementation. At the lower half of the model is the enhancement category made up of the substitution and augmentation levels. The upper half of the model is the transformation category made up of the modification and redefinition levels (Puentedura, 2006; Puentadura, 2012; Johnson, 2013).

The four levels of this model are defined by how technology is used in instruction. At the substation level, technology is a direct substitute for past instructional practices (Puentedura, 2006 & 2012). For instance, instead of writing a story on notebook paper, a student uses a word processor to type the story on the computer. The augmentation level consists of using technology as a direct substitute, but with some practical improvements (Puentedura, 2006 & 2012). For instance, the student writing the story now uses tools embedded in the word processor (spell check, dictionary, etc.) to make practical improvements to their work. At the modification level, technology is now used to redesign the task in some significant way (Puentedura, 2006 & 2012). Now the student writing the story creates a blog or Google document that can be shared with the teacher and other students for the purposes of real time collaboration and peer review. At the highest level of the model, redefinition transforms the use of technology through the creation of new tasks that would not have been possible prior to the implementation of technology (Puentedura, 2006 & 2012). Now the written story becomes a global collaboration through the use of Skype, as research, collaboration, and peer review occur in real time with students in other

parts of the world. The completed story is published online and shared within moments with others throughout the world.

In recent years, a number of diagrams outlining the use of SAMR with suggestions for activities and strategies at each level have mushroomed in education giving rise to discussions about defining the purposes of technology in education and classroom instruction (Puentedura, 2012; Johnson, 2013). Johnson (2013) wrote, "the challenge for administrators has been just getting teachers to use technology in the classroom. But the goal has now become getting teachers to integrate technology in powerful ways that increase engagement, require higher-order thinking skills, differentiate instruction, and improve learning" (p. 85 & 87). The following diagram illustrates the technology transformation that would take place when writing a research paper in relation to the SAMR model.

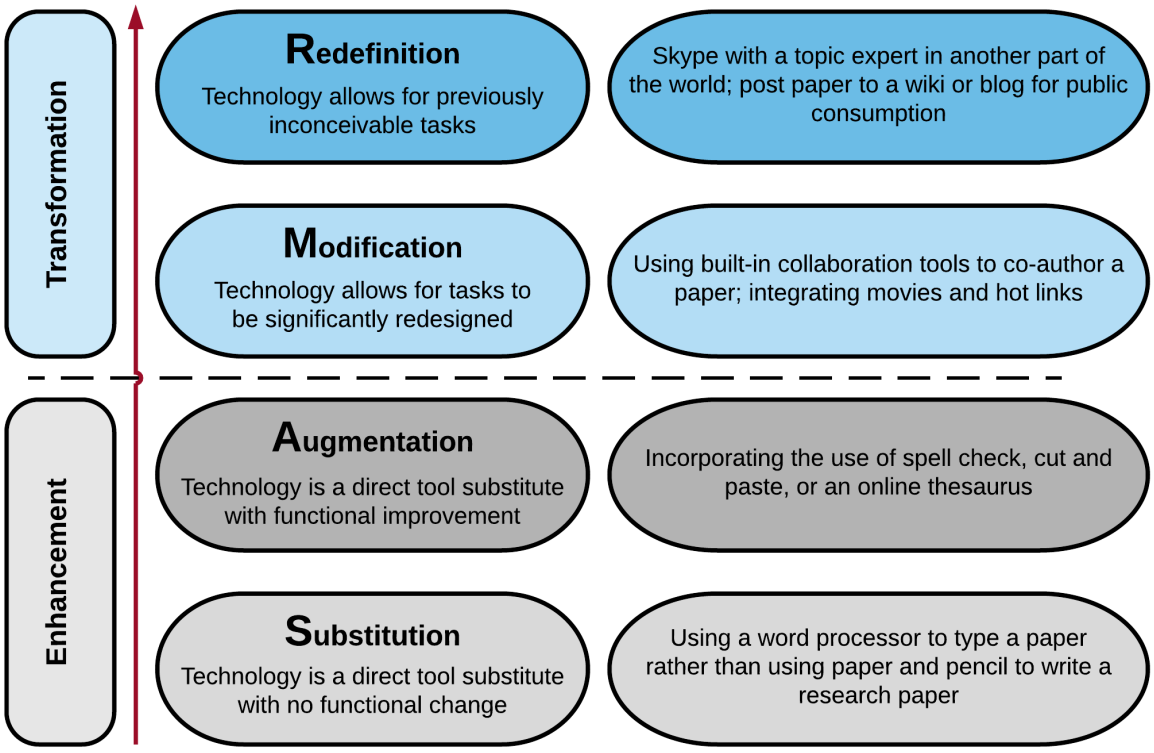


Figure A2. SAMR model illustrated with a research paper.

Chou et al. (2012) wrote that neither student engagement nor productivity will increase simply with the introduction of a mobile device. “The mobile devices alone do not transform the classroom” (Chou et al., 2012, p. 15). The authors state the key to improved teaching practice and pedagogy is through instructional design of activities, which must be embedded in PD opportunities. Use of the SAMR model will be the focus for the purposes of this study. This model was specifically chosen because of its recognition of the diverse ways in which one application can facilitate learning; also, due to its nascence in the education world. This model was introduced in 2006 and the online discussions, blogs, and educational websites discuss the use of this model consistently. The International Society for Technology in Education (ISTE) 2014 conference lists 30 different sessions that will discuss or incorporate the SAMR model in some way. It is a model that has piqued the interest of educators and administrators, particularly in the world of ever-changing technology.

Summary

The use of mobile devices in primary and secondary schools is prompting a new wave of mobile learning in K-12 education. Two thousand U.S. schools have adopted mobile learning devices in the classroom and the number is rapidly increasing (Lawrence, 2012). With this uptick of mobile learning, administrators and teachers are searching for best practices for implementing these devices in an effort to improve student engagement and learning. This dissertation of practice will address the learning needs and concerns of teachers in the process of adopting and implementing mobile devices within their classroom instruction. The project detailed within this study includes a review of relevant literature that will inform the conceptual framework for design, implementation, and evaluation of teacher PD focused on the adoption and integration of mobile device technology within the classroom setting.

In order to create an effective model for integration of mobile devices, an effective plan will need to include activities aligned with the state content standards, as well as, the ISTE standards for learning, teaching, and leading in the digital age. The activities need to be job-embedded and focused on specific content or pedagogic practices. The plan needs to incorporate active learning as teachers participate in the PD activities, allow time for teacher reflection, and be sustained over a period of time. Finally, an effective PD plan must include intentional and ongoing evaluation.

Based on the review of relevant literature, a PD plan will be designed using the Loucks-Horsley (2009) PD model as the foundation. The anticipated goals of this PD plan include working with teachers to 1) understand the SAMR model for technology integration and implementation of mobile devices, 2) create and implement lessons/units integrating mobile technologies that target the upper levels of the SAMR model, 3) actively engage in reflection on the development and implementation of new instructional practices, and 4) identify one lesson to share/model/demonstrate to the staff during a mini tech camp at the conclusion of the PD.

