The Evolution of Pre-Service Teachers TPACK After Completing an Undergraduate Technology Integration Course

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THE EVOLUTION OF PRE-SERVICE TEACHERS TPACK AFTER
COMPLETING AN UNDERGRADUATE TECHNOLOGY INTEGRATION COURSE

by

Sherri J. Booker

A Dissertation

Presented in Partial Fulfillment of Requirements for the
Degree of
Doctor of Education
In
Leadership for Learning
Instructional Technology
In the
Bagwell College of Education
Kennesaw State University

Dr. Anissa Vega, Chair

Kennesaw, GA
2017
Abstract

The steady momentum of emerging technology tools continues to impact the educational environment, generating dramatic changes over the past five years (Spalding, 2016). According to the 2016 National Educational Technology Plan (NETP), educational institutions that prepare educators often fail to give teachers the technology skills required to do their job well. Many teacher preparation programs claimed technology was integrated throughout the courses within the program; however, the comfort level with technology for pre-service teachers entering the teaching field remained low (Moore-Hayes, 2011; Giles & Kent, 2016; NETP, 2016; Niess & Gillow-Wiles, 2016). As members of the educational learning community, teacher preparation programs must remain focused in supporting pre-service teachers as technology integration has become an integral part of the teaching process. This case study focuses on the experiences of two pre-service teachers as they address teaching requirements during their practicum, working to seamlessly integrate technology into their students’ learning experiences. Both teachers participated in the ITEC 3100 stand-alone course at the beginning of their Junior year. The course extended the learning experience beyond basic skill development to include an overview of various technology frameworks. Using both the Technological Pedagogical and Content Knowledge (TPACK) framework (Mishra & Koehler, 2007) and the Levels of Technology Integration (LoTi) Model (Moersch, 2013), the course design focuses on identifying specific tools and strategies that best support pre-service teachers as they develop the necessary skills to integrate technology into the learning environment ultimately enhancing the learning experiences for the students.

*Keywords:* technology integration, pre-service teachers, Technological Pedagogical and Content Knowledge (TPACK), Levels of Technology Integration (LoTi)
EVOLUTION OF PRE-SERVICE TEACHERS TPACK

Acknowledgements

I wish to dedicate this degree to the honor of my Mom and in loving memory of my Dad. As a family, we always pulled together as a team, tackling times of difficulty, and celebrating times of joy. They were my solid rock, loving me, and selflessly helping me. Believing in me, they picked me up when I was down, lead me when I needed guidance and walked beside me in friendship.

There are times in our lives when we really do not see the big picture. Along my life path, I sometimes questioned the events that were happening, often fighting the path that lay in front of me. Little did I realize at the time; very special points were being put into place just for me. I thank God for looking after me in the times I felt alone, leading me all the while in the right direction. I thank God for placing so many special people in my path – those who would love me for the person I am. I thank God for the special points that helped me grow into the person I am today.

When reflecting upon this journey for a doctorate, I am overwhelmed to think this challenge evolved during this time in my life. I served in many capacities over my 32 years in the public school system, striving to make things better for the students under my care. Then, out of the blue, Dr. Jo Williamson came into the picture and changed my life path again - one of those very special points in time. Dr. Jo believed in me and encouraged me to continue my path as a life-long learner. Her compassion and friendship has held strong, providing the encouraging words when I was down and out, yet becoming my cheerleader to keep me moving in the right direction. Thanks, Dr. Jo, your friendship is a priceless treasure.

This new path toward a doctorate definitely caused some changes with my personal life. My family and friends have been so supportive, standing behind me all the way.
To my Daddy, the words of “I’m so proud of you” will remain in my heart forever.

After his passing, Mama was the one who kept encouraging me to “hang in there”.

After all, we are living members of the Lake Wobegon group where “all the women are strong, all the men are good-looking, and all the children are above average” – Garrison Keillor, Prairie Home Companion. Mom, you are my dear friend.

My daughter, Sara, and her family, Patrick, Ceci and Ellie who always met me with a smile on their face. Sara thanks for the encouragement along the way. You mean more to me than you will ever know.

Ceci and Ellie – Thank you for those beautiful twinkling eyes and expressive smiles each time you learned something new. You have a wonderful start as a life-long learner…I pray your lives will continue to be magical and exciting!

To my brother, Tom, thanks for being my big brother. Certainly, it is five o’clock somewhere!

To my co-workers (Dr. Redish, Dr. Williamson, Dr. Dias, Dr. Fuller, Dr. Moore, Dr. Wright and my partner-in-crime, Helen) – thanks for believing in me and understanding my times of frustration while working on this degree. Your support is priceless.

To all my family and friends – thanks for all the “rain checks” you supplied throughout the past six years. I do look forward to having more personal time instead of weekends of study time.

Last, but certainly not least, to my dissertation committee – Dr. Vega for staying with me when I was ready to quit, Dr. Jorrín-Abellán for encouraging me to continue down this path, and Dr. Fuller for wisely guiding me through the process.
Table of Contents

Copyright Notice.................................................................................................................. ii
Abstract ................................................................................................................................. iii
Acknowledgements.............................................................................................................. iv
List of Tables ........................................................................................................................... ix
List of Figures ......................................................................................................................... x
Chapter 1: Introduction to the study .....................................................................................1
  Problem Statement ..............................................................................................................1
  Research Question ............................................................................................................. 5
  Purpose of the Study .......................................................................................................... 5
  Significance of the Study ................................................................................................... 6
  Definition of Relevant Terms ............................................................................................ 7
  Conclusion ......................................................................................................................... 12
Chapter 2: Review of Literature .........................................................................................15
  Conceptual Framework ..................................................................................................... 15
    Personal Narrative Supporting the Conceptual Framework ........................................... 15
    Personal Interests and Goals ......................................................................................... 16
    Identity and Positionality ............................................................................................... 18
    Starting Points ................................................................................................................ 19
  Topical Research: Technology in the Classroom ............................................................... 19
    Computer Assisted Instruction (CAI) ........................................................................... 19
    Apple Classroom of Tomorrow (ACOT) ....................................................................... 20
    Computer-Supported Collaborative Learning ............................................................... 21
    No Child Left Behind Act and the International Society for Technology in Education (ISTE) Essential Conditions .......................................................... 22
    International Society for Technology in Education (ISTE) Standards ......................... 28
    National Education Technology Plan ........................................................................... 31
    Federal Funding .............................................................................................................. 31
  Theoretical Framework ...................................................................................................... 32
    Pedagogical Content Knowledge (PCK) ....................................................................... 33
    Technological Pedagogical and Content Knowledge (TPACK) ................................... 33
    Technology Integration .................................................................................................. 37
    TPACK and Technology Integration ............................................................................. 39
    TPACK and the Assessment of Teacher Competencies ................................................. 40
    Technology Integration Strategies ................................................................................ 42
    Pre-Service Teacher TPACK ......................................................................................... 44
    Pre-Service Teacher Preparation Programs .................................................................... 45
    Pre-Service Teacher Technology Courses .................................................................... 49
    TPACK and Lesson Planning ......................................................................................... 50
    Technology Integration Matrix ....................................................................................... 51
  Conceptual Framework for this study ............................................................................. 53
  Summary ............................................................................................................................ 55
Chapter 3: Methodology ........................................................................................................57
  Background of Research Context ...................................................................................58
  SRU Teacher Preparation Program: Teacher Quality Program (TQP) .............................58
  Overview of the ITEC 3100 Course ..............................................................................60
Research Question ............................................................................................................61
Research Design ................................................................................................................62
Framework of the Design ..................................................................................................64
  Hopscotch Model ............................................................................................................64
Bounds of the Case ..........................................................................................................67
Research Setting and Context .........................................................................................67
Participants .......................................................................................................................69
Researcher Background and Role ...................................................................................72
Strategies to Ensure the Trustworthiness of the Study ...................................................74
  Triangulation ....................................................................................................................75
  Member Checking ..........................................................................................................75
  Researcher Reflexivity .....................................................................................................76
Instruments .........................................................................................................................76
  Technology Integration Matrix (TIM) ..............................................................................76
  Technology Integration Matrix – Observation (TIM-O) Instrument ................................77
  Technology Integration Matrix – Lesson Plan (TIM-LP) Instrument .............................78
Data Collection ..................................................................................................................78
  Interviews .........................................................................................................................79
  Lesson Submission .........................................................................................................80
  Video Recording .............................................................................................................80
  Teacher Reflection .........................................................................................................81
Data Analysis Procedures ...............................................................................................81
Ethical Considerations ......................................................................................................82
Summary .............................................................................................................................82

Chapter 4: Findings ............................................................................................................84
Case Study .........................................................................................................................84
  David .................................................................................................................................84
  Trina ................................................................................................................................87
Overview of Results .........................................................................................................89
  Interviews, Lesson Plans, and Post-Reflection (NVivo Pro 11) Analysis .......................90
    Themes and Categories ...............................................................................................93
    Interviews ......................................................................................................................95
    Lesson Plans ...............................................................................................................96
    Post-Reflections ............................................................................................................100
Lesson Plan Analysis - TIM-LP .....................................................................................100
Video Review - TIM-O ......................................................................................................102
Amalgamated Analysis ...................................................................................................105
Conclusions .......................................................................................................................108
EVOLUTION OF PRE-SERVICE TEACHERS TPACK

Chapter 5: Discussion ........................................................................................................ 111
Overview of the Study ...................................................................................................... 111
Discussion of the Findings ............................................................................................... 114
Recommendations ............................................................................................................. 119
Limitations ......................................................................................................................... 123
Implications for Future Research ..................................................................................... 124
Conclusion ......................................................................................................................... 125

References ......................................................................................................................... 127

Appendices ......................................................................................................................... 140
Appendix A – Technology Integration Matrix (TIM) Instruments and Results .......... 140
Appendix B – ITEC 3100 Syllabus ................................................................................... 143
Appendix C – End-of-Course Student Comments ............................................................ 151
Appendix D – Pre-Assessment/Post Assessment Survey and Analysis ......................... 152
Appendix E – Letter to Former ITEC Students ................................................................. 161
Appendix F – Online Survey – Participant Consent......................................................... 162
Appendix G – Transcripts of Participants’ Interviews ....................................................... 165
Appendix H – Lesson Plans ............................................................................................... 174
Appendix I – Video ............................................................................................................ 185
Appendix J – Transcripts of Participants’ Post-Reflections .............................................. 186
Appendix K – Sample Lesson Idea Template .................................................................. 188
List of Tables

<table>
<thead>
<tr>
<th>Table</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>81</td>
</tr>
<tr>
<td>2</td>
<td>101</td>
</tr>
<tr>
<td>3</td>
<td>105</td>
</tr>
<tr>
<td>4</td>
<td>113</td>
</tr>
</tbody>
</table>

1. Data Collection Timeline
2. TIM-LP Summary
3. Word Frequency Analysis
4. Summative Table – Instrument Ratings
# List of Figures

<table>
<thead>
<tr>
<th>Figure</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Elements of a Conceptual Framework</td>
<td>16</td>
</tr>
<tr>
<td>2</td>
<td>General Comparison NETP 2010 and NETP 2016</td>
<td>24</td>
</tr>
<tr>
<td>3</td>
<td>Alignment of the NCLB Goals and the ISTE Essential Conditions</td>
<td>25</td>
</tr>
<tr>
<td>4</td>
<td>Diagram of Shulman’s PCK</td>
<td>33</td>
</tr>
<tr>
<td>5</td>
<td>TPACK Diagram</td>
<td>35</td>
</tr>
<tr>
<td>6</td>
<td>Model for ICT/TPACK Assessment</td>
<td>41</td>
</tr>
<tr>
<td>7</td>
<td>Guiding Model for Incorporating Technology into Pre-service Education</td>
<td>43</td>
</tr>
<tr>
<td>8</td>
<td>Goldilocks and TPACK</td>
<td>46</td>
</tr>
<tr>
<td>9</td>
<td>SQD-Model</td>
<td>48</td>
</tr>
<tr>
<td>10</td>
<td>Pre-Service Teachers’ TPACK Development</td>
<td>54</td>
</tr>
<tr>
<td>11</td>
<td>Hopscotch Model</td>
<td>66</td>
</tr>
<tr>
<td>12</td>
<td>Word Frequency for Interviews, Lesson Plans and Post-Reflections</td>
<td>90</td>
</tr>
<tr>
<td>13</td>
<td>Word Frequency Cloud for David</td>
<td>91</td>
</tr>
<tr>
<td>14</td>
<td>Word Frequency Cloud for Trina</td>
<td>92</td>
</tr>
<tr>
<td>15</td>
<td>Word Frequency Analysis Summary</td>
<td>93</td>
</tr>
<tr>
<td>16</td>
<td>Coding Categories</td>
<td>94</td>
</tr>
<tr>
<td>17</td>
<td>Query Analysis of David’s Practicum Experience</td>
<td>95</td>
</tr>
<tr>
<td>18</td>
<td>Query Analysis of Trina’s Practicum Experience</td>
<td>96</td>
</tr>
<tr>
<td>19</td>
<td>Word Tag Query Display of Post-Reflection Responses</td>
<td>104</td>
</tr>
<tr>
<td>20</td>
<td>Combined Post-Reflections Word Cloud for David and Trina</td>
<td>107</td>
</tr>
<tr>
<td>21</td>
<td>TPACK as Measured by the LoTi and TIM Instrument Levels</td>
<td>121</td>
</tr>
</tbody>
</table>
Chapter 1: Introduction to the Study

Technology has become an integral part of our daily life and has steadily permeated the world of education (Spaulding, 2016). Today’s children live in a world of technology, having never experienced a time without such tools; yet, many adults strive to become familiar with the various technology tools and devices. For in-service teachers, the struggle extends beyond a basic understanding of how to use the hardware and software, but more importantly, to developing a deep understanding of how the various technology tools assimilate into the learning environment as well as support the ways students think and learn (Niess, 2016). The increased availability of various technology tools tends to promote an assumption among stakeholders that pre-service teacher candidates come equipped with an understanding of technology use and its integration into the curriculum (Elwood & Savenye, 2015). To successfully integrate technology into the curriculum, pre-service teacher candidates must also acquire an understanding of teaching pedagogy and basic content knowledge (Hsieh, 2015; Elwood & Savenye, 2015).

Problem Statement

The steady momentum of emerging technology tools continues to impact the educational environment, generating dramatic changes over the past five years (Spalding, 2016). According to the 2016 National Educational Technology Plan (NETP), educational institutions that prepare educators often fail to give teachers the technology skills required to do their job well. Many
teacher preparation programs claimed technology was integrated throughout the courses within the program; however, the comfort level with technology for pre-service teachers entering the teaching field remained low (Moore-Hayes, 2011; Giles & Kent, 2016; NETP, 2016; Niess & Gillow-Wiles, 2016). With the onset of new technologies appearing in the classroom, effective technology integration moves to the forefront as these tools support the teaching and learning of content (Polly & Rock, 2016). Pre-service teachers interact with a variety of digital tools throughout their daily routine; however, they do not fully understand how these tools can be used to improve their teaching practices, stating the lack of training as one of the major barriers to integrating technology into the learning environment (NETP, 2010, p 25; Ertmer & Ottenbreit-Leftwich, 2010; Brantley-Dias & Ertmer, 2013; Elwood & Savenye, 2015). Emphasized within the NETP 2016 Act, teacher preparation institutions should provide technology-supported learning experiences that promote and enable all educators to acquire the ability to select, evaluate, and appropriately use technology tools to advance student engagement and support learning (p. 25). Following the findings of Mishra and Koehler (2009), teacher education programs need to focus on building good pedagogical practices, technical skills and content knowledge, as well as understanding the inter-relationship of these concepts (Tondeur et al., 2012).

Extending Shulman’s (1986) original Pedagogical Content Knowledge framework to include technology, Mishra and Koehler (2006) designed the Technological, Pedagogical, and Content Knowledge (TPACK) framework. Researchers adapted various theories on technology acceptance used in the business world to address the acceptance of technology in the field of education (Teo, 2015). The Technology Acceptance Model (TAM) (Davis, Bagozzi & Warshaw, 1989), the Theory of Planned Behavior (TPB) (Ajzen, 1991), and the Unified Theory of
Acceptance and Use of Technology (UTAUT) (Venkatesh, Morris, Davis & Davis, 2003) served as theories for studying technology acceptance within the educational setting (Teo, 2015). A pre-service teachers’ development of technology integration is a process that requires teachers to develop a variety of capabilities (Polly, Mims, Shepherd, & Inan, 2010). Tondeur et al. (2012) identified the most useful strategies for technology integration in pre-service teacher programs. The data review provided evidence on content and delivery methods that best prepare pre-service teachers to integrate technology into their classrooms (Tondeur et al., 2012). The findings emphasized the need for pre-service preparation programs to:

- align theory and practice
- use teacher educators as role models
- reflect on attitudes about the role of technology in education
- learn technology by design
- collaborate with peers
- scaffold authentic technology experiences
- move from traditional assessment to continuous feedback (Tondeur et al., 2012)

Debate over the strengths and weaknesses of the TPACK framework caused researchers to design and validate instruments that supported the analysis and evaluation of a teacher’s level of technology implementation (Kay, 2006; Kay, 2007; Schmidt, et al., 2009; Tondeur et al., 2016). Although many of the instruments proved to be robust, the self-reported nature of the instruments tended to reflect an increased confidence level as related to professional topic (Harris, Grandgenett, & Hofer, 2010). Harris et al. (2010) designed and validated a more pedagogically inclusive instrument. Extending their research from 2009, Harris and Hofer collaboratively designed an evaluative instrument involving the Learning Activity Type (LAT)
Taxonomies (Harris et al., 2016). The curriculum-keyed taxonomies of learning steps teachers through a “heavily scaffolded lesson planning process” where technology is appropriately integrated into the lesson (Harris & Hofer, 2016, p. 1). The goal of the process, described in the Developing TPACK with Learning Activity Types Manual, focuses on technology as enhancing “students’ curriculum-based learning needs, rather than focusing on the particular features of educational tools or resources” (Harris & Hofer, 2016, p. 8). Developing lesson plans and activities following the LAT Taxonomies, the process involves five basic instructional decisions:

- Choosing learning goals
- Making practical pedagogical decisions about the nature of the learning experience
- Selecting and sequencing appropriate activity types to combine to form the learning experience
- Selecting formative and summative assessment strategies that will reveal what and how well students are learning
- Selecting tools and resources that will best help students benefit from the learning experience (Harris & Hofer, 2009)

The Florida Center for Instructional Technology through a grant awarded by the Florida Department of Education developed the Technology Integration Matrix (TIM) to identify and assess the level of technology integration established within the learning environment (Allsopp, Hohlfeld, & Kemker, 2007) (See Appendix A). As a technology integration tool, the matrix assisted teachers, schools, and districts with identifying the level of technology integration within the classroom and determining strategies and models that support technology integration in positive and meaningful ways (Allsopp et al., 2007). Allsopp et al. (2007) reiterated that teachers
who have not been taught methods to integrate technology tend to refrain from integrating technology into their daily lesson ideas.

The problem this study seeks to address is the gap in the literature that explains how, following a stand-alone technology integration course, pre-service teachers integrate technology into lesson designs in other pre-service courses as they near the end of their pre-service program. Were pre-service teachers able to select and include specific technology tools into lesson ideas and activities that served to enhance the learning experience for students? What did the technology-infused lessons look like? What additional technology resources do the pre-service teachers feel would have supported their lesson design?

Research Question

How do pre-service teachers integrate technology into their instructional practices during their student-teaching practicum after completing a stand-alone technology integration course?

Purpose of the Study

Niess (2008a) concluded that “tomorrow’s teachers must be prepared to rethink, unlearn and relearn, change, revise and adapt.” (p. 225) When it comes to technology, simply observing from the sidelines is no longer an option for today’s educators. Teachers must move forward, expanding their understanding and views of technology in the learning environment in order to develop a strong TPACK. As pre-service teachers move into the teaching field and become lifelong learners, they fuel their journey with the tools and knowledge required to develop the necessary skill sets to become the future technology teacher leaders within their school systems. Albion and Ertmer (2002) reiterate changing teachers’ beliefs about teaching can be a daunting task. Providing an alternate view of what teaching can look like and how different methods can affect beliefs can promote change (Albion & Ertmer, 2002).
The purpose of this study is to fill the gap in the literature by investigating evidence of technology integration in lesson ideas created by pre-service teachers who took a technology stand-alone course. Interviews, questionnaires, video recordings, and document analysis will serve as the data set for this study. The role of technology within the learning environment has increased over the past years (Hsieh, 2015) forcing teacher preparation programs to redefine course goals such that pre-service candidates obtain the knowledge, skills, and abilities to integrate technology into the learning environment (Hsieh, 2015). Gaining an understanding of how a pre-service teacher’s TPACK evolves after completing the stand-alone technology course provides valuable information for course designers and coordinators as they assess the strengths and weaknesses of a pre-service technology course. Identifying specific tools and strategies that best support pre-service teachers as they develop the necessary skills to integrate technology into the learning environment ultimately enhances the learning experiences for the students. The analysis of these data will also inform teacher preparation programs of elements and best practices that influence and support a quality technology integration course.

Significance of the Study

Former Secretary of Education Arne Duncan emphasized President Obama’s vision placing the United States as a world leader in the proportion of college graduates by 2020 (NCLB, 2010). Addressing that charge, the Department of Education established the National Education Technology Plan (NETP) in 2016 called for engaging and empowering personalized learning experiences for learners of all ages. The plan required state-of-the-art technology and Universal Design for Learning (UDL) concepts to promote student achievement (NETP, 2016). Educators at all levels within the field must heed the messages and identify quality technology courses for pre-service teachers where technology-rich resources blend seamlessly throughou
pedagogically sound learning activities. According to the National Education Technology Plan (2016), “Schools should be able to rely on teacher preparation programs to ensure that new teachers come to them prepared to use technology in meaningful ways. No new teacher exiting a preparation program should require remediation by his or her hiring school or district” (p 32).

To address this call to action, a large suburban university in the Southeast United States designed an undergraduate course, ITEC 3100 – Improving Learning with Technology in the Elementary Classroom. The intellectual goal of this study is to determine how pre-service teacher’s TPACK evolved after participating in the ITEC 3100 course. The practical goal focuses on how the course content established a strong baseline understanding of the process of technology integration, where pre-service teachers appropriately integrate technology tools into lesson ideas and activities. The personal goal encompasses the desire to understand if and how pre-service teachers apply technology integration strategies into the lesson design assignments of future lesson activities they create during their pre-service teacher program. This study will inform teacher preparation institutions of whether or how pre-service teachers apply skills of technology integration learned in a stand-alone technology course during the pre-service courses that follow. Identifying strategies, best practices, and technology tools that support technology integration could inform both stand-alone courses and online/blended courses.

**Definition of Relevant Terms**

*Apple Classroom of Tomorrow (ACOT)* was initiated in 1985 as a collaborative project between Apple Computer, Inc., public schools, universities, and research agencies. The goal of the project was to place a wide range of technology tools into the classroom (Apple Computer, Inc., 1991).
Artificial Intelligence (AI) is one of the paradigm shifts within instructional technology as described by T. Koschmann (1996). Artificial Intelligence began to appear in the early 1870’s when several workers within the field of Artificial Intelligence research moved over to support the field of education research.

**Authentic learning** refers to learning experiences that address and focus on real-world issues. Authentic learning activities fall into four themes:

1. An activity that involves real-world problems and that mimics the work of professionals; the activity involves presentation of findings to audiences beyond the classroom.
2. Use of open-ended inquiry, thinking skills, and metacognition.
3. Students engage in discourse and social learning in a community of learners.
4. Students direct their own learning in project-based work. (Educational Research Newsletters and Webinars, 2016)

**Collaborative learning** is described by Koschmann (1996) as a method of learning where a commitment to learning [is] through doing. The learners are engaged in cooperative (as opposed to competitive) pursuit of knowledge, and the traditional role of the teacher moves to that of a facilitator.

**Computer Assisted Instruction (CAI)** is a program that was initiated within the United States to focus on three areas: a survey on trends and issues, a discussion of studies that have attempted to evaluate the impact of CAI, and overview of the costs surrounding the program and equipment (Chambers & Sprecher, 1980).

**Computer efficiency** is defined as the “degree to which computers are being used to support concept-based or process-based instruction, consequential learning, and higher order thinking skills” (Moersch, 1996, p. 52).

**Computer-Supported Collaborative Learning (CSCL)** is the paradigm shift designed by T. Koschmann (1996). His model was built upon the research traditions (anthropology,
sociology, linguistics, and communication science) that focused on understanding language, culture, and other aspects of the social setting.

_E-Rate_ Program is the federally funded program sponsored by the Universal Service Administrative Company (USAC) under the supervision of the Federal Communications Commission (FCC). The program makes telecommunication and information services more affordable for schools and libraries (Federal Communications Commission, 2016).

_**Engaged Learning**_ indicates that students have opportunities to engage deeply in their own learning, to practice the transfer or application of knowledge across contexts (whether among courses or between courses and off-campus contexts), to interact with other perspectives and voices, to receive frequent feedback about their performance, and to reflect on both that feedback and their learning (Center for Engaged Learning, 2016).

_**Information and Communication Technology (ICT)**_ refers to the variety of communication devices or applications – radio, television, computers, cell phones, etc. (technopedia.com, 2016).

_In-service_ refers to those teachers who have entered the teaching profession (thefreedictionary.com/in-service, 2016).

_**International Society for Technology in Education (ISTE)**_ is premier nonprofit organization serving educators and education leaders committed to empowering connected learners in a connected world. Their mission is to empower learners to flourish in a connected world by cultivating a passionate professional learning community, linking educators and partners, leveraging knowledge and expertise, advocating for strategic policies, and continually improving learning and teaching (ISTE, 2016).
**ISTE Essential Conditions** are the 14 critical elements necessary to effectively leverage technology for learning. They offer educators and school leaders a research-backed framework to guide implementation of the ISTE Standards, tech planning, and system-wide change (ISTE, 2016).

**Intelligent Tutoring Systems (ITS)** is one of the paradigm shifts in instructional technology as described by T. Koschmann (1996). Intelligent Tutoring Systems use computers to provide immediate feedback and customized learning activities to support student learning with little intervention by a human teacher.

**Learning Activity Types (LAT)** “function as conceptual planning tools for teachers; they comprise a methodological shorthand that can be used to both build and describe plans for standards-based learning experiences” (Harris & Hofer, 2009).

**Levels of Technology Integration (LoTi)** is a technology integration framework designed by C. Moersch (2014). This framework serves to help teachers assess their comfort level with computers, their understanding of best practices (pedagogy), and their understanding of technology integration.

**No Child Left Behind Act (NCLB)** and policy is a reform blueprint reauthorizing the Elementary and Secondary Education Act. This national education law serves to provide equal opportunities for all students (2001, 2010, 2016).

**Partnership for 21st Century Skills** mission is to serve as a catalyst for 21st century learning to build collaborative partnerships among education, business, community, and government leaders. The organization believes that all learners need and deserve 21st century learning opportunities to thrive as tomorrow’s leaders, workers, and citizens (Partner’s for 21st Century Skills, 2016).
Pedagogical Content Knowledge (PCK) was originally designed by L. Shulman (1986) to serve as a concept model displaying the relationship between pedagogy and content knowledge.

Preservice Teachers’ Knowledge of Teaching and Technology Survey (PKOTT) is a 47-question survey designed to measure teacher’s self-assessment of their Technological Pedagogical Content Knowledge (TPACK) and related knowledge domains included in the framework (Schmidt et al., 2009).

Pre-service refers to teacher candidates who are participating in a teacher preparation program (Reference.com, 2016).

Preparing Tomorrow’s Teachers to use Technology (PT3) is a federally funded grant program allocating funds to ensure that new teachers are prepared to use technology when they reach the classroom (Rockman, 2004).

Synthesize Qualitative Data (SQD) refers to a twelve-theme model that highlights critical factors that need to be considered when designing pre-service technology training (Tondeur, 2012).

Technology integration refers to the process of identifying and creating technology-rich learning experiences within the content areas (Edutopia, 2016).

Technology Integration Specialists refers to teachers possessing the unique ability to understand, consider, and choose to use technologies only when they uniquely enhance the curriculum, instruction, and students’ learning (Bradshaw, 2002a).

Technological, Pedagogical and Content Knowledge (TPACK) is an extended version to Shulman’s PCK concept model (1986). This new model was created by Mishra and Koehler (2006), adding technology knowledge into the overall framework. This framework serves as a model for describing and understanding the integration of technology into the learning
environment. *Content Knowledge (CK)* is knowledge about the actual subject matter that is to be learned or taught (Mishra & Koehler, 2006). *Pedagogical Knowledge (PK)* is deep knowledge about the processes and practices or methods of teaching and learning (Mishra & Koehler, 2006). *Technological Knowledge (TK)* is knowledge about standard technologies and more advanced technologies (Mishra & Koehler, 2006).

*Technology Integration Matrix (TIM)* serves as a comprehensive framework for evaluating technology integration in instructional settings (Welsh, Harmes, & Winkelman, 2011).

*Technology Integration Matrix – Observation (TIM-O)* serves as a flexible tool for a classroom walkthrough, serving as a tool for formative feedback. The results from the TIM-O directly tie to the format and characteristics associated with the TIM (Welsh, Harmes, & Winkelman, 2011).

*Universal Design for Learning (UDL)* enables, motivates, and inspires all students to achieve, regardless of background, languages, or disabilities (NCLB, 2010).

