TEACHERS' PLANNING PROCESS: TPACK, PROFESSIONAL DEVELOPMENT, AND THE PURPOSEFUL INTEGRATION OF TECHNOLOGY

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ABSTRACT

Technology is becoming quite pervasive in society at large. Its integration into secondary schools and its use with curriculum requires a unique knowledge of its purposeful articulation as it relates to curriculum goals and student outcomes. Therefore, this study will focus on how an educator's decision-making process determines how technology will be integrated within the planning process of secondary educators, and how these decisions may be affected by an educators technological pedagogical content knowledge, otherwise known as TPACK.

Qualitative analysis was then used to evaluate a Technology Integration Rationale (TIR) that was produced by members of a rural professional development cohort. Qualitative analysis was also conducted on transcribed face-to-face semi-structured interviews. The TIR and the interviews involved a cohort representing a rural school district who attended a professional development course that was facilitated by a University in the Rocky Mountain West. The TIR was then scored using a valid rubric to measure an educator's TPACK score. Face-to-face semi-structured interviews were transcribed by hand to gain a sense of an educator's understanding of the TPACK framework as it relates to the purposeful use of technology in lesson decision-making.

The study found that ones growing familiarity with the use of a specific technology could affect an educator's self-assessed TPACK score. Once an educator understood how to use a specific technology its familiarity made it transparent or simply just another piece of the curriculum. The study also found that barriers can have a significant effect on an educators' decision making when deciding to use technology, and as a result affects an educator's self-assessed TPACK score.

Recommendations for further study include examining how the familiarity or transparent nature of technology can affect curricular decision-making, future professional development regarding the TPACK framework, and educator beliefs or efficacy as it relates to integrating technology.

CHAPTER 1

INTRODUCTION

Technology Integration

As technology becomes more ubiquitous in society, there is an implied pressure that the use of technology most also become prevalent and transparent within the classrooms of our public schools. To an extent this is occurring as shown by a study performed by the National Center of Educational Statistics (2009). The study showed that while, "eighty-three percent of [the] district respondents agreed with the statement, teachers are interested in using technology in classroom instruction" (pg. 3). However, there was a disparity of educators in fact, "58 percent, who agreed that, teachers are sufficiently trained to integrate technology into classroom instruction" (p. 3).

The integration of technology as an organic part of the curriculum is becoming paramount to how educators plan and integrate new technologies into the curriculum. Implementation barriers such as teacher technological knowledge as noted by the NCES (2009) can limit how technology will be accessed, implemented, and used across the curriculum. Without a comprehensive technological knowledge, developing and planning for lessons that effectively use technology will present many challenges to educators. The U. S. Department of Education (2010) effectively summarizes these as it states, "The challenge for our education system is to leverage the learning sciences and modern technology to create engaging, relevant, and personalized learning experiences for all learners that mirror students' daily lives and the reality of their futures" (pg. x).

Therefore, to meet these challenges a complex set of technological knowledge may be necessary for such planning. A growing body of research (e.g., Mishra & Koehler, 2006) has extended the work of Shulman (1980; 1987) offering a conceptual framework known as TPACK or technological pedagogical content knowledge (Mishra & Koehler, 2006). The TPACK framework provides a coherent structure that allows educators to better understand sound technology integration. Sound technology integration affects how educators make effective decisions regarding: academic content or what they will teach, teaching goals, pedagogical methods or how they will teach, and finally how teachers will assess lesson outcomes.

Despite the significant body of research implicated by TPACK that allows educators to better understand technical knowledge usage, other factors may hinder or further confound technological decision making in lesson planning. According to the Teachers' Tools for the 21st Century: A Report on Teachers' Use of Technology (1999), "Teachers' preparation and training to use education technology is a key factor to consider when examining their use of computers and the Internet for instructional purposes" (pg. iii). In another study conducted by The National Staff Development Council (2010), findings indicated that despite making some gains in Educator professional development, the "United States has moved backward in providing the vast majority of teachers with the kind of ongoing, intensive professional learning that research shows has a substantial impact on student learning" (pg. 1). Professional development, time, and the unknown relative advantages from the implementation of technological knowledge present many more intrinsic difficulties in curriculum planning

(Bitner & Bitner, 2001; Cifuentes, Maxwell & Bulu, 2011; Moersch, 2011; Rogers, 2003).

Despite the barriers and challenges presented educators who choose to integrate technology into the school curriculum, must also be mindful to not integrate technology simply for the sake of its relative utility, or perceived advantages (Harris & Hofer, 2011, Moersch, 2001). The use of technology in this way may not support lesson objectives, align with the curriculum, or reflect the useful demonstration of knowledge needed for assessments. As Harris & Hofer (2011) explain, "When integrating educational technologies into instruction, teachers' planning must occur at the nexus of standards-based curriculum requirements, effective pedagogical practices, and available technologies' affordances and constraints" (p. 99).

Therefore, careful planning must be paramount to integrating any technology within a lesson plan or in the decision-making process to achieve curricular goals. While technology integration is a part of the cognitive process that educators regard when planning, a careful look at how in-service educators' make decisions related to pedagogical tasks should also be considered. Furthermore research should also inquire into how technology decisions or pedagogical tool selection is influenced by an educators Teacher Pedagogical Content Knowledge (TPACK) (Mishra & Koehler, 2006).

Problem Statement

The use of technology in schools has increased dramatically since the technology boom of the 1980's. The mid to late 1990's witnessed significant leaps in the prevalence

and availability of technology (Lang & Lippincot, 2011). In its annual survey the Public Broadcasting System (PBS) with Grunwald Associates LTD (Lang & Lippincot, 2011) reported that, "with each passing year, teachers' reliance on media and technology for classroom instruction and student engagement is increasing (pg 1). The report explains that, in many cases, there has been a significant gain in the use and integration of various technologies, and media in curriculum delivery On a national level, there have been significant increases in teacher perceptions and value of technology with ratings rising from 10% to 40% in a short duration of three years (p. 4). This growth potential can affect many different aspects of curriculum planning and instruction.

Technology has also permeated national standards. With the adoption of the national Common Core State Standards (CCSS), and its future adoption by many other states, technology will increasingly be integrated with curriculum standards and practice. More importantly, in the interests of student career readiness the CCSS stress the importance of technology and analytics. For example, "When making mathematical models, [students] know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data" (CCSS, p. 7).

Despite the influence of the CCSS Initiative, current educator efficacy and technological pedagogical content knowledge has not kept pace with the skills needed for effective curriculum design and planning. Therefore, it is becoming increasingly critical for pre-service and in-service educators to acquire the skills needed to successfully integrate technology in their curriculum and lesson planning. Through national standards

and the prevalence of technology in society, technology viewed as a natural integrated part of the curriculum is becoming increasingly important to curriculum planning (Xiaoyu & Kang, 2010)

Ertemer (2010) and Moersch (2011) explain that an educator's bias, efficacy, technological knowledge, access and other factors have resulted in technology uses as a last minute "add on" or used as an incoherent or ambiguous fragment of a unit or lesson plan (Moersch, p. 45). With the increased utilization of technology in the classroom, in-service educators face many new organizational factors in their decision making process of how to select appropriate contextually authentic tools to best serve the learning process (Harris & Hoffer, 2009). This growing technological paradigm, poses many challenges for in-service educators with minimal to no experience in developing curriculum or unit plans that best introduce technology as an organic part of the decision making process (Becker ,2001; Harris & Hoffer, 2009). Improper planning, or a significant diversion from established routines, as noted by Yinger (1979), poses significant consequences such as poor behavior among students or the failure to meet educational goals by educators. Yinger (1979) defines a routine, "as established procedures whose main function is to control and coordinate specific sequences of behavior" (p. 165). This sequence of behaviors manifested through activity routines have the capacity to: reduce student anxiety about the sequence of instruction, can increase student time on task, increase a teachers pre-instruction or preactive planning time, and promote creativity in the planning process.

Recognizing this potential within integrating technology into the planning

process, Harris & Hoffer (2009) describe an approach to curriculum-based technology integration that enables educators to develop technological knowledge. Developing an educator's TPACK then allows for instructional planning that is based in creating routines that enrich contextual learning activity types. The introduction of technological knowledge and its related domains as introduced by Mishra & Punya (2006) Harris & Hoffer (2009) therefore, can potentially influence an educator's decision-making process on many different levels (Graham, et. al., 2009).

As access to technology and its subsequent knowledge becomes more prevalent, its application within the curriculum and pedagogical utility becomes increasingly important to educators. Furthermore, the implications of how technology is then utilized in constructing lesson plans, and how pedagogical and curricular decisions are made, becomes increasingly compelling.

Subsequently, despite the increasing ubiquity of technology in educational settings, and the prevalence of professional development opportunities targeting technology, the use of technological strategies and knowledge to plan, deliver, and assess lessons remains a significant challenge to most in-service educators. Despite the magnitude of research done in the areas mentioned, the current literature does not offer much insight into the decision-making process of in-service teachers in terms of technology integration during lesson planning, and its potential connection to the TPACK framework.