Throughout the PD series, an exit slip or ticket out will be provided at the conclusion of each PD session as a method to audit teacher concerns, questions, and understandings. The CBAM model will inform the construction of the exit slip questions and responses will be analyzed based on the Stages of Concern. As the PD plan draws to its conclusion, an evaluation will be conducted employing the characteristics and levels of analysis suggested by Guskey (2000) for effective PD evaluation.

Conceptualization. This PD series will be conducted at the beginning of the 2014-2015 school year, starting in August and ending with the evaluation in January. The purpose of this dissertation of practice is to develop a comprehensive program of professional development for

teachers working within a district that is actively pursuing the adoption and implementation of mobile devices into classrooms. The plan will be put into action with all of the K-6 teachers within the school district previously described. The goals of this plan are to:

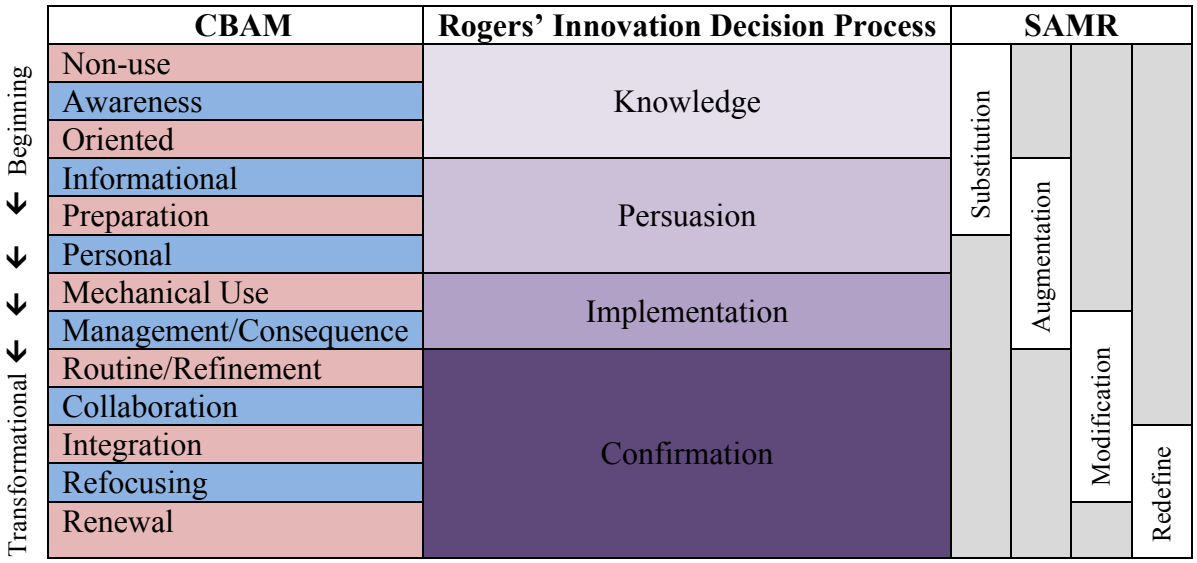
- Transform instructional practices to effectively integrate mobile devices into the classroom,
- Actively engage teachers in reflection on the development and implementation of new instructional practices,
- Develop lessons that present meaningful integration of mobile technology, and
- Use mobile technologies for teaching 21st century skills, including creativity, critical-thinking, and problem solving.

The organization of this PD training sequence was intended to move teacher participants through the CBAM Levels of Use by using the Stages of Concern as the transition between each of the levels. The use of CBAM, Rogers Innovation Decision Process, and SAMR are conceptualized according to table A1. In order to move participants through the Levels of Use (as indicated in red), participants must be provided information and support through the use of PD that provides training materials that use the Stages of Concern (as indicated in blue) as the action to be taken during the workshop.

The PD series is constructed to work with teachers to move them from the beginning or less sophisticated levels of use to the advanced or transformational levels of use. This corresponds with Rogers' Innovation Decision Process, where participants in the beginning levels would also reside in the early stages of the innovation decision and would advance in that decision as they proceed towards a more integrative or transformative level of use regarding the innovation. Simultaneously, teachers at the beginning levels of use would be expected to

implement technology at the substitution level. Again, the transformation in their technology integration would advance as they gain knowledge and advance through to higher levels of use, thus resulting in technology use at the modification and redefinition levels within classroom instruction.

Table A1. Conceptualization of CBAM, Rogers' Innovation Decision Process, and SAMR.



It is important to remain cognizant of the potential for rejection throughout this process, particularly during the beginning levels or stages of this conceptualization. During this early period, it would be important to focus on addressing the attributes of the innovation (Rogers, 2003). In this conceptualization, communicating with adopters to emphasize the five attributes of an innovation are key to moving participants from non-use through orientation and preparation to mechanical use. Those attributes include relative advantage, compatibility, complexity/simplicity, trialability, and observability. Rogers (2003) wrote innovations that demonstrate all of these characteristics will be adopted more quickly than innovations that miss one or more of these attributes. Sahin (2006) supported this when he wrote that research has shown all of these attributes influence the likelihood of staff adopting new technology into their

teaching. Therefore, the PD plan outlined in this dissertation of practice was developed with special attention to targeting participants Stages of Concern in order to move participants through the Levels of Use as a way of developing transformational classroom instruction.

APPENDIX B: PROFESSIONAL DEVELOPMENT OFFERINGS

A series of monthly workshops were envisioned following the recommendations of Loucks-Horsley (2009) where teachers engage with the pedagogy in the role of students. It was anticipated that participants would complete a prepared lesson or activity utilizing technology in the same manner that would be expected of their students. After completion of the lesson, discussion would focus on how to use that lesson within their own classrooms, how to adjust various parts of the lesson for suitability regarding specific grade levels or disciplines, and how to evaluate the lesson. Teacher participants would be encouraged to implement that lesson, either as-is or with changes suiting the particular grade level or discipline within teachers' classrooms. At subsequent workshops, participants would reflect with the participant group on successes and additional questions regarding implementation of the sample lesson and implementation of devices in general. It was also anticipated that subsequent workshops would provide the opportunity to work collaboratively with others on designing additional lessons for implementing technology into individual classrooms.

Moving the participants from *non-use* to *orientation* through the stage of *awareness* was undertaken a year prior to the implementation of devices. The school administration (superintendent, principals, and technology coordinator) and school board embarked upon the mission of establishing an aggressive timeline for integrating more technology into the districts classrooms as a result of the passing of a public referendum. The referendum was passed in the fall of the 2013-14 school year and a decision was made to determine an appropriate mobile device for use in the elementary classrooms that could be purchased over the summer and implemented at the beginning of the following school year.

Two mobile devices were considered for this agenda: an iOS device (iPad) and an Android device (LearnPad™). Sales representatives were brought into the district on several occasions to provide staff with the opportunity to see and feel the devices, as well as consider the pros and cons of both platforms (*awareness*). Late in the spring of that year, a survey was sent to the staff to gather their opinions and votes for which platform to purchase. The staff voted to purchase the Android device.