**Conclusion**

“Teacher education programs have the responsibility to equip pre-service teachers with sufficient knowledge, skills, and competencies to effectively and successfully integrate technology in classrooms” (Hsieh, 2015, p. 2169). States and school systems strove to update and enhance the technology resources within the local schools, seeking extra funding from grants and other federally-funded programs (NETP, 2010, 2016). With much of the needed technology now located within the local schools, many teachers remain ill-equipped to address properly integrating technology into the curriculum (Spaulding, 2016). According to the National Education Technology Plan, “technology can accelerate, amplify, and expand the impact of...
effective teaching practices” (NETP, 2016, p. 3). Properly implemented, technology can support the following learning principles:

1. Technology can enable personalized learning;
2. Technology can help organize learning around real-world issues;
3. Technology can support learning with educational resources extending beyond the classroom;
4. Technology can promote students’ personal passions and interests; and
5. Technology can help close the digital divide, transforming learning and providing equitable access by all students. (NETP, 2016)

Today’s teachers must be equipped with the ability to “select, evaluate, and use appropriate technology and resources” when designing quality learning experiences that are challenging and engaging (NETP, 2016, p. 25). According to the NETP (2016), half of the teachers surveyed perceived lack of training as one of the main hindrances for integrating technology into their classroom. When reflecting on teacher preparation programs, all pre-service teachers need to graduate with a deep understanding of how technology can be used to support learning (Harris et al., 2010; Bull & Cisse, 2011; NETP, 2016). An even stronger statement from the National Education Technology Plan asserts:

Schools should be able to rely on teacher preparation programs to ensure that new teachers come to them prepared to use technology in meaningful ways. No new teacher exiting a preparation program should require remediation by his or her hiring school district. Instead, every new teacher should be prepared to model how to select and use the most appropriate apps and tools. (NETP, 2016, p. 32)
In this chapter, the literature calls for technology instruction for pre-service teachers. This study proposes to discover how pre-service teachers develop and evolve TPACK by investigating a stand-alone technology course specifically designed to blend the technology practices outlined in the National Education Technology Plan (NETP, 2016) and the technology integration standards established by the International Society for Technology in Education (ISTE, 2016).
Chapter 2: Review of Literature

The first part of this chapter provides an overview of technology as it moved into the field of education, the theories developed to support technology integration into the learning environment and the strategies designed to promote best practices while integrating technology into the curriculum, ultimately improving teaching and learning. The second part addresses various changes within professional development programs required to meet the needs of pre-service and in-service teachers as they begin to integrate technology tools into the curriculum.

Conceptual Framework

Personal Narrative Supporting the Conceptual Framework

Ravitch and Riggan (2017) define a conceptual framework as an argument discussing why the topic of study is valued, and why studying the topic is appropriate and rigorous (p. 5). Using their Elements of a Conceptual Framework (Ravitch & Riggan, 2017) (Figure 1), the researcher formulated a similar map to identify and solidify the conceptual framework for this study.
Figure 1. Elements of a Conceptual Framework

Personal Interests and Goals

As the primary investigator, I the researcher brings a unique set of skills and experiences to the study. Moving through life, each person follows a path where, along the way, points in time help define personal interests and goals. Often these points in time do not surface until later in life when time to reflect develops as a strategy for personal growth. The points in time connect to reveal a unique, yet specific story.

The researcher’s path began over twenty years ago. Slowly emerging into the classroom, computers moved into the upper elementary classes of the local schools. Intrigued with this new tool, the researcher explored the best ways to integrate the computer applications into the learning environment for my third grade students. The more excited the students became with the various software activities, the more motivated the researcher became to locate software applications that would best fit the learning needs of my students. The researcher attended local and county professional development sessions where information and instruction focused on
computer skill development. Little did the researcher know, the path toward technology integration had begun.

A new fork in the path appeared when the researcher joined the Technology And NetworKing (TANK) team, a committee of the local school’s PTA organization. The charge of this committee focused on networking the computers within the school where each classroom computer would be connected to the Internet. This task resulted in connectivity to a world-wide source of information. Networking the school fell on the shoulders of three volunteers – a father who happened to be the head of Technology Services for the school system, a friend of the school and the researcher. As a worker bee, the researcher did not realize the level of education and training she was receiving – pulling cables, ghosting, setting profiles, etc. This new path led the researcher to obtain a Novell Certified Network Administrator (CNA) certificate. The new focus allowed her to serve local schools as a Technology Services Support technician for the next three years, working to maintain the network and support teachers with their computer issues.

During this period, the researcher did not fully realize the decisions and policies being set by national, state, and county administrators. The No Child Left Behind Act (2001) soon influenced the direction of technology networking within school systems and technology use within the classroom. Guidelines and security protocols required school districts to re-evaluate policies and procedures within the system. Establishing the Instructional Technology Department opened the door to a new job position, the Technology Integration Specialist (TIS) - a new path begins. Over the next ten years, the researcher served the same schools, striving to support administrators, teachers, and staff members with technology integration. The level of comradery and trust enabled her to smoothly transition from one position into the other.
Identity and Positionality

The 2009 National economy issues brought the elimination of the entire Instructional Technology Department. A new job path involved supporting a local school as their Technology Coach, a position a former principal created specifically for the researcher. During this time, a grant to research the impact of the university’s Urban Education Program where pre-service teachers completed their pre-service program while serving in a local school established a partnership between Metro County District Schools (MCDS) and Southern Regional University (SRU). Having established a strong working relationship with many of the area administrators while working as a TIS, the researcher’s computer lab was selected for the pre-service teachers to participate in the newly designed SRU technology course. Co-teaching with the program designer for the technology course established a working relationship that would become another identifiable point in time as a new path emerged. The technology course, deemed a success, soon became part of the pre-service teacher program on campus where this researcher began to serve as the Lecturer for the Department of Instructional Technology in the College of Education. Not only did the researcher serve the pre-service teachers, but also supported the course designer with maintaining a rigorous course of study where technology integration strategies, pedagogical practices, and content knowledge remained at the forefront of the course design. Points in time provided a unique storyline where the researcher’s goals and passion led to a place where the researcher now strives to provide a quality technology course for the pre-service teachers as they enroll in the ITEC 3100 course.

Having witnessed and participated in the development of the ITEC 3100 technology course, the researcher held a special role within the process. Firmly grounded in the design and maintenance of the course, she brought a degree of expertise that no one else can claim. For the
most part, the course remains true to its original design, focusing on technology integration where best practices, student-based and standard-based learning, collaborative and cooperative projects, and authentic activities intertwined throughout the lesson design (See Appendix B).

Starting Points

Many pre-service teachers expressed gratitude for the variety of topics covered within the technology course. Participants, in the end-of-course evaluations, often stated that the ITEC3100 course should be available to all pre-service teachers as the course establishes a strong foundation for integrating technology into lesson ideas (See Appendix C). Valuing the overall focus of the course, the topics covered and the need to prepare pre-service teachers to successfully integrate technology as they design lesson ideas for students, she could only ponder: Do pre-service teachers continue to integrate technology into their lesson ideas after completing the ITEC 3100 course? What tools and strategies best served them when designing lesson ideas throughout the remaining courses of their pre-service teacher program? These questions motivated the researcher to investigate the various tools and strategies pre-service teachers incorporate into their lesson designs.

Topical Research

Technology and the Classroom

Background – Computer Assisted Instruction (CAI)

Affordable personal computers came into existence in the early 1980’s. As these units moved into the school environment, developing educational software became a high priority for many computer companies. Most of the early software applications fell into one of the basic instructional software categories: drill and practice, tutorial programs, simulation programs, basic utility programs and interactive video programs (Roblyer, 2013, p. 78-79). The age of
technology in the classroom had begun, meshing technology with the educational environment and bringing the need for instructional standards within the area of technology. According to Chambers and Sprecher (1980) computer assisted instruction (CAI) emerged within the United States, primarily at Florida State University, Dartmouth, and Stanford. The study focused on three main areas: a survey of the trends and existing centers of activity, a discussion of the studies that have attempted to evaluate the impact of CAI within special learning experiences, and an overview of the issues surrounding the cost of the programs and equipment (Chambers & Sprecher, 1980). Even during this early period of technology integration, these researchers expressed “the development, evaluation, sharing, and implementation of quality instructional courseware” remained a critical issue (p. 340).

**Apple Classroom Of Tomorrow (ACOT)**

As school districts focused on implementing technology projects throughout their schools, many computer companies conducted research projects to identify strategies and resources to support student learning. The Apple Classroom Of Tomorrow (ACOT) research project served as a long-term project to explore how learning and teaching change when teachers and students have access to interactive computer technologies (Apple Computer, Inc., 1991). ACOT promoted a philosophy that instruction should be learner-centered, not teacher-centered where students take responsibility for their own learning (p. 1). Following the constructivist approach, the role of the teacher shifts from that of a lecturer to that of a mentor or coach, guiding students in their construction of knowledge (p. 1). According to the report, a learner-centered environment is not dependent upon computers; however, computers can offer learners fundamentally different experiences than other mediums. Computer technology supports interactivity, can be used to integrate information, and can expand and compress space and time,
allowing students to do things that are otherwise impossible (p. 2). The ACOT study provided rich information supporting the value of technology within the learning environment.

**Computer-Supported Collaborative Learning**

Koschmann (1996) discussed the paradigm shifts within instructional technology. These changes came into play over a relatively brief period of time. Within his study, Koschmann (1996) described three major paradigm shifts: Computer-Assisted Instruction (CAI), Intelligent Tutoring Systems (ITSs) and Logo-as-Latin. The CAI applications used a strategy of identifying a set of learning goals, decomposing the goals into a set of simpler component tasks, and then developing a sequence of activities that would eventually lead to the achievement of the original learning goal (p. 6). The reach of this design is still present in many of the computer programs available in schools today, namely drill and practice applications. The Intelligent Tutoring Systems (ITS) paradigm emerged when workers in the field of Artificial Intelligence (AI) moved into the field of education. As this movement grew, developers defined the learning process as a representation of a problem space consisting of an initial state, a goal state, and a set of operations for moving from one state to another (Koschmann, 1996). According to Koschmann, the difference between the CAI and AI paradigms is relatively small – both focusing on a problem and providing feedback. However, the ITS strove to design programs involving a more interactive format and addressing more complex sets of skills (Koschmann, 1996). The Logo-as-Latin Paradigm followed the constructivist views where learning occurs under circumstances of personal inquiry and discovery (Koschmann, 1996). According to the Logo-as-Latin paradigm, the participant took the role of the *tutor* and the computer the role of the *tutee*. Through the activities of programming – designing, building, and debugging programs – the learner acquired cognitive benefits (Koschmann, 1996). After reviewing and analyzing previous paradigms,
Koschmann introduced a new paradigm – Computer-Supported Collaborative Learning (CSCL). Within this approach, CSCL applications may serve a variety of roles. Collaborative learning activities, real-world context, and global interaction are some of the components within the CSCL model. Within each of the paradigms Koschmann discussed, elements can be identified throughout the technology integration statement of many school improvement plans.

The No-Child-Left-Behind Act and the International Society for Technology in Education (ISTE) Essential Conditions

The No-Child-Left-Behind Act (NCLB) (2001) mandated system and instructional changes for school systems. According to Learning Point Associates (2007), goals addressing the technology component within NCLB included:

1. To improve student achievement through the use of technology in elementary schools and secondary schools.
2. To assist every student in crossing the digital divide by ensuring that every student is technologically literate by the time the student finishes eighth grade, regardless of the student’s race, ethnicity, gender, family income, geographical location, or disability.

To encourage the effective integration of technology resources and systems, teacher training and curriculum development need to establish research-based instructional methods that can be widely implemented as best practices by state education agencies and local education agencies (Learning Point Associates, 2007).

In response to the mandatory components within the NCLB Act (2001), ISTE formulated Essential Conditions to serve as a framework for teachers and school leaders. The fourteen elements provide guidance when analyzing and designing system-wide change.
1. Shared Vision: Proactive leadership develops a shared vision for educational technology among all education stakeholders, including teachers and support staff, school and district administrators, teacher educators, students, parents, and the community.

2. Empowered Leaders: Stakeholders at every level are empowered to be leaders in effecting change.

3. Implementation Planning: All stakeholders follow a systematic plan aligned with a shared vision for school effectiveness and student learning through the infusion of information and communication technology (ICT) and digital learning resources.

4. Consistent and Adequate Funding: Ongoing funding supports technology infrastructure, personnel, digital resources, and staff development.

5. Equitable Access: All students, teachers, staff, and school leaders have robust and reliable connectivity and access to current and emerging technologies and digital resources.

6. Skilled Personnel: Educators, support staff, and other leaders are skilled in the selection and effective use of appropriate ICT resources.

7. Ongoing Professional Learning: Educators have ongoing access to technology-related professional learning plans and opportunities, as well as dedicated time to practice and share ideas.

8. Technical Support: Educators and students have access to reliable assistance for maintaining, renewing, and using ICT and digital learning resources.

10. Student-Centered Learning: Planning, teaching, and assessment all center on the needs and abilities of the students.

11. Assessment and Evaluation: Teaching, learning, leadership and the use of ICT and digital resources are continually assessed and evaluated.

12. Engaged Communities: Leaders and educators develop and maintain partnerships and collaboration within the community to support and fund the use of ICT and digital learning resources.

13. Support Policies: Leaders and educators develop and maintain partnerships and collaboration within the community to support and fund the use of ICT and digital learning resources.

14. Supportive External Context: Policies and initiatives at the national, regional, and local levels support schools and teacher preparation programs in the effective implementation of technology for achieving curriculum and learning technology (ICT) standards. (ISTE, 2013)

The 2010 and 2016 NCLB revisions brought an in-depth study and review of the previous plan, and each revision brought an updated model with identified goals and objectives. A brief comparison of the two models is listed below (Figure 2):

**Figure 2.** General comparison NETP 2010 and NETP 2016

<table>
<thead>
<tr>
<th>2010</th>
<th>2016</th>
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<tr>
<td>National Education Technology Plan</td>
<td>National Education Technology Plan</td>
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<tr>
<td>Learning Powered by Technology</td>
<td>Future Ready Learning</td>
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Comparing the NCLB goals with the fourteen ISTE Essential Conditions provided a tight alignment between the goals and objectives of both programs. Figure 3 displays the alignment between the programs.

**Figure 3.** Alignment of the NCLB goals and the ISTE Essential Conditions

<table>
<thead>
<tr>
<th>NCLB 2010</th>
<th>NCLB 2016</th>
<th>ISTE Essential Conditions 2013</th>
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<tbody>
<tr>
<td><strong>1. Learning: Engage and Empower</strong>&lt;br&gt;All learners will have engaging and empowering learning experiences both in and out of school that prepare them to be active, creative, knowledgeable, and ethical participants in our globally networked society.</td>
<td><strong>1. Learning: Engaging and Empowering Learning through Technology</strong>&lt;br&gt;All learners will have engaging and empowering learning experiences in both formal and informal settings that prepare them to be active, creative, knowledgeable, and ethical participants in our globally connected society.</td>
<td><strong>1. Shared Vision:</strong>&lt;br&gt;Proactive leadership develops a shared vision for educational technology among all education stakeholders, including teachers and support staff, school and district administrators, teacher educators, students, parents, and the community.</td>
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| **2. Empowered Leaders:**<br>Stakeholders at every level are empowered to be leaders in effecting change. |
|   | 2. **Assessment: Measure What Matters**  
|   | Our education system at all levels will leverage the power of technology to measure what matters and use assessment data for continuous improvement.  
|   | 4. **Assessment**  
|   | At all levels, our education system will leverage the power of technology to measure what matters and use assessment data to improve learning.  
|   | 11. **Assessment and Evaluation:**  
|   | Planning, teaching, and assessment all center on the needs and abilities of the students.  
|   | 5. **Teaching: Prepare and Connect**  
|   | Professional educators will be supported individually and in teams by technology that connects them to data, content, resources, expertise, and learning experiences that enable and inspire more effective teaching for all learners.  
|   | 2. **Teaching with Technology**  
|   | Educators will be supported by technology that connects them to people, data, content, resources, expertise, and learning experiences that can empower and inspire them to provide more effective teaching for all learners.  
|   | 6. **Skilled Personnel:**  
|   | Educators, support staff, and other leaders are skilled in the selection and effective use of appropriate ICT resources.  
|   | 7. **Ongoing Professional Learning:**  
|   | Educators have ongoing access to technology-related professional learning plans and opportunities, as well as dedicated time to practice and share ideas.  
|   | 3. **Implementation Planning:**  
|   | All stakeholders follow a systematic plan aligned with a shared vision for school effectiveness and student learning through the infusion of information and communication technology (ICT) and digital learning resources.  
|   | 9. **Curriculum Framework:**  
|   | Content standards and related digital curriculum resources align with and support digital age learning and work.  
|   | 10. **Student-Centered Learning:**  
|   | Planning, teaching, and assessment all center on the needs and abilities of the students.  

---

**Implementation Planning:**

All stakeholders follow a systematic plan aligned with a shared vision for school effectiveness and student learning through the infusion of information and communication technology (ICT) and digital learning resources.

**Curriculum Framework:**

Content standards and related digital curriculum resources align with and support digital age learning and work.

**Student-Centered Learning:**

Planning, teaching, and assessment all center on the needs and abilities of the students.

**Assessment: Measure What Matters**

Our education system at all levels will leverage the power of technology to measure what matters and use assessment data for continuous improvement.

**Assessment**

At all levels, our education system will leverage the power of technology to measure what matters and use assessment data to improve learning.

**Assessment and Evaluation**

Planning, teaching, and assessment all center on the needs and abilities of the students.

**Teaching: Prepare and Connect**

Professional educators will be supported individually and in teams by technology that connects them to data, content, resources, expertise, and learning experiences that enable and inspire more effective teaching for all learners.

**Teaching with Technology**

Educators will be supported by technology that connects them to people, data, content, resources, expertise, and learning experiences that can empower and inspire them to provide more effective teaching for all learners.

**Skilled Personnel**

Educators, support staff, and other leaders are skilled in the selection and effective use of appropriate ICT resources.

**Ongoing Professional Learning**

Educators have ongoing access to technology-related professional learning plans and opportunities, as well as dedicated time to practice and share ideas.
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<tr>
<td><strong>Technical Support:</strong></td>
<td>Educators and students have access to reliable assistance for maintaining, renewing, and using ICT and digital learning resources.</td>
<td><strong>Engaged Communities:</strong> Leaders and educators develop and maintain partnerships and collaboration within the community to support and fund the use of ICT and digital learning resources.</td>
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<tr>
<td>6. <strong>Infrastructure: Access and Enable</strong></td>
<td>All students and educators will have access to a comprehensive infrastructure for learning when and where they need it.</td>
<td>5. <strong>Infrastructure</strong> All students and educators will have access to a robust and comprehensive infrastructure when and where they need it for learning.</td>
</tr>
<tr>
<td>4. <strong>Consistent and Adequate Funding:</strong></td>
<td>Ongoing funding supports technology infrastructure, personnel, digital resources, and staff development.</td>
<td>5. <strong>Equitable Access:</strong> All students, teachers, staff, and school leaders have robust and reliable connectivity and access to current and emerging technologies and digital resources.</td>
</tr>
<tr>
<td>13. <strong>Support Policies:</strong></td>
<td>Policies, financial plans, accountability measures and incentive structures support the use of ICT and other digital resources for both learning and district/school operations.</td>
<td></td>
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<tr>
<td>3. <strong>Leadership</strong></td>
<td>Embed an understanding of technology-enabled education within the roles and responsibilities of education leaders at all levels and set state, regional, and local visions for technology in learning.</td>
<td>12. <strong>Engaged Communities:</strong> Leaders and educators develop and maintain partnerships and collaboration within the community to support and fund the use of ICT and digital learning resources.</td>
</tr>
<tr>
<td>13. <strong>Support Policies:</strong></td>
<td>Policies, financial plans,</td>
<td></td>
</tr>
<tr>
<td>6. <strong>Productivity: Redesign and Transformation</strong></td>
<td>Our education system at all levels will redesign processes and structures to take advantage of the power of technology to improve learning outcomes while making</td>
<td></td>
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</tbody>
</table>
more efficient use of time, money, and staff. accountability measures and incentive structures support the use of ICT and other digital resources for both learning and district/school operations.

14. **Supportive External Context:** Policies and initiatives at the national, regional, and local levels support schools and teacher preparation programs in the effective implementation of technology for achieving curriculum and learning technology (ICT) standards.

Each of these areas addressed in the fourteen ISTE Essential Conditions served as the baseline when developing the technology standards for students, teachers, coaches, and administrators.

**International Society for Technology in Education**

In response to the new Federal guidelines and the alignment to the ISTE Essential Conditions, the International Society for Technology in Education (ISTE) developed technology standards for students, teachers, coaches, and administrators. These standards are often viewed as the foundation for technology integration, supporting, and enhancing the learning environment, whether adopted as listed or used to align specific state and school technology standards. The ISTE teacher standards addressed five specific categories:

1. **Facilitate and inspire student learning and creativity:** Teachers use their knowledge of subject matter, teaching and learning, and technology to facilitate experiences that advance student learning, creativity, and innovation in both face-to-face and virtual environments.
2. Design and develop digital age learning experiences and assessments: Teachers design, develop, and evaluate authentic learning experiences and assessments incorporating contemporary tools and resources to maximize content learning in context and to develop the knowledge, skills, and attitudes identified in the Standards – S.

3. Model digital age work and learning: Teachers exhibit knowledge, skills, and work processes representative of an innovative professional in a global and digital society.

4. Promote and model digital citizenship and responsibility: Teachers understand local and global societal issues and responsibilities in an evolving digital culture and exhibit legal and ethical behavior in their professional practices.

5. Engage in professional growth and leadership: Teachers continuously improve their professional practice, model lifelong learning, and exhibit leadership in their school and professional community by promoting and demonstrating the effective use of digital tools and resources.

Student standards addressed six categories:

1. Creativity and innovation: Students demonstrate creative thinking, construct knowledge, and develop innovative products and processes using technology.

2. Communication and collaboration: Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others.

3. Research and information fluency: Students apply digital tools to gather, evaluate, and use information.
4. Critical thinking, problem solving, and decision making: Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.

5. Digital citizenship: Students understand human, cultural, and societal issues related to technology and practice legal and ethical behavior.

6. Technology operations and concepts: Students demonstrate a sound understanding of technology concepts, systems, and operations. (ISTE, 2013)

Many state educational departments and local school systems scrambled to address the goals and establish a standard of compliance. The Department of Health, Education and Welfare allocated federal funds to support this new educational mandate. One such funding program, the Schools and Libraries Universal Service Support Program, commonly known as the E-Rate program (Federal Communications Commission, 2016), provided funding specifically for school systems to update, improve, and strengthen their network systems. School systems then had the opportunity to design a quality infrastructure, accommodating and supporting Internet connectivity throughout their schools.

In the beginning, the focus of the technology integration program supported a top-down implementation process. At the time, the NCLB Act and federal funding drove much of the project; however, as the project moved forward, principal and teacher input became a critical component for the success of the project. Distributed leadership, still in its infancy, became an effective change agent for the project. According to Spillane (2001), the success of a project does not occur due to the actions of one individual, but by the interactions between the many participants and the situation.
National Education Technology Plan

In the letter to the members of Congress, the Secretary of Education, Arne Duncan, expressed the rigorous and inclusive process taken to develop the National Education Plan 2010. According to Duncan, “education is vital to America’s individual and collective economic growth and prosperity, and is necessary for our democracy to work” (p. v). “The [National Education] plan calls for the advanced technologies used in our daily personal and professional lives [to be applied] to our entire education system to improve student learning, accelerate and scale up the adoption of effective practices, and use data and information for continuous improvement” (p. v). Personalized learning experiences are mandated for all learners where “what and how we teach [will] match what people need to know and how they learn” (p. v). Duncan continued to proclaim the need for “state-of-the-art technologies and Universal Design for Learning (UDL) concepts to enable, motivate, and inspire all students to achieve, regardless of background, languages, or disabilities. It calls for ensuring that our professional educators are well connected to the content and resources, data and information, and peers and experts they need to be highly effective. And it calls for leveraging the power of technology to support continuous and lifelong learning” (p. v). The challenge to state and local school systems forced major improvements to the learning process.

Federal Funding

Realizing the need to support pre-service teachers, the federally funded grant program, Preparing Tomorrow’s Teachers to use Technology (PT3) allocated funding to “ensure that new teachers are prepared to use computers and other technology when they reach the classroom” (Rockman, 2004, p. i). Conducting a literature review of several PT3 projects, Polly, Mims, Shepherd, and Inan (2010) focused on two guiding questions:
1. What approaches were commonly used in the PT3 initiatives?

2. What were the reported outcomes of these approaches used in PT3 initiatives?

The data revealed numerous PT3 projects invested project resources to develop pre-service teachers’ and faculty members’ TPACK (Polly et al., 2010). Several themes emerged from the analysis. Collaborative workshops, mentoring, planning, and co-teaching technology-rich lessons promoted the use of technology within the classroom. Providing technology-rich field experiences positively influenced teacher candidates’ integration of technology in a manner in which K-12 students used technology to meet an academic standard (Polly et al., 2010).

Approaches to teacher and pre-service teacher learning, such as individualized mentorship, the development of curricula materials and creating technology-rich field experiences are associated with greater technological knowledge and skills, more use of technology in methods courses and field experiences, and more frequent uses of technology with K-12 learners (Polly et al., 2010).

**Theoretical Frameworks**

**Pedagogical Content Knowledge (PCK)**

Lee Shulman’s (1987) concept of pedagogical content knowledge (PCK) historically served as a framework for teacher education programs. Shulman provided an analysis of these components (pedagogical content knowledge) and stressed the importance of evaluating how these components work together rather than separately (Roblyer & Doering, 2010). According to Archambault and Crippen (2009), Shulman also stated that knowledge of what makes a subject difficult or easy to learn is a part of PCK. Having the ability to teach a particular topic effectively, teachers must realize the potential pitfalls to which students frequently fall victim, depending on the preconceptions they have developed based on their ages and backgrounds. As researchers continued to study Shulman’s concepts, the overall framework extended to include
both content knowledge and pedagogical knowledge (Doering, Veletsianos, Scharber, & Miller, 2009). Two interconnecting circles represented Shulman’s theory where the intersection of content and pedagogy displays the Pedagogical-Content Knowledge (PCK) (Figure 4).

**Figure 4.** Diagram of Shulman’s PCK

![Diagram of Shulman’s PCK](image)

*Figure 4. Diagram of Shulman’s PCK. The Pedagogical circle and Content circle joined to form Pedagogical-Content Knowledge. Technological, Pedagogical Content Knowledge: A Framework for Teacher Knowledge” By Mishra, P. & Koehler, M., 2006, Teachers College Record, 108, 1017-1054.*

**Technological Pedagogical and Content Knowledge (TPACK)**

Other scholars extended Shulman’s conceptualization by including a third component to teacher knowledge – technology knowledge (Doering et al., 2009). Mishra and Koehler (2006) redesigned the framework to include technology and coined the new acronym TPCK to address the focus of technology integration with regards to effective teaching practices. Technological pedagogical content knowledge is an understanding that emerges from an interaction of content, pedagogy, and technology knowledge (Roblyer & Doering, 2010). An updated version of the TPACK framework published in the *Journal of Computing in Teacher Education* (2007) displayed the interdependence of the three knowledge domains (T, P, C) - so the framework better explains the “Total PACKage” of teacher knowledge (Doering et al., 2009). TPACK
involved an understanding of the complexity of relationships among students, teachers, content, technologies, and practices (Archambault & Crippen, 2009).

Mishra and Koehler (2006) formulated the basis of their framework with the understanding that teaching is a highly complex activity that draws on many types of knowledge. As this framework evolved, Mishra and Koehler believed the heart of PCK is the manner in which subject matter transformed teaching. This occurred when teachers interpreted the subject matter, found different ways to represent the information, and made it accessible to learners. According to Mishra and Koehler (2006), technologies transformed the nature of the classroom and the rapid evolution of new digital technologies prevented the technologies from becoming transparent.

TPACK emphasized the connections among technologies, curriculum content, and specific pedagogical approaches, demonstrating how teachers’ understandings of technology, pedagogy, and content could interact with one another to produce effective discipline-based teaching with educational technologies (Harris, Mishra, & Koehler, 2009). Within this framework, three major components surfaced – content knowledge (CK), pedagogical knowledge (PK), and technological knowledge (TK) (Figure 5).
Figure 5. TPACK Diagram

According to Mishra and Koehler (2006), content knowledge is knowledge about the actual subject matter that is to be learned or taught. Along with developing a deep understanding of their assigned content area, teachers must develop a general understanding of the nature of knowledge and inquiry in different fields (Mishra & Koehler, 2006).

Pedagogical knowledge is deep knowledge about the processes and practices or methods of teaching and learning. As a generic form of knowledge, pedagogical knowledge is involved in all issues of student learning, classroom management, lesson plan development and implementation, and student evaluation. Teachers with deep pedagogical knowledge understand how students construct knowledge, acquire skills, and develop habits of mind and positive dispositions toward learning (Mishra & Koehler, 2006).
Technology knowledge is knowledge about standard technologies and more advanced technologies (Mishra & Koehler, 2006). This knowledge ranges from knowing how to operate the equipment and software to knowing how to maintain and troubleshoot technology issues. A teacher’s level of technology knowledge will adapt and grow as new technologies are introduced.