Purpose Statement

The act of teaching is complex and is subject to many different variables throughout a lesson. As Yinger (1979) notes, "The complexity and unpredictability that characterize the teaching environment impose many demands on the teacher, and it becomes necessary to find methods to decrease the amount of information to be processed at any one time" (pg, 167). One of these methods is the development of a lesson plan to guide the activity routines within a unit or lesson.

Yinger (1979) specifies "activity routines" as acts to control and coordinate the features of [instructional] activities (p. 165). These activity routines, with respect to the planning for the use of technology, may ultimately affect whether technology will be integrated into a lesson or not. The use of technological knowledge then becomes paramount to an educators decision making process.

Therefore, it is the purpose of this study to examine how in-service teachers describe their decision making process. Hora (2012) has shown that focused and sustained professional development in technology integration can affect an educator's "decision making pathway" (p. 209). This study will focus on how an educator's decision-making process can influence how technology will be integrated into the curriculum, and how these decisions may be connected to or inform an educator's score on a technology integration assessment tool.

Research Questions

This study is guided by the following research questions:

1. How do educators describe their process of instructional planning?
2. How do educators describe their process in planning instruction that integrates technology?
3. How does a teacher's self reported TPACK align with his or her intention in planning instruction that integrates technology?

Overview of the Study

As ubiquitous computing becomes more context-aware, digital information access has become more seamless and less obtrusive (Poslad, 2009, p. 12). Poslad (2009) defines, "context-aware" as systems that are aware of their situation (or context) in their physical, virtual (ICT), and user environment, and can adapt the system to this in some way" (p. 213). To a layperson this type of computing leverages its strength from the input by a user, therefore enabling for faster indexing within search engines or interfacing with various applications. Therefore with the advent of smarter technologies it may be perceived that newer challenges will be presented to educators on many different levels of curriculum planning (Harris & Hofer, 2009).

"Smart technologies" refer to sensors and other micro-controllers that react to an environment, such as tab devices, the iPad, or other haptic (touch sensitive) devices. The introduction of newer technologies and the decision to adopt a particular technology centers on what Hall & Khan (2003) describe as, "...a series of individual decisions to

begin using the new technology, decisions which are often the result of a comparison of the uncertain benefits of the new invention with the uncertain costs of adopting it" (p. 2). Hall & Kahn relate this rational to a process called diffusion, which educators are a product of this phenomenon. These associated costs by Hall & Kahn (2003) may regard the diffusion of technology from an economic perspective. However, public schools are also affected by similar decisions as they relate to technology integration. Some of the associated costs within schools relate to the various strata of a public institution. Moe & Chub (2009) describe the various politics that surround the diffusion or use of technology as various political blocks including local government, administrators, educators, and members of the community. Collins & Halverson (2009) also speak of other costs that challenge the diffusion or integration of technology as barriers, such as associated costs that are derived from funding, access, efficacy, time, and training. To mitigate the associated costs of integrating technology in schools, stakeholders in education will need new skills that are increasingly related to understanding the diffusion of technology. These challenges will affect various elements of human efficacy, pedagogical knowledge, content knowledge, technological knowledge, and the intersections of these three domains as noted by (Mishra & Hofer, 2006).

TPACK is an extension of the categories or domains of knowledge based on Shulman's work (1996, 1997). Shulman (1997) considers pedagogical content knowledge to be the category that differentiates between the distinctions of a content specialist to that of the pedagogue. Shulman states further that the key to distinguishing the knowledge base of teaching lies at the intersection of content and pedagogy. He

further discusses that the power of transforming this knowledge lies solely with the educator into creating dynamic and rich forms that are adaptable and pedagogically powerful.

This study was designed to examine the decision-making process of in-service teachers in a professional development model based on the TPACK activity type taxonomy, and will measure teacher integration of technology by the use of a scoring rubric designed and researched by Harris, Grandgenett, & Hofer (2010). The study also collected data from personal interviews to establish a teachers' technological knowledge as it relates to curricular decision-making. The personal interviews were designed to understand how a teacher's lessons or task selections integrated technology, and attempt to answer how those pedagogical considerations were made in relation to the Harris et al. (2010) instrument. The interview also provides data regarding post-professional development knowledge, and how this technological knowledge is being applied within the TPACK framework. Special attention will be paid to teachers' decisions and thought making processes to determine how the integration of technology can be viewed as an organic part of planning.

Lesson Planning is an event that embodies many different factors. Yinger (1979) notes that the classroom environment is not only complex and unpredictable, but teaching behavior may be to a large degree "controlled" or "shaped" by the environment. Westerman (1991) also introduces the notion that planning can be affected by three different phases of a teachers decision-making during the course of teaching, which can affect curriculum planning. The analysis of pre-active, interactive, and post-active traits

of decision-making by Westerman also articulates the significant differences regarding novice and expert teachers in their planning. Despite these factors and differences amongst practicing teachers, a significant increase of quality technology integration has been recognized by the introduction of the TPACK paradigm (Harris, Grandgenett, & Hofer, 2010).

These dynamic forms are related to activities or activity types that are essentially the result of planning and "knowledge-in-action" of content and known pedagogical practices (Harris & Hoffer, 2009). Harris and Hoffer also assert that when, "integrating educational technologies into instruction, teachers' planning must occur at the nexus of standards-based curriculum requirements, effective pedagogical practices, and available technologies' affordances and constraints" (p. 99). The resultant research has examined how these plans are created, the resulting tasks, and underlying contingencies (Harris & Hoffer, 2009). In an analysis of literature on TPACK, Abbitt (2011) has recognized that the work of Mishra and Koehler (2006) has, "emerged as a representation of the knowledge required to use technology in an educational setting in ways that are contextually authentic and pedagogically appropriate" (p. 281). Abitt (2011) also highlights the work of Albion, Jamieson-Proctor, and Finger (2010) who found that, "that the TPACK framework can be used to measure other factors, or constructs such as self-efficacy and confidence beliefs" (p. 283) both of which affect planning. In this light, the use of TPACK becomes a valuable tool to measure the effectiveness of professional development, lesson planning, and curricular decision-making.

Limitations

The findings of this study are constrained by the following two limitations. First, the data for this study was collected from a group of in-service K-12 teachers from a single school district who participated in a semester-long series of professional development workshops. Since the research was conducted in a single school district, the findings may not represent finding in a larger group of rural educators, or be generalized to a national audience.

Second, the interview data collected may be affected by hidden factors such as personal bias, socio-economic status, access to technology, educator time limitations, budget constraints, or biases toward the interviewer or interview process.

Delimitations

The research was conducted within a single school district in which a closed network of collaboration and sharing provided the data related to the implementation of the TPACK framework. Such a closed network constrains the research to a limited demographic of educators. Other factors that demarcate this research coincide with a single cohort of educators, and the duration of the study as it relates to a single academic semester. A longitudinal focus or comparisons to other Rocky Mountain rural school districts further constrains the research.

In analyzing the cohort of educators, the number of questions that can be asked during the interview may be limited to time constraints, due to the length of a response, scheduling, or travel. Proper transcription of digitally recorded interviews present further

limitations in the accuracy of coding, and subsequent analysis based on a misunderstanding of a response. The scoring rubric as it applies to such interviews and the TIR is used in two different studies by Harris, Grandgenett, & Hofer (2010) and in Harris, Grandgenett, & Hofer (2012) may present challenges in the data analysis.

Significance of the Study

Integrating technology with a school's current curriculum can present certain barriers. The types of technology present, availability, access issues such as firewalls or content filtering software may affect the level of technology integration. Teacher efficacy in the use of technology can also be a significant barrier in integrating technology. Further deep content knowledge blended with newer pedagogical methods may present other challenges. It is the goal of this research to analyze how an educators TPACK score, and curricular decision-making process may be affected from exposure to focused professional development in technology integration, along with the influence of the TPACK framework. This study will focus on how an educator's decision-making process in light of exposure to best practice models and TPACK can influence how, and to what purposeful end technology may be integrated into the curriculum.

CHAPTER 2

LITERATURE REVIEW

Technology Integration

Effective advances and applications in technology can be seen as a benefit to most government agencies, corporations, research sciences, and more resolutely in the hands of everyday people. In contrast only a small gain in the proliferation and the effective integration of technology can be seen in the classroom. This inequity of integration is best shown by the studies performed by Lang & Lippincot (2011), and Raine (2011). In a recent study, Rainie (2011) looked at the "state of reading" in the digital age by analyzing the Pew Internet survey data regarding how teens use technology such as the Internet, smart phones, and social networking sites. Data collected from May of 2010 showed that 94% of students ages 12-17 that are online, do research for school assignments. Additional research conducted by the Pew Research group shows that the generation gap is closing regarding the use and ownership of digital devices. A significant share of ownership of these types of devices is nearing an equal status between Millennial, Generation X's, and Baby Boomers alike (Rainie, n.d.). With this dwindling generational gap of digital device ownership and widespread proliferation of digital applications in business, and in personal life, education is still significantly lacking in the actualization of implementing digital technologies across the curriculum (Lang & Lipincott, 2011).