At this point, the intent was to establish an ongoing system of professional development and support for these teachers as they embarked upon using these new devices and implementing technology into their instructional practices. This system of PD and support was envisioned to provide ongoing formal instruction through regularly scheduled PD sessions; informal instruction and support via time set aside weekly for drop-in questions and instruction; and impromptu instruction and support through individualized classroom assistance and postings to a district technology blog. Figure B1 outlines the initial schedule envisioned for this PD series. Throughout this period of PD and support, data indicating the Levels of Use staff members were working at and supporting them through each of the Stages of Concern to move through the Levels of Use were closely tracked and monitored.

Wk		Important Dates	Device Introduction	Workshop	Lunch & learn	Observation/Modeling	Blog	Non-Use	Awareness	Oriented	Informational	Preparation	Personal	Mechanical Use	Management/Consequence	Routine/Refinement	Collaboration	Integration	Refocusing	Renewal
	August																			
1	8/11 - 8/15		Aug. 12: Device Training																	
2	8/18 - 8/22																			
3	8/25 - 8/29			Aug. 27: Prep for start of year			Aug. 30 post													
	September																			
4	9/1 - 9/5	Sept. 2 School starts					Sept. 6 post													
5	9/8 - 9/12				Sept. 10		Sept. 13 post													
6	9/15 - 9/19			Sept. 17			Sept. 20 post													
7	9/22 - 9/26				Sept. 24		Sept. 27 post													
8	9/29 - 10/3				Oct. 1		Oct. 4 post													
	October																			
9	10/6 - 10/10				Oct. 8		Oct. 11 post													
10	10/13 - 10/17	Oct. 16/17 MEA					Oct. 18 post													
11	10/20 - 10/24			Oct. 22			Oct. 25 post													
12	10/27 - 10/31				Oct. 29		Nov. 1 post													
	November																			
13	11/3 - 11/7				Nov. 5		Nov. 8 post													
14	11/10 - 11/14				Nov. 12		Nov. 15 post													
15	11/17 - 11/21			Nov. 19			Nov. 22 post													
16	11/24 - 11/28	Nov. 26/27/28 Thanksgiving					Nov. 29 post													
	December																			
17	12/1 - 12/5				Dec. 3		Dec. 6 post													
18	12/8 - 12/12				Dec. 10		Dec. 13 post													
19	12/15 - 12/19			Dec. 17			Dec. 20 post													
20	12/22 - 12/26	Dec. 24 Christmas break																		
21	12/29 - 1/2	Christmas break					Jan. 3 post													
	January																			
22	1/5 - 1/9				Jan. 7		Jan. 10 post													
23	1/12 - 1/16						Jan. 17 post													
24	1/19 - 1/23		Jan. Showcase				Jan. 24 post													
25	1/26 - 1/30						Jan. 31 post													
	February																			
	2/2 - 2/6																			
	2/9 - 2/13																			
	2/16 - 2/20	Evaluation report complete by Feb. 20																		
	2/23 - 2/27																			

Figure B1. Proposed schedule for PD series. Orange indicates proposed dates for formal training workshops. Green indicates proposed dates for informal training.

Formal Workshops

August Training/Introduction to Device (August 12, 2014). In the first official training for elementary teachers with the LearnPads™, 22 participants (5 male, 17 female) were in attendance. This was not considered a mandatory training as it fell prior to the start of contract days for the teachers. A trainer from the company from which the devices were purchased conducted the workshop. The trainer was a current middle school teacher in another district who had been using this particular tablet device in the classroom for at least one year. The focus of information in this session targeted the knowledge sector of Rogers (2003) innovation decision process. The bulk of the information presented at this workshop provided knowledge of the design of the device, use of the key features (using the QR scanner, turning sound up/down, etc.), and how to navigate the teacher online portal.

The introductory training session for the new devices was coordinated by the school administration and presented by an outside consultant with knowledge and experience with this particular device. This first session really focused on providing *orientation* for the staff through an *informational* presentation and was held two weeks prior to the beginning of the school year. Data collected throughout this training session indicated a strong tendency towards using specific strategies to provide open communication and attempts to alleviate as much in-the-moment anxiety as possible on the part of the trainer. These strategies were indicated through comments such as, “I’ve been using LearnPads™ in my classroom for a year now and this is what I found works best”, “Don’t worry if it doesn’t make sense right now. You’ll probably need to play with it for a bit so you can decide what will work best for you”, and “If you’re not confused, then I haven’t done my job.” Questions and concerns expressed by participants throughout the session suggested participants were struggling and confused with many of the key *informational* points.

Questions and comments during this period included, “I don’t understand why we have to go through so many steps”, “This seems like it’s going to take a lot of time to create each lesson”, “How exactly are we supposed to organize this? By discipline, by subject, by day? It’s just so confusing.”

To begin, teachers received a tablet device and were provided an overview of said tablet. This included navigating the home and back buttons, using the QR scanner, turning sound up and down, and how to put the device into sleep mode or turn it off completely. This first part of the workshop also devoted a significant amount of time to demonstrating and explaining the use of the teacher web portal that is a major function of this particular tablet. It is interesting to note that content cannot be created directly on this device. Content creation is done through a web portal that can be accessed through a laptop, computer, iPad, etc. The design for content creation is executed by constructing a “lesson” and adding content to that lesson. Content is added according to categories. Those categories contain resources such as websites, documents, videos, etc. Once a lesson is created, a QR code is generated for that lesson that the teacher can print or display through a projector for students to scan with the tablets.

Scanning with the tablet allows the content that the teacher added to the lesson to load onto that device. The student does not have access to any other materials, apps, or websites. Once students have scanned the QR code enrolling their device into the teacher’s class and scanned for their lesson, the teacher can see all of the student devices through the web portal on a dashboard. This dashboard allows teachers to block students (either individually or as a group) from viewing their screens, displaying individual tablet content, change lesson content, or send out new content to individual or group tablets. This feature appeared to cause much excitement

for the teachers and I was told that is the key feature that teachers wanted that helped them decide to choose this device over others for classroom implementation.

Secondly, the trainer walked participants through the steps needed to create a "lesson". This particular aspect of the training appeared to be quite confusing for the participants. This may be due to participant uncertainty regarding whether a lesson means lesson in the traditional sense, or means adding content for all disciplines for a day or a week, etc. The trainer explained that any of these options are viable; each teacher has to decide how best to collect content for individual classes, disciplines, units, etc. and decide how best to organize that information including how often they want their students scanning codes to access new information. During this period, participant comments and behaviors indicated a possible rejection of this particular device. A portion of this time period of the workshop focused on individual work by the participants to create resources and lessons for classroom use. A number of participants were observed surfing other Internet sites or having non-workshop related conversations. A number of participants also commented on feelings of confusion, bewilderment, and a general sense of being overwhelmed. The trainer for this workshop commented, "If you're not feeling confused today, then I haven't done my job."

At the completion of the introductory workshop, a short three-question survey or "exit slip" was made available for staff. This survey explored what points of the workshop were considered helpful, what learning did participants come away with, and what questions or concerns remained at the end of this workshop. Overwhelmingly, the participants reported questions and concerns regarding the use of the teachers' portal. Concerns about the need for a refresher of the "basics" in using the teacher online portal and requests for clarification regarding how to put together a lesson to be sent to the device blanketed the survey results.