As these three components intercept, additional components develop within the framework. Technological content knowledge (TCK) is knowledge about the manner in which technology and content are reciprocally related, technological pedagogical knowledge (TPK) is knowledge of the existence, components, and capabilities of various technologies as they are used in teaching and learning settings, and conversely, knowing how teaching might change as the result of using particular technologies, and technological pedagogical content knowledge (TPACK) is an emergent form of knowledge that goes beyond all three components (Mishra and Koehler, 2006).

TPACK is the basis of good teaching with technology and requires an understanding of the representation of concepts using technologies; pedagogical techniques that use technologies in constructive ways to teach content; knowledge of what makes concepts difficult or easy to learn and how technology can help redress some of the problems that students face; knowledge of students’ prior knowledge and theories of epistemology; and knowledge of how technologies can be used to build on existing knowledge and to develop new epistemologies or strengthen old ones (Mishra & Koehler, 2006). All components within this framework interact with one another creating a system of complex relationships. The TPACK framework is a metacognitive tool teachers can use to enhance technology integration into their classrooms by helping them visualize how their technology knowledge and skills work in tandem with their other knowledge
domains about teaching and learning (Mishra & Koehler, 2009). TPACK is a form of knowledge that experts bring to play anytime they teach (Mishra & Koehler, 2006).

**Technology Integration**

The influx of computers into the learning environment, the charge to provide equal learning opportunities for all students and the established ISTE technology standards catapulted many school systems into conceptualizing the digital age of learning. As local schools contemplated short-term and long-term goals, the need for professional development addressing technology integration was apparent. Striving to create a technology-rich learning environment, researchers and educators delved into the many facets of technology integration, working to identify strategies and best practices to improve student achievement. Earle (2002) stated integrating technology is not about technology – it is primarily about content and effective instructional practices. Technology integration involves the tools with which we deliver content and implement practices in better ways. Its focus must be on curriculum and learning. Integration is defined not by the amount or type of technology used, but by how and why it is used (p. 12). Fullan (2000), in a review of educational reform, stated that as technology becomes more powerful, good teachers become more indispensable. Within his review, Fullan reiterated:

Technology generates a glut of information, but it has no particular pedagogical wisdom – especially regarding new breakthroughs in cognitive science about how learners must construct their own meaning for deep understanding to occur. This means that teachers must become experts in pedagogical design. It also means that teachers must use the powers of technology, both in the classroom and in sharing with other teachers what they are learning. (p. 582)
Technology integration is more than gaining an understanding of the basic skills required to implement the various technology tools into the curriculum. According to Bradshaw (2002a), *technology integrationists* are described as teachers possessing the unique ability to understand, consider, and choose to use technologies *only* when they uniquely enhance the curriculum, instruction, and students’ learning – a position that empowers appropriate technology decision-making in schools. Hughes (2004) extended the definition to identify technology integrationists as teachers who have the ability to interpret new technology concepts through their professional knowledge – the knowledge that both consciously and subconsciously directs their daily teaching activities (p. 346). Ertmer (2005) discussed the missing condition for a successful technology integration program – teacher pedagogical beliefs. Following a study released by Becker (2000), Ertmer concurred that three of the four conditions described by Becker had been achieved. According to Becker (2000), computers are deemed a “valuable and well-functioning instructional tool” (p. 25) in schools and classrooms in which teachers: (a) have convenient access, (b) are adequately prepared, (c) have some freedom in the curriculum, and (d) hold personal beliefs aligned with a constructivist pedagogy. Ertmer (2005) described the first three conditions as first-order change elements; that is, changes that adjust current practice in an incremental fashion without changing existing structures of beliefs. However, the fourth component comprises a second-order change – change that confronts teachers’ fundamental beliefs and, thus, requires new ways of both seeing and doing things. While first-order changes are, in effect, reversible, second-order changes are seen as irreversible (p. 26). Second-order changes are more challenging and often more threatening to the teachers. Ertmer (2005) identified three strategies to promote change in teacher beliefs about teaching and learning and beliefs about technology:
• Personal experiences: Structured after Guskey’s (1986) argument that change in beliefs follows, rather than precedes practice, and that by helping teachers adopt new practices that are successful, the associated beliefs will also change. This idea is supported by the self-efficacy literature (Bandura, 1998; Schunk, 2000) which highlights the importance of building a teacher’s confidence through successful experiences with small instructional changes before attempting larger changes.

• Vicarious experiences: Structured after Schunk’s (2000) findings that vicarious experience is considered to be a powerful learning tool because observing similar others serves both information and motivational functions.

• Social-cultural influences: Structured after Becker and Riel’s (1999) conclusion that teachers’ practices and beliefs are continually shaped by their ongoing experiences as teachers, by the values and opinions expressed by those around them, and by the expectations of influential others, all of which are transmitted through formal and informal norms, rules, and procedures. (p. 94)

According to Ertmer (2009) technology integration required that pre-service and in-service teachers gain knowledge about (1) the technology tools, themselves, and (2) the specific affordances of each tool that, when used to teach content, enable difficult concepts to be learned more readily (p. 4). Blending all elements of Mishra and Koehler’s TPACK framework supported and strengthened a teacher’s understanding of technology integration.

**TPACK and Technology Integration**

Angeli and Valanides (2005) believed the issue is no longer whether teachers should integrate technology in their existing practices, but how to use technology to transform their teaching with technology and create new opportunities for learning. Building on earlier studies
Margerum-Lays & Marx, (2003), Shulman (1986) & Cochran, DeRuiter, King (1993), Angeli and Valanides revised the TPACK framework to include an information and communication technology component (ICT). According to the researchers, ICT knowledge is defined as knowing how to operate a computer and knowing how to use a multitude of tools/software, as well as troubleshooting in problematic situations. ICT-related PCK is the form of knowledge that makes a teacher competent to teach with ICT and can be described as the ways in which knowledge about tools and their affordances, pedagogy, content, learners, and context are synthesized into an understanding of how particular topics can be taught with ICT (Angeli & Valanides, 2009). The researchers identified five principles to define this process:

1. Identify topics to be taught with ICT in ways that signify the added value of ICT tools.
2. Identify representations for transforming the content to be taught into forms that are comprehensible to learners and difficult to be supported by traditional means.
3. Identify teaching strategies, which are difficult or impossible to be implemented by traditional means.
4. Select ICT tools with inherent features to afford content transformations and support teaching strategies.
5. Infuse ICT activities in the classroom. (Angeli & Valanides, 2005)

**TPACK and the Assessment of Teacher Competencies**

Within the new framework, three assessment components make up a structure to assess teachers’ competencies to teach with technology (Figure 6) – an expert assessment, a peer assessment, and a self-assessment (Angeli & Valanides, 2009). The Peer Assessment supports teachers as reformers, and they must be allowed to define and defend their role within a
community of learners. The Self-Assessment component allows the teachers to bring their own perspectives of the design process and provides the opportunities to defend their selected design. The Expert Assessment brings a more in-depth understanding to the design process, yet asks the learners to reflect on their individual growth while taking into consideration the ideas and suggestions presented by the peer assessor. According to Angeli and Valanides (2009), as teachers progressively develop more sophisticated ways of thinking about the various ways technology can transform their teaching practices, it is evident that ongoing and progress-oriented assessment procedures can be most beneficial in assessing complex learning outcomes, such as ICT_TPK competency (Figure 6).

**Figure 6.** Model for ICT/TPACK Assessment

Throughout the studies previously discussed, the TPACK survey proved to be a valid and reliable tool for TPACK assessment levels. The TPACK framework provided a method to organize key areas of high quality instruction incorporating the use of technology...the findings have important implications, especially for the field of teacher preparation, which must adapt to prepare future teachers for settings other than the traditional classroom (Archambault & Crippen, 2009). From their study, Archambault and Crippen (2009) discovered that pre-service teachers
feel adequately prepared in their ability to address pedagogical and content issues and less comfortable dealing with technology. With the strong focus on planning lessons, identifying content and standards, addressing and assessing student progress, traditional teacher preparation programs promote these skills. The charge to teacher preparation programs is to move beyond the traditional settings for teacher preparation to include integration of technology throughout content courses, as well as field experiences where the use of technology can be contextualized (Archambault & Crippen, 2009). Mouza (2011) noted that urban and low socioeconomic schools face constraints such as teacher ideology, limited resources, prescribed curricula, and pressure stemming from standardized testing. Mouza also felt that as teachers engaged in practice-based professional development they continued to learn from their own classroom teaching through the process of analysis and reflection. Such learning is essential for continuously improving their use of technology in teaching and learning, especially in light of the rapid technological changes and advances occurring in our society (Archambault & Crippen, 2009). With the value of the TPACK framework, it is possible to begin to differentiate between models of introducing technology integration in teacher preparation programs and to better understand how pre-service teachers develop their knowledge of technology, pedagogy, and content and their abilities to use this knowledge for instructional planning (Abbitt, 2011).

Technology Integration Strategies

Kay (2006) identified, described, and evaluated strategies used to incorporate technology into pre-service education. The associated literature listed ten strategies used to teach technology to pre-service teachers. The identified strategies included: integrating technology in all courses; using multimedia; focusing on education faculty; delivering a single technology course; modeling how to use technology; collaboration among pre-service teachers, mentor teachers, and
faculty; practicing technology in the field; offering mini-workshops; improving access to software, hardware and/or support; and focusing on mentor teachers. After analyzing the various studies, Kay (2006) discovered that programs utilizing four or more of the strategies reported significant increases in computer usage. From her study, Kay developed a model for incorporating technology into pre-service education (Figure 7).

**Figure 7.** Guiding Model for Incorporating Technology into Pre-service Education

Kay stressed the dynamics of this model include several critical and interactive components: (1) good access to software, hardware and support, (2) model and construct authentic teaching activities, and (3) collaboration among pre-service teachers, faculty, and mentor teachers (Kay, 2006). The model displays the relationship between types of professional development and stakeholders. In order to fully support pre-service teachers as they learn to integrate technology into the curriculum, it is important to include modeling and collaboration strategies when designing the professional development sessions – whether through an
integration approach, workshop sessions, a single course, or via multimedia (Kay, 2006). Establishing a baseline through collaboration and modeling, pre-service teachers are more likely to develop skills and attitudes that “translate to meaningful use of technology” (Kay, 2006).

In 2007, Kay extended her research to include an analysis of how pre-service teachers learn to use technology. She identified four learning strategies that significantly correlated with the amount learned and the use of computers in the classroom: collaborative learning, using authentic tasks, exploratory learning, and formal instruction. Collaborative learning and using authentic tasks rated the highest for perceived helpfulness. Kay stated that using one or more of the strategies significantly increases higher level technology skills (Kay, 2007).

**Pre-service Teacher TPACK**

Schmidt, Baran, Thompson, Mishra, Koehler, & Shin (2009) conducted a study to design and validate the pre-service teachers’ self-assessment of the TPACK framework. The study served as a starting point for future longitudinal studies. The extended studies followed pre-service teachers who participated in the original study as they finished the content coursework within their program of study. A second goal involved classroom observations of the pre-service teachers when beginning their induction year of teaching (Schmidt et al., 2009). Analyzing and comparing the data collected from the follow-up studies with the initial data established the changes in the pre-service beliefs about teaching and technology integration (Schmidt et al., 2009). Future plans for the study involved modification of the instrument, utilizing the instrument to evaluate the effectiveness of pre-service teacher technology courses, and administering the instrument when pre-service teachers participated in various content-rich courses (Schmidt et al., 2009).
TPACK is a useful model for thinking about what knowledge teachers must have to integrate technology into teaching and how they might develop this knowledge. Merely knowing how to use technology is not the same as knowing how to teach with it (Mishra & Koehler, 2006). Using TPACK as a framework for identifying and studying technology knowledge could potentially have an impact on the type of training and professional development experiences that are designed for both pre-service and in-service teachers (Schmidt et al., 2009).

The TPACK framework pushes trainers and researchers to rethink the knowledge that teachers should have. Instead of providing a professional development session that focuses on a specific task, professional development programs should be viewed as an opportunity to bring the areas of technology, pedagogy, and content knowledge together, as one knowledge base (Doering, Veletsianos, Scharber, & Miller, 2009). If teachers lack technology knowledge, how can they approach teaching and learning through a frame of TPACK? A focus on lacking knowledge bases is key before teachers can think of TPACK as a new knowledge base (Doering et al., 2009).

Pre-service Teacher Preparation Programs

Researchers continued to define strategies to improve pre-service teacher preparation programs. Although Mishra and Koehler’s TPACK framework has served as a model to describe what teachers need to know to effectively integrate technology into their classroom lessons (Bakir, 2016), many researchers extended the focus of the framework, placing more emphasis on the pedagogical component. Teacher preparation programs re-focused the importance of a pre-service teacher’s ability to think strategically with respect to integrating technologies as learning tools rather than focusing on particular technologies and how to use them (Niess, 2010). According to Brantley-Dias and Ertmer (2013), a thorough description of TPACK, or its
components, failed to be addressed. These researchers stated teachers need to adopt new pedagogies (e.g., problem-solving, case-based, inquiry-based, etc.) as well as new curricula in which technology plays an integral but supporting role. In their view, technology is seen as a part, or contained within the TPACK framework, using concentric circles instead of intersecting circles to represent their framework (Brantley-Dias & Ertmer, 2013) (Figure 8).

**Figure 8.** Goldilocks and TPACK

![Figure 8. Conception of the relationship between technological and pedagogical content knowledge based on Shulman’s framework. Goldilocks and TPACK: Is the construct “Just Right?” by Brantley-Dias, L. and Ertmer, P., (2013), Journal of Research on Technology in Education, 46(2), 103-128.](image)

Brantley-Dias and Ertmer (2013) felt [supporters of technology integration] should help pre-service teachers understand how various digital tools are appropriate and effective when teaching certain content. They recommended that:

TPACK should be developed as part of every teacher’s PCK. Methods instructors and those who facilitate discipline-specific professional development programs must demonstrate the best instructional material and activities for teaching their content,
whether it is technology based or not. [They further state]...How can we expect our method teachers to model how to think about and enact technology-enabled lessons if they do not have the knowledge or skills themselves? (p.121)

The TPACK framework pushes staff development personnel and researchers to rethink the knowledge that teachers should have. Instead of providing a professional development session that focuses on a specific task, professional development programs should be viewed as an opportunity to bring the areas of technology, pedagogy, and content knowledge together as one knowledge base (Doering, Veletsianos, Scharber, & Miller, 2009). Ozgun-Koca, Meagher, and Edwards (2009-2010) found that the activities written by those students with field placements in technology-rich environments showed more sophistication, not just in the use of technology, but also in terms of implementing inquiry-based and open-ended instructional approaches. Presenting training sessions in this manner supports the learning process for the adults and allow them time to assimilate the strategies and tools into their teaching practice. Often the movement toward technology acceptance follows Roger’s Diffusion of Innovation Theory (Rogers, 2003) where participants enter the professional development process at varying degrees of acceptance. Often the most resistant learners become the strongest advocates for technology integration.

Tondeur, Braak, Sang, Voogt, Fisser, and Ottenbreit-Leftwich (2012) proposed a new model to prepare pre-service teachers as they integrate technology into the content areas. Using the Synthesize Qualitative Data (SQD) approach originally designed by Noblit and Hare (1988) and an overall review as related to the field of education, twelve key themes for content and delivery methods emerged (Figure 9). Seven key themes explicitly related to the preparation of pre-service teachers while five key themes [addressed] conditions necessary to implement such
In a follow-up study, Tondeur et al. (2016) identified six of the twelve themes necessary at the core-level of the framework. As seen in Figure 9, the six themes, serving as strategies, encircle the core issue of Preparing Pre-Service Teachers for Technology Use. The six strategies are as follows:

1. Involving teacher educators acting as role models
2. Observing, discussing and reflecting upon successful uses of technology
3. Providing the opportunity to learn about technology integration by (re-)designing curriculum materials
4. Demonstrating that group work might mitigate feelings of insecurity when teachers need to design technology-related curriculum materials

5. Applying the knowledge of educational technology in authentic settings

6. Providing on-going and process-oriented feedback

Synthesizing findings from the various studies and frameworks discussed above established a knowledge baseline to support the framework of this study.

**Pre-Service Teacher Technology Courses**

In order to enhance the development of a teacher’s TPACK, courses and support should be considered for all pre-service teachers. A strong integration course allows pre-service teachers to concentrate on the various areas of technology and develop the skills to use and support technology within the design of the various learning activities. Not only do pre-service teachers build a strong technology foundation, but pre-service teachers are also able to share their skills and support those fellow teachers who are beginning to include technology in the learning environment. Moursund and Bielefeldt (1999) recommended teacher education programs should include the following three components when striving to improve the effectiveness of their pre-service teacher programs:

1. Integrate instructional technology into all teacher education courses

2. Modeling and mentoring technology-integrated teaching and learning by teacher education faculty members

3. Field experiences should be aligned with mentor teachers who support and encourage students as they practice teaching with technology

Bakir (2016) confirmed the value of these three components two decades later and acknowledged that other research validates Moursund and Bielefeldt’s recommendations

**TPACK and Lesson Planning**

Harris and Hofer (2006, 2009) and Harris (2008) began to study teacher planning practices. Not only did they focus on planning activities based on content, they also addressed the integration of technology tools and resources within the lesson design. Following findings from the previous research, Harris and Hofer suggested a *logical approach* to support teachers as they integrate technology into their teaching (2010). Teachers’ planning is tied directly to specific standards within the curriculum. When integrating technology into the activities, the same approach should be utilized. According to Harris et al. (2010), selecting the specific digital tool or resource should be determined by the standard-based learning activity. Five basic decision-making steps for designing a learning activity emerged from the study (Harris & Hofer, 2009):

- Choosing learning goals
- Making practical pedagogical decisions about the nature of the learning experience
- Selecting and sequencing appropriate activity types to combine to form the learning experience
- Selecting formative and summative assessment strategies that will reveal what and how well students are learning
- Selecting tools and resources that will best help students to benefit from the learning experiences being planned

To further support the five decisions, Harris and Hofer identified *activity types* that focused on content areas from K-12. As their research continued, they identified activity types
within six curriculum areas – elementary literacy, secondary English, mathematics, science, social studies, and world languages. Harris and Hofer believed these activity types served as a “methodological shorthand that can be used to both build and describe plans for standards-based learning experiences” (p. 101). Each activity type directly related to what students do, placing a focus on the content first - technology second. To further define the activity types, Harris and Hofer designed a set of taxonomies to further identify and clarify the structure of the activity types. Within each taxonomy, the researchers identified the specific activity type, provided a brief explanation of the activity type, and listed possible technologies that would support the learning activity type (Harris & Hofer, 2016). The taxonomies and identified activity types enabled teachers to design learning experiences that focus on content, are standards-based, and use appropriate technologies to promote student learning. Combining the activity types supports the development of content-rich and technology infused lesson plans, projects, and units. Through this process, teachers authentically developed TPACK while designing and implementing quality lesson plans (Harris & Hofer, 2010).

**Technology Integration Matrix**

Created in 2006, the Technology Integration Matrix (TIM) served as a comprehensive framework for evaluating technology integration within instructional environments (Welsh, Harmes, & Winkelman, 2011) (See Appendix A). The Florida Department of Education funded the development of the framework to expand the opportunities for teachers, administrators, and school district personnel to observe exemplary technology integration strategies, enhancing the learning experiences for all students (Welsh et al., 2011). The research and development of the TIM framework involved components from two key models that supported technology integration into the classroom – 1. Jonassen’s Constructivist Learning Environments and 2. The
Apple Classroom Of Tomorrow (ACOT) Levels of Technology Integration (Allsopp, Hohlfeld, & Kemker, 2007). According to Jonassen (n. d.), students are more engaged with the learning process when activities are constructive, collaborative, intentional, contextual, conversational, and reflective (Allsopp, Hohlfeld, & Kemker, 2007). The ACOT Levels of Technology Integration promote the process teachers follow when learning to integrate technology into the learning environment within their classroom:

1. Entry - beginning to develop basic technology skills
2. Adoption – beginning to use the technology to support the learning experiences of their students
3. Adaptation – beginning to use the technology within the traditional learning activities
4. Invention – developing and inventing new ways to integrate technology to support student learning (Allsopp, Hohlfeld, & Kemker, 2007).

The TIM model extended the ACOT levels to include one additional level – Transformation. Transformation involves the extension of an activity where the presence of technology is critical to the success of the activity. This level extends the learning experiences beyond the walls of the classroom and encourages a global focus throughout the learning process (Allsopp, Hohlfeld, & Kemker, 2007).

The TIM matrix involves 25 interactive cells, describing five interdependent characteristics of meaningful learning and addressing five levels of technology integration as adapted from the research of Jonassen, Howland, Moore, & Marra (2003). The five interdependent characteristics include: active, constructive, goal-directed, authentic, and collaboration (Welsh, Harmes, & Winkelman, 2011). Intertwined with these characteristics are the five levels of technology integration: entry, adoption, adaptation, infusion, and
transformation (Welsh et al., 2011). Forming a matrix of 25 cells, the matrix provides schools with a baseline for organizing, evaluating, and developing a strong learning environment throughout the school, integrating technology to support the learning experiences for all students (Welsh et al., 2011).

Bartoschek and Carlos (2013) described the TIM as the “widely accepted conceptual framework for assessing the level of pedagogical technology integration” (p. 437). The use of the matrix extends far beyond Florida to include many schools within the United States and in other countries (Arizona K12 Center, 2012; Bartoschek & Carlos, 2013; Kruger & Bester, 2015). For many research projects since the introduction of the TIM matrix, researchers selected the matrix as a component to support triangulation in their study (Strudler, Schrader, & Asay, 2016; Kruger & Bester, 2015; Marcovitz & Janiszewiski, 2015; Muilenburg & Berge, 2015; Sheninger & Kieschnick, n.d.). Although the matrix has not been formally validated, experts and novices within the field realize the value of the TIM matrix when focusing on the teacher’s teaching practice and the student’s learning processes (Bartoschek & Carlos, 2013). Muilenburg and Berge (2015) stated the TIM matrix “provides a useful framework for building a more nuanced understanding of technology integration for teachers” (p. 439).

**Conceptual Framework for this study**

Synthesizing the various frameworks discussed in the previous paragraphs, an overall design of the conceptual framework of this study was created. Figure 10 provides the graphical display of that framework.
As pre-service teachers move through the pre-service teacher program, technology appears in two sections of the framework. Technology integration strategies grouped with best practices and content knowledge support the overarching components within the TPACK framework (Mischra & Koehler, 2006). These three sections work to build the basic foundation of a teacher’s TPACK. Technology skills along with modeling and reflective practice provide the stimulus to strengthen and enhance teacher TPACK. Modeling involves both internal and external factors to promote TPACK development. Internally, professors who model technology integration throughout their coursework demonstrate how various technology tools can support the delivery of specific content. Through field experiences, collaborating teachers serve as the external mentors for the pre-service teachers. Identifying technology tools available within the
school setting and modeling the use of those tools allows pre-service teachers to observe, learn, and include those technology tools when designing lesson plans.

Reflective practice promotes a time where teachers self-reflect on the work completed Pre-Service Teachers’ TPACK Development Pre-Service Teachers’ TPACK Development Pre-Service Teachers’ TPACK Development activity, and to identify strategies to enhance the learning experience for the students. Through the process of reflective practice, teachers develop the skills to analyze and critically solve any issues that arose during the implementation of learning activity, thus extending their personal learning and teaching skills.

Promoting a strong technology integration course requires a careful blend of the TPACK components and the various strategies that enhance TPACK development. As pre-service teachers strengthen specific technology skills and develop strategies to integrate technology into lesson plans, their TPACK continues to evolve. The TIM Instruments and the LoTi framework serve to measure TPACK and provide feedback to the pre-service teacher, contributing to personal reflective practices.

Summary

The learning environment within the classroom has drastically changed over the past few decades (Spaulding, 2016). Access to essential technology tools helps students locate information through the Internet, extending the learning environment far beyond the walls of the school. Connecting the classrooms to the global communication network of the Internet, schools realized the need for change in the instructional process within the classroom.

This chapter presented a historical path taken as technology began to infiltrate the learning environment of schools. As technology tools began to extend into the field of education, government regulations and input started a movement to appropriately integrate the tools into the
learning environment. Research and funded studies provided an in-depth overview of basic requirements to implement technology integration within the learning environment, but also focused on the deeper pedagogical aspects of promoting best practices where technology integration is properly aligned to content standards. This researcher plans to further investigate the various components that support the evolution of a pre-service teacher’s TPACK, identifying strategies and features that best promote the integration of technology within the learning environment.
Chapter 3: Methodology

Introduction

As a result of the analysis of the data gathered from a five-year federal grant research project, the Teacher Quality Program (TQP), a newly designed technology integration course was added to the traditional teacher education program within the Early Childhood Education department at Southern Regional University (SRU), a pseudonym for the university where this study was conducted. Although designed as a stand-alone course, the focus of the technology class extended beyond basic computer skills, incorporating pedagogical and content knowledge throughout the coursework. Presented during the participant’s junior year, participants received information and resources to support the creation of technology rich lesson ideas. Following the constructivist worldview where personal involvement and construction of ideas serve as a baseline for in-depth understanding, the purpose of this study focused on the evolution of the technology integration practices of pre-service teachers as they designed and implemented technology enhanced lessons throughout their student-teaching practicum. This chapter provides an overview and establishes the foundations of the research process designed to study how pre-service teachers perceive and utilize technology as a supportive component within the learning experiences of their students. As a component of the overall conceptual framework, this process directly supports the overarching question for this study.
Background of Research Context

SRU Teacher Preparation Program: Teacher Quality Program (TQP)

The College of Education (COE) at SRU in collaboration with Metro County School District (MCSD) received a $400,000 research grant to develop, implement, and evaluate a Vertically Articulated Professional Development School (VAPDS) model for teacher preparation. Part of an innovative teacher preparation program, the model established a teacher preparation program designed to increase student achievement for students in an urban school environment. Pre-service teachers enrolled in this program participated in courses designed under an eight-pillar design, focusing on eight high-needs areas: Literacy, Technology, English as a Second Language, Special Education, Poverty, Math, Parent Involvement, and Classroom Management. The overall plan emphasized six main objectives:

1. Develop and implement an urban education emphasis within existing teacher preparation programs that will meet the needs of the Professional Development School (PDS) cluster in Area 2 of MCSD.

2. Develop and implement the Vertically Aligned PSD model (1 high school, 1 middle school, 5 elementary schools) within a high-need feeder pattern with an emphasis on articulation across levels. The PDSs are aligned with the Nine Essentials of PDS (National Association of Professional Development Schools) and the PDS Standards developed by the National Council for the Accreditation of Teacher Education (NCATE).

3. Use assessment to positively impact student learning in K-12 schools.

4. Collaboratively plan, conduct, and disseminate scholarly research.

5. Recruit and retain highly qualified individuals including those from underrepresented groups and from other professions for high needs areas.

6. Engage parents/family and community as stakeholders in the PDS cluster.
Although the technology courses (ITEC 3100 - elementary focus, ITEC 3200 - middle School focus and ITEC 3300 – high school focus) reflected a stand-alone model, the underlying structure of the course embedded best practices and research-based strategies (Mishra & Koehler, 2006, 2009; Kay, 2006, 2007; Harris et al., 2010; Ertmer, 2009; Neiss, 2010; Polly et al., 2010). The course, presented within the first semester of the participants’ junior year, included skill training on selected software applications located within the MCSD, but also extended the coursework to include a study of strategies and models, promoting more effective and appropriate use of technology within the learning environment. The supportive models and practices included in the course established a strong research-based framework, addressing components that promote essential technology integration strategies: International Society for Technology in Education - Student (ISTE-S) and International Society for Technology in Education - Teacher (ISTE-T) Standards, TPACK, LoTi Levels, Bloom’s Taxonomy of Critical Thinking, performance-based standards, authentic learning tasks, and collaborative, project-based learning activities (See Appendix B). Extending the ITEC courses beyond the basic skill-based format of a typical stand-alone technology course served as the impetus to add the technology course into the on-campus pre-service teacher program. Less than two years after implementing the technology course in the Urban Education Program, the Early Childhood Elementary Department requested and redesigned their pre-service program to include the ITEC 3100 course, requiring the course of all elementary education candidates. Following a mandate from the new Performance Standards Commission (PSC) rules, the courses were aligned to the InTASC Standards, the PSC rules, and the Council for the Accreditation of Educator Preparation (CAEP) themes.
Overview of the ITEC 3100 Course

Pre-service teachers participated in the ITEC 3100 course at the beginning of their junior year, Fall 2015. As the Lecturer for the course, the researcher’s involvement with the overall implementation and continued design of the course directly reflects the conceptual framework for this study. The focus of the course not only addressed basic technology skills, but extended the scope of the course to include best practices and research-based strategies for integrating technology into the classroom learning environment (See Appendix B). A guidance page and lesson idea template served as tools to support the pre-service teachers as they began exploring the various technology tools and analyzing the benefits of the technology resources. Participants demonstrated their understanding of the various components introduced in the course through a web-based portfolio designed to highlight each topic of study. The portfolio not only served as an assessment tool for their final grade, but also as a supplemental resource in a resume and a resource for future job interviews.

Administering and analyzing the results of pre-assessment and post-assessment survey data (n=31) since the inception of the course, the results of the analysis verified the impact of the course, returning highly significant results of a 2-tailed significance level of 0.00. These results supported the implementation of a special technology class into the pre-service teacher program (Booker, 2014) (See Appendix D). Understanding the various computer programs used within the classroom, developing high-quality technology lesson, and integrating technology throughout the curriculum served these pre-service teachers as their TPACK evolved. Although the results of the analysis found significant differences in the scores, the scores reflected information from a self-reporting survey (See Appendix D). Participants believed the course made a positive impact on the evolution of their TPACK (See Appendix C). The focus of this study extends beyond the
initial discoveries from the self-reported data of the grant study to identifying how a pre-service teacher’s TPACK continues to evolve after completing the ITEC course where basic technology skills become a supporting component of a standards-based, project-based learning environment. How do the pre-service teachers integrate technology into lesson plans in order to extend and enhance the learning experience for the students after completing the instructional technology course? How do the pre-service teachers feel technology supports the learning experiences they plan for their students?