Xiaoyu & Kang (2010) in Development of Integration of Information Technology and Academic Courses, have attempted to explain why K-12 technology integration is

seemingly stuck in the first level of integration. Based on a review of the literature, they propose that most research does not focus on two of the most critical aspects of integrating information technology across the curriculum, which are informational technology and its associated implementation in curriculum. They also found a vast difference on how researchers approach educational technology research. Xiaoyu & Kang (2010) explain that experts would conduct research on educational technology, but many at times would neglect the second matter of looking at their research in terms of their own curriculum. In order to incite change and potential paradigm shifts in research and pedagogical methodology Xiaoyu & Kang (2010) suggest moving through three levels of integration. The authors believe that the blending of educational technology research with formal practice in integration of information technology in all aspects of the curriculum is bound to bring a qualitative change within the academic structure of information technology curriculum used in schools. A summary of their three levels is of interest in this study of integration:

1. The integration of curriculum and information technology into the teaching process as:
    a. Pedagogical tool
    b. Communication tool
2. Integration into the organization and delivery of course content
    a. At this level students are afforded an interactive self-learning environment
    b. Integration of technology is seen as a cognitive tool
3. Independent learning by students
    a. Full integration into the curricula at all teaching levels
    b. Effective teaching practices and stimulates curricular optimization

Barriers To Integration

Despite Xiaoyu & Kang's (2010) analysis, and their three levels of integration, there are still many barriers to true technology integration as presented by Moe and Chubb (2009) have presented. They make several claims as to why technology has not been fully adopted by the educational community. These barriers include: political policy, teacher unions, and philosophical positions that block technology reform in schools. Buckenmeyer (2008) confirms these types of barriers to integration, but also sites that relevant, continuous, and timely professional development must be offered. Adequate time to learn new technologies must be paramount in order to affect new and creative approaches to pedagogical methods.

Holden & Rada (2011) recently studied the Technology Acceptance Model (TAM) to explore how users come to accept and use a given technology and can be applied to teachers' use of educational technologies. The researchers sought to extend the model to include efficacy as a possible measure of technology acceptance among educators. A review of the literature review found many other reasons why technology is either adopted or not used (Holden & Rada, 2011). They cite some of these as, "user characteristics (i.e. age, self-efficacy, anxiety, playfulness, prior experience, level of education, etc.), political influences, and organizational factors" (Holden & Rada, 2011, p. 349). Despite these barriers, the researchers focused on self-efficacy as the more important measure. They found that by, "increasing [an educators'] technology self-efficacy, they might directly increase their acceptance and indirectly increase their usage behavior" (pg. 365).

Walker & Sheppard (2011) also agree with the canon of research on technology barriers, but expand upon the cannon by including research on the effects of established pedagogy and classroom practices, and by also looking at how intrinsic and extrinsic motivators and professional development experiences can affect technology integration and lesson planning.

Technology and Professional Development

In addition to the technological barriers to technology integration, there are several other factors that affect technology integration in regards to pedagogical methods and curriculum planning. Walker & Sheppard (2011) found that an educators' technological knowledge must be developed or found through one's self-motivation or an extrinsic drive to innovate with technology in lessons.

Thus, in order to transform pedagogical paradigms, we must look at how educators' knowledge of content can greatly affect these newer approaches to creative pedagogy. Shulman (1987) argues that the key to distinguishing the knowledge base of teaching lies at the intersection of content and pedagogy. Therefore, in order for an educator to transform their working content knowledge into effective pedagogy Shulman introduces a "Model of Pedagogical Reasoning and Action." Shulman (1987) bases his conception of pedagogical reasoning and action from the point of view of the teacher, who is presented with the challenge of taking what he or she already understands and making it ready for effective instruction (p. 14). This reasoning process coupled with professional development and exposure to TPACK, as presented by Mishra and Koehler

(2006), can greatly affect curricular decisions and delivery of content as a growing body of research has shown (Abbitt, 2011).

Niess (2005) relates that in order to achieve newer approaches to technology integration and newer pedagogical approaches, educators must develop a pedagogical content knowledge related to technology, which will in turn affect lesson planning and educator decision making at all levels. Mishra and Koehler (2006) who extended Shulman's (1986; 1987) work provides a framework that through effective professional development educators will be able to construct lesson plans and activities that integrate technology within the conceptual framework that embraces three domains consisting of content, pedagogy, and technology, as shown by Polly (2005), Mishra & Koehler (2006), and their subsequent intersections.

Technology Activity Types

With the growing body of research in TPACK, we must also look at factors that affect students interaction of complex thinking when involved with high-level tasks that integrate technology (Henningsen & Stein, 1997). Henningsen and Stein (1997) discuss how classroom behaviors can affect tasks, high level thinking, and reasoning. Their research separates curriculum developers and classroom teachers in task development, and curriculum planning. In this research, professional development engages classroom teachers to be effective agents of change in regards to curricular task development that is contextually content rich with regard to rigorous cognitive demands. Despite this nuance between curriculum developers and teachers, Henningsen and Stein (1997) discuss

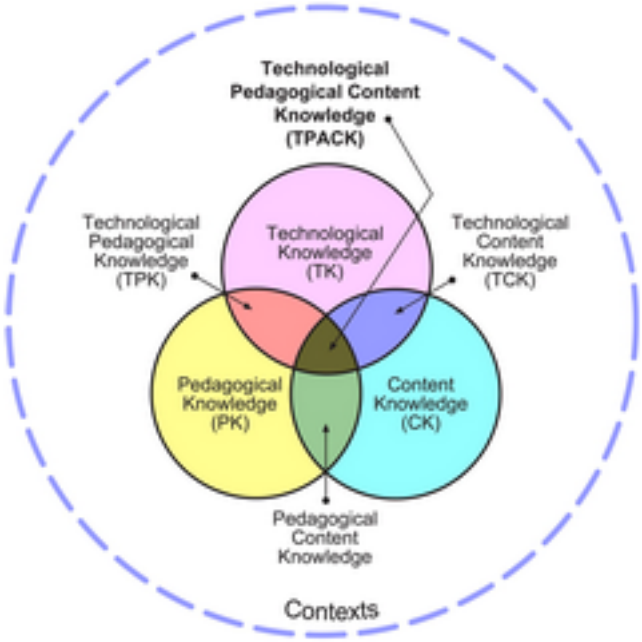
various patterns of decline of how high-level activities can be reduced to low-level procedures during the task-implementation phase. The authors cite factors that produce this phenomenon are due to established: classroom norms, task conditions, and teacher/student dispositions, which inevitably create a classroom culture that delimit high-level tasks (Hennnigsen & Stein, 1997). The authors also argue that there are three specific profiles of decline: procedures without connections, unsystematic exploration, and no content specific activity (Hennnigsen & Stein, 1997).

Planning with Technology

An activities cognitive decline is not central to this study but should be mentioned as it relates to curricular decisions, and lesson planning within the literature. Cognitive decline can be the result of poor planning, or error's in making judgments, or the inability to carry out decisions in an uncertain, complex environment. Shavelson & Stern, (1981) shed light on this issue through an analysis of literature. They found that, "research on instructional planning suggests that teachers balance multiple goals such as maintaining a flow of activity, reducing management problems, teaching concepts and skills, and maintaining a social organization" Shavelson & Stern, 1981, pg. 491). Shavelson & Stern (1981) also create a case for the different types of planning between novice and experienced teachers. However, (Westerman 1991) suggests a planning model that targets experienced teachers exclusively. Westerman's (1991) model suggests that lesson planning occurs on three levels: preactive, interactive, and postactive; "[d]uring planning, the expert teacher's goals are based on his or her understanding of the learning

task. However, during teaching, these goals are shaped and tailored to what is happening in the classroom. Tailoring lesson plans to accommodate student needs is what many novices cannot do" (Westerman, 1991, pg. 300). Due to the dynamic nature of lesson planning the learning objectives and the learning activity also becomes a dynamic event.

Figure 2.1 TPACK Conceptual Framework



This dynamic type of interaction can be nurtured with technical content knowledge as discussed by Harris & Hofer (2011): "Because teachers' planning is conceptualized around content goals and organized according to learning activities, technology integration methods should be similarly focused. Possibilities for technology use should be considered according to the types of learning activities that have been selected, which, have been chosen to match students' learning needs and preferences" (pg. 214).

Common Core State Standards Initiative

The Common Core State Standards Initiative demonstrates the importance of technology integration. The "More About English" section of the webpage describes how educators will plan for the use of media technology: "Just as media and technology are integrated in school and life in the twenty-first century, skills related to media use (both critical analysis and production of media) are integrated throughout the standards" (CCSS, n.p.). In the Key Points in Mathematics section there is an emphasis on mathematical modeling. The CCSS specify that, "[w]hen making mathematical models, technology is valuable for varying assumptions, exploring consequences, and comparing predictions with data" (CCSS, n.p.). Throughout the standards technology is marginally mentioned, but in broad general terms. In the English Language Arts Standards the authors present disclaimers and limitations of the standards, which may also pertain to the planning and use of technology as it may apply to curricular goals and specific content standards to be met. "While the Standards focus on what is most essential, they do not describe all that can or should be taught. A great deal is left to the discretion of teachers and curriculum developers. The aim of the Standards is to articulate the fundamentals, not to set out an exhaustive list or a set of restrictions that limits what can be taught beyond what is specified herein" (CCSS, n.p.).