August Training/Preparation at the start of the school year (August 27, 2014). The second formal workshop for LearnPad™ integration was, in actuality, a part of the staff welcome and preparation time just days prior to the official start of the new school year. During this time period, staff reviewed district policies and expectations for the school year, reviewed the teacher portal for LearnPads™, and were introduced to a new teacher observation protocol for the coming school year.

The review of the LP teacher portal focused on logging in to the portal, and how to find or create new lesson resources. Due to the amount of additional information covered during this workshop time, the amount of time to review and discuss the mobile device initiative was restricted. Due to this restriction, the results of the workshop exit slip remained consistent as those from the training earlier in the month. Many questions and concerns remained regarding the teacher portal. Several comments were posted stating a need for one-to-one review/training time to better grasp the concept of the teacher portal and better utilize this feature of the devices being used at these grade levels.

September Training/Portal exploration (September 23, 2014). Two issues arose with the device introduction and PD implementation. The first issue required a change be made to the anticipated PD schedule. Initially, the plan called for formal training/workshops to occur monthly during a portion of an afternoon that was created as a part of an early out (of school for students)/ PLC (professional learning community) time. Upon discussion with district administration, it was discovered that plans had been made at the end of the prior school year to set this time aside for grade level/discipline teams to work together on team goals, common assessments, and classroom interventions. As a result, it was determined that the best time to provide some type of formal training with the staff would be during the staff meeting times.

These staff meetings occur twice a month approximately 45 minutes prior to the school day, twice a month. One of those monthly staff meetings would be set aside for formal technology training. The second issue resulted in a change to the device introduction into the classrooms. As the school year began, the devices themselves had arrived, but the carts for storing and charging were placed on backorder due to manufacturing problems. This backorder resulted in a delay of several weeks for introducing the devices into the classrooms. While the devices were delayed, the staff was encouraged to continue working within the portal to create lessons that would be used once the devices were made available within their classrooms.

The September 23 workshop focused once again on the LP teacher portal. Exploration of specific tips, tricks, and hints for using the portal, as well as a question and answer time were provided during this workshop. Specific tips for use included how to create a default selection of tools or resources for students to have access to at any time or with any lesson. There were several questions about finding and sharing apps and resources with one another within the district. Tips on how to search for resources and how to share selected apps or resources was demonstrated and discussed. Questions during this workshop also focused on assigning devices to students within the classrooms.

Concerns regarding how to track which student was using a particular device, how to prevent damage to the devices, and to ensure charging of the devices each day were expressed and discussed in depth. This particular time became a period of brainstorming and problem solving as several ideas and suggestions were put forth. Exit slips at the end of this workshop time indicated a handful of participants remained concerned about the use of the portal. These concerns and questions focused on finding time to work with the technology integrationist in a face-to-face, one-on-one setting. Several questions also arose regarding recommendations for

apps and resources specific to various grade levels or disciplines. Several requests were also made asking for availability to specific subscription websites to be made available through the teacher portal.

October Training/Vocabulary Fun (October 28, 2014). Based on the number of questions regarding resource recommendations after the previous workshop and in the weeks that followed, it was determined that the focus for this workshop would involve an activity for vocabulary. The purpose of this workshop was to expose the staff to a new and simple resource that could be used within their classrooms at any grade level and in any discipline. The activity required the staff/students to work in collaborative teams of three to four and, as a group, choose four vocabulary words from a list of ten fourth grade words that typically appear on common core assessments.

The team then used the *Pic Collage* app to take pictures demonstrating their understanding of each word, place the pictures into a collage, and label each word. At the completion of the assignment, the team had to electronically hand in the collage using the hand in method built into the mobile devices they were using.

The activity took approximately fifteen minutes for the staff teams to complete. At the end of the activity, the teams came back together as a group and discussed how this activity could be used at each grade level. Suggestions from members of the group also indicated ways this activity could be adapted for a variety of disciplines and variants to the activity itself. Exit slips for this workshop indicated an overwhelming appreciation for finding something new for use in the classroom. Questions and concerns that arose at this point focused on time issues; How do I find time to put together an activity such as this?; How long will students need to complete this type of activity?

November Training/Comic Calculations (November 25, 2014). The November workshop was structured similarly to the workshop in October. Staff was once again put into the role of the student and asked to complete an activity. This month focused on third grade common core word problems within the mathematics discipline. Staff/students were once again asked to work in collaborative teams of three or four to complete the assigned activity. In this scenario, the teams were given a list of 10 common core word problems for math that were appropriate for the third grade level. After a short introduction to the *Comic Strip It* app, the teams were asked to select one of the word problems to demonstrate through the comic strip. Not only were they given a choice of which word problem to work with, the teams were given a choice as to whether to create the comic as a word problem to be solved or create the comic as a solution to the word problem.

The work time and debriefing discussion for this activity replicated that of the last workshop held one month earlier. Thus, the activity took approximately 15 minutes to complete. Upon finishing, the group reconvened to discuss how this activity could be used at each grade level and what adjustments could be made for discipline-specific uses. Several questions during this period focused on appropriate use for younger students such as kindergarten and first grade. There was concern that at these earlier grade levels the specific app may be overwhelming or confusing for students use.

This led to a discussion amongst the staff regarding the level of technology knowledge students have prior to starting their educational career. One staff member noted, “Are we getting to the point where a basic understanding of technology will be essential for kindergarten readiness?” Once again, exit slips indicated an appreciation for the opportunity to try and take back to the classroom a new application for instructional use. One teacher excitedly stated on the

way out the door, “I’m going to use this activity this afternoon. I can’t wait, my students will be so excited!” Questions and concerns surrounding this activity focused on directions for classroom use: Can we make copies of the instructions for our students? Would it be easier to make my students a paper copy of the directions or should I provide them electronically? How do I go about printing the instructions from the technology blog?

December Training/Introduction to Formative Assessments (Dec. 23, 2014). The December training focused on the use of two formative assessment applications and was presented by members of the teaching staff. These two members volunteered to present to their fellow colleagues after attending a regional technology conference in the early part of the month. They returned from the conference with an excitement to share the new ideas and fresh instructional practices they had experienced. Building on that momentum, the administration and technology integrationist felt it was imperative to have them share their enthusiasm and thoughts with their colleagues.

In discussing the key ideas brought back from the conference that would have maximum impact on the staff as a whole, it was determined that the teacher presenters would demonstrate and discuss the use of the mobile device as a document camera and two simple formative assessment tools for classroom use, *Socrative* and *Kahoot*. These particular uses for the devices were chosen due to the presenting teachers finding these particular uses important within their own classroom. Responses after training focused on possible ways of implementing these uses into classroom instruction, including “I am interested in showing documents on my Smartboard, so using the LearnPad™ as a document camera will help with that”; “I may have questions later about set up for Socrative”; and “I can use this [Socrative] to initiate a unit and also for review at the end.”