To investigate the issues above, the researcher conducted this study implementing two tools designed by the Florida Department of Education and the Florida Center for Instructional Technology (Welsh et al., 2011). The basic Technology Integration Matrix (TIM) framework supported the interview sessions, general survey questions, and lesson plan reviews (See Appendix A). The Technology Integration Matrix – Observation (TIM-O) served to analyze the video taken during the classroom sessions. All data was used to support the triangulation of the findings.

**Research Question**

1. How do pre-service teachers integrate technology into their instructional practices during their student-teaching practicum after completing a stand-alone technology integration course?

In order to seek an in-depth understanding, a case study design was utilized in order to glean different perspectives on the issue (Creswell, 2013). Gathering data on each individual’s construction of knowledge of teaching in a technology-rich context served as a unit of analysis (Yin, 2014). Meeting the criteria established for the study, participants from the Fall 2015 ITEC course were invited to participate in the study. The pre-service candidates provided technology-rich lesson ideas for analysis, participated in a structured interview, submitted a self-selected
technology enhanced lesson for analysis, and completed a short informational reflection in which the participants were encouraged to discuss their beliefs about integrating technology in the classroom, as well as identify elements that influenced the use of technology within their lesson ideas. Data collected provided a deeper understanding of the research questions designed for this study.

This chapter will also explain the research process, including the (1) research method and design, (2) researcher background and role, (3) data collection, (4) participants, (5) data analysis overview, and (6) ethical considerations.

**Research Design**

As a constructivist, Stake (2005) believed knowledge is socially constructed and, through experiential and contextual accounts, case study researchers assist readers in the construction of knowledge. A qualitative case study places the researcher as the primary source for the data collection and analysis, implementing an investigative process that results in a rich descriptive report (Merriam, 2009). According to Merriam (2009), a case study is “an in-depth description and analysis of a bounded system [where] the researcher aims to uncover the interaction of significant factors characteristic of the phenomenon”. Selecting the case study model for this research affords the opportunity to conduct research that focuses on rich descriptions and explanations, as well as supports the conceptual framework. As stated by Merriam (2009), Stake “valued qualitative case study for its ability to capture complex action, perception, and interpretation. From case study reports pour vignettes and narratives that feed into the generalizations of readers and writers”. Merriam (2009) defined the case study according to special characteristics: particularistic, descriptive, and heuristic. Particularistic involves focusing on a particular event, situation, program, or phenomenon. This study addresses the evolution of
pre-service teacher’s TPACK while developing technology-rich activities. Reviewing lesson ideas and identifying the level of technology integration within those activities serves as an evaluative tool in determining the extent pre-service teachers, who attended a technology integration course early in their teacher preparation program, valued the use of technology tools for enhancing activities designed during their student-teaching practicum. Information from this study may enlighten course designers of strengths or weaknesses within the overall structure of the technology course. The descriptive component of the case study returns a *thick description* of the actual phenomenon being studied (Stake, 1995). Along with reviewing and analyzing lesson ideas, interviews will be conducted with the pre-service teacher candidates, gleaning personal views and realizations about using technology tools to support and extend identified learning goals. Reaching a point of saturation within the data provides a deeper understanding of the overall results of the study. Through the heuristic component, the reader’s understanding is strengthened facilitating the discovery of new information or confirmation of existing information. Stake (1995) claimed that knowledge gained from a case study is different in four ways:

- More concrete – the findings are more concrete, vivid and sensory
- More contextual – the experiences are tied to context
- More developed – readers bring their own experiences to the study, extending their understanding through generalizations
- Based more on reference populations – through the generalization listed above, readers have a population in mind
Pre-service candidates within this study bring personal experiences to the study, and yet, shared similar experiences with the other pre-service candidates participating in the study. Their shared experiences provided a deeper explanation of the strengths and weaknesses of the pre-service teacher program. Data collected from the personal interviews and review of video recordings served as an example of how pre-service teacher candidates view technology integration into the curriculum and the steps taken to extend and enhance the learning environment for students through the use of technology-rich lessons. The characteristics and components of the case study model support this study, guiding the researcher to carefully investigate the research question, analyze data for a deeper understand, and identify rich-descriptive results to address the research question.

**Framework of Design**

Stake (1995) stated the “design of all research requires conceptual bridges from ideas to express needed understanding, conceptual bridges from what is already known, cognitive structures to guide data gathering, and outlines for presenting interpretations to others.” According to Stake (2005), a case study optimizes understanding by pursuing scholarly research questions. It gains credibility by thoroughly triangulating the descriptions and interpretations (Stake, 2005).

**Hopscotch Model**

Designed to support novice researchers, Jorrín-Abellán (2016) designed a conceptual model and a web-based tool to assist researchers as they work through the qualitative research process. According to Jorrín-Abellán (2016), the “model helps to incorporate the theoretical background behind any qualitative study, as well as the intrinsic complexity of the multiple technical procedures that could be followed within the many different traditions in the field”
Analyzing related studies within the field, Jorrín-Abellán (2016) selected nine seminal works for the final analysis – Miles and Huberman (1994), Denzin and Lincoln (2003), Shenton (2004), Guba and Lincoln (2005), Maxwell (2008), Stake (2010), Chenail (2011), Yin (2011), and Creswell (2013). Connecting the theoretical and practical components, the web-tool emerged and is called the Hopscotch Model (Figure 1). The tool serves as a graphic organizer to display the actual components of the study. Methodically addressing the context of the case, the procedures and the conceptual structure, the researcher is able to carefully design the overall procedures for the study. Within the framework of this study, how pre-service teachers view technology as a supportive tool within the educational process becomes a focal point of the study. Figure 1 displays the final design for this study.
Identifying major components of best practices and technology integration, the topics of higher order thinking, authentic project-based activities, levels of technology integration, standards-based content, and teacher reflection became valued topics throughout this study. Establishing triangulation through interviews, documentation, and the TIM instruments served as a strong baseline for data analysis and topic interpretation.


**Bounds of the Case**

Merriam (2009) described the *boundedness of a system* as a study where a limited number of people or a precise observational time frame is required. According to Stake (2005), a case is a *functioning body* or a system, where some features lie within the boundaries of the case and some lie outside. The ITEC 3100 classes served as a *bounded system* of this case study. As a unique group of individuals, these participants serve as a single entity that participated in a specific course designed to promote and enhance technology integration into the curriculum. Due to specific requirements (i.e. participation in the technology course), purposive sampling became the sampling strategy for this study (Palys, 2008). Once identified, interviews were conducted to obtain a rich understanding of pre-service candidates’ views of technology within the learning environment and what influenced their technology integration practices.

**Research Setting and Context**

According to Stake (1995), researchers ask, “What can be learned *here* that a reader needs to know?” With that in mind, this study focused on the evolution of a pre-service teacher’s TPACK and how those teachers integrated technology into their lesson ideas. Pre-service teacher candidates at SRU did not participate in a technology integration course prior to Fall 2014. Prior to that date, their College of Education was involved in a five-year research project with the MCSD. At that time, the focus was the implementation of a professional development school (PDS) program where pre-service teachers received their teaching program coursework while in the field. Participants spent their junior and senior years of study working in an assigned school, taking all their assigned courses within that school location. These pre-service teachers essentially received two years of intense on-the-job training, working side-by-side with a
collaborating in-service teacher and supporting the learning of all the students within that classroom.

As part of the overall design of the PDS, technology was considered an essential element. Although the course reflected a stand-alone model, the overall format of the course extended far beyond a typical skills-based technology course. Best practices, technology integration strategies and elements supporting rigorous learning experiences provided a strong instructional baseline, promoting pedagogical and content development.

Once the research grant ended, the Department of Early Childhood Elementary Education (ECEE) requested the technology course be available to students participating in the traditional educational program on campus. With minor updates to the course, the course re-opened for enrollment in Fall 2014 for all students in the ECEE program.

As an Instructional Technology Specialist for the Metro County School District, this researcher became a co-instructor for the technology course offered during the TQP grant project. When the program moved into the ECEE program, the Instructional Technology Department at Southern Regional University hired this researcher to continue the course on the university campus. Over the years, this researcher supported a faculty member, the course designer, as updates and minor changes supported the evolution of the course. The course proved to have a solid design foundation, continuing to provide valuable tools and information for integrating technology into the curriculum. Presently, several other departments have added the technology course into their program design.

Many of the pre-service candidates in the college accept teaching positions within the surrounding school systems. Many of those systems have begun to update and accelerate the use of technology within their schools. Computers, iPads, interactive whiteboards, student response
systems, handheld devices, and a variety of instructional software are now available to teachers within these counties. Charged by the federal government in the National Education Technology Plan (NETP) (2016), schools are required to support and promote the use of technology throughout the curriculum. The International Society for Technology in Education (ISTE) continued to update technology standards to address the guidelines established by the NETP. Due to this top-down change initiative, educational systems revised and updated professional development and other instructional courses to address these guidelines. At the college level, educational programs addressed the need to include technology standards within all teaching programs. Many of the departments within the college turned to the Instructional Technology Department for assistance, selecting the ITEC 3100 course as their solution to addressing the technology standards.

Following Stake’s charge “What can be learned here” (1995), this study focuses on the need to understand the views of the pre-service teacher candidates who participated in the ITEC 3100 course. Focusing on the established research questions, the researcher hopes to gain a deeper understanding of how pre-service teachers integrate technology into their instructional practices after completing a stand-alone technology course.

Participants

The identified participants attended the ITEC 3100 technology course during the first semester of their junior year. Students generally range in age from seventeen to late thirties. All participants were working to obtain a teaching certificate upon completion of the Early Childhood Education program. Participants in this study attended the ITEC 3100 course during the Fall semester 2015 and completed their student teaching practicum during Spring 2016. Participants in this study were selected using a purposive sample (Palys, 2008). Merriam (2009)
restated the need to select a sample that will provide the most information for the study where the researcher is able to “discover, understand, and gain insight”. Due to the specific nature of the study, criterion sampling (Palys, 2008) was used to further identify participants who meet the specific requirements for this study. Initially, participant selection focused on the following criteria:

- Participated in the ITEC 3100 course
- Completed their student teaching practicum with students in 3rd, 4th, or 5th grade
- Completed their student teaching practicum within the same county school system

The identified grade levels and county school system supported a more uniformed use and availability of technology tools, thus minimizing external factors that could influence the study. Completing an online survey, volunteers provided the necessary information addressing the three basic requirements, as well as providing consent to participate in the study (See Appendix F).

After numerous requests via email inviting participants to join the study, only seven pre-service teachers agreed to participate. Of the seven volunteers, only two participants met the criteria established for the participant selection procedure – participating in the ITEC 3100 course, working with students in 3rd, 4th, or 5th grade and completing their practicum course. The two volunteers did not complete their practicum experiences within the same school system. These discrepancies will be further addressed within the limitations section of Chapter 5.

Pseudonyms were created to protect the identity of the individual participants and the educational institutions involved in the study. Names of the participants and educational institutions have been changed or removed within the various appendix documents.

David and Trina participated in the ITEC 3100 technology course in Fall 2015. During their practicum, Trina served in a suburban elementary school located approximately ten miles...
from the Southern Regional University campus. The elementary school houses approximately 700 students. The school’s overall performance rating is higher than 87% of schools in the state and is higher than its district. Although the school supports a variety of races, seventy-nine percent of the student body is white (The Governor’s Office of Student Achievement, 2017).

Trina was assigned to a third grade classroom for her practicum experience. Through a collaborative teaching arrangement, Trina’s collaborating teacher supported two sets of students. In order to extend the practicum experience to cover all content areas, Trina served two groups of students. The first group, a smaller group of nineteen students, focused on reading and writing skills. This group supported English Language Learner (ELL) students and students with an Individual Education Plan (IEP). The second class focused on math, science, and social studies where Trina worked with a group of twenty-six “predominately gifted students” (See Appendix G).

David applied to complete his practicum semester abroad. He was accepted and assigned to a partnering school in Trinidad. The school officially opened in 1994. It is a private corporation and completed the Southern Association of Colleges and Schools accreditation process in 1996. The school now houses approximately 465 students who represent 30 different nationalities (International School of Port of Spain, 2017). Using the Measures of Academic Progress (MAP), an adaptive computerized assessment instrument, the overall school scores for Mathematics, Reading, and Language Use were consistently higher than comparative data from United States schools and International schools (ISPS Annual Report, 2017). Although a relatively small group of students, David supported twelve 4th graders throughout his practicum experience.
Although the two pre-service teachers completed their practicum in different locations, many identifiers within the school environments provided similar practicum experiences for each pre-service teacher. Both schools supported students from higher socioeconomic family units, received extra financial support from parents whether from a strong Parent Teacher Organization (PTO) or tuition requirements, and provided a variety of technology tools to support student learning (See Appendix G).

**Researcher Background and Role**

Patton (1990) stated qualitative research strives for depth of understanding. The understanding is an end in itself to understand the nature of the setting – what it means for participants to be in that setting, what their lives are like, what’s going on for them, what their meanings are, and/or what the world looks like in that particular setting. This researcher has been an active member of the technology integration field for the past eighteen years, supporting the implementation of technology into education through a wide range of jobs including Technology Networking and Service, Technology Integration Specialist, and Lecturer for the Instructional Technology Department at Southern Regional University. Striving to provide pre-service candidates with a strong overview of technology integration and the role it plays within the learning environment, this researcher desires a deeper understanding of the evolution of TPACK within these pre-service teacher candidates.

This study served as a tool to investigate how pre-service teacher candidates begin to integrate technology tools and resources into lesson ideas in order to enhance the learning experiences for their students. Along with identifying elements that support technology integration, the study served as a resource for revising and extending the focus of the technology course designed specifically for these pre-service teacher candidates. Offering a course that
builds a pre-service teacher’s self-efficacy and provides a strong baseline on various technology tools and resources supports the development of a pre-service teacher’s TPACK, promoting technology credentials desired by many principals and school systems.

Maxwell’s Interactive Model emphasizes the use of three kinds of goals for conducting a qualitative research study: personal goals, practical goals, and intellectual goals (Maxwell, 2008).

- **Personal goal**: Results from this study will serve as a guide to identify strengths and weaknesses of the ITEC 3100 course. Adjustments will strengthen the overall course, extending the focus of the course to meet the needs of the participants as they develop lesson designs and a strong TPACK.

- **Practical goal** (*accomplishing something or provide information that is important to others*): After participating in the technology course, pre-service teachers will continue to integrate technology into lesson designs.

- **Intellectual goal** (*understanding something or gaining insight*): Providing a pedagogically, content-rich technology course will support the evolution of pre-service teachers’ lesson design skills and TPACK.

Within this study, the researcher assumed the role of the primary investigator, collecting and analyzing the data to further understand the research questions and attempt to reach the above goals.

According to Shenton (2004), gaining access to conduct a research study is often a daunting task for the researcher. For this study, the researcher entered the project having established *known sponsorship* (Patton, 1990), receiving internal support due to the researcher’s job identification. Participants for the study were selected from those pre-service candidates who
attended the ITEC 3100 technology course in Fall 2015. As Stake (1995) stated, participants will often readily agree to participating in a study if they have personal knowledge of the researcher, and if permission for the study has been granted through supervisors. Throughout the study, the researcher strove to maintain openness and reciprocity with all participants and stakeholders. Stakeholders on a variety of levels, including students, instructors, departments, and administration will hopefully benefit from the findings of this study. Triangulation, member checking, and researcher reflexivity practices were used throughout the study, serving as a checks and balances technique.

**Strategies to Ensure the Trustworthiness of the Study**

Incorporating several entrance tactics as described by Shenton and Hayter (2004), trustworthiness will be obtained. According to Shenton and Hayter (2004), *known sponsor approach*, a term coined by Patton (1990), is the most successful method to secure entry into an organization. Bringing a degree of credibility often causes individuals to immediately acquiesce to the study (Stake, 2005). The flipside to this tactic is the researcher may be seen as too closely aligned to the organization, thus stimulating a negative reaction to the research (Shenton & Hayter, 2004). As a member of the Instructional Technology Department and lead instructor for the ITEC 3100 course, credibility and trustworthiness was easily established. Reciprocity (tactic three) and openness (tactic four) were implemented to promote and assure credibility and trustworthiness (Shenton & Hayter, 2004).

Following the analysis structure of noted case study researchers (Maxwell, Merriam, Stake, & Yin), Credibility/Trustworthiness/Internal Validity, Reliability/Consistency, and Transferability/External Validity were addressed throughout the study. According to Maxwell (2008), a critical element of a case study is how research findings match reality. Within this
study, studying pre-service teachers as they prepare to enter their chosen career provided an in-depth overview of their beliefs and attitudes as they progressed through their teacher preparation program. Most researchers agree that when rigor is attached to interviews, the internal validity is heightened (Merriam, 2009). Following these same lines, triangulation supported the process of credibility and internal validation. Interviews were a critical component of this study.

Addressing reliability and consistency, this study sought to describe and explain the work as those who experience it (Merriam, 2009). When research findings can be replicated, the findings are considered reliable and consistent (Merriam, 2009). Triangulation between the interviews, lesson ideas, and reflective practice served to provide reliability and consistency within this study.

External validity and transferability served to provide similar findings within other studies focusing on the same issues. Member checking, peer-examinations, and data triangulation enhanced the transferability and validity of the study.

**Triangulation**

Triangulation within qualitative research serves as a tool for ensuring the credibility of the findings. Triangulation involves using multiple sources of data for comparing and cross-checking the information collected (Merriam, 2009). When findings are supported through multiple methods of data collection, the credibility and trustworthiness of the research increases. Within this study, interviews, documents, and personal reflections served to promote triangulation of the information collected.

**Member Checking**

According to Merriam (2009), member checking is another strategy to promote credibility within a study. Participants received a copy of the interview transcripts, a copy of any
narratives added to the final research report, and the opportunity to provide feedback on information listed or misrepresented within the final research paper.

**Researcher Reflexivity**

Addressing any personal biases, dispositions, and assumptions on the part of the researcher is critical to the credibility of the study. The researcher’s position, or reflexivity, supports the integrity of the researcher (Merriam, 2009). According to Lincoln and Guba (1994), reflexivity forces the researcher to come to terms with the choice a researcher makes when conducting a study. Depending upon the actual topic of study, the research often brings three categories of self to the project: the researcher-based self, the brought self, and the situationally-created self (Lincoln & Guba, 1994). Providing an open, honest reflection of each of the three selves strengthens the credibility and trustworthiness of the researcher’s role within the study. The researcher plans to maintain a journal of personal reflections and peer-examinations throughout the research process, addressing subjectivity, biases, dispositions, and assumptions (Merriam, 2009).

**Instruments**

**Technology Integration Matrix (TIM)**

Created in 2006, the Technology Integration Matrix Rubric (TIM) served as a comprehensive framework for evaluating technology integration within instructional environments (Welsh, Harmes, & Winkelman, 2011) (See Appendix A). The Florida Department of Education funded the development of the framework to expand the opportunities for teachers, administrators, and school district personnel to observe exemplary technology integration strategies, enhancing the learning experiences for all students (Welsh et al., 2011).
The TIM matrix involves 25 interactive cells, describing five interdependent characteristics of meaningful learning and addressing five levels of technology integration as adapted from the research of Jonassen, Howland, Moore, & Marra (2003). The five interdependent characteristics include: active, constructive, goal-directed, authentic, and collaboration (Welsh, Harmes, & Winkelman, 2011). Intertwined with these characteristics are the five levels of technology integration: entry, adoption, adaptation, infusion, and transformation (Welsh et al., 2011). Forming a matrix of 25 cells, the matrix provides schools with a baseline for organizing, evaluating, and developing a strong learning environment throughout the school, integrating technology to support the learning experiences for all students (Welsh et al., 2011).

Checking for inter-rater reliability, the researcher compared evaluation results against other professionals in the field of instructional technology. Once a baseline was established, the researcher finalized the TIM evaluation process.

**Technology Integration Matrix – Observation (TIM-O) Instrument**

The TIM framework was extended to include an observation tool and supportive video links where teachers receive formative feedback (See Appendix A). According to Keller-Kyriakides (2016), feedback that does not grade the teacher but affords the teacher the opportunity to understand the current level of technology integration, allows the teacher to reflect upon the level of student learning and support future lesson planning. Information gathered using the TIM tools also support administrators and school systems when identifying and planning appropriate professional development sessions to support the teachers’ practice of integrating technology into the curriculum.
Technology Integration Matrix – Lesson Plan (TIM-LP) Instrument

The TIM - Lesson Plan instrument complements the Observation Instrument. According to the TIM designers, the need to separate the data evolved as districts and teachers wanted to evaluate personal lesson plans without needing to become an observer at the district level (TIM, 2011). Separating out the various sections within the Observation Instrument allowed data to remain intact and not become “intermixed with actual observation data when generating reports” (TIM, 2011, para. 6). Providing separate instruments also allowed the tools to be used in conjunction with each other, thus strengthening the analysis of the data.

Technology is a tool that impacts society on a daily basis (Lim, Zhoa, Tondeur, Chai, & Tsai, 2013; Bull & Cisse, 2016; Niess & Gillow-Wiles, 2016; Spaulding, 2016). Remaining up-to-date with the various components can be overwhelming. For many in-service teachers, basic technology skills are either self-taught or acquired through staff development programs (Allsopp et al., 2007). Providing high quality professional development to pre-service and in-service teachers must be a priority of school systems. Establishing the appropriate tools and training for the teachers can positively impact the learning environment for students, expanding and extending learning experiences. The TIM instrument serves as a valuable tool for both pre-service and in-service teachers as they move forward to gain a deeper understanding of strategies and practices that effectively promote technology integration into their classroom (Allsopp et al., 2007).

Data Collection

Receiving approval for the research study via the Institutional Review Board (IRB) procedures, the researcher acquired a list of possible pre-service teacher candidates. Due to the nature of this case study, a purposive sample was conducted, where a specific set of criteria were
addressed (Palys, 2008). An email, seeking volunteers, was sent to the identified students (See Appendix E). The email provided an overview of the study, requirements of the participants, and an overview of the safety and interview protocol as established through the IRB.

Once the volunteers were identified, the researcher scheduled interviews with the purposefully selected volunteers, balancing the selected volunteers by gender, race, and age. A nice balance was obtained despite the limited number of participants – one male, one female; one Black/African American, one White; both fell within the same age bracket. Several forms of data were collected to support triangulation.

**Interviews**

Stake (1995) viewed the interview as the “main road to multiple realities”. Each interview brought a unique view of the experience, each telling a very specific story (See Appendix G). Additional probing provided information that enriches the baseline of reported data. Interview protocol and questions addressed the established research question. The interview session used semi-structured and open-ended questions addressing the interviewee’s comfort level with technology, their views toward technology integration, and elements that influenced their technology practices.

The interviews were conducted through a private phone setting, providing the opportunity to record the interview session. Candidates discussed their beliefs about integrating technology into the learning environment, providing predictions of their future technology integration within an assigned classroom environment, and describing elements that influenced the use of technology within their lesson ideas. Reviewing the audio session allowed the researcher to review and update any information discrepancies between the lesson plan and the lesson implementation.
Lesson Plan Submission

Documents serve as a “substitute for records of activity that the researcher could not observe directly” (Stake, 1995). This data can provide a personal view and overall meaning of every day events (Merriam, 2009). Documents serve as a reliable source of a person’s attitudes, beliefs, and view of the world (Merriam, 2009). Participants were asked to submit at least one technology rich lesson idea (See Appendix H). Using the Technology Integration Matrix – Lesson Plan (TIM-LP), a recognized evaluation tool within the field of technology integration, the technology lesson ideas were analyzed to determine the level of technology integration (See Appendix A).

Video Recording

Stake (1995) reiterates the need for the researcher to provide incontestable descriptions for analysis. Observation, as a research tool, makes sense of our world and helps us determine our future actions (Merriam, 2009). Observation allows the researcher to record behavior as it is happening (Merriam, 2009). In lieu of observations, one participant was able to provide a video recording of a selected technology-rich lesson idea as it was presented to students within the assigned practicum classroom (See Appendix I). The researcher reviewed the video, coding, and analyzing identified events for emerging themes.

Within the TIM framework, the designers supplied an additional tool, the TIM Observation Instrument (TIM-O), serving as a classroom evaluation tool (See Appendix A). This instrument was used to evaluate the submitted video recording. Using yes/no answers, the researcher reviewed what was happening within the classroom learning environment. The instrument further extended the video analysis, identifying where the lesson fell within each characteristic on the TIM matrix (Welsh et al., 2011).
Teacher Reflections

Effective reflective practice continually emerges as a way practitioners can better understand what they know and do as they develop a strong baseline of knowledge while considering what has been learned during practice (Loughran, 2002). As a final evaluative tool, the pre-service participants completed a short, reflective overview of their views of technology integration within the learning environment (See Appendix H). Participants were encouraged to reflect on their beliefs about integrating technology in the classroom and to identify elements that influenced the use of technology within their lesson ideas.

The data collection was conducted over a five to six-month period of time. Once IRB approval was obtained, an email was sent to students who participated in the ITEC 3100 course during Fall 2015. Once the final sample was formed, the data collection process began. Table 1 displays a tentative schedule for the data collection and analysis process.

Table 1
Data Collection Timeline

<table>
<thead>
<tr>
<th>IRB approval and Sample selection process</th>
<th>Lesson Plan Sample 1 submission</th>
<th>Interviews</th>
<th>Video recording of a technology lesson</th>
<th>Participant Reflection</th>
<th>Data Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>January 2017</td>
<td>February 2017</td>
<td>February-April 2017</td>
<td>Mid-April – May 2017</td>
<td>June 2017</td>
<td>June-September 2017</td>
</tr>
</tbody>
</table>

Data Analysis Procedures

All artifacts and data samples were collected and reviewed. The interview sessions were transcribed using Dragon Dictation (http://www.nuance.com/dragon/index.htm) and basic editing techniques (See Appendix G). Using an inside-out approach, the interview primary document was analyzed using NVivo Pro 11 (QSR International, 2017) through an open coding process. A
comparative analysis of the coded text to organize the data into categories was conducted. Co-occurrence and network relationships were analyzed. After identifying the categories gleaned from the interview transcripts, additional reviews were completed to identify and connect the categories throughout the interview data.

Using qualitative content analysis procedures, elements were identified throughout the various components of the data collection process. Cavanagh (1997) described content analysis as a flexible method for analyzing text data. Emerging themes from the interview process, the video analysis, the submitted lesson ideas, and the personal reflection narrative were analyzed and referenced to the research questions to identify the overall findings of the study.

**Ethical Considerations**

There was no threat of psychological, social, legal, economic, or physical risk that might occur to participants. All data was stored in a secure, locked location within the researcher’s office. The Primary Investigator conducted the data collection and analysis. Participant names and any form of identification were coded to protect the individuals participating in the study. No names or personal information were used for article publication, conference presentations, or general discussion of the study. Participants were given the option to opt out of the study at any time (Belmont Report, 1979).

**Summary**

Stake (2005) stated a case study optimizes understanding by pursuing scholarly research questions. He defined a case study is both a process of inquiry about the case and the product of that inquiry (Stake, 2005). The use of technology tools within our daily life has increased dramatically over the past ten years. As these tools address needs in our personal and working lives, the tools become a valued component within the educational setting. Preparing our pre-
service teachers with a deeper understanding of the value of technology within the learning environment serves to support the local schools with the task of extending and enhancing student learning experiences as technology is integrated into the curriculum.

The case study method served as the proper research vehicle for gathering rich, descriptive details of pre-service teachers’ views and beliefs for integrating technology into the learning activities created for their students. Interviews, video analysis, documents, and reflective practice served as the tools to obtain detailed information for analysis. These four data collection methods also served to promote triangulation between the various types of data. Serving as the interpreter in this study, the researcher hoped to provide a thick description of pre-service teachers’ views of technology integration and the elements that support those views (Stake, 1995).
Chapter 4: Findings

This chapter focuses on the findings from the data analysis. Several analysis tools provided supportive information to address the overall question for this research study: How do pre-service teachers integrate technology into their instructional practices during their student-teaching practicum after completing a stand-alone technology integration course? Two participants provided the data for analysis. Along with a scheduled interview, each participant provided at least one lesson plan sample for analysis using the Technology Integration Matrix (TIM), one participant submitted a video recording of a teaching experience where technology supported the lesson, and both participants completed a four question post-interview reflection addressing their views of technology integration and future use of technology in the classroom.

Case Study

David

Imagine working through your practicum experience on an island in the Caribbean. Sandy beaches, warm temperatures, a melting pot of cultures, and an eco-friendly environment, hosting the oldest protected rainforest in the Western Hemisphere (Trinidad and Tobago, 2016). An island paradise, indeed. This is the location where David, the first participant for this study, conducted his practicum. As part of the Southern Regional University (SRU) education program, the Trinidad Experience served as an outreach program for pre-service teachers where cultural
and social opportunities enhanced the overall pre-service teacher practicum experience (College of Education, 2017). Assigned to one of the local International Schools, David found himself engulfed in a wonderful culture and heightened learning experience — “an experience that was different, very different, than if in the United States” (See Appendix G).