Therefore the implementation of technology still resides with the careful consideration of what specific technologies or technological tools will best aid in reaching curricular goals. This also may relate to how other contextual factors that may be present during the lesson planning process will affect the use of technology.

TPACK - Technical Pedagogical and Content Knowledge

History

TPACK or Technological Pedagogical Content Knowledge was definitively introduced by Mathew Koehler & Punya Mishra (2006). Mathew Koehler (2012) states that, "Technological Pedagogical Content Knowledge (TPACK) attempts to identify the nature of knowledge required by teachers for technology integration in their teaching, while addressing the complex, multifaceted and situated nature of teacher knowledge. At the heart of the TPACK framework, is the complex interplay of three primary forms of knowledge: Content (CK), Pedagogy (PK), and Technology (TK) (See Figure 2.1 below). The TPACK framework builds on Shulman's idea (1987) of Pedagogical Content Knowledge" However, TPACK just did not emanate from this seminal work. Prior to Koeler & Mishra (2006), "a precursor to the TPACK idea was a brief mention of the [developing] triad of content, theory (as opposed to pedagogy), and technology in (Mishra 2009)" (AACTE, p. 24).

In 1953, Popper gave a summer lecture at Peterhouse, Cambridge, on his book Conjectures and Refutations. He remarked, "that the criterion of the scientific status of a theory is its falsifiability, refutability, or testability" (Popper, 1953, p.13). Therefore, many individuals have been focusing on TPACK's testability. Schmidt, Baran, Thompson, Mishra, Koehler, & Shin, (2009) discuss the early history of TPACK in creating and developing an instrument to measure TPACK:

"Pierson (1999; 2001), Keating and Evans (2001), and Zhao (2003) similarly describe the relationships between technology, content, and pedagogy. Other

researchers have addressed similar ideas, though often under different labeling schemes, including integration literacy (Gunter & Bumbach, 2004); information and communication (ICT)-related PCK (e.g., Angeli & Valanides, 2005); Technological Content Knowledge (Slough & Connell, 2006); and electronic PCK or e-PCK (e.g., Franklin, 2004; Irving, 2006). Others who have demonstrated a sensitivity to the relationships between content, pedagogy, and technology include Hughes (2004); McCrory (2004); Margerum-Leys and Marx (2002); Niess (2005); and Slough & Connell (2006)" (Schmidt et al., 2009, p. 124).

Since TPACK's inception the framework or theory has seen various contributions within Popper's classifications of, refutability and testability. These areas have been mainstays of the growing TPACK cannon. This growing body of research includes, but is not limited to, preservice and inservice educators knowledge or demonstration of TPACK, educator efficacy as it relates to TPACK, contextual factors as they relate to TPACK, lesson or curriculum planning as it relates to TPACK, activity types, and the contribution of various validation tools such as surveys, scoring rubrics, Likert scales, and interview prompts. All of which contribute to the growing body of evidence that validates the TPACK framework and its guiding theory.

In a comprehensive review of the literature Abbit (2011) provides a compelling case for the TPACK framework and by historically viewing TPACK in the light of the types of research and papers produced since its original inception. Abbit (2011) perhaps offers the most comprehensive review of the literature. Abbit (2011) considers many of the TPACK framework regarding planning, instrument development, the study of activity

types, and educator efficacy. To a similar end, Voogt, Fisser, Pareja Roblin, Tondeur, & van Braak, (2012), also present a far-reaching review of TPACK literature in regards to its theoretical basis and its practical use. They summarize that three different views of TPACK have emerged (p. 5):

1. TK or T(PCK) is an extension of Shulman's (1987) PCK, which was discussed in (Niess 2005; Cox & Graham 2009).
2. The view that TPACK is a unique and distinct body of knowledge, which comprise "domain knowledge" and the understanding of specific learning difficulties and contextual factors regarding student learning.
3. The theoretical view between the three domains as they relate to knowledge and practice. This view also considers knowledge and practice in context. The authors of the article also provide recommendations for further research to support the TPACK theory. They conclude that PCK should be developed for specific domains and that consensus among scholars and practitioners should be sought through Delphi-type studies.

In light of these findings this study will attempt to align with the first and third point of view as they relate to how educator's perceive TPACK as it relates to their Technology Rationale and in face-to-face interviews.

Educator Decision Making

Delores A. Westerman (1991) in her article, Expert and Novice Teacher Decision Making discusses the work conducted by P. W. Jackson and his introduction of how

complexity in the classroom can affect the decision making process of an educator. "Jackson (1968) initiated a paradigm shift in educational research when he wrote about the complexity of the classroom. He described teacher decision making as preactive, interactive, and post-active, that is, occurring before, during, and after teaching" (Westerman, p. 292). In her literature review, Westerman (1991) contrasts the decision making process between experienced and novice teachers and, explains how, "[t]hey found that experienced teachers attended to a larger number of instructional goals in making interactive decisions. The experienced teachers also used a larger range of instructional strategies and linked their actions to student cues in more complex ways than the novice teachers" (Westerman, 1991, p. 293). In the interest of lesson planning and the use of technology among the educators involved in this study, the "three stages of decision-making: preactive or planning, interactive or teaching, and post-active evaluating and reflecting" (Westerman, 1991, p. 294) is of considerable importance. Shulman (1987) also discusses the unique type of reasoning that successful educators undergo in the process of planning. He suggests that educators transform ideas into interactive lessons using five different types of pedagogical reasoning processes (p. 16):

1. Preparation (of the given [educational] materials) including the process of critical interpretation
2. Representation of the ideas in the form of new analogies, metaphors, and so forth
3. Instructional selections from among an array of teaching methods and models

4. Adaptation of these representations to the general characteristics of the children to be taught
5. Tailoring the adaptations to the specific youngsters in the classroom.

In the data analysis of Westerman (1991) she verifies these processes among experienced teachers. As this relates to integrating technology into the lesson planning process, TPACK becomes an integral part of Shulman's first premise of preparation. Therefore it becomes significantly interesting to understand the cognitive process of instructional planning and perhaps more importantly to this research, to understand the pedagogical reasoning in planning instruction that integrates technology.

CHAPTER 3

METHODS AND PROCEDURES

This study qualitatively analyzes an educator's decision-making process can be influenced when technology is integrated into the curriculum, and how these decisions may be connected or inform an educator's TPACK score on a technology integration assessment tool.

This study examines focused professional development using the TPACK framework to understand curricular and pedagogical decisions when planning lessons that integrate technology. The participants in this study were drawn from a group of teachers who work in a rural school district in the Rocky Mountain west. The group of teachers enrolled in a professional development course facilitated by a University in the Rocky Mountain West. The group was introduced to various technologies, and asked to provide evidence that demonstrates the integration of technology in their curricular planning. A subset of the teachers was invited to participate in the study. The participant's responses to the interview questions (see Appendix A) were analyzed to discern the development of the educators' TPACK and assess their overall implementation of technology as it relates to curricular planning decisions.

A Technology Integration Rationale (TIR) was a document produced by each teacher during the professional development course to describe the content and/or topics for their lesson, describe the students and the learning needs or preferences addressed in the lesson, and the educational technologies chosen for the lesson. The TIR was used

provide an analysis of the participants' TPACK scores and was subject to member checking procedure. To achieve this, a validated TPACK scoring instrument (see Appendix C) was used to quantitatively measure the educators' TPACK score. The compiled data was analyzed to discern how technology is implemented as it relates to the specified research questions.

The Research Context

Location

The research was conducted in a rural Rocky Mountain school district. A cohort of in-service teachers from the district voluntarily engaged in a professional development course facilitated by a University in the Rocky Mountain West. From this cohort a purposeful sample of participants representing middle school and high school in-service educators were invited to participate.

The District

There are six K-12 schools in the rural school district. The public schools consist of four elementary schools, one middle school, and one high school. Each of the schools in this district is based in a rural region, which affords students a smaller student to teacher ratio, and smaller classroom sizes.

The Participants

In-service K-12 educators from a rural Rocky Mountain School district participated in a semester long professional development course offered by faculty members from a University in the Rocky Mountain West. The middle school and high school in-service

teachers in the course were invited to participate in this study designed to examine how technology can be organized as a constraint or an affordance to lesson planning.

Rationale for Participant Selection

The use of technology in the classroom presents many different challenges to educators. New concepts and tools will affect task selection and the decision making process that affects lesson planning. Educator perceptions, biases, time, class/school culture, or unfamiliarity with new tools can affect how technology will ultimately be used in lesson planning and classroom activities (Harris & Hofer, 2009). A purposeful selection of educators was selected consisting of middle and high school in-service educators. Secondary educators were invited to participate in this study, however content area was not a consideration as the purpose of this study was to understand an educator's decision-making process as it may be influenced when technology is integrated into the curriculum, and how these decisions may influence or inform an educator's TPACK score using a technology integration assessment tool.

Researcher's Position Relative to the Participants

The researcher is a certified 5-12 math and art teacher, who has no affiliation with the rural Rocky Mountain School district. The researcher is in no way affiliated to the school district nor is he a current colleague with the participants in this study.