January Training/Reading Fluency (Jan. 23, 2015). The January workshop focused on two applications that could be used to target creative activities involving reading fluency. Several requests had been made for additional resources for reading comprehension and fluency prior to this workshop. One of the resources shared with staff was suggested by the district reading specialist who had found an article that discussed the use of this resource specifically for reading fluency. This resource was an audio recording application that allows students to record while they are reading, called *Audioboo*. These recordings are saved to the classroom teachers' account and can be played back for the students to hear and reflect upon regarding reading fluency skills. This particular application also creates a unique QR code for each recording, allowing teachers and students to create artwork, publish writing, and post pictures along with the QR code corresponding to the student recording to target visual and auditory learning. The second resource (*Tellagami*) explored with staff was another application that allows for audio recording or text additions along with creating an avatar that "speaks" when the recording is played back. Students can customize the avatar by changing skin color, hair color, eye color, facial expression, clothing, and change background imagery. If the student chooses to use the text-to-speech option, they can select from four male or four female voices to read that text. The students can also elect to record their own voice for playback. Upon completion, the finished avatar and voice can be shared with others or embedded into a classroom website.

Staff discussed this application as a viable option for students whose parents are reticent of allowing pictures or videos of their child to be publicly posted. This will allow those students to publish their work without the danger of posting their own portrait. Exit slips indicated many positive reactions to these resources and illustrated preparation for use by several teachers. Responses included, "I can have kids record their reading fluency stories and listen," "Record

readings from science for comprehension," "Use it to build self-esteem and parent involvement," "Love that we were given great new ideas that I can see myself using!"

Reflection. Due to the change in time devoted to formal professional development, little or no time was appropriated for teacher reflection. It was hoped that part of the time provided for formal training would be used for reflection and sharing as a group and in doing so, would develop a support network within the school. From the start, formal workshop time was limited to a 40-45 minute time slot each month. Within that time, it was expected that questions and concerns would be answered, technology for curricular uses would be explored, teachers would be provided an opportunity to explore new ideas in the role of the student, and opportunity for reflection and feedback would be granted. Even with those expectations, in many cases, additional district needs were often added to the agenda and usurped portions of that allotted time. This also meant that the reduction in workshop duration afforded no opportunity for staff to develop lesson plans while in the moment. Staff had to manage with brainstorming ideas for integration into various grade levels or disciplines during the limited time remaining at the conclusion of each activity and any actual lesson planning or writing was abandoned during workshops.

In discussions with administration regarding the need for greater focus on professional development and larger time allotments, it was made apparent that the use of any time for such endeavors needed to be approved through a district staff development committee consisting of administrators, teachers, and support staff. In addition to this committee, the state teachers union has a strong influence over how and when time within and outside of teacher contract time can be utilized and compensated. Thus, an underlying message is present that unless teachers

recognize the need for such material, they are reluctant to 'grant' such opportunities. This also became a point in question when the informal opportunity for learning was proposed.

Informal Timely Support Workshops

The early stages of planning for informal learning opportunities focused on providing a time for participants to meet either individually or in small groups to ask questions, share tips and tricks, and discuss next steps for individual classrooms. These learning opportunities were considered timely support workshops; an elective learning opportunity that was organized based on current questions and concerns. Initially, this was envisioned as an opportunity that would be offered weekly. The original concept was to offer this training during the period of time set aside for lunch, as this provided teachers with a thirty minute period away from their students and would allow teachers to spend time either individually or with their grade-level partner discussing questions, concerns, tips, and tricks relevant to their specific grade level. This time was conceived as a "Lunch and Learn" period where the agenda for the sessions would be established based on feedback from workshop exit slips. Discussion topics and tips and tricks would focus on the Stages of Concern most relevant to the majority of participants at that particular time, as well as provide the opportunity for teachers to establish a sense of community and learning together in a safe and supportive environment.

The initial plans for this opportunity were brought into question before the commencement of the school year. Discussion with administration focused on a number of considerations surrounding this time period. Administration stated that although the schedule indicated that every teacher had a thirty-minute period free during the middle of the day, in many cases teachers would use this time for returning parent phone calls and emails. Administrators perceived this time as valuable to the teachers and did not feel that many would take advantage

of professional development opportunities during classroom hours. There was also a concern regarding the possible perception of the professional development infringing on a guaranteed duty-free lunch as per the teachers contract. The question of whether this would be perceived as a contract violation led to an administrative decision to move this particular training to a period after classes had dismissed, but still within the teacher contracted time in school.

The final decision was to provide this opportunity on Wednesday afternoons. This day was chosen specifically with teachers who also served as sports coaches in mind. Wednesday evenings remain untouched in regards to scheduling sporting events due to the traditional Christian practice of holding religious activities on this particular night. Classes dismiss for the day at 3:15 p.m., yet teachers are contracted to remain in the school until 4 p.m. Thus, the informal professional development was earmarked for Wednesdays at 3:25 p.m. This provided a possible 35-minute period to work individually or in small groups on specific questions and concerns related to technology implementation. Once the LP carts were placed in the classrooms, it was announced that the after school gathering would begin meeting on a weekly basis. This gathering time became know as “Let’s Get Appy”; a play on words to indicate the focus on technology, as well as focusing on the positive energy and support that resulted in working collaboratively with peers. Initially, there was a fairly large turnout (8 - 10 people). The majority of those in attendance were looking for information regarding the use of the teacher portal. After a few weeks, the attendance waned to the point of zero participation.

Discussions with administrators and teachers indicated that the concept was still desired, but perhaps additional communication was warranted as a reminder of the availability of this offering, as well as providing an explicit invitation to share tips, tricks, ideas, and classroom applications. This approach was executed for twelve weeks with mixed results. On several

occasions, this particular night of the week was secured for various district meetings, including webinars to explore new curriculum and school board special interest groups, which conflicted with the time set aside for technology support. Of the twelve weeks in which this approach was used, a group of two to five people were able to meet on five occasions. Positive feedback did result from those able to attend these offerings. Consistent comments surrounding the enjoyment of working collaboratively with colleagues and having the opportunity to share classroom ideas at these meetings were indicative of the benefits of this proposition.

One-to-One Support

Although the majority of the participating staff were ready to take the step into integrating technology at a greater level, there were a handful of staff who considered this initiative to be "one more thing" that required time and attention that these individuals felt they didn't have available, particularly in the face of additional instructional changes that were implemented during this same period. Hall and Loucks (1978) wrote, "Everyone approaching a change, initially implementing an innovation, or developing skill in using an innovation will have certain perceptions, feelings, motivations, frustrations, and satisfactions about the innovation and the change process."

Impromptu observations, modeling, and co-teaching were offered to teachers with the intention of providing one-to-one support as needed. This allowed for individualization of support, particularly for those struggling to move forward in the Levels of Use. This was considered a key effort for those at greatest risk of rejection in regards to the integration of the mobile technologies into their classrooms. The majority of the teaching staff accessed the use of one-on-one support for rectifying hardware issues ranging from difficulties with wireless connectivity to dealing with devices that froze during daily operations. In the first four weeks of

implementation, these issues resulted in numerous conversations, email exchanges, and classroom visits to model communication with students regarding patience when dealing with technology and how to problem solve issues when they arise.