He supported twelve students in his fourth-grade classroom. As an international school, the “students were paying tuition and most of the parents were working for the oil industry or some other off-shore business”. Most of the special technology was funded through their tuition. Students “received Chromebooks and iPads for their school work and most of the students came to school with their own iPhone. These students had a lot of technology at their fingertips.” The availability of technology tools made an impact on the overall use of technology in the classroom.

David worked to incorporate technology into the learning activities. He found that technology was used practically “every day” and often “throughout every subject”. With access to their own tools, students could “basically do anything”. Very few Internet policies or acceptable use policies were in place within the Trinidad school, leaving the teacher with the responsibility to establish acceptable use procedures within the classroom. According to David, “it was cool to be able to use my judgement and actually explore the websites before using them” (See Appendix G). David took this freedom seriously, exploring and identifying appropriate educational sites for his students to access. David felt the technology course from SRU provided a great “baseline” of information and skills, both of which “will help [him] in future teaching experiences” (See Appendix G). “I used Dropbox for actual student documents. When my collaborating teacher would present me with a standard, I would try my best to incorporate the students’ interests because that’s definitely, most of the time, it’s always going to go back to the
technology. I would research websites to find an appropriate website to address that standard” (See Appendix G).

The Trinidad school implemented the Primary Years Program (PYP), “incorporating all the different disciplines within one large network” (See Appendix G). One component of the program involved a global issue where all students focused on a specific topic, infusing all content areas throughout the study. When planning for the project, David would “think about the assessment component first”, focusing on “what will be assessed” and “what the students needed to know”. He felt this process of backward design afforded the largest degree of freedom when designing technology-rich activities. Focusing on the “need to differentiate” and address “the different multiple intelligences”, David felt he promoted and enhanced student engagement (See Appendix G).

Students in David’s class used technology tools to explore and investigate a variety of instructionally sound websites and tools (e.g., SMARTboard, Google Docs, Tumblebooks, NearPod) (See Appendix G). Along with basic productivity tools, David worked to extend activities to include projects that would involve multimedia and other presentation tools. NearPod became one of his favorite websites where content and assessment seamlessly meshed into an engaging activity. He found the program to be “flexible” for teacher use and promoted student interactivity. As a teacher, he could control the flow of content while “holding students accountable for their own learning”. Students used other websites to design projects that served to promote the learning experiences for other students, as David stated “students often learn better from a friend”. David encouraged students to use Storyboard Maker, comic book creation applications, graphing websites, English language translation sites, and other content-related sites to support and extend the learning environment for themselves and others.
As David begins his teaching career, he looks forward to getting to “know the other teachers and to learn their strategies” for integrating technology into the curriculum. David starts his teaching career with a “closet full of iPads”. He is already thinking how [he] will incorporate the iPads into the classroom, hoping to “solidify their reading and math skills”. “I am going to definitely come up with some ways to use the iPads. I already have the Scope and Sequence, which is really cool, so I am already looking at that and thinking how I can incorporate iPads in each of the lessons” (See Appendix G). According to David, “it is just a matter of time to see what else I can feature” in my classroom (See Appendix G).

**Trina**

Teaching in a large school system outside a metropolitan area, the second participant enjoyed working with third graders. Being familiar with the school and its community, Trina knew the school resided in a higher socioeconomic area of the county where parents provided extra financial support. Once in the school, Trina realized “how much [technology] was really in” the school. The school purchased “four iPad carts” and “four laptop carts” which served as a rolling lab for classroom checkout. Individual classrooms housed approximately “six desktops for student use” and a “couple of computer labs” provided space for full class use. Every classroom was outfitted with “the latest version of an interactive SMARTboard”. “I would use the SMARTboard like the students. I would have lesson plans that included different type activities where students would use online activities or a website where they could interact with the SMARTboard. I used the document camera and SMARTboard every day. I also used a new APP called SeeSaw. Basically the kids could video record themselves as they worked in a group and then afterwards they could edit the file and do a final presentation into the camera or…they would upload basically to the classroom library where students could watch their presentations
and their peers” (See Appendix G). The extra financial support from the school’s Parent Teacher Student Association and Foundation established a technology baseline that supported all grade levels in the school.

Trina’s practicum experience extended beyond one classroom. Her supervising teacher collaborated with another teacher in order to focus on specific content areas. In one class, the focus was math, science, and social studies; the other class focused on reading and writing. In order to fulfill the requirements of her practicum, Trina “rotated between the two classes”. The supervising teacher’s class, a smaller class of nineteen students, focused on the needs of “students identified with Individual Educational Plans (IEP), with English Language Learner (ELL) support, or as being served through special education programs”. The larger class of 26 students served “predominantly gifted” students.

Trina systematically designed her activities for her students. First, she would “think about what she was planning” for her students and then review the plan to determine if any technology tool would enhance the activity. Following the “guidelines for designing a lesson”, she knew “technology had to be in” the lesson in such a way as to “fit the needs of the students”. Often in her planning, she incorporated “more than one example of technology” which provided support to the students “on different levels [to] fit their needs” (See Appendix G). Whether working on an individual project or collaboratively with others, students selected technology tools that best met the project’s goal.

“I wouldn’t necessarily create something new, but would go online and whatever was available to me, I would use for my lesson plans. Starting from the beginning [creating a whole new activity] takes a lot of time. A lot of time I would use something that was convenient and that, of course, the students responded well to” (See Appendix G). When
creating lesson plans, “we were given guidelines to the lessons that we were to create and it always had to have technology in it. I would first focus on the concept and then go back and think how I could use a video or how I could use the iPads.” (See Appendix G)

Trina expressed the importance of technology within the educational environment. During her practicum experience, she attended professional development sessions with her supervising teacher. She “absolutely loved” attending the sessions, discovering new “cool tools” and realizing how easily the tools could be integrated into the curriculum. Trina stated that she “want[ed] to use technology as much as possible”. She saw technology tools as a supportive component to extend student learning, a time-saving feature for teachers, and a valued tool to promote collaboration between students and teachers. According to Trina, technology promotes student self-reflection, advocates collaboration, and provides immediate feedback to students and teachers. Providing time for the students to “get up and touch things” promotes interactivity and engagement (See Appendix G).

**Overview of the Results**

Two distinctly different teaching locations, two technology literate pre-service teachers, and two local schools supplying a variety of technology tools brought data for analysis. Each pre-service teacher participated in an interview, provided at least one technology-rich lesson idea, and completed a four-questions post-interview reflection on technology tools and future goals for technology within their classroom. David also supplied a video recording of a technology infused lesson. Using NVivo 11 Pro software, the researcher analyzed the interview, lesson plan, and post-reflection data. The data was coded and reviewed for themes and specific categories. The Technology Integration Matrix – Lesson Plan (TIM-LP) and the Technology
Evolution of Pre-Service Teachers TPACK

Integration Matrix – Observation (TIM-O) instrument served to review and analyze the lesson plans and the video (See Appendix A).

Interview, Lesson Plan, and Post-Reflection Analysis – NVivo Pro 11 Software

The word cloud (Figure 12) displays the word frequencies as identified within the interviews, the lesson plans, and the reflection questions obtained from the study participants. Searching for themes and categories brought the first category to light – students. Technology, learning, and lesson surfaced as related themes. While the focus of this study surrounded the pre-service teachers’ TPACK, the main focus by the pre-service teachers still remained that of the student.

Figure 12. Word Frequency for Interviews, Lesson Plans, and Post-Reflections

Repeating the word cloud process on each individual participant (Figure 13 and 14) reflected similar results as the word cloud in Figure 12.

**Figure 13.** Word Frequency Cloud for David

Figure 14. Word Frequency Cloud for Trina

Both pre-service teachers commented on the importance of focusing on the needs of their students. David stated “incorporating technology is very important in this day and time”, but it is also important to focus on what “the students need to know”. For Trina, she would “think about what [she] was planning…[and] whenever [she] had the concept in [her] head, [she] would go back and think, ‘OK, how can I use a video or how can I use the iPads?’” Often, adding technology to the lesson moves the activity “from a dull lesson to being so excit[ing] just because the iPads are being taken out” of the cart (See Appendix G).
Themes and Categories

As a baseline for the study, the word clouds served to identify overall themes within the two case studies. Working to further analyze the data, additional tools within the NVivo software program enabled the researcher to identify additional themes and categories for a more in-depth review. Figure 15 provides a summary of the Word Frequency results.

**Figure 15. Word Frequency Analysis Summary**

<table>
<thead>
<tr>
<th>Word</th>
<th>Length</th>
<th>Count</th>
<th>Weighted Percentage (%)</th>
<th>Similar Words</th>
</tr>
</thead>
<tbody>
<tr>
<td>students</td>
<td>8</td>
<td>137</td>
<td>3.48</td>
<td>student, students, students'</td>
</tr>
<tr>
<td>theme</td>
<td>5</td>
<td>67</td>
<td>1.70</td>
<td>theme, themes</td>
</tr>
<tr>
<td>technology</td>
<td>10</td>
<td>63</td>
<td>1.60</td>
<td>technology</td>
</tr>
<tr>
<td>using</td>
<td>5</td>
<td>55</td>
<td>1.40</td>
<td>used, useful, uses, using</td>
</tr>
<tr>
<td>lesson</td>
<td>6</td>
<td>48</td>
<td>1.22</td>
<td>lesson, lessons</td>
</tr>
<tr>
<td>book</td>
<td>4</td>
<td>43</td>
<td>1.09</td>
<td>book, books</td>
</tr>
<tr>
<td>know</td>
<td>4</td>
<td>42</td>
<td>1.07</td>
<td>know, knowing</td>
</tr>
<tr>
<td>learning</td>
<td>8</td>
<td>42</td>
<td>1.07</td>
<td>learn, learned, learning</td>
</tr>
<tr>
<td>think</td>
<td>5</td>
<td>42</td>
<td>1.07</td>
<td>think, thinking</td>
</tr>
<tr>
<td>just</td>
<td>4</td>
<td>38</td>
<td>0.96</td>
<td>just</td>
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<tr>
<td>also</td>
<td>4</td>
<td>34</td>
<td>0.86</td>
<td>also</td>
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<tr>
<td>like</td>
<td>4</td>
<td>34</td>
<td>0.86</td>
<td>like</td>
</tr>
<tr>
<td>reading</td>
<td>7</td>
<td>29</td>
<td>0.74</td>
<td>read, reading</td>
</tr>
</tbody>
</table>

The open coding process led to the identification of three major headings: Pre-Practicum Technology Experiences, Practicum Technology Experiences and Post-Practicum Technology Experiences – thoughts and reflections. Figure 16 provides a graphical display of the identified topics. Each of these categories parallel the main components of the conceptual framework for this study. Interlacing the various frameworks identified within the ITEC 3100 course, the
coding provided subcategories relating to the Levels of Technology Integration (LoTi) (Moersch, 2014), Bloom’s Taxonomy of Higher Order Thinking Skills (Bloom, 1956), and strategies tied to best practices. In order to further analyze the LoTi levels, coding also focused on teacher use versus student use of technology tools.

**Figure 16. Coding Categories**

*Figure 16. Topical display of the coding categories represented within the NVivo coding nodes. (2017). http://www.qsrinternational.com/nvivo-product*
Interviews

Through the ITEC 3100 course, pre-service teachers were encouraged to focus on selected standards and identify ways to incorporate technology into a lesson in order to extend the learning experience for their students (See Appendix G). Integrating technology into a learning experience can enhance the overall study of a topic and can promote student engagement. Reviewing the various components within the NVivo data files, the researcher conducted a query matrix to identify the information presented during the interview as related to the overall information presented in the lesson plan. Figure 17 and 18 showcase the results of the query. Figure 17 displays the query analysis for David’s data, while Figure 18 showcases Trina’s data.

**Figure 17. Query Analysis of David’s Practicum Experience**

*Figure 17. Query display for David’s Practicum Experiences, NVivo query (2017)*
Figure 18. Query Analysis of Trina’s Practicum Experience

![Figure 18. Query display for Trina’s Practicum Experiences, NVivo query (2017)](image)

**Lesson Plans**

Basic technology use remained higher for the teacher than for the students. When reviewing the types of technology selected, both pre-service teachers relied heavily on presentation tools or Internet sites to introduce an area of study. A PowerPoint, Internet site, or SMARTboard served as the catalyst to introduce a topic to the students. Using a PowerPoint and the pen tools provided by the SMARTboard, David modeled the process of using literary skills to identify the numerical setup for a two-step math problem (See Appendix I). When establishing who was using the tools during the introduction of a topic, the pre-service teachers controlled the majority of the introductory session. With the pre-service teacher leading this part of the lessons,
the LoTi level fell within the Awareness level, a Level 1, where very little technology is being used by the students (Moersch, 2013). For this section of the lesson, the Bloom’s Level remained at the lower levels of remembering, understanding, and applying. Trina used think-for-a-moment and turn-and-talk-to-a-friend recall strategies to introduce the new topic of study. David led a discussion and modeled the steps to solve a two-step problem. During the practice session, students were encouraged to help solve the problem; yet, no technology was used by the students.

The body of the lesson and the final components within the lesson provided a different view of technology use (See Appendix H). Beyond the basic introduction, the students seemed more involved with activities designed to promote student engagement (See Appendix G). Students were working with iPads or laptops to complete activities, exploring and learning about the topic at hand. Trina enjoyed using SeeSaw application with her students as the software “allowed students to be in control [while the teacher is still able to] see what they are doing”. Trina stated technology “makes things easier” for both the students and the teacher (See Appendix G). David used NearPod as a tool to support both learning and provide immediate feedback to the students. As a content management software, David provided the opportunity to solve the problem using an electronic whiteboard tool within NearPod. While students solved the problem, their written steps were also displayed on the teacher’s device. As viewed within the video recording, David monitored student work, moving quickly to support students who seemed to struggle with the task at hand. David was also able to share student work with the entire class for discussion and evaluation. Immediate feedback served as a tool for open communication, often clarifying misunderstandings and redirecting students before deeper misunderstandings had a chance to develop.
The activities, at this point in the lesson plan, moved the lesson to the Infusion level of the LoTi framework, a Level 3. In some of the activities, the students did have a choice of a topic, but did not have a choice for the actual technology tool. Trina’s students chose the book to review, but all students completed a SeeSaw video for their final presentation. For David’s students, NearPod supported the creation of new multi-step math problems. David found NearPod to be “so flexible”, a tool that “you can add anything [to support the lesson] – a PowerPoint, a drawing, multiple choice questions…you can add really anything”. With very little changes, both activities could have easily moved to a Level 4, Integration, within the LoTi Levels. Allowing the opportunity for students to have a voice in the activity and the option of selecting a technology tool of their choice, easily supporting and promoting a more student-directed project (Moersch, 2013).

The final projects designed by each pre-service teacher supported a higher level of thinking. Students in both groups were challenged to create a sample to demonstrate their understanding of a concept. David’s group created two-step math problems to challenge their fellow classmates (See Appendix H, Appendix I). Using NearPod, each student easily distributed the new problem to all class members. Trina’s students designed a video presentation using the SeeSaw application, demonstrating their understanding of content covered throughout the three-part lesson (See Appendix H). Provided with a “secret theme”, students created a “song, comic, or skit” to demonstrate their skills of identifying a theme. Fellow students were challenged to [identify] “what theme was [portrayed]” in the SeeSaw video (See Appendix H). These final products set the stage for students to apply their understanding of the presented concept and to create a final product to support the learning of their fellow classmates. Within the Bloom’s
Taxonomy of Higher Order Thinking, both pre-service teachers tried to extend the students’ learning experiences to the highest level – that of creating (See Appendix H).

Both pre-service teachers used a variety of pedagogically sound strategies when designing the learning activities (See Appendix H). Small groups, collaborative partnerships, differentiated activities, and assessments promoted a quality learning environment for all the students. Within the interview, both pre-service teachers first focused on content when designing a lesson, and then, determined if a technology tool would appropriately enhance the overall learning experience for their students. Trina stated she often “used more than one example of technology” within a learning experience. “A lot of times what I used can work with kids on a lot of different levels [in order to] fit their needs”. Working in a foreign country, David turned to “Google Translate to [support] several ELL students”, serving as a bridge between the two languages. He also utilized Easy Teach to strengthen literacy skills (See Appendix G).

The pre-service teachers selected a technology tool that seamlessly meshed with the goals of the final project (See Appendix H). The researcher did discover that within the body of the lesson, the pre-service teachers often returned to conventional methods to gain feedback from the students – “chart paper, information written using paper and pencil, use of laminated cards, using an activity sheet to cut, paste and take notes” (See Appendix G). It appeared as though the pre-service teachers were not as comfortable with substituting technology tools that could easily replace many of the conventional methods used within the classroom. Mishra and Koehler (2007) remind us that the extended use of technology develops as a pre-service teachers’ TPACK strengthens.
Post Reflections

Both pre-service teachers expounded on the opportunity of taking the technology course during their pre-service teacher program, feeling better prepared to integrate technology into the lessons designed to meet the needs of their students (See Appendix G). David stated that the resources he used during his practicum were “learned throughout [his] classes at Southern Regional [State]…definitely within the ITEC class”. For Trina, “the only SRU class, I guess, that really helped me understand [the value of technology in education] was [the ITEC 3100] course”. Trina further discussed her desire for extended technology support throughout her pre-service program. According to Trina, she “knew that technology is really useful, [but] would have loved to learn more”. She believed she would “have applied more, like the software and stuff, because honestly I forget…and it would be good to [continue] learning about it or to be refresh[ed] as I was going through [my pre-service program]” (See Appendix G).

According to these data, the pre-service teachers extended their lessons to a LoTi 3 where students used technology as part of the learning process, focusing on real-world concepts. With very little revision, such as allowing students to select their own topic and technology tool, the activities could easily meet the requirements of a LoTi Level 4. According to Moersch (1996), a LoTi 4 serves as the identifying point where the focus shifts from teacher-centered to a learner-centered environment.

Lesson Plan Analysis – Technology Integration Matrix (TIM-LP)

The Technology Integration Matrix (TIM) has become an established instrument within the field of educational technology. The instrument has evolved into a set of instruments designed to evaluate lesson plans, in-class integration via observation, and supports faculty as school improvement plans are reviewed and updated. Using the Technology Integration Matrix –
Lesson Plan (TIM-LP) instrument (See Appendix A), the data collected supported triangulation of this study. Implementing the TIM on sample lesson plans, other professionals in the field of instructional technology helped establish inter-rater reliability for this study. During the process, members discovered that the full matrix which includes a deeper definition of each area proved to be the most reliable format (See Appendix A). Comparison reviews completed using the online matrix did not provide the same ratings. With this finding in mind, the researcher decided to use the original, full matrix to evaluate the lesson plans presented by the participants in the study.

The results from the TIM-LP evaluation ran parallel to the analysis within the NVivo coding analysis. Both pre-service teachers received the Adaptation level for Active Learning, Collaborative Learning, Constructive Learning, and Goal-Directed Learning (TIM, 2011) (See Appendix A). David’s lesson plan reached the Adaptation level for Authentic Learning. Trina’s lesson plan rated one level lower scoring the rating of Adoption level for the Authentic Learning category. Table 2 displays a summary for the lesson plan evaluations.

Table 2

<table>
<thead>
<tr>
<th>Entry Level</th>
<th>Adoption Level</th>
<th>Adaptation Level</th>
<th>Infusion Level</th>
<th>Transformation Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active Learning</td>
<td>David</td>
<td>Trina</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collaborative Learning</td>
<td>David</td>
<td>Trina</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constructive Learning</td>
<td>David</td>
<td>Trina</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Authentic Learning</td>
<td>Trina</td>
<td></td>
<td></td>
<td>David</td>
</tr>
<tr>
<td>Goal-Directed Learning</td>
<td></td>
<td></td>
<td></td>
<td>David Trina</td>
</tr>
</tbody>
</table>

*TIM-LP Summary*
Category listings within the TIM-LP complemented the levels identified within the Levels of Technology Integration (Moersch, 2013). The Adaptation level for the Active Learning category requires students to work independently with technology in a conventional manner (TIM-LP, 2017). Both pre-service teachers served as facilitators and, although the technology tool was pre-selected for the activity, the students used the technology tools to support the learning process. The Adaptation level parallels the Infusion level, Level 3, of the Levels of Technology Integration (LoTi) model. Components within the Infusion level include teacher-directed tasks, products generated by the students, digital resources that are readily available to the students, and an in-depth study of the content (Moersch, 2013). Both pre-service teachers extended their lesson plans to support higher order thinking while incorporating technology tools to enhance the activities and further engage their students, moving the activity to the create level of the Bloom’s Taxonomy of Higher Order Thinking.

**Video Review TIM-O**

The Technology Integration Matrix serves as a method for school districts to provide feedback to administrators and teachers (TIM, 2011) (See Appendix A). The recommendation is to use multiple tools to provide a consistent analysis throughout the data collection (TIM, 2017). The Technology Integration Matrix – Observation (TIM-O) tool was designed to support an observer throughout an observation session. According to the TIM designers, the TIM-O supports the observer to “identify the level of technology integration demonstrated in a lesson” (TIM, 2017). Comparing results from the TIM-O to the TIM-LP allow researchers the opportunity to include additional information to the overall analysis of the lesson. According to the TIM program, “an effective teacher will vary the level and methods of technology integration depending on the goals of a particular lesson and the needs of a particular group of students”
The results from the TIM-LP and the TIM-O often complement each other, providing a deeper understanding of the overall lesson design. Where the TIM-O information “provides one type of data about how the teacher integrates technology within a single lesson”, the TIM-LP may fill in some of the gaps or, at the least, provides a larger overview of the lesson (TIM, 2017).

David provided a video recording of his multi-step lesson where students used NearPod to solve and create two-step math problems. The researcher determined the video to be a critical component of the information David submitted for review, thus included the TIM-O results in this study. David’s video closely emulated the descriptions provided within the formal lesson plan. He modeled the process of analyzing the vocabulary within the story problem and demonstrated the process to formulate the mathematical equation for the problem (See Appendix I). Working independently and in small groups, students practiced implementing the steps modeled by David. As students appeared to grasp a deeper understanding of the process, David challenged students to create two-step problems for their fellow classmates, moving students from the role of a participant to that of a teacher.

The TIM-O analysis of David’s video recording supports the final results provided from the TIM-LP analysis (See Appendix A). The TIM-O analysis provided a final rating of Adaptation for all five characteristic levels – Active, Collaborative, Constructive, Authentic, and Goal-Directed. As with the TIM-LP, the researcher used the full descriptor version of the matrix to evaluate the observation session. The details provided within the full set of descriptors provided a deeper understanding of the actual level. The identified TIM instruments served as two components within the triangulation process. Both instruments provided information supporting the evolution of David’s TPACK as a strong LoTi 3 with some indication of moving
into a LoTi 4. Students demonstrated the ease of working with various technology tools and had the opportunity to work on real-world topics. The analysis of the Post-Reflection Questions reflected the personal goals of both pre-service teachers and their views for integrating technology into their classrooms (See Appendix J). The Post-Reflection Word Tag Query displayed a difference in the overall view of technology within the learning environment (Figure 19). Showing as the major word in the word analysis, technology moved as a predominant component within the classroom. The Post-Reflection analysis served as the third method of evaluation, supporting the triangulation of this study.

**Figure 19.** Word Tag Query Display of Post-Reflection Responses

*Figure 19. Word Tag Query Display Post-Reflection Responses, NVivo query, (2017)*
Amalgamated Analysis

Conducting a word frequency query through NVivo Pro 11, four educational terms rose to the surface of the frequency listing: students, technology, lesson, and learning. Table 3 displays the information gleaned from the query.

Table 3
Word Frequency Analysis

<table>
<thead>
<tr>
<th>Interview and Lesson Plan Word Analysis</th>
<th>Student</th>
<th>Technology</th>
<th>Lesson</th>
<th>Learning</th>
</tr>
</thead>
<tbody>
<tr>
<td>David</td>
<td>52</td>
<td>24</td>
<td>20</td>
<td>14</td>
</tr>
<tr>
<td>Trina</td>
<td>77</td>
<td>25</td>
<td>24</td>
<td>24</td>
</tr>
<tr>
<td>Combined total</td>
<td>129</td>
<td>49</td>
<td>44</td>
<td>38</td>
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</table>

<table>
<thead>
<tr>
<th>Post-Reflection Word Analysis</th>
<th></th>
<th></th>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>David</td>
<td>4</td>
<td>7</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Trina</td>
<td>4</td>
<td>7</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Combined total:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interview, Lesson Plan and Post-Reflection</td>
<td>137</td>
<td>63</td>
<td>48</td>
<td>42</td>
</tr>
<tr>
<td>Extended Emphasis</td>
<td>+8</td>
<td>+14</td>
<td>+4</td>
<td>+4</td>
</tr>
</tbody>
</table>

The word frequency tool served as one component of the analysis process. Both pre-service teachers displayed the understanding of the main focus within the process of lesson planning. Lessons and learning served as a baseline when designing activities throughout the learning environment. Technology remained a strong component in the interviews and throughout the lesson plans, emphasizing the realization of the importance of technology use in the classroom. David felt technology is a “great way to create meaningful lessons and keep students active and involved”. He hopes to become an “expert of Google classroom and Google
Docs”, striving to extend both technology skills and strategies to provide a “paper free classroom” (See Appendix G). Trina stated her views of technology have been “solidified” and believes the use of technology within the classroom will “only be more and more critical” in the future. Trina plans to participate in professional development provided in the school system and to conference with fellow teachers in order to discover the tools other classroom teachers incorporate into the learning experiences of their students. She witnessed her students “take control” of their learning and felt technology served as a management and organizational tool for teachers, addressing the many work-related tasks required throughout the school year (See Appendix G). Both pre-service teachers acknowledged the purpose for integrating technology, and strove to improve student engagement and motivation by using technology to enhance the learning experience for the students. The word cloud below (Figure 20) provides a new perspective of how the pre-service teachers view technology integration within the classroom.
The NVivo analysis, combined with results from the TIM-LP, the TIM-O and the Post-Reflections, served to portray a growth in the pre-service teachers’ TPACK. Increased pedagogical awareness, technological expertise, and content knowledge strengthened the designed lessons to a solid Level 3 (Infusion) with some elements supporting the characteristics of a Level 4 (Integration) where students developed and shared projects that could enhance the learning experiences of other students.
Conclusions

According to Koehler and Mishra (2015), “the TPACK framework can provide the terminology and structure needed to describe the complex web of relationships that exist when teachers integrate technology into the teaching of subject matter” (p. 4). Supporting pre-service teachers as they develop the understanding and skills to integrate technology into learning experiences for their students has become a focused goal within the educational field, extending from the national level to the local school system. Although there is not overwhelming “evidence pointing to an agreed-upon approach, or route, to developing TPACK”, the framework does “characterize the knowledge that teachers need in order to skillfully teach with technology” (Koehler & Mishra, 2015, p. 4).

The pre-service teachers in this study extended their basic technology skills and investigated the strategies and techniques for technology integration through various frameworks presented in the ITEC 3100 course. Both pre-service teachers expressed appreciation for the ITEC 3100 technology course being a part of their pre-service program. “The [ITEC 3100] course really helped me understand [the value of technology in education]” (See Appendix G). According to Trina, she wished the topic of technology integration would have extended throughout her other courses. She believed if other professors “taught [students] how to incorporate certain programs [that supported the topic of their specific course]”, pre-service teachers could build a repertoire of technology tools relating to that specific topic of study (See Appendix G). In her interview, Trina also suggested other options to help pre-service teachers continue developing their basic technology skills and deepen their understanding of integrating technology into the curriculum – an additional technology course scheduled later in the pre-service program, mini-courses throughout the total program of study, online learning experiences
to “keep refreshing our brains”, or a social media strategy to keep pre-service teachers up-to-date with new trends and technology tools (See Appendix G).

Information gained from this study provided insight for answering the research question – How do pre-service teachers integrate technology into their instructional practices during their student-teaching practicum after attending a stand-alone technology integration course? Developing basic technology skills, exploring pedagogically sound practices and working to integrate the technology into a learning activity in such a way as to extend student’s thinking skills while increasing engagement and motivation serves as a guideline when designing a quality technology course.

The progress demonstrated by the two pre-service teachers in this study appeared to support the importance of a technology course for pre-service teachers during their pre-service teacher program. Attaining a Level 3, Infusion and Adaptation, during the pre-service teacher program demonstrates growth in the pre-service teachers TPACK. According the Moersch (1996), as a teacher moves from one level to the next, the focus will shift from a teacher-centered to a learner-centered learning environment. Within the LoTi Levels, the shift to a learner-centered environment occurs in the Integration level – Level 4. To further define the characteristics of the Integration level, evaluators often refer to the sub-categories for further refinement. Level 4a, the mechanical level, supports students while they are applying their learning, but the teacher is often experiencing management concerns (Moersch, 2013). Level 4b extends the learning environment to a fully student-centered experience (Moersch, 2013). As stated earlier, both pre-service teachers received the level 3 rating, yet parts of their lesson plans displayed some components of a Level 4 – where students were held accountable for their
learning, the Bloom’s Level moved to the create level, and the teacher moved into the role of a facilitator.
Chapter 5: Discussion

Overview of the study

Following the findings of Mishra and Koehler (2009), teacher education programs need to focus on building good pedagogical practices, technical skills, and content knowledge, as well as understanding the inter-relationship of these concepts (Tondeur, van Braak, Sang, Boogt, Fisser, & Otenbreit-Leftwich, 2012, p. 134). Realizing the need to support pre-service teachers in gaining a deeper understanding of technology integration to enhance and extend the learning environment, pre-service teacher programs should design technology integration courses to meet the needs of pre-service teachers. According to Koh, Chai, and Lim (2017), 21st century learning:

- involves activities that promote the development of social skills for collaboration, conflict resolution, and multicultural communication; cognitive skills to engage in critical thinking for innovation and complex problem solving; metacognitive skills to engage in self-reflection and self-learning; productivity skills to organize work effectively and efficiently; and technological skills to exploit information and communications technology (ICT) tools appropriately. (p. 55)

Learning in the 21st century consists of an active learning environment, tools that promote higher order thinking, tools to direct and monitor achievement, and tools to support learning through collaboration.
This study focused on pre-service teachers and their TPACK development after completing a stand-alone technology integration class during the first semester of their teacher preparation program. Each pre-service teacher completed a pre-assessment and post-assessment survey as part of the course requirements (See Appendix D). Designed following the format of Schmidt, Baran, Thompson, Koehler, Mishra, and Shin’s (2009) Pre-Service Knowledge of Teaching and Technology (PKOTT) questionnaire, the survey used a five-point Likert scale to identify the overall technology comfort level toward specific technology integration strategies and tools. Analysis of the pre-assessment and post-assessment surveys supported the assumption that while many of the pre-service teachers were comfortable with many of the current technology tools, actually integrating technology into the curriculum proved to be a limitation for many pre-service teachers (Ertmer, 2005; Polly et al., 2010; NCLB, 2016; NETP, 2016).