Description of the Participants

The cohort of educators in this study represent a cross section of in-service educators who have either been selected by the administration, or personally volunteered for a professional development course facilitated by a University in the Rocky Mountain West. A subset of the cohort represents a purposeful sample of middle and high school in-service educators. Years of teaching experience, content area, and gender were not regarded as factors in the selection process. The cohort contained nineteen secondary teachers who met the criteria for participation in the study. From that group only six teachers were available to participate in the semi-structured face-to-face interview.

Invitation of Participants

Participants were purposefully selected and then invited to participate in an on-site interview to be conducted by the researcher. Participation was voluntary, and the preservation of anonymity was followed to ensure the integrity of each individual and their recorded data.

Instruments and Procedures for Data Collection

Semi-structured personal interviews were conducted with six in-service teachers to assess an educator's response to the TPACK professional development, and to discern how an educator decided to implement technology or not in lesson planning. A scoring rubric developed by Harris & Hofer (2012) also provided a analysis of the TIR—a personal response to professional development, integration of technology, and task development as it relates to an educator's TPACK score. This enabled the researcher to

analyze the interview audio recordings and analyze the educators' TPACK score as it aligns with their intention in planning instruction that integrates technology.

As Harris & Hofer (2012) explain, "[g]iven the brevity and idiosyncrasy of experienced teachers' written planning documents, we realized that we could not assess their lesson plans [or other planning artifacts] in the same way that we assessed inexperienced teachers' planning artifacts" (p. 2). Therefore this rubric will be used as it was intentioned to analyze audio recordings and derive a TPACK score based on their instrument.

Reliability

As for reliability of Harris & Hofer's (2012) instrument: "Using the data generated, reliability across both locations was calculated using four different strategies: 1) inter-rater reliability, computed using the Intraclass Correlation Coefficient (ICC), 2) inter-rater reliability, computed using a second percent score agreement procedure, 3) internal consistency within the rubric, computed using Cronbach's Alpha of a .911, and 4) test-retest reliability as represented by the percent agreement between scorings of the same videos examined one month apart by the same teachers" (Harris et al., 2012, p. 4). The overall percent agreement for two separate test groups was 87.0%. "Given this conservative nature of this statistic, the result provides further evidence for the instrument's reliability" (Harris et al., 2012, p. 6).

Validity

Harris, Grandgenett, & Hofer, (2012) operationalized a Technology Integration Rubric by conducting two types of measures which were used to study TPACK as it is

relates to its conceptual framework. Construct validity was performed using several expert reviews. Experts were described as "individuals, which had extensive experience with TPACK" (Harris et al., 2012, p. 4). The second type of validity measure used with the rubric was face validity. This measure was "determined by analyzing the scorers' feedback on both the process of using the rubric and its perceived utility. All of the scorers' written comments supported the rubric's ability to help teacher educators to assess the quality of TPACK-based technology integration inferred from lesson plan documents" (Harris et al., 2012, p. 4).

Trustworthiness

Trustworthiness was established by following qualitative methods as published by Lincoln & Guba (1985). The researcher followed the member checking protocol during the face-to-face interviews to establish credible data from which to establish coding and categories. The researcher would stop and clarify responses from each participant.

Further trustworthiness was established during the coding process. A procedure outlined by Johnson & Christensen (2012) enabled the researcher to create a hierarchal structure from which the best possible codes and categories could be arbitrated and then selected. A concept map was created through a web application called SpiderScribe and this allowed the researcher to efficiently work through the arbitration process of code selection.

Reliability and Validity Analysis

Harris & Hofer (2012) operationalize TPACK and have provided an instrument that reflects key TPACK concepts and that has proven to be both reliable and valid in two

successive rounds of testing. The researcher used this instrument in the spirit that it was conceptualized, and the use of member-checking analysis ensured the reliability and the validity of the analysis within the TIR.

Plan for Data Analysis

The overall analysis of the results provides a valuable insight for answering the research questions regarding the effectiveness of the TPACK professional development, and examines the connections between participants' interview responses and their TPACK score as it relates to the decision-making process. This methodology allowed the researcher to examine how the integration of technology affects teacher's planning in regards to: integrating technology, its subsequent effect on planning cognitively rich tasks, and finally how curricular and pedagogical decisions are made in regards to a teacher's TPACK score.

TPACK Analyses

Qualitative analysis of an educator's TPACK score, personal interviews, and scoring TIR's of participating in-service teachers were used to assess the decision-making process the use of technology as an organic tool when lesson planning. A score was attributed to the TIR using a scoring rubric (Harris, Grandgenett, & Hofer, 2012). The rubric is shown in Appendix D and was used to analyze the educator's rationale with the educator's self-reported TPACK during the face-to-face interviews.

Technology Integration Rational Analysis

TPACK analysis was conducted on the TIR produced in the professional development course at a University in the Rocky Mountain West. The rationales were assessed using the Harris et al. (2012) scoring rubric. Additionally the interview questions that were used with the scoring rubric were used with a four point Likert scale (Appendix C). A score of a four on a particular question provided strong evidence of the categories in the scoring rubric, while a score of a one provided weak evidence of a category in the scoring rubric.

Interview Analyses

The face-to-face interview questions are derived from the ideas and examples used in Shulman (1987), Polly (2011), Harris & Hofer (2012), and Henningson & Stein (2010). The length of the questions and the anticipated time of the response were created to be concise, and to the point. Biased or loaded questions were avoided, along with double-barrel questions, confusing or wordy questions, and questions that did not entirely relate to the study were avoided (OWL, 2011). These standards helped in guiding the development and selection of questions used in during the interview process. The personal face-to-face interviews also increased the reliability of the interview instrument, and provided descriptive analysis of the TPACK professional development as it applies to the educator's Technology Rationale and the educator's decision making process as it relates to integrating technology in lesson planning.

Transcribing and Segmenting the Data

The TIRs were reviewed and scored based on the Technology Integration Rubric designed by Harris & Hofer (2011, 2012). This rubric was selected based upon the literature review of Abitt (2011), and from the research literature on TPACK interview protocols. Abitt (2011) found that this type of rubric was a good "recommendation for use in multiple content disciplines" (p. 295), and its usefulness in "investigating the emergence of TPK and TCK" (p. 295). This rubric rated each lesson plan on four dimensions: (1) curriculum goals and technologies, (2) instructional strategies and technologies, (3) technology selection, and (4) "fit" of content, pedagogy, and technology (Abbit, p. 294). As a result of further study, Harris & Hofer (2012) were able to extend their rubric to include personal interviews conducted with educators.

The interviews were digitally recorded, and then transcribed verbatim using ExpressScribe transcription software. The interview transcripts were then analyzed starting with margin notes to identify key points, divergent ideas, or reoccurring ideas between the participants. A preliminary set of codes was created in alignment with the margin notes. An operational definition for each code was then established. Finally, the codes were organized into categories that best represented the data. This inductive process was used as outlined by Lincoln & Guba (1985). To verify the accuracy of the codes and resulting categories, a hierarchal category system as recommended by Johnson & Christensen (2012) was used. Once verified codes, sub-codes, and categories were provided clearer descriptions and specific examples were noted in Chapter IV and in table 4.3.

Table 3.1 Articulation of Research Questions and Data Sources

Research Questions	Data Source
1. How do educators describe their process of instructional planning?	InterviewQ1: Please briefly describe your planning process. InterviewQ2:What types of resources do you use in lesson planning? InterviewQ3:Has the professional development course affected the way you approach lesson planning? If so how?
2. How do educators describe their process of planning instruction that integrates technology?	InterviewQ4:When it comes to including technology in your lesson planning, what are the major factors that influence your decision making process? InterviewQ5:Describe a time when you had success when integrating technology in our lesson plan. InterviewQ6:How have you successfully delivered course content, technologies, and or teaching approaches in the classroom lesson or in planning?
3. How does a teacher's self-reported TPACK align with his or her intention in planning instruction that integrates technology?	InterviewQ7:A semester later where are you on a scale of 1 to 5, where would your rate your TPACK regarding integrating technology into your lesson planning? InterviewQ8:After participating in the professional development course how has this affected your purposeful use of technology in your lesson planning? InterviewQ9:In what ways do you research or discover new or developing technology ideas in education? InterviewQ10:What type of future support would you need in order to continue technology integration in your lesson planning? Technology Integration Rationale (TIR) score

CHAPTER 4

RESULTS AND ANALYSIS

The purpose of this study was understand how an educator's decision-making process can influence how technology will be integrated into the curriculum, and how these decisions may be connected or inform an educator's score on a technology integration assessment tool. The participants in this study were drawn from a group of teachers who work in a rural district in the Rocky Mountain West. The group was introduced to various technologies, and asked to provide evidence that demonstrates the integration of technology in their curricular planning. A subset of the teachers was invited to participate in the study. The participants' responses to the interview questions (see Appendix A) were analyzed to discern the development of the educators' TPACK, and assess their overall implementation of technology as it relates to planning decisions.