Six weeks after the device rollout into classrooms, three staff members requested that I meet with them. These individuals had not yet used the implemented devices in their classrooms and had been vocal about the lack of time they had to explore the use of such technology. During our meeting together, we explored specific questions these individuals had surrounding device management and lesson creation. They referred to themselves as the 'most non-technical' on the staff and therefore perceived this as an opportunity to ask questions without judgment from others as a critical step in their undertaking with technology. It was also during this meeting that each teacher planned a specific date for one-on-one support within their classroom in the form of modeling a short lesson with their students. After this initial meeting and the subsequent modeled lessons, each of these individuals went on to find a niche for integrating technology within their classroom instruction.

Support for individuals was also essential to staff working in special services. Several members of the special services staff had difficulty finding appropriate applications available through the device content store that targeted the needs of their students. These teachers also struggled with finding accessibility features available through other devices that are not available with the LearnPad™. Missing features include VoiceOver, built-in braille support, ability to invert colors, text to speech capabilities, and closed captioning. A solution to these issues remains unresolved. One-on-one support perseveres as teachers continue to explore and implement new and different ways to engage their students through the use of technology integration.

Blog

In an effort to provide resources and information to those staff whose learning preference leaned towards being a self-directed learner, a blog was established to post additional tips, tricks, and examples of technology applications and classroom integration. This blog also allowed visitors to post questions and comments anonymously. It was anticipated that some of the staff would prefer to ask questions through an anonymous format and this would allow for answers to be posted publicly allowing others to benefit as well.

The blog dashboard was used to track the number of page views, comments, and traffic sources to the blog. In the first six months of existence, the blog garnered 478 page views. 94% of those page views originated in the United States. The remaining 6% originated in Germany, France, Malaysia, Poland, and Romania. The dashboard also allows for tracking the referring URL and referring web sites to the blog. This view indicates that 7% of the traffic originated from URLs or sites directly linked to the school district. To date, there have been zero comments or questions posted to the blog. Aside from dashboard indicators that the blog was accessed from school district URLs, teachers did email the researcher on six different occasions to request directions for printing instructions from the blog or to make approving comments on how instructional materials were posted on the blog.

Technology Showcase

Six months into the rollout of these technology devices, it was determined that the staff was ready to start sharing the various technology integrated lessons they were implementing with parents. Initially, this sharing opportunity was envisioned as an evening event where parents and community members would be invited to the school for classroom demonstrations and opportunities to try the technology. Discussion with staff established the need to change this

strategy. The district had invited the stakeholders to a public meeting six weeks after the start of the school year. The purpose of that evening was to provide information to the public on steps that had been taken to fulfill the three questions that had been part of the referendum. Along with sharing architectural plans for upgrading schools in the district and plans for improving security, two elementary teachers were asked to demonstrate and discuss the new technology that was being implemented. The turnout from the public totaled about 40. Thus, when the discussion of the technology showcase for the elementary developed it was suggested that hosting an open host for an evening event would not be the best approach. Several ideas were proposed and the staff concluded that the best avenue would be to add a technology proponent to an annual open house event titled *Books & Breakfast*. This event is held each year on the Friday prior to Valentine's Day. Parents and family are invited to join the classrooms for breakfast and an hour of book reading in the classroom.

This year, the teachers felt it would be advantageous to add technology to this event. They felt this was an opportune time to demonstrate some of the activities they have implemented into their instruction and, since the event traditionally has brought an excellent turnout, concerns about attendance would be dispelled. In addition to hosting the *Books & Breakfast with Technology* event, the administration sought to publicize this event through the district website as one of the school board goals for the school year was to promote educational events. It was determined that pictures and video clips of the event would be taken and compiled into a video celebrating *Books & Breakfast with Technology* and would be posted to the district website for public consumption.

The resulting event was quite successful. There was a very large turnout of parents, grandparents, and other family members. The teachers described many examples of positive and

enthusiastic comments from those who participated. The compilation video created from video clips and photos taken during the event was added to the school website and advertised through a weekly newsletter from the elementary principal to district parents. The completed video can be found at https://www.youtube.com/watch?v=h8GL-PMaIZQ.

APPENDIX C: ADDITIONAL OBSERVATIONS

Prior to approaching the district constituency with a referendum for several issues, including an increase in per pupil dollars earmarked for technology integration, several teachers in the district led an early exploration into implementing a mobile tablet into classroom activities. The administration and teachers from this early project described the implementation of the pilot devices as mainly limited to accessing the Internet, typing papers, and playing games, although their vision for this early implementation had been purposeful utilization of technology into instructional practices. The pilot teachers reported difficulty with using the devices within their current instructional practices. Some of these difficulties included the ability to readily observe what students were working on within a large classroom, student ability to change device settings without permission, and knowing how to find and use resources available through the device. The teachers expressed the need for focused and continuous training to transform their instructional practices with the use of mobile devices.

Upon approval of the referendum dollars, an exploration of mobile technologies available for classroom implementation was conducted and the district chose to purchase an Android tablet called LearnPads™, for all K-6 elementary classrooms for fall 2014 implementation. The district technology plan included moving the devices that were part of the early attempts at implementation (iPads) into carts for use in the middle school and purchasing additional technology in the summer of 2015 for implementation at the high school level for the fall of that year. In addition, the referendum outlined the goal of hiring a technology integrationist to assist the district with creating and implementing a cohesive professional development plan for the implementation of mobile devices and to support staff in their endeavors to change instructional practices to better meet the needs of students.

This plan was not intended to be a one-to-one (one device for every student) implementation plan. The goal was to increase the availability of technology to a possible one-to-two scenario (one device for every two children; or in this case, a cart containing a set of classroom devices to be shared between two classrooms in the same grade level). Several adjustments were made to this plan over time. First, one of the elementary teachers received a grant to purchase an additional set of devices for her classroom, which created a one-to-one availability at that grade level. In addition, a private donation of $35,000 earmarked for educational technology was made to the district in the winter of 2014. This prompted the district to explore the possibility of implementing technology devices at a one-to-one capacity over a three-year period at the secondary (Gr. 7-12) level.

Throughout the implementation of this PD model, the community had several opportunities to learn about the process of technology integration in the district. Aside from the community referendum update held in the fall and the technology showcase added to the February Books and Breakfast morning, the local newspaper ran an extensive article about the program detailing the districts efforts and success in supporting teachers and students undertaking technology implementation. In addition, the district technology integrationist was asked to speak with the local Rotary Club about the efforts that were taken to create a positive implementation in the district.

Overall, the evaluation data collected indicate evidence supporting the success of this model. There was strong evidence that participants had positive perceptions of the workshops, activities, and support provided through this model. While responses to the PD evaluation questionnaire were positive overall, there were a few trends of which the administration should consider as additional plans are put into place for the continuation of this PD model. None of

these trends are clear indicators of serious issues — and some are to be expected since the integration of mobile technologies represents a pedagogical change over time, not an instantaneous transformation. Nevertheless, these trends should be monitored and considered in ongoing PD planning.