The ITEC 3100 course evolved as a need to address the gap between the basic understanding of software applications and hardware designs with the ability to integrate technology into learning activities to promote student engagement and increase motivation. The course extended the study of technology integration to include strategies and frameworks that promoted the pedagogical understanding of properly integrating technology into the content areas. Several technology integration frameworks, the Bloom’s Taxonomy of Higher Order Thinking Skills, the Levels of Technology Integration (LoTi), project-based learning, student centered and collaborative learning experiences served to extend basic lesson ideas to a higher level. Interwoven into the technology course, students explored the components of the various frameworks as they designed technology infused lesson ideas. Using a pre-designed template, students addressed specific components reflecting best practices, guiding students through a thoughtful, reflective planning process (See Appendix K).
Participants in the case study completed an interview session with the researcher, provided lesson plans, and completed a set of four post-reflection questions. As stated earlier, David also submitted a video recording for analysis. The data were analyzed using NVivo Pro 11 and the Technology Integration Matrix (TIM) instruments. The pre-service participants displayed the ability to transfer strategies addressed in the ITEC 3100 to the lesson plans designed during their practicum semester. At this point in their TPACK development, both pre-service teachers reached the Infusion level, Level 3, of the LoTi framework. For both, minor additions to the existing lesson plans could move the activity to a Level 4, Integration – the minimum goal level to support a technology-rich learning activity (Moersch, 2013). The post-reflections displayed a slight change in the pre-service teachers’ focus. The word cloud graphic for the interview and lesson plan analysis displayed students as the primary term, while technology followed in second place. In the final word analysis of the post-reflections, the terms were reversed, displaying a positive growth in the importance of technology within the learning environment. According to Table 4, student increased by 8 and technology increased by 14.

Table 4

*Summative Table – Instrument Ratings*

<table>
<thead>
<tr>
<th></th>
<th>David</th>
<th>Trina</th>
</tr>
</thead>
<tbody>
<tr>
<td>LoTi Level</td>
<td>3 - Infusion</td>
<td>3 – Infusion</td>
</tr>
<tr>
<td>TIM – Lesson Plan (LP)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Active Learning</td>
<td>3 - Adaptation</td>
<td>3 – Adaptation</td>
</tr>
<tr>
<td>Collaborative Learning</td>
<td>3 – Adaptation</td>
<td>3 - Adaptation</td>
</tr>
<tr>
<td>Constructive Learning</td>
<td>3 - Adaptation</td>
<td>3 – Adaptation</td>
</tr>
<tr>
<td>Authentic Learning</td>
<td>3 - Adaptation</td>
<td>2 – Adoption</td>
</tr>
<tr>
<td>Goal-Directed Learning</td>
<td>3 - Adaptation</td>
<td>3 – Adaptation</td>
</tr>
<tr>
<td>TIM – Observation (O)</td>
<td>3 - Adaptation</td>
<td>n/a</td>
</tr>
</tbody>
</table>
Further research may provide a deeper understanding of the results of the word analysis. Statements from the post-reflections reveal a change in the teachers’ views of using technology as they begin their teaching career. David desires to become more proficient with technology and looks forward to using the iPad cart that has been assigned to his classroom (See Appendix G). Trina plans to attend professional development sessions that will strengthen her technology skills and support the integration of new tools into her classroom (See Appendix G). Both pre-service teachers stated the need to continue developing their own TPACK in order to apply technology into their teaching. According to Padmavathi (2016), “developing TPACK capabilities is not a one-time activity. It is a process where teachers continuously have to evolve new ways of teaching, recording their observations, and interacting with peers to find reliable and tested ways of using technology” (p. 7).

**Discussion of Findings**

The study provided information and data to assist in answering the three goals established at the onset of this study. The first goal, a personal goal, involved identifying the strengths and weaknesses of the ITEC 3100 course. Through reflective practices, I continually review information provided from the end-of-the-course student evaluations. Since the inception of the ITEC 3100 course, student views and suggestions provided the impetus to update and modify components within the coursework. From this study and the information provided from the interviews, suggested modifications will become part of the re-structuring process for the next semester. New technology innovations and student input keep the course in a perpetual state of revision.

The second goal, a practical goal, focused on the individual pre-service teacher and his/her integration of technology into the learning process in order to support student
achievement. Conducting this study provided the opportunity to identify various strategies and technology tools used when creating activities for the students. The TPACK framework served as the model to identify the development level of each pre-service teacher’s TPACK. The Levels of Technology Integration matrix and Technology Integration Matrix served as instruments to determine the level of the TPACK development. Working in parallel, both instruments returned results to support a positive growth in TPACK for both pre-service teachers.

The third goal, an intellectual goal, attempted to identify components and strategies that would enhance a technology-rich course in order to support the evolution of teachers’ lesson design and TPACK. Analyzing the data collected throughout the study and conducting further research to support the findings of the study, several components were identified that will promote the integration of technology, enhance the basic framework of the ITEC 3100 course, and further strengthen the pre-service teacher’s TPACK.

The findings provided insight to the evolution of a pre-service teacher’s TPACK after completing a stand-alone technology course. Both pre-service teachers expressed gratitude for the ITEC 3100 course being part of their pre-service program. They appreciated the opportunity to become familiar and fluent with various technology tools and strategies (See Appendix G). Focusing on the needs of the students, the pre-service teachers worked to integrate technology into the lesson so as to support the topic of discussion while increasing student engagement through the use of technology. Designing project-based activities, the SeeSaw video presentation and the NearPod multi-step math problems, students collaboratively created presentations that would support the learning experiences for other students in the class. Technology served as a catalyst to extend students’ thinking into the higher levels of the Bloom’s Taxonomy, and
afforded students another method to redeliver information obtained throughout the learning experience.

Both pre-service teachers acknowledged the ITEC 3100 course as a beneficial course within their pre-service teacher preparation program. Trina expressed being “overwhelmed by the amount of technology in the school where she completed her practicum” (See Appendix G). Although the school was located in an affluent area of the county, she “really didn’t know how much [was there] until [she] was really in there”. Realizing many of the technology tools found within the school were part of the ITEC 3100 course, Trina felt confident to incorporate those tools into the classroom she supported.

David also experienced a plethora of technology tools within his school—a SMARTBoard, document camera, and iPads for each student and high speed Internet (See Appendix G). Students had their own Chromebook so they “could basically do anything. We used technology throughout the day, if not, throughout every subject” (See Appendix G). Although in very different locations, one on the mainland of the United States and the other a tropical island in the Caribbean, the classrooms mirrored each other with respect to the available technology tools.

Moving to a Level 3, Infusion, on the Levels of Technology Integration (LoTi) framework and the Adaptation level within the Technology Integration Matrix Instruments is commendable for the pre-service teachers. While following an established lesson plan template where critical lesson planning components were addressed (e.g., differentiation, supporting ELL students, formative and summative assessments, project-based learning activities, and grouping strategies), the pre-service teachers also focused on integrating technology into the lesson plan. The positive change in their TPACK, as displayed within the TIM-LP, the TIM-O, and the
NVivo analysis (Figures 11-19 and Tables 2-4), provided a knowledge baseline as these teachers integrated technology to enhance the lesson activities designed for the students. Recent research studies also report a positive growth in pre-service TPACK after completing a technology course during their program (Bull & Crisse, 2011; Jin, Jenner, Karakaya, Kramer, & Schmidt-Crawford, 2015; Özdemir, 2016; Padmavathi, 2016; Schouten, Maurer, & Jackson, 2016; Spaulding, 2016).

When asked what they would changes if they were to present the lesson again, both pre-service teachers stated they would have liked more time in order to extend the learning experience for the students (See Appendix G). David stated the lesson went well, but there “is always room to grow”. He would have like more time so the students “could make more of their own two-step problems, giving [the students] more accountability towards their own learning” (See Appendix G). Trina stated she would have liked to extend the lesson over several days so students could record themselves, review the video and then re-record and edit the video to ensure the best reflection of their topic (See Appendix G). Both pre-service teachers seem to understand the need to extend learning activities to a higher order of thinking and to schedule enough work time for students to analyze and update the project prior to the final presentation to the class. After reflecting on the proposed question, the shift in the students’ thought process fuels the growth of their computer efficiency, the “degree to which computers are used within the classroom to support project-based instruction and higher order thinking skills” (Moersch, 1996, p. 52). This shift moves the instruction from a teacher-centered to a student-centered learning environment, a major component within the LoTi Level 4, Integration.

Analysis of the post-reflection data depicted a shift in the overall word frequency. In the word analysis for the interview session and the lesson plans, both teacher word clouds displayed student as the most frequently used term. In the post-reflection word analysis, technology moved
to the number one position – an increase of 14 uses. The pre-service teachers still viewed the students as a major focus within the learning environment; but now, the pre-service teachers regarded technology as a valued component required to enhance student learning (Figure 18). This shift substantiates a positive growth in TPACK for the pre-service teachers.

When asked what other courses in her pre-service preparation program supported technology integration, Trina stated the ITEC 3100 course might have been scheduled at the wrong time within her coursework. In some ways, she thought taking the technology course during the practicum semester might have served her better. She said she would have “loved to know more about [technology while] I was in the schools. I think I could have applied more, like the software and stuff, because honestly I forget [things] and I think it would be good to be learning about it or to be refreshing as I was going through [my practicum experiences]” (See Appendix G).

In her other pre-service teacher courses, Trina expressed the need for more modeling of technology tools by the other professors. She stated that she understands they are all very busy, but “in a perfect world, [it would be nice] if all the professors…had taught us about how to incorporate certain programs [related to the course topic]” (See Appendix G). Trina suggested an online course, a mini-course, or a professional learning community could be established to help support the pre-service teachers as they work through the teacher preparation program (See Appendix G). Presenting this information to other course designers within the teacher preparation program could lead to changes that would ultimately provide better support of the technology needs of the pre-service teachers.
Recommendations

Recent research addresses the same issues discussed in the post-reflection analysis in this study. Designing a quality technology course for pre-service teachers has been a topic of concern since the early 2000’s (Angeli & Valanides, 2005; Doering et al., 2009; Ertmer, & Ottenbreit-Leftwich, 2009; Harris & Hofer, 2009; Kay, 2006; Mishra & Koehler, 2006; Moersch, 1996, 2014). Many recent articles and studies have indicated the need to support pre-service teachers with their pedagogical knowledge (PK) while providing instruction to help develop their technological knowledge (TK) (Hofer & Harris, 2017; Koh, et al., 2017; Lyublinskaya & Tournaki, 2017; Özdemir, 2016; Polly & Rock, 2016; Powers & Musgrove, 2016; Price & Roth, 2011; Schouten et al., 2016). Several themes run through the various articles. The themes support a structure for technology integration courses, focusing on the specific needs of the pre-service teachers in order to develop and strengthen their TPACK. To strengthen technology integration throughout the pre-service teacher program, the following components are recommended:

1. Instructors in the teacher preparation programs will model technology integration within their coursework and require pre-service teachers to integrate technology into course assignments (Foulger, Graziano, Slykhuis, Schmidt-Crawford, & Trust, 2016; Mulder, 2016)

2. Collaboration between the pre-service teacher, the faculty member and the mentor teacher will be established to promote support and guidance when modeling technology integration (Kay, 2006; Sedivy-Benton & Leland, 2014)

3. Instruction on effective teaching and learning strategies that promote technology integration will be designed to enrich the learning experiences through project-based, collaborative learning activities (Polly & Rock, 2016)
4. Pre-service candidates will receive on-going support as they learn to design technology-rich instruction (Polly & Rock, 2016)

5. Field experience sessions will be scheduled so pre-service teachers can implement technology-rich lessons (Ertmer, 2016; Ntuli, 2016)

6. Pre-service teachers will reflect on implemented technology lessons (Ertmer, 2016)

Findings from this study align to the research discussed above. Providing pre-service teachers with pedagogically sound, technologically rich, and content-based support allows the development of a strong TPACK. When designing technology integration support for pre-service teachers, whether face-to-face, blended, or online, the program should strive to incorporate all six components in order to fully meet the needs of the pre-service teachers.

According to Foulger et al., (2016), the 2016 National Education Technology Plan (NETP) “challenges everyone in preparing new teachers to be accountable for including experiences with educational technology that model innovative and appropriate use.” This charge holds pre-service teacher preparation programs responsible to “establish curriculum within their courses for teaching with technology, serve as role models in the use of technology in teaching, and provide support to preservice teachers to develop their own ability to teach with technology” (Foulger et al., 2016). A new goal has been set for teacher preparation programs.

The ITEC 3100 course is a stand-alone course that extends beyond basic technology skills. Using research-based frameworks, the overall design of the course also incorporates foundational features from TPACK, LoTi, Bloom’s Higher Order of Thinking Skills, project-based authentic learning, and student-centered learning. Results from this study provided encouraging information on the evolution of a pre-service teachers’ TPACK after completing a stand-alone technology integration course. The TIM instruments and the LoTi framework served
as instruments to support the measurement the TPACK model. Following the research of Moersch (2013), the integration level (Level 4) has been identified as the minimum level to ensure a technology-rich learning activity. The TIM instruments parallel the LoTi framework where the adoption and adaptation levels match with the Level 4a (mechanical) and Level 4b (routine), respectively. Figure 21 displays an overview of the two instruments as related to the development of TPACK. Participants in this study reached the Adaption level when assessed using the TIM instruments. Within the LoTi level, both teachers approached Level 4a where students began to move toward a voice and choice learning environment.

**Figure 21. TPACK as Measured by the LoTi and TIM Instrument Levels**

<table>
<thead>
<tr>
<th>TPACK</th>
<th>Levels of Technology Integration</th>
<th>Technology Integration Matrix</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Level 0 – Non-use</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Level 1 – Awareness</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Level 2 – Exploration</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(Teacher using the tools)</td>
<td>Entry (Teacher using the tools)</td>
</tr>
<tr>
<td></td>
<td>Level 3 – Infusion</td>
<td>Adoption (Teacher directs students)</td>
</tr>
<tr>
<td></td>
<td>(Teacher directs students)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Level 4a – Mechanical</td>
<td>Adaption (Students explore and use technology)</td>
</tr>
<tr>
<td></td>
<td>(Student Centered)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Level 4b – Routine</td>
<td>Infusion (Students have voice and choice)</td>
</tr>
<tr>
<td></td>
<td>(Student Centered – Routine)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Level 5 – Expansion</td>
<td>Transformation (Facilitates higher order learning activities and may not be possible without technology)</td>
</tr>
<tr>
<td></td>
<td>(Student Centered – Extends to experts)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Level 6 – Refinement</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(Student Centered – Real World)</td>
<td></td>
</tr>
</tbody>
</table>

Figure 21. TPACK as Measured by the LoTi and TIM instrument levels.

Just as David stated in his interview, “there is always room for growth” (See Appendix G). As the researcher reflected upon the overall design of the ITEC 3100 course, there is still
room for growth. Meshing research-based frameworks, pedagogical strategies, and a project-based learning environment, the ITEC 3100 course serves as a solid technology integration course, carefully balancing pedagogy, content knowledge, and technology. To further support the development of TPACK for the pre-service teachers, there are three areas that could extend the value of the ITEC 3100 course.

Presently, the College of Education is reviewing the teacher preparation program, preparing for an accreditation review. As technology integration moved to the forefront of the educational field, the college is carefully reviewing syllabi across departments to identify technology-infused activities. Establishing a professional learning community between the Instructional Technology Department and the other departments within the college would address one of the elements missing from the list of recommendations. Content knowledge, technological knowledge, and pedagogical knowledge could be enhanced through a collaborative learning community where instructors throughout the college of education review, analyze, and update their coursework to further advance technology integration strategies.

The ITEC 3100 course includes a few reflection activities over the course of the semester. Ntuli (2016) discussed the value of reflection as an assessment strategy for pre-service teachers as they begin to build skills and techniques to integrate technology into the learning environment. A reflection assignment “ensures that candidates take ownership of their learning as they reflect on their accomplishments, and the areas they need to keep working on” (Ntuli, 2016, p. 2999). Reflective practice serves as a method to assess professional growth, allowing pre-service teachers the opportunity to identify strengths and weaknesses in their personal TPACK development. As the ITEC 3100 program coordinator, this researcher plans to review
the coursework to identify more opportunities to supplement the course with reflection assignments.

Another recommendation for enhancing a technology integration program involves field experiences. Researchers advocated field experience sessions as a method to offer pre-service teachers the opportunity to implement the technology-rich activities designed during their teacher preparation program. Not only does this practice provide an authentic teaching experience, but the pre-service teachers are able to receive feedback from the teaching experience and reflect on the specific educational practices and technology tools that enhance the learning experience for the students (Ertmer, 2016). Although more time would be required to schedule field experiences, it is a practice worth investigating for the ITEC 3100 program.

**Limitations**

Over the course of completing the study, various factors arose which served as limitations to the overall study. After many attempts to secure volunteers, only seven former students completed the initial consent survey. The researcher feels the request for volunteers did not arrive at the most opportune time for the participants - all who were immersed in their practicum semester of the pre-service teacher program. Of the seven who did complete the consent survey, only two met the criteria established in the original guidelines for the study. Both participants attended the ITEC 3100 course and were working with students in 3rd, 4th, or 5th grade; unfortunately, they were not teaching in the same school district. While waiting on the possibility of obtaining more participants, the researcher moved forward with the interview sessions. Upon completing the interviews, the researcher realized the schools provided many of the same technology tools (Internet, laptops, SMARTboard, iPads), placing the two teaching experiences on a similar level when integrating technology into the classroom. Although a limitation in one
respect, the findings from two different locations provided an insight into the use of technology within those environments. Another limitation for the study relates to the type of school participating in the study. Further research is necessary to follow the TPACK development for pre-service teachers assigned to technology-poor schools.

The original list of students who took the ITEC 3100 class in Fall 2015 included ninety-three (n=93) participants. Although a respectable sized sample, it proved to be inadequate for this study. An extended study could prove to return a deeper view of the evolution of a pre-service teachers’ TPACK. Gathering lesson plans and conducting observations throughout the semesters following the ITEC 3100 course could deliver additional data, supplying richer information for analysis.

Naturalistic generalizability of the study could serve as a limitation. Although the basic structure of this study could easily be replicated, findings from this study may not prove sufficient to support a similar study in another location. Further research is required to verify naturalistic generalizability of the study.

The researcher’s relationship to the study also served as a limitation. Throughout the process, the researcher strove to serve as an independent entity, striving to maintain the integrity of the study.

**Implications for Future Research**

Expounding on the results from this study, additional research over an extended period of time could provide a more detailed overview of the evolution of a pre-service teachers’ TPACK. A longitudinal study could provide a wealth of information on the development of TPACK, the designing process of technology-rich lesson plans and the integration of technology into the learning environment. Do teachers have technology tools available within their new classroom?
How do the teachers integrate technology that is available to support student learning? Did the teacher’s TPACK continue to develop as they began working with their students? What type of technology support and professional development did the teachers receive once in a school system? Would additional coursework or support during their junior and senior years actually further enhance their TPACK? What types of coursework would best fit those needs?

**Conclusion**

Mishra and Koehler (2006) stated “teachers need a specialized form of professional knowledge termed as technological pedagogical content knowledge (TPACK) to support information communication technology.” Also suggested in the TPACK framework, focusing solely on the technology tools does not provide adequate support to develop a strong TPACK. Pedagogy and content knowledge are critical components of the framework (Koehler & Mishra, 2015). The educational systems have the responsibility to “adequately prepare you people for the challenges today and opportunities of the future” (Price & Roth, 2011). Price and Roth (2011) conducted a review of evaluation data which culminated three areas needing immediate focus in order to support teachers in the successful implementation of technology:

1. **Lesson plan development** where teachers develop and use curriculum framing questions to guide learning.

2. **Instructional strategies** where teachers use curriculum framing questions to guide student work and student thinking.

3. **Implementation of new technology-rich activities** where teachers integrate technology use to support specific components of a learning activity (research, writing and revision, communication).
Pre-service teachers need to be “given the opportunities to develop adequate pedagogical reasoning and become confident and competent in infusing technology in their teaching (Angeli, 2005). In today’s world, access to information is at the tip of your fingers, making it extremely easy for students to locate information. What is difficult is the process of developing the skills for “organizing, sharing and collaborating” that information in order to “interact, share, and thus learn” (Padmavathi, 2016). Padmavathi (2016) reminds us that “teachers have to understand that TPACK is not just the addition of [technology] to traditional teaching rather it is [the process of] integrating the advantages of using [technology] in a way that is appropriate to the discipline concerned and nature of the topic dealt. TPACK requires thorough understanding of PCK, knowledge of how [technology] can be used to access and process subject matter and also the combination of both to transform the way the content is presented for enhancing learning.”

These elements are addressed within the goals and objectives of the ITEC 3100 course (See Appendix B). Although the ITEC 3100 course serves as a solid introductory course for pre-service teachers, addressing all the components within the TPACK framework, continual review and redesign are required in order to maintain the quality of the course and to address the needs of the students as new technology tools emerge.
References


Niess, M. (2008a). *Handbook of technological pedagogical content knowledge (TPCK) for educators* (pp. 223-250). Guiding Preservice Teachers in Developing TPCK (Eds.).


Ntuli, E. (2016). Effective instructional technology courses: Reflection on the changes implemented to enhance pre-service teachers’ TPACK knowledge. Presentation at SITE 2016 Conference: Savannah, GA.


Appendix A

Technology Integration Matrix (TIM) Instruments

Respecting the guidelines set by University of South Florida, the overall forms from the TIM Matrix will not be supplied within this section. An image of the basic matrix and the completed evaluations for each participant will be supplied for review.

Technology Integration Matrix
# Technology Integration Matrix – Lesson Plan Instrument Results for Each Participant

## David – Lesson Plan Analysis

### Lesson Date: 08/15/2017

<table>
<thead>
<tr>
<th>Entry</th>
<th>Adoption</th>
<th>Adaptation</th>
<th>Infusion</th>
<th>Transformation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active</td>
<td>Information passively received</td>
<td>Conventional, procedural use of tools</td>
<td>Conventional/independent use of tools; some student choice and exploration</td>
<td>Choice of tools and regular, self-directed use</td>
</tr>
<tr>
<td>Collaborative</td>
<td>Individual student use of tools</td>
<td>Collaborative use of tools in conventional ways</td>
<td>Collaborative use of tools; some student choice and exploration</td>
<td>Choice of tools and regular use for collaboration</td>
</tr>
<tr>
<td>Constructive</td>
<td>Information delivered to students</td>
<td>Guided, conventional use for building knowledge</td>
<td>Independent use for building knowledge; some student choice and exploration</td>
<td>Choice and regular use for building knowledge</td>
</tr>
<tr>
<td>Authentic</td>
<td>Use unrelated to the world outside of the instructional setting</td>
<td>Guided use in activities with some meaningful context</td>
<td>Independent use in activities connected to students’ lives; some student choice and exploration</td>
<td>Choice of tools and regular use in meaningful activities</td>
</tr>
<tr>
<td>Goal Directed</td>
<td>Directions given, step-by-step task monitoring</td>
<td>Conventional and procedural use of tools to plan or monitor</td>
<td>Purposeful use of tools to plan and monitor; some student choice and exploration</td>
<td>Flexible and seamless use of tools to plan and monitor</td>
</tr>
</tbody>
</table>

## Trina – Lesson Plan Analysis

### Lesson Date: 08/15/2017

<table>
<thead>
<tr>
<th>Entry</th>
<th>Adoption</th>
<th>Adaptation</th>
<th>Infusion</th>
<th>Transformation</th>
</tr>
</thead>
<tbody>
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<td>Purposeful use of tools to plan and monitor; some student choice and exploration</td>
<td>Flexible and seamless use of tools to plan and monitor</td>
</tr>
</tbody>
</table>
### Technology Integration Matrix – Observation Instrument

**David - Video Analysis**

**Lesson Date:** 06/26/2017

**Matrix Based Observation**

Click in the boxes below to choose the TIM levels that best describe this lesson. Click on Lesson Detailed Indicators for specific student, teacher, and learning environment descriptors typical for each characteristic.

<table>
<thead>
<tr>
<th>Entry</th>
<th>Adoption</th>
<th>Adaptation</th>
<th>Infusion</th>
<th>Transformation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active</td>
<td>Conventional/procedural use of tools</td>
<td>Collaborative use of tools in a conventional context</td>
<td>Choice of tools and regular, self-directed use</td>
<td>Collaborative with peers and outside resources in ways not possible without technology</td>
</tr>
<tr>
<td>Collaborative</td>
<td>Individual/student use of tools</td>
<td>Collaborative use of tools in a conventional context</td>
<td>Choice of tools and regular use for collaboration</td>
<td>Extensive and unconventional use of technology tools to build knowledge</td>
</tr>
<tr>
<td>Constructive</td>
<td>Information delivered to students</td>
<td>Independent use for building knowledge; some student choice and exploration</td>
<td>Choice and regular use for building knowledge</td>
<td>Extensive and unconventional use of technology tools to build knowledge</td>
</tr>
<tr>
<td>Authentic</td>
<td>Use resources to be the world outside of the instructional setting</td>
<td>Student use in activities with some meaningful context</td>
<td>Choice of tools and regular use in meaningful activities</td>
<td>Innovation use for higher order learning activities in a local or global context</td>
</tr>
<tr>
<td>Goal Directed</td>
<td>Direction given, step-by-step task monitoring</td>
<td>Conventional/procedural use of tools to plan and monitor</td>
<td>Flexible and seamless use of tools to plan and monitor</td>
<td>Extensive and higher order use of tools to plan and monitor</td>
</tr>
</tbody>
</table>
Appendix B

ITEC 3100 Syllabus
(Partial syllabus)

Southern Regional University
College of Education
Department of Educational Leadership

ITEC 3100: Improving Learning with Technology in the Elementary Classroom, Fall 2015

Instructor/Contact Information:

Dr. XXXXXXX
Associate Professor, Department of Instructional Technology
Hall xxx
D2L mail (or for quick questions xxxxxxxxx@.edu)

All assignments must be submitted via D2L or Weebly Portfolio as assigned in syllabus

Ms. XXXXXXX
COE Technology Coach
Hall xxx

Course Meetings:  KH 2105, Fridays, 12:30-3:15 p.m., Aug. 16, 23, 30; Sept. 6, 13, 20, 27; Oct. 4, 11, 18, 25 (optional); Nov. 1, 8, 15 (online), 22

Optional Open Labs w/ Ms. XXXXX:  Fridays, 9-11 a.m.

Student Lab Hours (KH2107):  The student lab is generally open 8 a.m.-5 p.m. daily. On
Thursdays or Fridays the lab may be open until 6 p.m. Often there is someone available at 7 a.m. to
let you in, as well.  Call (xxx) xxx-xxxx to confirm.  At times there are classes scheduled in KH2107.
If there is a computer available, you can slip in the back and work most of the time even if a class is
scheduled.  You are also welcome to use computers in KH 2105 when the lab is empty or instructor
will allow you to work.  You can check the lab schedule for both KH 2105 and 2107 at:
https://education..edu/instructionaltechnology/content/lab-reservations  TRAC computers have same
software as labs.  Check TRAC hours.

Additional Support:  Students have access to the SRU Writing Center http://.edu/writingcenter/ and
Student Support Services http://www..edu/stu_dev/dsss/dsss.html.  If accommodations are required,
students should send documentation to the instructor immediately. Accommodations for future
assignments will be made within 5 days of receipt of documentation. All students can make
appointments with instructor or coach.
Required Texts:

Prerequisite: Admission into Teacher Education

Course Description: Teacher candidates learn to use technologies to promote student achievement in elementary content area and technology literacy standards. Special topics include using technology to improve students’ English language learning, to assess student learning, and to differentiate instruction. Candidates also learn to manage their digital activities in ways appropriate for a professional educator; advocate for students without beyond-school access; and teach K-12 students how to use technology safely, ethically, and legally.