Technology Integration Rationale

The Technology Integration Rationale (TIR) was an artifact written by each teacher participating in a professional development course facilitated by a University in the Rocky Mountain West. Participants in the course were asked to produce a lesson that culminated a semester long study regarding technology integration and the study of the TPACK framework. The TIR was scored using a Rubric developed by Harris et. al. (2012). The rubric is designed with the integration of technology within four categories. The first three categories relate the integration of technology as it fits within the TPACK

framework. Category one is related to Technological Content Knowledge (TCK), category two articulates with Technological Pedagogical Knowledge (TPK), category three aligns with Pedagogical Content Knowledge (PCK), and finally category four looks at the overall fit within the conceptual framework of TPACK. On this rubric a score of a four indicates a strong, or exemplary example of the construct. A three indicates that the TIR is aligned, supports, or is appropriate. Two indicates that the TIR is partially, minimally, marginally, or fits somewhat with the lesson. Finally a one does not align, does not support, is inappropriate, and that the TIR does not fit with the lesson plan. Table 4.1 contains the results of each of the participants (n=18) based on the scoring rubric, and Figure 4.1 contains the percentages of each score.

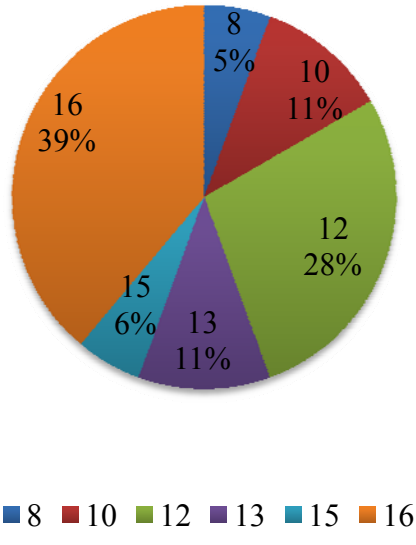
Based on the data collected in Table 4.1 the cohort produced a median TPACK score of 13, which provides a significant measure of TPACK integration and knowledge among the participants.

Further analysis of the TPACK score in Table 4.1 shows that the lowest TPACK score of n=18 was an 8, which represented one individual out of the 18 scored or 6%. Figure 4.1 shows the total percent of the scores that were recorded for the participants.

Table 4.1 Technology Integration Rationale Rubric Results

Educator	Curriculum Goals & Technologies	Instructional Strategies & Technologies	Technology Selection(s)	"Fit"	Total Score
Educator 1	4	3	3	3	13
Educator 2	4	4	3	4	15
Educator 3	4	4	4	4	16
Educator 4	4	4	4	4	16
Educator 5	3	3	3	3	12
Educator 6	4	4	4	4	16
Educator 7	3	2	2	3	10
Educator 8	4	4	4	4	16
Educator 9	4	4	4	4	16
Educator 10	4	3	3	3	13
Educator 11	3	3	3	3	12
Educator 12	3	2	3	2	10
Educator 13	3	3	3	3	12
Educator 14	2	2	2	2	8
Educator 15	3	3	3	3	12
Educator 16	4	4	4	4	16
Educator 17	4	4	4	4	16
Educator 18	3	3	3	3	12

Figure 4.1 Percentage of TPACK Scores



The range of possible scores was 4 to 16 based upon the rubric in Appendix D. Figure 4.1 shows the total percent of the scores that were recorded for the cohort.

This shows that nearly half of the cohort was advanced proficient with the remaining members of the cohort proficient or nearing proficient when providing a rationale for integrating technology within their lesson planning process. It also shows that the professional development, as it relates to TPACK may have had some causal affect on the way educators planned with technology in mind. This coincides with the findings by Harris et al. (2011).

The results indicate that the educators' TPACK score as it relates to the TIR's is indicative of the educator's understanding of the TPACK philosophical framework. The results also demonstrate how an educator's understanding of TPK, TCK, and PCK are interrelated to form TPACK, and this points to how a teacher's written rationale or decision-making as influenced by TPACK aligns with their intention in planning instruction that integrates technology.

Face-to-Face Interview Analysis

The analysis of the semi-structured interviews allowed the researcher to examine teachers' decision-making process as it relates to instructional planning. Pseudonyms were used during the transcription of the interviews, using a simple convention of Teacher 1 to Teacher 6. This convention was used for each individual interviewed to comply with the participants' request for anonymity.

Ten interview questions were given in a semi-structured interview format. The

interviews were digitally recorded and then transcribed verbatim. Margin notes were used to develop codes and categories based on the three research questions:

1. How do educators describe their process of instructional planning?
2. How do educators describe their process in planning instruction that integrates technology?
3. How does a teacher's self-reported TPACK align with their intention in planning instruction that integrates technology?

Codes and Examples

The following codes and examples were derived from the margin notes from each interviewee and then synthesized following the recommendation of Lincoln & Guba (1985) and Johnson & Christensen (2012). Table 4.3 provides a summary of the codes, descriptions, themes, and examples that emerged from the data. Due to the nature of the study and the design of the interview questions, there are a few occurring codes (Johnson & Christensen, 2012). These "are codes that partially or completely overlap. In other words, the same lines or segments of text may have more than one code attached to them" (p.6). For example, Pedagogical Content Knowledge (PCK) is coded in interview questions one, four, and five. Shulman (1987) states that PCK , "...is of special interest because it identifies the distinctive bodies of knowledge for teaching. It represents the blending of content and pedagogy into an understanding of how particular topics, problems, or issues are organized, represented, and adapted to the diverse interests and abilities of learners, and presented for instruction" (p. 6).

Research Question One – Description
of Instructional Planning Process

The major categories that developed were those related to the process, resources, Impact of PD, integration, and Purposeful Integration. These categories emerged from several codes including Logistics, Pedagogical Transformation, Internet, Contextually Authentic, Impact of PD (Professional Development), Barriers, and a self-assessed TPACK score. The following explanation of codes were based on the relative frequency of which they occurred in the margin notes of each interview transcription.

Logistics relates to the acquisition of necessary materials and a conceptual working idea of how a lesson may be managed. Logistics ranged from chemicals on hand to perform a lab, or getting the approval from the administration to unblock a web site. This also included an informal rough sketch of how the idea would conceptually flow, and was either drawn up or informally written in a lesson plan format. Examples of Logistics appear frequently in all six interviews and is best noted by these responses:

> [Teacher 3] "Well I just first look at the supplies I have. You know so like with chemistry we can just do regular laboratory with the equipment that I have, chemicals and stuff."
>
> [Teacher 4] "...But I have to think about first okay how many computers do I have working? I have to get approval from the curriculum department so they can unblock a web site."

Pedagogical Transformation "...require[s] some combination or ordering of the following processes, each of which employs a kind of repertoire" (Shulman, 1987, p. 16).

1. Preparation (of the given text materials) including the process of critical interpretation
2. Instructional selections from among an array of teaching methods and models

3. Adaption of these representations to the general characteristics of the children to be taught
4. Tailoring the adaptations to the specific youngsters in the classroom.

Examples of this include:

> [Teacher 2] 'Okay so I like to look at the end goal. At the end of this unit or at the end of the story they're going to have the skills... So my lesson plan is how are we going to get to there. So here is the end goal and we'll do the steps to get there."

> [Teacher 1] "...But a lot of times I also then try to figure out how I am going to present it and how am I going to make it exciting. So is it going to be exciting? Are they going to be moving? Are they going to be involving technology? Am I going to be doing all of the talking? Are they going to be doing the talking? Are they teaching or am I teaching? You know we both can teach it. Is it going to be out loud or listening? All those things with language come into play. So once I decide what to do then I figure out how to plan."

Evidence of Shulman's (1987) discourse on pedagogical transformation was paramount to the types of decisions made when planning with technology. Resources used in planning were paramount to decision making. However due to the nature of the co-occurring codes in the interviews that defined resources the researcher decided that the individual codes best answered the research question. The individual co-occurring codes also best represent the idea of pedagogical transformation. Resources under this context refers to curricula, ancillary materials, or other errata such as the Internet that enables an educator to further shaping an idea or to explore its feasibility based on items or inventory on hand. Examples of these include but are not limited to:

Instructional Selections - This will be defined as the adopted text and other ancillary materials adopted by the district.

> [Teacher 3] "I will even use my college books, like extra text books or other texts from when I taught high school. I just bring whatever I can to modify the information to my kids needs, but the is probably my main resource. Whether its an actual lesson that I want to modify, or just information the background information and make it relevant. Because you know I hear, so what Teacher 3 how does this apply to me?"

> [Teacher 5] "So then I look at all the resources and in history they, part of our standards is that they learn how to read primary documents. So I look at what kind of documents would help them understand the content that I want them to know."

The Internet is a resource defined as the use of the Internet as a means to augment an idea. It was used to either search on line for an idea to plan from or to flesh out information to support a lesson idea.

> [Teacher 4] "Yeah, I use the Internet or I like to do a lot of cross curriculum stuff with other teachers especially science and math and we have been trying to do that. And I usually meet with the science teachers, and also, What are you guys doing? Do you have a specific standard or benchmark that you are trying to meet? So I can incorporate that into my lesson."

Contextually Authentic is a code representing the incorporation of real life situations into the lesson idea, and is a direct relation of the curriculum or lesson objectives that relates to a real world event that impacts the student's life directly.