Staff have accepted and embraced the technology, however, survey results indicate teachers feel they have not had time to fully master the technology at this point and do not feel they have all the resources needed to accomplish mastery. Time was a central issue for several survey questions. In most cases, the staff did not feel they had enough time to interact with one another on a professional or informal level (items #4 and #5). Staff also indicated a negative response when asked about time for familiarizing themselves with the LearnPads™ (item #6) in the early fall (see Appendix D). Additionally, although results indicated adequate materials were available to teachers (item #14), a number of participants remained uncertain regarding implementation of mobile technologies into classroom instruction (item #7). These results may be reflected in the fact that classrooms are currently sharing devices with another classroom. Several requests have already been made as to when additional technology can be purchased and how soon classrooms can expect to gain additional sets of devices. There is a certain amount of impatience on the part of staff that for the next two or three years, technology purchases will be earmarked for increasing technology in the upper grade levels of the district.

A second frustration for staff focuses on the content store for this device. Just after the rollout of LearnPads™ into the classroom, teachers started experiencing problems with finding appropriate apps and purchasing apps. The district had understood that the LearnPad™ content store would be updated based on requests from teachers and resources would be made available within 48 hours of individualized requests. Within weeks of the device rollout, the LearnPad™

company changed their policy regarding app requests and the content store. Districts are now asked to contact individual app developers directly to seek permission to install the resource files into the content store. This has resulted in continued frustration for staff and administration and may contribute to negative opinions on whether needed resources and materials are available.

APPENDIX D: DATA COLLECTION AND ANALYSIS

Throughout this PD series, a number of formative assessments were conducted. At the conclusion of each workshop, a brief survey called an "exit slip" or "ticket out" was provided for teachers to reflect, comment, and ask additional questions. The exit slips presented participants with the following questions:

A. Name one thing you felt was valuable about the workshop today.

B. How might you use information from today's workshop in your classroom?

C. Do you have any comments, concerns, or questions?

Responses from the exit slips were compiled in a database to inform next steps in the PD sequence and analyzed to determine themes regarding participant concerns and understandings. The slips also provided the mechanism for monitoring participants' Stages of Concerns. The training topics for both formal and informal learning opportunities were adjusted pending results of the analysis from the exit slips. Analysis of these responses was done through thematic coding to identify common concerns, issues, and perceptions, which were later discussed with outside experts. These themes were compared to similar concepts addressed in research on concerns-based adoption. The iterative process of analyzing the responses and discussing the results with individuals outside of the education training process provided an additional examination of the results.

The tech blog, which was developed by this researcher as a resource for teachers, included a response link that allowed participants to post anonymous comments, questions, concerns, or suggestions at any time. These responses provided a secondary source for monitoring the Stages of Concern and were similarly analyzed using thematic coding and discussed with outside experts. Analysis of the blog responses assisted in informing next steps

for the “Let’s Get Appy” sessions after school weekly. The responses also helped determine topics for future blog posts. Participants were reminded and encouraged to use the response link at their convenience during all formal, informal, and impromptu sessions.

Throughout the PD series, an evaluator journal was kept detailing observations, discussions, and thoughts regarding the PD implementation. In addition, changes and adjustments made to the proposed plan was documented, as well as, reasons for those adjustments. In addition to the written journal, a timeline was created to document many of the observations that occurred during this six-month period and provide evidence of change to classroom practices and changes to the use of the device over the evaluation period. This researchers’ perspectives and biases are addressed in Appendix F: Authorial Perspectives.

Summative data was collected through a mobile technology (LearnPad™) PD questionnaire after six months of implementation. Results of that survey are documented below.

Table D1. Responses to Six-Month Questionnaire.

Please indicate how strongly you agree or disagree with the following statements.	Disagree Strongly	Disagree	Agree	Agree Strongly
1. This PD series helped establish a solid working relationship between the Breckenridge leadership team and myself.	1	1	10	7
2. As a result of the time spent this fall, I feel like I understand the philosophy behind designing lessons for technology implementation.	1	1	13	5
3. I feel I know what is expected of me as far as integrating LearnPads into my classroom.	1	4	8	8
4. I had enough time to interact **professionally** with my colleagues this fall.	1	5	13	1
5. I had enough time to interact **informally** with my colleagues this fall.	2	7	11	0
6. I had enough time to become familiar with using LearnPads this fall.	2	7	7	3
7. I feel well prepared to implement LearnPads.	2	7	8	3
8. I feel the tech blog was helpful in providing additional information for LearnPad implementation.	0	4	12	3

Table D1. Responses to Six-Month Questionnaire (continued).

Please indicate how strongly you agree or disagree with the following statements.	Disagree Strongly	Disagree	Agree	Agree Strongly
9. I feel the "Let's Get Appy" sessions were helpful in providing additional information for LearnPad implementation.	0	2	12	6
10. I am worried that integrating LearnPads will take up too much of my time.	2	13	3	2
11. I understand how to integrate LearnPads in my classroom.	1	2	14	3
12. The training workshops were too long.	0	20	0	0
13. The training workshops were too short.	1	10	9	0
14. I will have access to the materials I will need in order to implement LearnPad activities in my classroom.	1	4	14	2
15. I am excited about implementing LearnPads.	1	2	11	7
16. I feel that the Breckenridge leadership team will value my input regarding technology implementation.	1	2	11	7
17. The things I learned during the fall workshops will be difficult to implement in my classroom.	2	10	5	2

18. Please explain your response to #16:

- "We were consulted about how to organize the technology showcase with parents."
- "We get asked about what we need on a regular basis."
- "I get frustrated that we are always adding new things and don't have time for any of it."
- "We were part of the decision process for choosing the LearnPads."
- "We gave input for using technology with the Books & Breakfast morning."
- "I was asked to be part of the community referendum showcase."
- "I was asked to present to the staff on how to use Socrative and Kahoot for assessment."
- "I was asked to go to the TIES conference."
- They are great! Very encouraging!
- "I run out of time for everything."

Table D1. Responses to Six-Month Questionnaire (continued).

19. Do you have suggestions for improving future LearnPad™ workshops?

- It was a difficult year as MANY new items were implemented at one time. We need repetitions until we become comfortable. The district has to understand utilizing the LearnPads takes time & I felt a lot of other items were thrown at us at the same time.
- Takes alot of time and effort. Kids do like it.
- Hold them during contracted hours – it's hard to juggle life, learning new technology, etc. An extremely busy class that sucks the life out of me. I wish I had time to use the tech blog and I didn't get to any Let's Get Appy sessions. I question that we had training in August and didn't use the LearnPads until Oct?
- Freezing problems. Study Island - student can't hear lesson, it won't open
- I liked the SAMR model! Should discuss more I did not attend any Let's Get Appy sessions.
- What tech blog? I love learning, it's a matter of making it a priority to attend. I stray away from them because of the lack of Internet strength (in my room). Just yesterday a student asked, "Is there a Recorder app on the Learnpad?" sometimes I feel like music apps are more & better on the iPads. Some of the information from Let's Get Appy may take too much class time to implement.
- Additional 1-1 help to check if people have individual questions or needs - staff meeting LP is great!
- Better functioning LearnPads. Show us more stuff that is already in the LearnPad store (apps) that will be useful, helpful.
- Have teachers show how they are using LearnPads. Continue introducing new ideas for them.
- Would like to view another classroom & its use of LearnPads / collaborate with another teacher to discuss usage of various apps, etc.
- We had good support but I feel we were doing so many new things this year I feel I was spread thin and did not have the time to use the LearnPads to the full extent. Making the lessons specific to our curriculum takes time.
- I would like more things for math in the upper grades.
- Just keep teaching us good educational things - I love it! :-)

APPENDIX E: MODEL PARAMETERS

This study was implemented in a small school district with a K-6 student population of approximately 350 students. The participants for this study included all of the elementary teaching staff and participation was considered an expectation of the teaching contract. In addition, support for this initiative was evident through the passing of a community referendum that provided funds for the purchase of mobile devices and to hire a professional for staff development focused on technology integration and 21st century instructional practices.