Purpose and Rationale: In an era when the needs of students are rapidly changing, schools are not providing digital-age learners with the types of environments that parallel the connectivity and social interaction patterns that they are accustomed to outside of school. This disparity threatens to further alienate youth and encourage the already-growing student perceptions that schools are outdated and irrelevant to their interests and goals. In a similar vein, current instructional practices and academic curricula are not producing students who have the knowledge, skills, and dispositions needed for digital-age work and citizenship. While students may be skilled in using technology to pursue their own social and entertainment purposes outside of school, they are still unprepared to use technology to pursue post-secondary studies, daily work in various professional and technical fields, life-long learning, and civic engagement. Students and teachers may also lack the skills to engage in safe and responsible use of technology for work and learning. Research suggests that these disparities are more pronounced and bear greater economic consequences for students in urban settings. Providing students with instruction on how to engage in safe and responsible use is required by the Children’s Internet Protection Act (CIPA) and comprises one of the major standards categories in both the National Education Technology Standards for Students and for Teachers (NETS-S, NETS-T).
Standards Addressed:

PTEU OUTCOMES AND PROFICIENCIES FOR INITIAL PROGRAMS:

<table>
<thead>
<tr>
<th>OUTCOMES &amp; PROFICIENCIES</th>
<th>KSD</th>
<th>NCATE STANDARD</th>
</tr>
</thead>
<tbody>
<tr>
<td>OUTCOME 1: Subject Matter Expert</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.1 Candidate possesses knowledge of discipline content, methods of inquiry, and connections to other disciplines and applications to common life experiences.</td>
<td>K</td>
<td>Content</td>
</tr>
<tr>
<td>1.2 Candidate knows and represents content accurately in multiple explanations, technology integration, and the application of various instructional strategies.</td>
<td>S</td>
<td>Pedagogical Content</td>
</tr>
<tr>
<td>1.3 Candidate uses content and pedagogical knowledge to assist students in the mastery of subject matter knowledge.</td>
<td>S</td>
<td>Pedagogical Content</td>
</tr>
<tr>
<td>OUTCOME 2: Facilitator of Learning</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.1 Candidate demonstrates knowledge of how learners develop, learn and think about subject content, as well as successful strategies to motivate students to learn.</td>
<td>K</td>
<td>Pedagogical &amp; Professional</td>
</tr>
<tr>
<td>2.2 Candidate uses knowledge of the influences of society, culture, community, and family on schools and learning to create and implement instruction that embodies multiple cultures and a rich, diverse curriculum.</td>
<td>K</td>
<td>Pedagogical &amp; Professional</td>
</tr>
<tr>
<td>2.3 Candidate creates effective, well-managed and active learning environments that reflect high expectations for student achievement.</td>
<td>S</td>
<td>Pedagogical &amp; Professional</td>
</tr>
<tr>
<td>2.4 Candidate designs and implements instruction that makes effective use of a variety of methods, materials, and technologies to positively impact learning of all students.</td>
<td>S</td>
<td>Pedagogical &amp; Professional Student Learning</td>
</tr>
<tr>
<td>2.5 Candidate utilizes a variety of assessments to evaluate student learning and uses the results to improve the quality of instruction that is differentiated to accommodate students’ diversities.</td>
<td>S</td>
<td>Pedagogical &amp; Professional Student Learning</td>
</tr>
<tr>
<td>OUTCOME 3: Collaborative Professional</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.1 Candidate reflects upon and improves professional performance based on professional standards, feedback, best practices and effective communication.</td>
<td>D</td>
<td>Disposition</td>
</tr>
<tr>
<td>3.2 Candidate builds collaborative and respectful relationships with colleagues, supervisors, students, parents and community members.</td>
<td>D</td>
<td>Disposition</td>
</tr>
<tr>
<td>3.3 Candidate displays professional and ethical behavior consistent with recognized educational standards and codes of ethics.</td>
<td>D</td>
<td>Disposition</td>
</tr>
</tbody>
</table>
EDUCATION TECHNOLOGY STANDARDS FOR TEACHERS
(International Society for Technology in Education, 2008)

1. Facilitate and Inspire Student Learning and Creativity

Teachers use their knowledge of subject matter, teaching and learning, and technology to facilitate experiences that advance student learning, creativity, and innovation in both face-to-face and virtual environments. Teachers:

a. promote, support, and model creative and innovative thinking and inventiveness.

b. engage students in exploring real-world issues and solving authentic problems using digital tools and resources.

c. promote student reflection using collaborative tools to reveal and clarify students' conceptual understanding and thinking, planning, and creative processes.

d. model collaborative knowledge construction by engaging in learning with students, colleagues, and others in face-to-face and virtual environments.

2. Design and Develop Digital-Age Learning Experiences and Assessments

Teachers design, develop, and evaluate authentic learning experiences and assessment incorporating contemporary tools and resources to maximize content learning in context and to develop the knowledge, skills, and attitudes identified in the NETS•S. Teachers:

a. design or adapt relevant learning experiences that incorporate digital tools and resources to promote student learning and creativity.

b. develop technology-enriched learning environments that enable all students to pursue their individual curiosities and become active participants in setting their own educational goals, managing their own learning, and assessing their own progress.

c. customize and personalize learning activities to address students' diverse learning styles, working strategies, and abilities using digital tools and resources.

d. provide students with multiple and varied formative and summative assessments aligned with content and technology standards and use resulting data to inform learning and teaching.

3. Model Digital-Age Work and Learning

Teachers exhibit knowledge, skills, and work processes representative of an innovative professional in a global and digital society. Teachers:
a. demonstrate fluency in technology systems and the transfer of current knowledge to new technologies and situations.

b. collaborate with students, peers, parents, and community members using digital tools and resources to support student success and innovation.

c. communicate relevant information and ideas effectively to students, parents, and peers using a variety of digital-age media and formats.

d. model and facilitate effective use of current and emerging digital tools to locate, analyze, evaluate, and use information resources to support research and learning.

4. Promote and Model Digital Citizenship and Responsibility

Teachers understand local and global societal issues and responsibilities in an evolving digital culture and exhibit legal and ethical behavior in their professional practices. Teachers:

a. advocate, model, and teach safe, legal, and ethical use of digital information and technology, including respect for copyright, intellectual property, and the appropriate documentation of sources.

b. address the diverse needs of all learners by using learner-centered strategies providing equitable access to appropriate digital tools and resources.

c. promote and model digital etiquette and responsible social interactions related to the use of technology and information.

d. develop and model cultural understanding and global awareness by engaging with colleagues and students of other cultures using digital-age communication and collaboration tools.

5. Engage in Professional Growth and Leadership

Teachers continuously improve their professional practice, model lifelong learning, and exhibit leadership in their school and professional community by promoting and demonstrating the effective use of digital tools and resources. Teachers:

a. participate in local and global learning communities to explore creative applications of technology to improve student learning.

b. exhibit leadership by demonstrating a vision of technology infusion, participating in shared decision making and community building, and developing the leadership and technology skills of others.

c. evaluate and reflect on current research and professional practice on a regular basis to make effective use of existing and emerging digital tools and resources in support of student learning.

d. contribute to the effectiveness, vitality, and self-renewal of the teaching profession and of their school and community.
## COURSE GOALS AND OBJECTIVES

<table>
<thead>
<tr>
<th>Course Goals</th>
<th>PTEU Outcomes/ Proficiencies for Initial Program</th>
<th>NCATE Standards</th>
<th>National Education Technology Standards for Teachers (NETS-T)</th>
<th>Assignments &amp; Activities (Bold Denotes a Field-based Assignment)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teacher candidates will:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Identify and explain the diverse needs of digital-age learners, especially students failing to meet academic standards and/or successfully complete high school.</td>
<td>Outcomes 2.1, 2.2</td>
<td>Pedagogical &amp; Professional</td>
<td>Standards 1.a-d</td>
<td>Digital-age Learners Readings/Discussions/Reflections</td>
</tr>
</tbody>
</table>
| 2. Identify, select and be able to use research-based teaching practices and instructional resources/tools best suited to meeting the diverse needs and wants of digital-age learners and to teaching concepts/standards in individual content areas. | Outcomes 2.3, 2.4 | Pedagogical & Professional Student Learning | Standards 1.a-d; 2.a-d | Instructional Technology Projects/Context Information  
Core-content area project  
Chapters 3-15, Text and Discussion Questions  
In-class demonstrations |
| 3. Design learning experiences for students that use technology and authentic, interdisciplinary, inquiry-based, student-centered teaching practices to motivate students and to foster students’ higher-order thinking, creativity, and academic achievement of state and national learning standards in the content areas. | Outcomes 2.3, 2.4 | Pedagogical & Professional Student Learning | Standards 1.a-d; 2.a-d | Instructional Technology Projects/Context Information |
| 4. Design technology-rich, research-based learning experiences that address the content area learning needs of English Language Learners and Special Education students. | Outcomes 2.2, 2.3, 2.4 | Pedagogical & Professional Student Learning | Standard 2.c | Instructional Technology Projects/Context Information  
Chapter 9, Text and Discussion Questions  
Lecture/Demonstrations |
| 5. Reflect on implementation of technology in schools and develop strategies for moving toward technology uses that focus on authentic, interdisciplinary, inquiry-based, student-centered learning experiences in the classroom. | Outcomes 3.1 | Disposition | Standards 1.a-d; 2.a-d; 4.d; 5.c | Instructional Technology Projects/Context Information  
In-class discussion of video models |
| 6. Strive to provide students with in technology-rich learning experiences, even when students may lack beyond-school access to computers and to technology-based content that is responsive to their cultural backgrounds and experiences. | Outcome 2.2, 3.3 | Pedagogical & Professional; Disposition | Standards 1.a-d; 2 a-d | Digital Equity Readings/Discussions/Reflections |
7. Use research-based strategies, including technology-based solutions, to assess student learning and differentiate instruction to accommodate students’ diversities.

8. Use information and communication technologies to engage parents and other community members in improving students’ academic achievement in the content areas.

9. Promote and model safe, legal, and ethical use of technology when working and learning, especially in highly social and collaborative environments enabled by information and communication technologies.

10. Develop strategies to engage in ongoing professional learning about teaching, learning, and instructional technology.

<table>
<thead>
<tr>
<th>7. Use research-based strategies, including technology-based solutions, to assess student learning and differentiate instruction to accommodate students’ diversities.</th>
<th>Outcome 2.5</th>
<th>Pedagogical &amp; Professional Student Learning</th>
<th>Standard 4b</th>
<th>Instructional Technology Projects/Context Information</th>
<th>In-class discussion/modeling of technology-supported assessment and differentiation strategies</th>
</tr>
</thead>
<tbody>
<tr>
<td>8. Use information and communication technologies to engage parents and other community members in improving students’ academic achievement in the content areas.</td>
<td>Outcome 3.2</td>
<td>Disposition</td>
<td>Standards 3.b-c</td>
<td>Digital Equity Readings/Discussions/Reflections</td>
<td></td>
</tr>
<tr>
<td>9. Promote and model safe, legal, and ethical use of technology when working and learning, especially in highly social and collaborative environments enabled by information and communication technologies.</td>
<td>Outcome 3.1, 3.3</td>
<td>Disposition</td>
<td>Standards 4.a-d</td>
<td>Chapter 8, text Readings/Discussions/Reflections Other assigned Readings on Web 2.0, Internet Safety, and respect for copyright and intellectual property</td>
<td></td>
</tr>
<tr>
<td>10. Develop strategies to engage in ongoing professional learning about teaching, learning, and instructional technology.</td>
<td>Outcome 3.3</td>
<td>Disposition</td>
<td>Standards 5.a-d</td>
<td>Professional Learning Reflections in Study Guides</td>
<td></td>
</tr>
</tbody>
</table>

Conceptual Framework

Collaborative Development of Expertise in Teaching and Learning: The Southern Regional University teacher education faculty is committed to preparing teachers who demonstrate expertise in facilitating learning in all candidates. Toward that end, the SRU teacher education community strongly upholds the concept of collaborative preparation requiring guidance from professionals inside and outside the university. In tandem with this belief is the understanding that teacher expertise develops along a continuum which includes the stages of preservice, induction, in-service, and renewal; further, as candidates develop a strong research-based knowledge of content and pedagogy, they develop their professional expertise in recognizing, facilitating, assessing, and evaluating student learning.

Knowledge Base: Teacher development is generally recognized as a continuum that includes four phases: preservice, induction, in-service, renewal (Odell, Huling, and Sweeny, 2000). Just as Sternberg (1996) believes that the concept of expertise is central to analyzing the teaching-learning process, the teacher education faculty at SRU believes that the concept of expertise is central to preparing effective classroom teachers and teacher leaders. Researchers describe how during the continuum phases teachers progress from being Novices learning to survive in
classrooms toward becoming Experts who have achieved elegance in their teaching. We, like Sternberg (1998), believe that expertise is not an end-state but a process of continued development.

**Use of Technology:** Technology Standards for Educators are required by the Professional Standards Commission. Telecommunication and information technologies will be integrated throughout the teacher preparation program, and all candidates must be able to use technology to improve student learning and meet Technology Standards for Educators. During the courses, candidates will be provided with opportunities to explore and use instructional media, especially microcomputers, to assist teaching. They will master use of productivity tools, such as multimedia facilities, local-net and Internet, and feel confident to design multimedia instructional materials, create WWW resources, and use presentation software.

**Diversity Statement:** A variety of materials and instructional strategies will be employed to meet the needs of the different learning styles of diverse learners in class. Candidates will gain knowledge as well as an understanding of differentiated strategies and curricula for providing effective instruction and assessment within multicultural classrooms. One element of course work is raising candidate awareness of critical multicultural issues. A second element is to cause candidates to explore how multiple attributes of multicultural populations influence decisions in employing specific methods and materials for every student. Among these attributes are age, disability, ethnicity, family structure, gender, geographic region, giftedness, language, race, religion, sexual orientation, and socioeconomic status. An emphasis on cognitive style differences provides a background for the consideration of cultural context. Southern Regional University provides program accessibility and accommodations for persons defined as disabled under Section 504 of the Rehabilitation Act of 1973 or the Americans with Disabilities Act of 1990. A number of services are available to support candidates with disabilities within their academic program. In order to make arrangements for special services, candidates must visit the Office of Disabled Student Support Services (ext. xxxx) and develop an individual assistance plan. In some cases, certification of disability is required. Please be aware that there are other support/mentor groups on the campus of Southern Regional University that address each of the multicultural variables outlined above.
# Appendix C

## End-of-Course Student Comments

<table>
<thead>
<tr>
<th>Collection of Comments from the ITEC 3100 End-of-Course Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>I learned SO SO MUCH about technology in the classroom. The content will be helpful when I'm a teacher.</td>
</tr>
<tr>
<td>I was exposed to many programs that will help me be a better teacher in the future</td>
</tr>
<tr>
<td>It is good that we learn about the technology that is out there and beneficial to us and our students.</td>
</tr>
<tr>
<td>I learned about technology that is being used to teach in the classrooms.</td>
</tr>
<tr>
<td>I thought everything taught in this course will help my in the future</td>
</tr>
<tr>
<td>There was a lot of work. But it applies to teaching in every way. As teachers we should know how to incorporate technology into the classroom and be able to use all that technology offers us. This class has taught me a lot because there were many sites and programs we used in this class I had never heard of before and definitely would have not known how to use it.</td>
</tr>
<tr>
<td>I learned many new things in this course that will benefit me as an educator.</td>
</tr>
<tr>
<td>The content provided useful practices to engage students in the classroom</td>
</tr>
<tr>
<td>This course offered many ideas to improve my ability to lead others with technology.</td>
</tr>
<tr>
<td>Content was EXTREMELY beneficial. Can't stress it enough- I feel so prepared and excited to use technology in my future classroom. I have an awesome list of resources and software that I would not have if I did not take this course.</td>
</tr>
<tr>
<td>I absolutely loved this course! I feel so much more prepared using technology in the classroom now! Technology plays such an important role in education now and I feel like I'm ready to help my students incorporate this into their learning.</td>
</tr>
<tr>
<td>I learned SO MUCH through this course! I have full confidence this course has made me a better teacher and will help me to land a job! This class has been the most helpful this semester! I cannot say enough good things about this course! It's basically the bomb!</td>
</tr>
<tr>
<td>It was great to learn about all this technology for the classroom. I was familiar with some of it already, but so much of it was new and I'm glad I got to learn about it.</td>
</tr>
</tbody>
</table>
**Appendix D**

Pre-Assessment / Post-Assessment Survey and Analysis – Summer 2015

<table>
<thead>
<tr>
<th>Instructional Technology Skills Addressed in ITEC 3100</th>
<th>Current Ability Level</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Not Able</td>
</tr>
<tr>
<td>Create and edit a podcast using Audacity. Publish that podcast to iTunes and classroom blog.</td>
<td></td>
</tr>
<tr>
<td>Make/publish/maintain an attractive, media-rich classroom blog using EduBlog to support standards-based learning and to engage students and parents in the learning process</td>
<td></td>
</tr>
<tr>
<td>Create and edit an instructional movie using MovieMaker. Post and embed that Movie on a blog or other type of classroom web site.</td>
<td></td>
</tr>
<tr>
<td>Locate, play, download, and edit instructional videos from Discovery Education</td>
<td></td>
</tr>
<tr>
<td>Use an Interactive White Board such as Promethean's ActivBoard or Smart's SmartBoard for classroom instruction</td>
<td></td>
</tr>
<tr>
<td>Find high-quality presentations (flipcharts/notebooks) for the Activboards/Smartboards on Promethean Planet or Smart Exchange</td>
<td></td>
</tr>
<tr>
<td>Make interactive presentations using ActivInspire or Smart Notebook for use on Activboards/SmartBoards</td>
<td></td>
</tr>
<tr>
<td>How to register and use Student Response Systems (clickers) and Web-based student response tools for formative and summative assessment of student knowledge (quizzes/tests), discussion starters, polls, surveys, assessing prior knowledge, and helping students overcome common misconceptions. Know what Beyond-the-Basics productivity tools schools typically provide for teachers and students; Know how Inspiration and Timeline might be useful to supporting the curriculum; and Know how to create products/help students create products in these software packages.</td>
<td></td>
</tr>
<tr>
<td>Know what Web-based productivity tools are available to support student instruction and how to use them (examples: Bubbl.us, Popplet, Inspiration, etc.)</td>
<td></td>
</tr>
<tr>
<td>Know how use advanced features of MS Word, such as using styles and creating sections, forms, and citations. Create narrated presentations using PowerPoint and other Web-based tools (Such as Jing or Prezi) and post them online for students/parents to view at home</td>
<td></td>
</tr>
<tr>
<td>Know how to make a simple spreadsheet using Excel</td>
<td></td>
</tr>
<tr>
<td>Find and implement online collaborative projects and publishing opportunities to motivate students</td>
<td></td>
</tr>
<tr>
<td>Know what types of content-specific technology tools and online resources are available for teaching your content and maximizing learning for English language learners, and special education students</td>
<td></td>
</tr>
<tr>
<td>Know what types of instructional software tools typically purchase for student and teacher use in the schools. Know how Skills Tutor, EASTMath, Khan Academy, Brain Pop, and other instructional software can be used to support instruction/assessment. Know what grade levels and learning standards these products address. Be able to assist in supporting students as they use these titles in classroom. Understand how technology can be used to support both direct instruction and authentic, constructivist learning models. Be able to assess the Level of Technology Implementation (LoTI) levels and the indicators of Engaged Learning in classroom instruction</td>
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**Comments:** (Why did you rank your current ability as not able/somewhat able/able? What you hope to learn in this class? What kind of support you need? What questions you have... etc.)

Use the back of this sheet to answer.
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Appendix E

Letter to Former ITEC 3100 Students

Dear Former ITEC 3100 student,
I hope this email finds you doing well. As a former ITEC 3100 student, I am contacting you to see if you would be interested in participating in a doctorate research project entitled the "Evolution of a Pre-Service Teacher's TPACK after Attending a Stand-alone Technology Course". I have limited my participation group to those students who are presently involved with their practicum and teaching grades 3-5.

The purpose of the study is to explore and identify strategies and techniques that supported the evolution of your technological, pedagogical and content knowledge (TPACK). As a participant of the study, you will be asked to participate in the following activities:

1. an interview (via Blackboard Collaborate in order to better meet your schedule - approximately 30-45 minutes)
2. submission of one to two technology-integrated lesson plans that you have created during your practicum coursework
3. participate in a voluntary classroom observation
4. submit a final personal reflection (short reflection addressing four guidance questions)

If you are interested in participating in this study, please use the following link to access and submit your "Consent to Participate" information:

https://www.surveymonkey.com/r/ITEC3100_Research_2017

Please feel free to contact me if you have any questions about the survey or the consent form.

Thanks so much for your help. I really appreciate your help and look forward to exploring this topic with you.

Sincerely,
Ms. Booker
Appendix F

Online Survey – Participant Consent

Title of Research Study: The Evolution of a Pre-Service Teacher's TPACK after Attending a Technology Integration Course

Researcher Contact Information:
Sherri Booker, Lecturer
State University
sbooker@.edu

You are invited to participate in a research study conducted by the above named researcher. Before you decide to participate in this study, you should read this form and ask questions about anything that you do not understand.

Description of the study:
The purpose of the study is to explore and identify strategies and techniques that supported the evolution of your Technological Pedagogical and Content Knowledge (TPACK). You are selected to join this study due to the following criteria:
1. You participated in the ITEC 3100 course in Spring or Fall of 2015.
2. You are presently enrolled in the pre-service teacher practicum.

Explanation of Procedures:
As a participant, you will participate in the following activities:
1. an interview
2. submission of one to two technology integrated lesson ideas that you have implemented or will implement during your practicum
3. provide a video of your teaching - possibly your EdTPA video
4. submission of a final personal reflection after participating in the study

Time Required:
The interview - approximately 30-45 minutes (a private connection via Blackboard will be available for an online interview session)
Observation session - if able to schedule, approximately a one-half to hour session
Personal Reflection - approximately 30 minutes.

Risks or Discomforts:
Participation in this research entails no known risks. No discomforts or stresses are expected as a result of the research. Only the research investigator will have access to the data.

Benefits:
Participants may expect to benefit from the research by improving teacher education at SRU.

Involvement in this research could ultimately help increase student achievement as teachers use their enhanced TPACK skills when designing lesson ideas.
Confidentiality:

The results of the study will be confidential and will not be released in any individually identifiable form without your prior consent unless required by law. While the study includes an online survey, the survey software has been programmed not to collect Internet protocol addresses that may reveal your computer's identity to the researcher. While research is underway, all documents and data containing your information will be stored in a locked cabinet in the researcher's office at Southern Regional University. All data will be destroyed within three years of the research conclusion.

Inclusion Criteria for Participation:
Participate must be 18 years or older and be enrolled in the College of Education Early Childhood Education Teacher Program. Research at Southern Regional University that involves human participants is carried out under the oversight of an Institutional Review Board. Questions or problems regarding these activities should be addressed to the Institutional Review Board, University, 1000 Road #0112.

1. I agree and give my consent to participate in this research project. I understand that participation is voluntary and that I may withdraw my consent at any time without penalty.
   Yes
   No

Practicum Experience

2. Are you presently participating in your practicum experience?
   Yes
   No

Demographics

Please provide the following information:

3. Gender:
   Male
   Female

4. Race:
   Hispanic or Latino
   American Indian or Alaska Native (Non-Hispanic or Latino)
   Asian (Non-Hispanic or Latino)
   Black or African American (Non-Hispanic or Latino)
   Native Hawaiian or Other Pacific Islander (Non-Hispanic or Latino)
   White (Non-Hispanic or Latino)

5. Age:
   18-25
   26-35
   36-45
   46-55
   56-65
   65+

6. Which school system are you assigned?
   xxxxxxx County School District
   xxxx County School District
   xxxxxxxx County School District
   xxxxxxxxxx School District
   xxxx County School District
   Other (please specify)

7. Which grade level(s) are you assigned?
   Pre-Kindergarten/Kindergarten
   First Grade
Second Grade
Third Grade
Fourth Grade
Fifth Grade

Contact information:
First:
Last:

8. Your name:
Account:
Personal Account: (Only to be used if I am unable to contact you via the SRU email)

9. Email addresses:

10. Phone number: (Only used if email contact fails.)

Your support is greatly appreciated.
Sincerely,
Sherri Booker
Thank you!

Non-qualified Participant response:

Thank you for your time.

11. Thank you for your information. If the survey is still in progress when you are completing your practicum, I'll get back to you. Hope things are going well for you!
Sincerely,
Ms. Booker
Appendix G

Transcripts of Interviews

Participant 1 – David

Q01: As you move through your program, how were you able to integrate technology into your lesson designs?
During my Practicum, I was able to integrate technology, basically all the time. In the classroom, we had a SMART board, I had my cell phone. We did a lot of things. We did a lot of GoNoodles and with that, you know, you use the SMARTboard and the students are able to see the GoNoodle interactive video and they were allowed to interact with that. We were able to do a lot of things because the students had their own Chrome Books. They did a lot of PowerPoints, a lot of Word documents. We also made a lot of graphs using those. So, I would say technology was used a lot throughout the day if not throughout every subject. Especially in Trinidad, you wouldn’t think 4th graders would be using Chrome Books because a lot of people have misconceptions about other countries. Yes, they had their own Chrome Books and they were able to basically do anything. We were also able to use email, like for example on my last day they were emailing me nice little notes that they were going to miss me.

Info1: How many students did you have?
12 – very small class size which is even better. I think this year with my job I will have probably around 20 – double that.

Q02: Which content areas were you able to incorporate technology in order to extend the learning experience for your students during your practicum experience?
During my practicum, we had this thing called the PYP, which is the Primary Years’ Program which incorporates all the different disciplines within one large network – the students are all learning about a global issue. So I would say basically we were using their Chrome Books and technology during every unit because they were all tied together towards them learning about one global issue. So the last unit that I remember was sharing the planet. So, within sharing the planet, they were doing graphs, like we were making graphs using their Chrome Books, making PowerPoints tying the literacy standard and we were doing PowerPoints also to present their Science projects within the sharing the planet unit. I would say we used it throughout every subject.

Q03: Which software applications or technology tools did you select to support your lesson ideas?
Uh, I did use PowerPoint, mainly because I love the PowerPoint clicker which is also another piece of technology that I loved to use and I could just switch PowerPoints. Um, I think we used a few YouTube videos, we definitely used YouTube. We did a graph website, I can’t remember
Q04: Why did you select these particular resources?
Mostly things that I learned throughout my classes at Southern Regional. I would definitely within my ITEC class that I took. I definitely remembered a few of those actual websites that I could use. I did use a lot of Dropbox for the actual student’s documents. Um…state the question again, I’m sorry. And a lot of it was me, whenever my collaborating teacher would present me with a standard, I would try my best to incorporate the student’s interests because that’s definitely, most of the time, it’s always going to go back towards technology, so I would research websites, Pintrest, whatever I can do to find an appropriate website to address that standard.

Q05: Why did you feel technology was the correct resource to enhance the learning experiences in the lessons you designed?
Well, kind of, where the sites lean towards. Something I thought was interesting was one day where my collaborating teacher wanted to present a book to the students about, I think it was worms maybe, and I wanted to read it in front of the class and do different voices, but ah, she kind a gave me advice, “you know what, they would actually love this book website, I cannot remember the name of the book website right now, but it’s um, what is it called? Do you know any good book websites? I can’t think of it right now. [Me – It’ll come to you.] Tumblebooks, that’s it. So, she used Tumblebooks and they went wild for that. I think that’s where we are leaning towards is, you know, animations and the different types of music that is presented when you are using technology. It’s not just the teacher standing in front of the class teaching any more. It is them interacting and moving pieces and listening to different types of music.

Q06: You presented some of your strongest technology infused lesson ideas. Describe how you came to select these as your best samples?
Multi-step problem. That was actually one of my favorite lessons. We used NearPod – it is one of my favorite assessments to do just because they all have their Chrome Book and they all have, you know you have all these different types of questions that they can answer, you know – multiple choice, draw it, you can do nearly anything with NearPod. It’s amazing. Making the NearPods, you know, it is so flexible, you can add anything, you can add a PowerPoint, you can add drawings, you can add multiple choice, you can add quizzes, you can add, you know, really anything to that, so it was a very flexible for me to use and flexible to keep the students interactive also.
Q07: After implementing these plans, what changes would you make to improve or extend the activities?
Um. I personally think that lesson went very well, but there is always room to grow. I think maybe a few more questions. Maybe even have the students make their own two-step problems. Giving them more accountability towards their own learning, even teaching their own friends, you know, you learn better when you are learning from a friend as opposed to a mentor, sometimes.

Q08: As you design your lesson ideas, describe the process or strategies you follow to incorporate technology into the lesson idea
Well, I always thought about assessment first, so I would always try to build the lesson around what is assessed and what the students needed to know. Whatever I thought was most appropriate and engaging for that lesson. The assessment is usually the thing that I am incorporating technology with, I mean, I do consider PowerPoints and my teaching the students using the SMART board as technology but they are not really interacting with it when I am teaching, but the assessment I always try to make it more engaging and hands on.

Q09: What experiences have supported you in developing a deeper understanding of the value of technology within the learning environment?
That’s a loaded question… I would say, definitely in the States we don’t have the, at least, I was at the International School in Trinidad and they did the PYP which is the Primary Years Program, and just learning about their curriculum, that really helped me learn about how technology is incorporated more because with the students that we now have, they are all surrounded by technology, by the Chrome Books, iPhones, everything that you can think of, and you get down to it and get really engaged. I would say that technology is very important in this day and time, you can’t just rely on a book any more. You need to differentiate and apply to all the different multiple intelligences when they are using technology.

Q10: What additional resources do you feel would strengthen your skills to integrate technology into the lessons you design?
I am about to start the new job and everything so different professional developments and just getting to know other teachers and knowing their strategies is going to help in the future. And um, I’m just excited to learn from other teachers that actually use a lot of technology in their classroom.