> [Teacher 6] "OK. So I might get onto a Spanish language newspaper, and look for some articles surrounding that particular theme [in the lesson]. Or I might look for some short video clip on YouTube or what not surrounding that particular theme [in the lesson]."

> [Teacher 1] "My goal is reeling issues to get as much true to life as possible in my planning as possible. So I try to offer the images to associate the words that associate words with real life."

The professional development course impacted the approach of the lesson planning process. As a group only 50% explicitly stated that there was some change in how they

approached planning from a logistical or pedagogical standpoint. However, after further discussion most of the participants conceded that there had been some change. Teacher Three surmised after further probing by the interviewer, "So I guess I'm just more aware of how much more stuff I can do with my kids when implementing technology, and the reasons why."

Other codes that cropped up with this category were technological responses, and the resulting barriers to the technological responses. A technological response is a type of reply that focused primarily on the technological aspect of the professional development as opposed to the focus on how an educator's pedagogy was affected through the study of the TPACK framework. One third of the participants focused on how the professional development was already part of their decision matrix when considering lesson ideas, another third focused primarily on the barriers of technology, and the remaining interviewed discussed how regarding TPACK, and the purposeful use of technology within the TPACK philosophy impacted their approach to lesson planning.

Emotional responses happened frequently during the interviews. These responses were due to many of the physical barriers that limited educators in implementing a lesson plan or idea that surfaced in the professional development course. At times the barriers to implementing an idea using technology would create an emotionally charged response: [Teacher 4] "I would be really irritated, and I would be so frustrated.. I would be like this is my lesson and I want to do it and it's not happening."

Despite the emotional responses, some of the barriers were due to administrative, hardware, bandwidth, or software limitations. Other barriers as noted in the literature

such as self efficacy was minimal with only two of the six participants interviewed spoke about their efficacy issues when adopting technology in the planning process. Teacher One claims that, "I think I was afraid of technology to a certain sense." However, this fear has not stopped them from trying to learn to use and integrate technology in their lesson planning, or in curricular decision-making.

Research Question Two – Instructional Planning that Integrates Technology

Research question two focuses on how educators describe their process in planning instruction that integrates technology into the learning process. From the margin notes and subsequent codes, a central theme emerged which was entitled Integration. This category carries with it many different nuances regarding how planning can be significantly enhanced or regarded as a hindrance to the planning process. The complexity of content knowledge affects the decision making process to integrate technology. Weak or strong content knowledge resulted in a difficulty in extending or augmenting lessons with technology. In Shulman's (1986) consideration of content knowledge, teachers need to master two types of knowledge: (a) content, also known as "deep" knowledge of the subject itself, and (b) knowledge of the curricular development. This two phased approach can be seen in Teacher Three's comment about students performing lab write-ups. While Teacher Three's students were studying acceleration in a science lab, this educator reports that by using Glogster, "The technology fully reinforced the curriculum... and that the lesson became more student centered." A deep focus of content knowledge in this case became a driving factor on how students and

educators engage the curriculum through the use of stimulating applications of technology. Teacher Three's deep understanding of content allowed them to make curricular development decisions in regards to technology.

Teachers who successfully integrated technology into their planning process demonstrated strong TK and PK and PCK. In essence those educators demonstrated not only Shulman's understanding of content knowledge and how it affects mastery of teaching, but also it reflects strength within the TPACK framework.

Teacher Six also spoke about the factors involved in deciding to use technology, "So when I look at sites to use as supplements to what I'm doing, it has to with empowering students to interact in unique ways with the curriculum." This last comment was also a common piece of criteria regarding engagement as an important aspect of deciding to use technology in lesson panning. This co-occurring code embedded with integration was focused on how students engaged with the curriculum through the use of stimulating applications of Web 2.0 technology. The following examples are indicative to this code:

> [Teacher 3] "Class analysis and discussions were more purposeful when we used Glogster."
>
> [Teacher 1] "But a lot of times I also then try to figure out how I am going to present it and how am I going to make it exciting."

Web applications such as Glogster were popular tools amongst those interviewed. Web 2.0 technologies are cloud driven applications that are accessed through the Internet. The unique ease of use and low overhead allow Web 2.0 technologies such as Glogster, Quizlet, and Voice Thread to be easily used or integrated into the curriculum by educators. Despite their relative simplicity these applications have a unique approach to

create content rich learning experiences. These applications not only motivated students, but allowed for collaboration, increased productivity, and the opportunity to advance ones proficiency with the curriculum through a student centered focus. A good example of this is:

> [Teacher 3] "Enables students to extract important information and share it effectively... and the will present it and it will explain more of what they did and why that happened the way it did."

A natural progression with many Web 2.0 technologies is the ability for an educator to assess students formatively and summatively. Teacher Six uses Voice thread exclusively for summative assessments:

> [Teacher 6] "So the reason I felt this was more effective was A)it was a more effective way to assess, and B) because rather than going around one at a time, you know, putting a kid on the spot in the middle of the classroom... the could create their own bubble... and feel less pressure."

Lastly in this analysis of research question two, during the interviews there was a large amount of emotional sentiment about the barriers presented in using technology and how this affected the use of technology in planning. Barriers are defined in the previous section, but to reemphasize, there are limitations due to physical computer related or software related contingencies. Teacher Four speaks best about their hardware limitations in deciding to use technology.

> [Teacher 4] "You know we are running off of computers that were created in 1993 and 1994 you know. And it's kind of deceiving you know because you come in here and these kids are like, "Oh brand new computers!" And you know maybe its a nice monitor, but its the thing underneath the table you know?" And so its like is this computer even capable of doing it?"

While the last remark is present in research question one, the margin notes regarding research question two teased out the limitations of technical support by the IT

department and the administration. Teacher Four when talking about the response from the school administration on LCD projectors relates an administrative barrier, "... and well they were like, we didn't just want to give them to you teachers just because you want them."

Administrative and IT barriers were co-occurring codes that were incorporated into the integration category. One group of educators found workarounds to these various limitations regarding out dated equipment or bandwidth issues. Teacher Three when using old hardware that infrequently breaks down had this to say, "So when our laptops or our LoggerPro's aren't working, that whole lab station is done... So those kids are limited in what they are learning..." A common workaround for Teacher Three pairs the students with other groups, however she realizes that all students work at different pacing, and may result in diminished understanding of part of an experiment.

Along with workarounds there were those who also chose to workaround the problem by choosing to do something else. This lends to making other decisions with the curriculum that may not include technology. Teacher Four gave an example of one of her colleagues who expressed dissatisfaction with bandwidth and the availability of resources, "I'm done, ...If I cannot do the lesson with the schools computers then I move on to something else." Similar sentiments were expressed due to the limited availability of bandwidth or other hardware related contingencies such as computers not functioning or slow processing speeds.

Finally, articulating content with technology proved to be challenging for a fraction of the educators due to the lack of time or as Shulman (1987) eloquently calls, "the

wisdom of practice" (p. 11). Teacher Two expressed, "I like to know what I'm doing before I teach. I don't always try things unless I am confident." Later in the interview Teacher Two also had this to say in regards to "the wisdom of practice": "...and this is a tough year, and it's just not a battle I'm willing to fight."

Research Question Three – TPACK Alignment with Intention to Integrate Technology

Matthew Koehler (2011) asserts that, "Technological Pedagogical Content Knowledge (TPACK) attempts to identify the nature of knowledge required by teachers for technology integration in their teaching, while addressing the complex, multifaceted and situated nature of teacher knowledge" (p. n.d.) In light of this definition the researcher wished to view this framework as it relates to how a teacher's self reported TPACK aligns with their intention in planning instruction that integrates technology.

The particular cohort studied had undertaken a professional development course, and a semester later the interviewer asked the educators to reevaluate their self-assessment regarding TPACK as it aligns with their present intentions to plan with technology. This portion of the interview also asked if the professional development caused any significant change to their pedagogy, and what future support would be needed to increase their TPACK as a whole.

The interviews revealed that there were two views regarding TPACK as it related to an educator's planning process. One view strictly looked at the domain of simply integrating technology. These individuals tended to view TPACK as separate domains, or in fragments, while another set of educators considered the many facets of TPACK as a conceptual whole. However, with the latter group, a lower TPACK score was self-

assessed due to the ubiquitous nature of the technologies used had become transparent or the existential view of technology changed from an otherness or something separate to simply being a part of the curriculum. Teacher Six provides a good example of how transparency affects one's TPACK score:

> [Teacher 6] "I think I have used technology less this year than in years past. I don't know if that's... It's possible maybe my concept of what I have used has been reduced because some the technology I use now is more transparent than it used to be. Take the LCD projector for example or Quizlet... it's just one of the ancillary materials used to teach."

Research question three culminated around the purposeful integration of technology as it relates to future and present forms of intent to purposefully plan for technology. After analyzing the margin notes a set of preliminary codes emerged on how this would be accomplished and maintained. These were later refined into the sub-code termed TPACK.

In regards to TPACK, most respondents provided two different types of TPACK self-assessment scores: one based on the pure integration of technology, and the other based on their current understanding of the TPACK framework. These were coded as TPACK-I (for integration) and as TPACK-U (current conceptual understanding).