This small district features a cohesive staff and buy-in regarding the use of mobile technologies in the classroom was already evident by the percentage of participant teachers (22%) who regularly inquired about the rollout date for the devices prior to the commencement of school and, subsequently, used the LearnPads™ on the first day the devices were in the classrooms. In addition, this study focused on the implementation of a specific device. There were specific training requirements needed to assist staff with understanding the use of the web-based teacher dashboard for lesson creation and observation of student devices that is an essential part of this particular device.

Although this PD model appears to be positive, concerns did arise regarding sustainability for this type of model. Supporting teachers on an individualized level meets the recommendations supported by many researchers, yet the time and staffing needed to do this on a consistent basis can be overwhelming. In this case, one person was responsible for working with and supporting teachers on a daily basis at the K-6 level. But, once additional grade levels, teachers, and technologies are added to this PD model, the amount of time and attention for individual teachers will become stretched thin. As more grade levels and teachers are added, the

possibility for responding to requests for assistance and support within a short turnaround time will become increasingly difficult.

Additionally, the evaluation of this PD model was conducted after six months of technology implementation. It is difficult to discern whether all of the initial objectives were met, mainly due to the fact that change takes place over time and the intent for reaching those objectives remains in progress. The district remains committed to retaining this PD model, to regularly evaluate its effectiveness, and to make alterations as needed with the knowledge that instructional change through technology integration is the goal.

During this period of implementation, staff was also in the midst of several other district and curricular changes. At the same time as this new technology was introduced, staff started using to a new method for teacher observations and teacher evaluations. Additionally, the state had recently adopted the Common Core English Standards resulting in teachers preparing for the implementation of these new standards through training workshops and curriculum seminars focused on changes for instructional planning and lesson implementation. The resulting evaluation report was conducted and created by an internal investigator. This person was hired for the purpose of supporting staff through the implementation and integration of new technologies in this district.

APPENDIX F: AUTHORIAL PERSPECTIVE

As an educator with 14 years of experience as a classroom instructor, and several years of supporting professional development and technology integration, I bring some strong perspectives to this research. The creation of the technology integrationist position while I was planning this dissertation was serendipitous. Before the position was announced, I had contacted the superintendent about conducting my research within the district on a voluntary basis. However, since I have worked with a number of school districts on K-12 curriculum/technology integration as an employee and a consultant, I was encouraged to apply for the position and was hired. By conducting this evaluation as part of my regular job duties, I have been able to not only contribute to the growth and improvement of the district, but to make a more robust contribution to research at the same time.

My experiences have provided opportunities to see examples of how to approach technology integration, as well as how *not* to approach it. I believe that one of the key predictors of effective technology integration is advanced planning and training of teachers on the relevant technologies, well before the tools are deployed to students. Additionally, those districts that were successful in employing new technologies typically provide a clear, strategic expectation from administrators that technology should be used as a tool to support classroom instruction. Successful districts tend to focus on preparing teachers to change their instruction with the understanding that once new instructional practices were in place, improved student achievement will be reflected in academic work. Those districts I have encountered that have failed with technology integration have demonstrated some common missteps. First, they did not provide adequate training for teachers on the use of technology to support instruction in advance of the technology deployment. Second, many focused on student achievement prior to considering

teacher training or support. Ultimately, these missteps led to many teachers setting the technology aside and continuing with instructional practices as they had in the past.

Although this PD series was created to assist teachers in understanding how to implement technology into their instruction, participants were consistently reminded that the focus needs to be about changing *instruction* to meet learning outcomes, rather than focusing on the technology. Technology is simply a tool to use to support learning instruction. Deployment of technology is not the strategic goal, learning is.

My formal training in the fine arts has led me to seek best instructional practices in meeting the individual needs of students and has shown me the importance of working with them on an individual basis to find a voice to express their thoughts and feelings. Providing a safe environment for exploration of new skills and concepts, while at the same time providing support and encouragement to embrace new ideas has been a consistent underpinning of my education career. Similarly, I believe that teaching is a creative process that requires an appropriate setting for teachers to be successful. Ensuring adequate training and addressing the concerns of teachers is an essential foundation to their success in the classroom as well.

I am committed to the notion that a successful educator must be a lifelong learner. Not only does he or she need to take advantage of learning opportunities that are presented, one must also be an autodidact. He or she must be constantly engaged as a deliberate, self-motivated learner who seeks out new knowledge and new concepts without prompting. That is admittedly an idealistic view. In engaging the CBAM, I am seeking to find a method to motivate teachers to become those self motivated learners – to help clear away the fears that prevent them from pursuing knowledge and personal growth while seeking to improve educational practice.

APPENDIX G: IRB Approval

NDSU NORTH DAKOTA STATE UNIVERSITY

August 26, 2014

Dr. Nate Wood
School of Education
FLC 210G

Re: IRB Certification of Exempt Human Subjects Research:
Protocol #HE15028 , "Developing Teacher Innovation: A Professional Development Model for Technology Integration"

Co-investigator(s) and research team: Miriam Tobola

Certification Date: 8/26/14 Expiration Date: 8/25/17
Study site(s): TBD
Sponsor: n/a

The above referenced human subjects research project has been certified as exempt (category # 1) in accordance with federal regulations (Code of Federal Regulations, Title 45, Part 46, Protection of Human Subjects). This determination is based on the original protocol (received 8/25/14) and revised consent handout (received 8/26/14).

Please also note the following:
- If you wish to continue the research after the expiration, submit a request for recertification several weeks prior to the expiration.
- The study must be conducted as described in the approved protocol. Changes to this protocol must be approved prior to initiating, unless the changes are necessary to eliminate an immediate hazard to subjects.
- Notify the IRB promptly of any adverse events, complaints, or unanticipated problems involving risks to subjects or others related to this project.
- Report any significant new findings that may affect the risks and benefits to the participants and the IRB.

Research records may be subject to a random or directed audit at any time to verify compliance with IRB standard operating procedures.

Thank you for your cooperation with NDSU IRB procedures. Best wishes for a successful study.
Sincerely,

Kristy Shirley
Digitally signed by Kristy Shirley
DN: cn=Kristy Shirley, o=NDSU, ou=SPA, email=kristy.shirley@ndsu.edu, c=US
Date: 2014.08.26 14:49:40 -05'00'

Kristy Shirley, CIP, Research Compliance Administrator

For more information regarding IRB Office submissions and guidelines, please consult www.ndsu.edu/irb. This Institution has an approved FederalWide Assurance with the Department of Health and Human Services: FWA00002439.

INSTITUTIONAL REVIEW BOARD
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