This will be my first year working with first grade – ever, so I am interested to see how they are going to incorporate technology. All I can see myself doing is sitting in front of the classroom reading a book, but I am sure it is a lot more than that.

Q11: How do you envision your use of technology as you begin your first year in the classroom? Do you have any goals in mind?
I know one thing that I have. I saw my classroom last week and, um, I know that I have a closet full of iPads. So, that is going to be great. I am going to definitely come up with some ways. I
have the Scope and Sequence, which is really cool, so I am already looking at that and thinking how I can incorporate these iPads in each of these lessons. I know that they do a lot of iRead and online, just different things that help solidify what they did in class, their reading skills or their math skills. So, I am going to use a lot of iPad APPS because I know that is already available for me. So, it is just a matter of time to see what else I can feature.

Q12: Is there anything you would like to share with me concerning this study? Um, I don’t think so. I think Southern Regional University does a really great job with the ITEC class. I know that I learned a lot and I incorporated a lot within my classroom in Trinidad. I know I actually have a lot of the notes, actually my whole notebook, from that class. We had a list of passwords from different websites and still have that to this day. I don’t really have any concerns about it, I am glad that I took it and glad that I was really supported. It definitely gave me a baseline, definitely have a lot that will help me in the future and we’ll see what I do in the next year.

Info2: Going to another country, do you think there is anything we could have added to improve the ITEC course? Maybe Google translate, I mean it’s an easy thing to use. I had several ELL students and starting them on Google translate and then weening them off was a great help. I think it is something automatic we kinda know to use today. Whenever we have a student that doesn’t speak English, we can provide extra support with Google translate.

Or, perhaps more websites – like Easy Teach - for English Language Learners.

Info3: Did your students have a lot of their own equipment? We definitely have more in the States – inside the classroom and outside of the classroom. I was in an International school which is, they go by, American standards. Um, the students are paying tuition as opposed to public schooling. A lot of things were actually funded through their actual tuition. So these students have a lot. Most of their parents work for the oil industry there or some kind of other off-shore business. I do not really know what the situation is like for other students at other schools, but I think we could maybe talk about the things that other schools didn’t really have. I was very fortunate to have all the iPads and Chrome Books, students with iPhones. I had the opportunity to tour another elementary school and it was all just blackboards, chalk, the rooms were separated by the blackboards…so there was absolutely no technology in the classroom. That was in 2015 so I think my situation was very unique compared to the rest of Trinidad. But, I was fortunate to have the experience abroad, different, very different than the United States even if I was at an International School.
Participant 2 – Trina

Q01: As you move through your program, how were you able to integrate technology into your lesson designs?

Well, most of the time that dominate form of technology that I used was the SMARTboard. Though I mean, I didn’t necessarily create any actual like presentations with the SMARTboard. I would just use the SMARTboard like, the students, I would have lesson plans that included different type activities where the students would like online activities like a web site to where they could interact with the SMARTboard. I did a lot of that I might pull up, like even if we were using a worksheet I might put it onto the dock camera and then they could come up and like point with their hands. There would be a little more interaction. So yes, the docu-cam, the SMARTboard were used almost every day. Actually, we do use it every day. Umm, we used to new APP called Seesaw, so we used the iPad carts a lot, yes, we basically let the kids videotape themselves as they worked in a group and then afterwards they could their final and do a final presentation into the camera or they could videotape their work, so they would work on the ipads and we could see because they would upload basically to us to a classroom library where students could watch their presentation and also their peers. They thought that was really awesome. And that was all new to us.

Info1: Tell me more about your school
I taught at XXX Elementary. It is definitely one of the more financially funded schools by not only parents but it’s pretty well to do. I didn’t really know how much until I was really in there. So, I was teaching in the third grade class. They have about four iPad carts and about four laptop carts in the media center area. And that’s for just the whole school but just recently, this next upcoming year, they will have one of each per grade level. And like, they have all new SMARTBoards, like they have the newest of the new. My teacher just got the latest at the end of the semester. Oh, and they also have a couple of computer labs, too. Like the laptop oh no. no or is a desktop; its desktop labs. [Just knowing XXX is a Metro County School, did XXX have desktops in the classroom?] Yeah, we actually had about six. [How many students did you have in your group?] Actually we had a pretty small, I- I actually rotated in between so I kinda taught two classes. We did, what you call, my teacher taught math, science and social studies and the other teacher taught reading and writing. So I ended up kind of moving with one class at one point, but at another point I wanted to teach two different groups of students because my students, I had a class of, when it was full 20 students and then one moved… So 19, it was very, very small. And they were like I had IEP students, and we had one ELL student and special education. The other class I went in, she had 26. And it was predominantly gifted.
Q02: Which content areas were you able to incorporate technology in order to extend the learning experience for your students during your practicum experience?

Oh, goodness, all of them. I think... I don’t know why it’s easier, not necessarily easier, but like science and social studies maybe it is, for me, a more fun way of using technology. Because just like for, sometimes like with presentations, I mean like with math they can use it, like I said before whether it’s just interacting with the Smartboard, but I find they can do more with technology in science and social studies. I think, weirdly, the one I used it the least in was probably a reading and writing. I know I could’ve done a lot more but like we do, I have presentations, that one I also had a little bit less control over what I was teaching. So, I had more control in math and social studies.

Q03: Which software applications or technology tools did you select to support your lesson ideas?

I did a lot of Word and PowerPoint. I’m just not familiar with all their names. We did some iRespond, that’s what we’d use in English and Language Arts. We would use a lot of the iResponds.

Q04: Why did you select these particular resources?

Yeah, I did use the SMART notebook. I use that, we use that a little bit with like cursive. Can I would get into the smart notebook and record myself because in the mornings especially for the end of the year they would learn a letter today. I would open up right before they got their and I would record myself, very slowly doing the curse so when they came in I would put it on a loop and they could watch it. They could then do the cursive in their notebooks.

Q05: Why did you feel technology was the correct resource to enhance the learning experiences in the lessons you designed?

Yea, convenience was one. Those were the ones that were available to me. Also not only my teachers but my team and my school were using certain tools and software. Also I would find, I mean a lot of the times, I wouldn’t necessarily create something brand new, so I would just go online and whatever was available to me I would use for my lesson plans, because we learned some awesome things in your classroom in like creating whole new, you know like, do different things with software but basically start from the beginning, and it takes a lot of time. So a lot of the times I would do, like I said, do something that was convenient and that, of course, the students responded well to. That was number one because I would try some things I know and then, and not necessarily technology but in general but would save some time.
Q06: You presented some of your strongest technology infused lesson ideas. Describe how you came to select these as your best samples?

The ones that I do have I mean they don’t have just one example of technology. And so for instance the ones that I’m using have three different types and the kids are working with one type, another time they might be working together on which is good and sometimes I lead with certain tools and other times they learn to use those tools and they start leading themselves. A lot of the times what I used can work with kids on a lot of different levels and to fit their needs. So just because I’m using one type of application for all the students I am still helping my IEP students and fitting the needs of my ELL students.

Q07: After implementing these plans, what changes would you make to improve or extend the activities?

Umm, give me one second to think back on my activities…. The ones that went really well, a lot of the times I wish they could have more time so I might extend it over a couple of days to where they can really you know maybe use that Seesaw app and actually to go back ,like for instance, like sometimes we really would just record ourselves and that was it and I would look at it and that’s how we would greet them because we ran out of time. But other times I would want them to look at each other’s and now I want you to go back and I want you to re-record and try to you know…so I would want to extend it over a couple of days. If it went really well that is one of the changes I would make.

Q08: As you design your lesson ideas, describe the process or strategies you follow to incorporate technology into the lesson idea.

Well, because we were given the guidelines to the lessons that we were to create it always had technology in there. So I would have to include technology and it would say. “How are you using technology, basically, to fit the needs of your students, so , hum… I would always think about it as I was planning. It wasn’t the first thing I would think about, but whenever I had the concept in my head, I would go back and think, “OK, how can I use a video or how can I use the iPads?”

Q09: What experiences have supported you in developing a deeper understanding of the value of technology within the learning environment?

Well, I mean, the only SRU class I guess, that really helped me understand was your course. But that is just my opinion. And I also think it should be somehow, I don’t know how to do it during the practicum, but if you could, I know that is a lot of time, especially for the students since it is already a heavy load, but that would help. But my experience also in the school just seeing how technology is used and how it can help so much and how the kids just, I mean, it goes from a dull lesson to being so excited because the students see the iPads are being taken out. That how I
probably know that technology is really useful. I would have loved to learn more about it as I am in the schools just because I think I could have applied more, like the software and stuff, because honestly I forget and I think it would be good to be learning about it or to be refreshing as I was going through.

Q10: What additional resources do you feel would strengthen your skills to integrate technology into the lessons you design?

Not necessarily. More the program in general had a question about technology in the lesson plans. But the other courses, in order to support technology is by having us do a PowerPoint presentation or basically what we did in our other courses as well, just to present what they were talking about in their content areas, but it didn’t help us further develop our understanding of technology.

Q11: How do you envision your use of technology as you begin your first year in the classroom? Do you have any goals in mind?

Oh, goodness, well, I still plan to use it every day. And I absolutely love going to Professional Development. I went to one about Seesaw and I was just taking notes, and this was so cool and kept telling my teacher that I love this. It looks awesome, the kids have control, you get to see what they are doing, I mean, it is great. I plan to keep going to the different things they have available for me because I, honestly, want to use technology as much as possible because I think that is the way things are heading now. I also think it also makes things easier for the teachers as well. Again, using my Smartboard, doc-u-cam, the iPads. I’ll looking up probably other programs and collaborate with my other third grade teachers and figure out what they use. But it will definitely be an daily thing where the kids have time to get up and touch things, and move with their groups and record things, you know, really interactive.

Q12: Is there anything you would like to share with me concerning this study?

The only thing I would like to share is like I said, is to have more, even if we have one big course prior to the Practicum, then maybe we have – even just a two credit or something that dives a little deeper into the different software or something, you know, so we could have a little bit throughout, then that’s what I would recommend. Just keep refreshing our brains and teaching us the newest things that are out there.

Info2:
I kinda see, I think in the great perfect world, if all the professors somehow, but see…here’s what I am trying to say….if all the other courses kind of helped us, example if our English Language Arts course, if he kind of taught us about how to incorporate certain programs of what he learned about technology and did that through his course. So if we learned about technology
in all the different courses, you know, so Math would do the same thing and it would teach us specifically not just about different things you can do, but more specific applications, specific ways to use things, then I guess that would be easier than trying to add on one random credit hour. But I do know that my professors were awesome and they worked really hard and to me they already seemed stressed, and I know that they already have so much to teach already and so, I don’t know, that’s a hard question. I don’t know what would be better….maybe just an online class where basically we watched a video – kind of like I said, a professional development thing – even if it was just sending us out an email or something that says “here, watch this new and this… “oh, you want to know what helps you and with your ELL’s.” You know, just a little reminder to keep us up-to-date.
Appendix H

Lesson Plans

Participant 1 – David

EECE LESSON PLAN TEMPLATE

Lesson Title

Multi step word problems

Lesson Topic

Solving multi step multiplication

Subject Area(s)

math

Grade Level(s)

4th grade

Time Frame:

n/a

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**STEP 1: Context and Learners**

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<th>The classroom contains human and physical resources to help with instruction. The classroom contains teacher aids to help with each class. During the week the class receives a student support teacher for 45 minute intervals. The support teacher works to provide extra assistance for students struggling in math and literacy. Students are put into groups according to interest levels and reading level. Student grouping can be based on mixed levels or leveled into groups according to gifted, on level or needs extra support.</th>
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<td>The ELL student will have direct teacher assistance. The ELL student will also use google translate at times during the lesson.</td>
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<td>Classroom learners include 12 students from around the world. We have 2 ELL students, 2 students with dyslexia, 2 struggling readers and 2 math-gifted students.</td>
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The school is an international school located on an island near the beach. The school is located next to a river basin that branches into the Caribbean Sea. Outside the classroom is a small courtyard with a small table where small group instruction can take place. Outside the school are three fields for sports and other school related activities. The school is also walking distance from the mall where students can get local foods and shopping for the latest fashion. There is also a grocery store where the locals can get necessary needs for home, kitchen and office.

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<td>CCSS.MATH.CONTENT.4.OA.A.3 Solve multistep word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.</td>
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| LESSON OBJECTIVES |
| Students will practice multi step problems with the use of literacy strategies. |

| ACADEMIC LANGUAGE |
| Vocab |
| Multiply |
| Divide |
| Comprehension |
| Multi-step |

| ESSENTIAL QUESTION |
| How can we use literacy strategies when solving multi-step mathematical problems? |

| PRE-REQUISITE KNOWLEDGE AND SKILLS |
| Knowledge of multiplication, division, subtraction. Below level, on level above level Literacy skills. |

| FLEXIBLE GROUPING STRATEGY |
| N/A |
| Step 3: Assessment | FORMATIVE ASSESSMENT | Students will participate in a near pod group assessment of multi-step word problems with a partner. Students will use the literacy strategy of underlining important information individually on laminated cards. Students will also solve the problems.

Challenge students will create multi-step word problems for each other to solve. |
<table>
<thead>
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<tbody>
<tr>
<td>SUMMATIVE ASSESSMENT</td>
<td>N/A</td>
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</tbody>
</table>
| Step 4: The Learning Experience | MATERIALS NEEDED | Task cards
Markers
Paper
One on one devices |
| DIFFERENTIATION STRATEGIES | One on one devices
NearPod assessment
Laminated task cards
PowerPoint presentation for visual learners |
| HIGHER ORDER THINKING QUESTIONS | How can we create our own multi-step word problems?
How can we investigate multi-step word problems?
How can we solve multi-step word problems? |
| LESSON INTRODUCTION | I will activate student background knowledge by asking students what are some good strategies that one can use in order to solve multi step word problems? |
| BODY OF LESSON | • The students and I will engage in a multi-step word problem power point presentation.

• I will introduce to students the literacy comprehension strategy of underlining important information when reading a text.

• I will model to students using the white board to underline important information in order to determine information needed to solve the word problem.

Tom had 114 baseball cards. He kept 10 and shared the rest evenly among his 8 friends. How many baseball cards did each friend get? |
- Above is an example of problems that I will model on the white board.
- I will then model to students how to use the information gathered by highlighting in order to solve the math multi-step problem.

**LESSON CLOSURE**
- After I have modeled to students how to solve multi-step problems using the comprehension strategy students will pair up and participate in the NearPod assessment.
- After students have paired and completed the NearPod assessment students will individually practice the comprehension strategy using differentiated activities.
- Lower performing students and on level students will practice the comprehension strategy using laminated task cards.
- The high level students will create their own multi-step problems and share with a partner to solve.

**RE-TEACHING RE-ENGAGEMENT PRACTICE**
- N/A

**EXTENSIONS**
- Students may switch to creating a multi-step word problem if they finish highlighting and solving the task card multi-step problems and vice versa.

**NEXT STEPS**
- N/A
Participant 2 – Trina (Three part lesson plan submitted)

Lesson One

Grade Level: 3rd

Content Area(s): Literacy-Reading

Anticipated Length of Time: 45 minutes

Number of Students: 19

Standards: ELAGSE3RL9: Compare and contrast the themes, settings, and plots of stories written by the same author about the same or similar characters (e.g., in books from a series).

Central Focus: Literacy Comprehension

Essential Literacy Strategy: Interpret theme of multiple books using text evidence

Related Skills: Identification of character, setting, and plot, using text evidence to support claims.

Language Function: Interpret

Learning Objective: Students will understand what theme is and how to find it in a story.

Prior Academic Learning or Prerequisite Skills: Students should be very familiar with identifying parts of a story such as character, setting, and plot. They should also have experience with analyzing these parts of a story. For example, analyzing how a character changes from beginning to end. Also, students should have practice using text evidence to support their opinions.

One KEY Learning Task Where Students Use the Language Function: Students will engage in the learning task of contributing verbally to the whole-group “finding the theme” diagram on chart paper.

Vocabulary: Theme, central message, motif, stated, implied, characterization.

Materials: SMART Board, document camera, 3rd Grade Reading Notebook RL.3.2 (TPT theme resource), Theme BrainPOP video, Theme BrainPop Quiz, Try Everything by Shakira audio and lyrics sheet for each student, The Old Woman Who Names Things by Cynthia Rylant, “Searching for a Theme” diagram, chart paper.
Introduction:
I will begin the lesson by having the students recall the recent book we read together, “Because of Winn Dixie”. I will ask them to explain how we analyzed the characters, setting, and plot of this story. This will lead me into asking the students to think to themselves about whether the author had a message or moral hidden inside the story. Were there any reoccurring ideas? Was there a problem that got solved at the end leading the main character to a realization? I will explain to them that what we know about the characters, setting, and plot can help us determine what the theme of a story is.

Body:
To connect to the students’ interests, I will begin by showing a BrainPOP video that uses Star Wars to explain theme. I will stop the video periodically to further explain concepts and check for understanding. As a quick assessment, I will pull up the video quiz. The students will come up to the SMART Board and click on the answer. This is a fun, interactive way to reemphasize key understandings, as well as assess.

Next, I will hand out the lyrics to “Try Everything” by Shakira to the students. As I am handing out the paper I will explain that they can find theme in many things. We just saw how movies and books have a theme, but songs do too. First, they will read through the lyrics and underline phrases or words that they think help them determine the theme. Are there any motifs (reoccurring words)? Then, we will listen to the song and discuss what we think the song writer is trying to say. The students will come up with many different answers, and this will bring up the point that there can be many themes. As long as we can back up our opinion of what we think theme is with evidence from the text, we are correct! I will also talk about how in this particular song, the theme was explicitly stated. I will explain how sometimes the theme is implied, meaning that they have to really dig deep.

Afterwards, the students will get out their reading notebooks. We will go through a guided lesson on theme using an activity sheet that they will cut, glue, and take notes on. They will take notes on what theme is and how you can infer it. We will also talk about common themes that are found in books by thinking about past books and fairytales we have read. This page in their reading notebooks will be a resource they can use throughout the rest of the lessons on theme.

Finally, I will read The Old Woman Who Names Things by Cynthia Rylant. As I read I will think-aloud to model for students what they should be doing while reading. I will write my thoughts down on a chart paper that is organized by the “Searching for a Theme” handout that they will be given to determine the theme for the following lessons. I will write how the characters feel and act, the setting throughout the story, and the events (or plot) that occur. We will discover how the character and setting change from the beginning to the end. Then, we will infer what the message or lesson of the book is. This will then give us our theme. This chart paper will be posted at the front of the room so students may use it as a resource if they become unsure of what they are to write.
Closure:
For the closure I will have different students raise their hands and tell me what theme is. I will ask them what some of the ways are that the writer can convey the theme. What is inferred versus stated? What is a motif?

Accommodations/Modifications:
My two reading/writing IEP students will receive reading notebook activity sheets that have the notes partially written out. They will have to fill in the blanks with the key words that complete the idea. I will also repeat myself as I am going through the guided lesson as one of my student’s requirements is to have information repeated. I also provide many visual cues for my ELL student. I will have pictures that go along with vocabulary. I will also pull together my two IEP students, one SPED student, and ELL student to brainstorm ideas together in a small group before completing the ticket-out-the-door.

Assessments:
The first assessment given is informal when the students are using the SMART Board to answer video quiz questions. A ticket-out-the-door will be the formal assessment given at the end where I will ask students to write down what theme is. I will also have them write one way that we can infer the theme of a book. This assessment will give me an idea of how well the students understood the concept of theme, and which students I need to re-engage.
Lesson Two

Grade Level: 3rd

Content Area(s): Literacy-Reading

Anticipated Length of Time: 45 minutes

Number of Students: 19

Standards: ELAGSE3RL9: Compare and contrast the themes, settings, and plots of stories written by the same author about the same or similar characters (e.g., in books from a series).

Central Focus: Literacy Comprehension

Essential Literacy Strategy: Interpret theme of multiple books using text evidence

Related Skills: Identification of character, setting, and plot, using text evidence to support claims.

Language Function: Interpret

Learning Objective: Students will determine the “big ideas” of a story and interpret the theme.

Prior Academic Learning or Prerequisite Skills: Students should be very familiar with identifying parts of a story such as character, setting, and plot. They should also have experience with analyzing these parts of a story. For example, analyzing how a character changes from beginning to end. Also, students should have practice using text evidence to support their opinions.

One KEY Learning Task Where Students Use the Language Function: Students will work in small groups to fill out their “Searching for a Theme” diagram, where they will analyze the parts of their story and interpret the theme of the story.

Vocabulary: Theme, central message, motif, stated, implied, characterization.


Introduction:
I will begin the lesson by having the students turn and talk to a partner about what we learned about yesterday. Specifically, what a theme is and what helps us find the theme. Then, I will have some of the students share. If there are any misconceptions, we will work through them as a class.
Body:
Next, students will watch the Flocabulary video on Theme. This video gives students a deeper understanding that theme isn’t just a word or two. It provides them with more examples of common themes. Students will raise their hands and talk about a new understanding that they have gained about theme.

Afterwards, we will go through the Theme Poster. We will talk about how these “big ideas” help narrow down what our theme is. We will talk about the big idea of the book we read yesterday. Then I will read them *Ida, Always* by Caron Levis and Charles Santoso. After we read the book, we will talk about what the theme was as a class. When they respond they will give one detail from the book that helped them determine this. Was it the characters, the setting, an event in the story? We will also make connections to this theme. It’s important when talking about loss to have students talk about their feelings. This also emphasizes the point that we talked about the previous day when we said that the author’s message should relate to our everyday world.

Students will then break partners and read a book of their choice. They will use their resources and what they have learned to infer the theme of their book. Just as we did with the other books, they will complete the “Searching for the Theme” paper with their partner. They will then share this with the class. There will be an open discussion allowing for questions from the students to each other.

Closure:
As the closure, I will have students respond to the question “Why do we learn about theme? How can a book’s theme connect to our everyday lives?” They will write their responses on a piece of paper. We will then do a “snowstorm” where the students carefully toss their paper in the middle of the room. They will then grab a random paper. Each student will read the paper they receive.

Accommodations/Modifications:
I have chosen a variety of different texts on many levels that are appropriate for all students. For my ELL student I have chosen a wordless picture book.

Assessments:
The formative assessment used will be the “Search for a theme” diagram that they fill out with their partner. The snowstorm closing activity is an informal assessment, but will help me decide how well students understand theme on a deeper level. Also, I will be constantly assessing student’s understanding of how well they infer theme when we are having whole-group discussions.
Lesson Three

Grade Level: 3rd

Content Area(s): Literacy-Reading

Anticipated Length of Time: 45 minutes

Number of Students: 19

Standards: ELAGSE3RL9: Compare and contrast the themes, settings, and plots of stories written by the same author about the same or similar characters (e.g., in books from a series).

Central Focus: Literacy Comprehension

Essential Literacy Strategy: Interpret theme of multiple books using text evidence

Related Skills: Identification of character, setting, and plot, using text evidence to support claims.

Language Function: Interpret

Learning Objective: Students will understand what theme is and how to find it in a story.

Prior Academic Learning or Prerequisite Skills:
Students should be very familiar with identifying parts of a story such as character, setting, and plot. They should also have experience with analyzing these parts of a story. For example, analyzing how a character changes from beginning to end. Also, students should have practice using text evidence to support their opinions.

One KEY Learning Task Where Students Use the Language Function:
Students will engage in the learning task of contributing verbally to the whole-group “finding the theme” diagram on chart paper.

Vocabulary: Theme, central message, motif, stated, implied, characterization.

Materials: SMART Board, document camera, The Heart and the Bottle by Oliver Jeffers, R2D2 poster,

Introduction:
**Body:**
This lesson will begin with students watching the reading of *The Heart and the Bottle*. As they are watching the reading, I will pause it periodically. They will take notes on the character, setting, and events when it is paused. Then, the students will write an R2D2 response of what the theme of the book is, including two details as text evidence. I will have a few copies of the book for students who want to look through it a second time. Once students are finished they will use a rubric to self-check and make sure they have included everything they need. An early finisher activity will be ready for those that get done quickly.

Afterwards, students will get in groups. They will be given a “secret theme”. They are to create a songs, comic, or skit that demonstrates their theme. The students will film themselves using the Seesaw App. As a class, we will watch all videos and write down what we think their secret theme is.

**Closure:**
This closure is a lead into our lesson that we will be doing next week. Next week we are comparing and contrasting themes among picture books by Kevin Henkes. I will ask them to fill out a Venn diagram of two of the books I read them. They only need to write bullets. This will give me an idea of how many days I need to have them compare and contrast next week.

**Accommodations/Modifications:**

**Assessments:**
The summative assessment I am giving them is their R2D2 responses. These will show me if they are able to infer what the theme of a book is using evidence from the book.
Appendix I

Video

Due to FERPA and CIPA mandates, the video cannot be included within this document. Although the participant received permission to use the video for his EdTPA project, the researcher does not have the students’ permission to publish the video outside the EdTPA realm. If it is necessary to view the video, please contact the researcher for further information.
Appendix J

Transcripts of Participants’ Post-Reflections

Participant 1 – David

The four reflection questions are:

1. After participating in this research study, how have your views of technology integration changed?

   After doing this study I really realized how much technology that I actually incorporated within my lesson without really thinking about it. Technology is really a great way to create meaningful lessons and keep students active and involved.

2. If you could wave a magic wand and design the perfect technology-rich classroom, what would it look like?

   The students would all have their own laptops in addition to their own Ipads. The classroom would be completely paper free. I would also be a pro/expert of google classroom and google docs.

3. In your future classroom, how do you see integrating technology into learning experiences for your students?

   I see my lessons centered around the use of technology to keep my students engaged. I believe that every lesson can involve some sort of technology.

4. Please feel free to share any thoughts you feel would support the findings of this research study.

   I really had a great time during our interview. Thank you for everything.
Participant 2 – Trina

1. After participating in this research study, how have your views of technology integration changed?

   After participating in this research study, my views haven't changed, they've just been solidified. The importance of using technology in the classroom now and in the years to come will only be more and more critical. Integration is key for the success of students.

2. If you could wave a magic wand and design the perfect technology-rich classroom, what would it look like?

   If I had the perfect classroom it would have all the tools I have now and more. This includes a Doc-u-Cam, SMARTBoard, and at least one iPad and laptop for every student. iPads are great when working in groups, recording projects, and for assessment. I added laptops for students because I think it's essential to have students practice typing in upper elementary grades. Another piece of technology I would have is iRespond. This is a great tool to collect data and inform teaching.

3. In your future classroom, how do you see integrating technology into learning experiences for your students?

   I see me using technology to enrich their learning experiences. I see myself using technology throughout the learning process. So, when introducing a concept I might show a video then they could interact with a quiz or solve a problem using the SMART Board. After they understand the material on a higher level, they might get in partners and record themselves solving a division problem on the iPads while orally explaining their thinking. As they get closer to mastering the concept they would work more one on one with a piece of technology.

4. Please feel free to share any thoughts you feel would support the findings of this research study.

   Rising teachers (and all teachers in general) need to become comfortable with integrating technology in their class. Throughout the teaching program there should be a greater emphasis put on it. We should constantly be shown new ways of how to implement technology. I think many teachers are scared that it will take up more of their time that they don't have, but once they are trained on it they might hold a different view. It takes time to learn how to use new programs and tools but in the long run it can be much more effective and time efficient.
Appendix K

Sample Lesson Idea Template

<table>
<thead>
<tr>
<th>Lesson Idea Name:</th>
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<tbody>
<tr>
<td>Content Area:</td>
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<tr>
<td>Grade Level(s):</td>
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<tr>
<td>Content Standard Addressed:</td>
<td></td>
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<tr>
<td>Technology Standard Addressed:</td>
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<td>Selected Technology Tool:</td>
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<td>URL(s) to support the lesson (if applicable):</td>
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<tr>
<td>Type of Instructional Software:</td>
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<tr>
<td>☐ Drill and Practice ☐ Tutorial ☐ Simulation ☐ Instructional Game ☐ e-books/e-references</td>
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<tr>
<td>Features of this software (check all that apply):</td>
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<tr>
<td>☐ Assessment Monitoring/Reporting</td>
<td></td>
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<tr>
<td>☐ Allows teacher to create customized lessons for students</td>
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<tr>
<td>☐ Multi-user or collaborative functions with others in the class</td>
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<tr>
<td>☐ Multi-user or collaborative with others outside the class</td>
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<tr>
<td>☐ Accessible to students beyond the school day</td>
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<tr>
<td>☐ Accessible via mobile devices</td>
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<tr>
<td>☐ Multiple languages</td>
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<tr>
<td>☐ Safety, security and/or privacy features</td>
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<td>Bloom’s Taxonomy Level(s):</td>
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<td>☐ Remembering ☐ Understanding ☐ Applying ☐ Analyzing ☐ Evaluating ☐ Creating</td>
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<td>Levels of Technology Integration (LoTi Level):</td>
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<td>☐ Level 1: Awareness ☐ Level 2: Exploration ☐ Level 3: Infusion ☐ Level 4: Integration</td>
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<tr>
<td>☐ Level 5: Expansion ☐ Level 6: Refinement</td>
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<tr>
<td>Lesson idea implementation:</td>
<td>As you address the standards, what will students and teachers do? How will the project be introduced? How long will it take to complete? How will student learning be assessed? How will the final product be used to inform/differentiate learning? How will you extend the student learning to a higher learning level? How will you conclude the lesson? How will you provide feedback to students about their work? MINIMUM 2 paragraph overview.</td>
</tr>
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