TPACK-I was heavily laden with physical barriers and other pedagogical constraints such as time, classroom management, or by the wisdom of practice. An example of the occurrence is noted by Teacher Two.

> [Teacher 2] "Currently I would say that my TPACK is about a three. This is not really where I would like to be. My capability of being able to use my TPACK, does not, is not reflected in my lesson plans due to the type of students this year, and the availability of technology."

Teacher Four, and as previously mentioned by Teacher Six both present a good

case for TPACK-U as they focus on the many interrelated domains of TPACK throughout their interviews:

> [Teacher 4] "I realized I needed to take an assessment of what they are capable of doing and what they know [technology wise]. And then probing them for information and then giving them a chance to go out and research and find some information on their own... as for my TPACK, I think it would be at a five because I use it you know I really do use it. And I try to really use it in the class."

The final theme that emerged from this group was Support. This theme is multifaceted in that it includes codes covering Informal Collaboration, Professional Development, and Administrative types of support. Informal collaboration is what occurs between colleagues. Talking with other teachers or professionals allows an educator to be exposed to various ideas and methods that can feed into ones intentional use of technology. Teacher Four has formed this type of informal collaboration by leading Teacher Tech. This was a response to the lack of professional development opportunities relating to technology integration:

> [Teacher 4] "Teacher Tech is that we are not getting professional development, and we are not getting the stuff we need so if we band together we come up with solutions on our own. And we get out of it is that we advance ourselves."
>
> [Teacher 1] "Using Prezi is a really cool thing I never learned about that. I mean another teacher showed me that."

Professional development codes define personal commitment to develop as an educator as it relates to the purposeful implementing technology. Much of the cannon of literature on professional development as it relates to TPACK development and technology integration calls for on-going professional development and sustained support through the learning process. Professional development examples were numerous and in

general each educator specified its need and importance.

> [Teacher 1] “Oh I would say more professional development. I would say more, you know, just keeping up with what is current. You know I think that is most important.”

Finally to round out the coding for research question three, educators remarked that there needed to be more interventions by the administration and from the IT department. Administrative/IT codes identified the types of support that are afforded by Administrative influence or by direct application by the school IT department. Administrative comments were more geared toward allowing educators more prep time to learn new things, funding for new equipment and bandwidth, and more sponsored professional development with the school district. For example, Teacher Two stated there was a need for, “...Instructions on how to use it and time to learn how to integrate.” Teacher Five had this to say about the necessity of having in house IT support:

[Teacher 5] “...but I wish there was someone in house I could go to and say, "I have this great idea how can I put this technically put this together?" Teacher Six also spoke of the strained time constraints of the IT Department, and how the system administrator has gone from managing servers to becoming the repair guy:

> [Teacher 6] “I think they are tied up, maybe the problem, maybe the reason they think that I am the repair guy and not a blank, is that this is what they are doing most of the time. Repairing broken mice, keyboards, fixing email server problems, and not enough time... Maybe that should be handled by technicians, and there should be a few more folks who, you know are looking at educational technology specifically.

The themes emerging from the data, all point to significant findings as they relate to specific criteria that affect the decision making process to integrate technology into their lesson planning.

Table 4.2 Categories Resulting from Data Analyses

Category	Codes Sub-Codes	Description	Examples
Research Question 1			
Process	Logistics	Logistics ranged from chemicals on hand to perform a lab, or getting the approval from the administration to unblock a web site	[Teacher 3] "Well I just first look at the supplies I have. You know so like with chemistry we can just do regular laboratory with the equipment that I have, chemicals and stuff." [Teacher 4] "...But I have to think about first okay how many computers do I have working? I have to get approval from the curriculum department so they can unblock a web site."
Process	Pedagogical Transformation	Describes the process or types of knowledge that aid an educator in the developing of an idea, and considering multiple dimensions of how to determine the feasibility of a lesson idea. This coincides with Shulman's concept of Pedagogical Reasoning.	[Teacher 2] "Okay so I like to look at the end goal. At the end of this unit or at the end of the story they're going to have the skills... So my lesson plan is how are we going to get to there. So here is the end goal and we'll do the steps to get there." [Teacher 1] "...So is

Table 4.2 Categories Resulting from Data Analyses – Continued

Category	Codes Sub-Codes	Description	Examples
			it going to be exciting? Are they going to be moving? Are they going to be involving technology? Am I going to be doing all of the talking? Are they going to be doing the talking? Are they teaching or am I teaching? You know we both can teach it. Is it going to be out loud or listening? All those things with language come into play. So once I decide what to do then I figure out how to plan."
Process	Pedagogical Transformation	Describes the process or types of knowledge that aid an educator in the developing of an idea, and considering multiple dimensions of how to determine the feasibility of a lesson idea. This coincides with Shulman's concept of Pedagogical Reasoning.	[Teacher 2] "Okay so I like to look at the end goal. At the end of this unit or at the end of the story they're going to have the skills... So my lesson plan is how are we going to get to there. So here is the end goal and we'll do the steps to get there." [Teacher 1] "...So is it going to be exciting? Are they

Table 4.2 Categories Resulting from Data Analyses – Continued

Category	Codes Sub-Codes	Description	Examples
			going to be moving? Are they going to be involving technology? Am I going to be doing all of the talking? Are they going to be doing the talking? Are they teaching or am I teaching? You know we both can teach it. Is it going to be out loud or listening? All those things with language come into play. So once I decide what to do then I figure out how to plan."
Resources	Established Curriculum	Embodies how a lesson idea may best represent a real life example that is relevant to the lives of the student.	[Teacher 3] "I will even use my college books, like extra text books or other texts from when I taught high school. I just bring whatever I can to modify the information to my kids needs, but the Internet is probably my main resource. Whether its an actual lesson that I want to modify, or just information the background information and make it relevant.

Table 4.2 Categories Resulting from Data Analyses – Continued

Category	Codes Sub-Codes	Description	Examples
			Because you know I hear, so what Teacher 3 how does this apply to me?" [Teacher 5] So then I look at all the resources and in history they, part of our standards is that they learn how to read primary documents. So I look at what kind of documents would help them understand the content that I want them to know.
	Internet	This code describes how an educator utilizes the Internet to further an idea or to see if a lesson already exists so that it may be used or modified.	[Teacher 4] "Yeah, I use the Internet or I like to do a lot of cross curriculum stuff with other teachers especially science and math and we have been trying to do that. And I usually meet with the science teachers, and also, What are you guys doing? Do you have a specific standard or benchmark that you are trying to meet? So I can incorporate that into my lesson."

Table 4.2 Categories Resulting from Data Analyses – Continued

Category	Codes Sub-Codes	Description	Examples
	Contextually Authentic	Incorporates real life situations into the lesson idea. It is a direct relation of the curriculum or lesson objectives that relates to a real world event that impacts the students life directly.	[Teacher 6] "OK. So I might get onto a Spanish language newspaper, and look for some articles surrounding that particular theme [in the lesson]. Or I might look for some short video clip on YouTube or what not surrounding that particular theme [in the lesson]." [Teacher 1] "My goal is reeling issues to get as much true to life as possible in my planning as possible. So I try to offer the images to associate the words that associate words with real life."
Impact of PD	Tech Response	Responses made to the difficulty of integrating technology as opposed to how the professional development curriculum affected planning decisions.	[Teacher 5] "I am a young teacher. I only graduated five years ago from College X so I was taught to use technology." [Teacher 3] "I guess a little bit."

Table 4.2 Categories Resulting from Data Analyses − Continued

Category	Codes Sub-Codes	Description	Examples
			[Teacher 2] "No... because we just don't have the technology, this has been a year were you know if the technology had been in place I would have used it more."
	Barriers	Barriers manifested in many ways throughout the interviews, these included emotional responses, administrative, hardware, bandwidth, software limitations.	Emotional [Teacher 2] "Our sixth grade class is extremely challenging." [Teacher 4] "I would be really irritated, and I would be so frustrated. I would be like this is my lesson and I want to do it, and it's not happening." [Teacher 6] "I am more focused on what I'm teaching, and then what tools not only could, but best allow students to interact with the materials."
<u>Research Question 2</u>			
Integration	Content Knowledge	The complexity of content knowledge affects the decision	[Teacher 3] "The technology fully reinforced the

Table 4.2 Categories Resulting from Data Analyses – Continued

Category	Codes Sub-Codes	Description	Examples
		making process to integrate technology. Weak or strong content knowledge resulted in a difficulty in extending or augmenting lessons with technology.	curriculum." [Teacher 6] "So when I look at sites to use as supplements to what I'm doing, it has to with empowering students to interact in unique ways with the curriculum."
	Engagement	How students engage the curriculum through the use of stimulating applications of technology.	[Teacher 3] "Class analysis and discussions were more purposeful when we used Glogster." [Teacher 1] "But a lot of times I also then try to figure out how I am going to present it and how am I going to make it exciting."
	Web 2.0	Web 2.0 technologies are cloud driven applications that are accessed through the Internet.	[Teacher 3] "Enables students to extract important information and share it effectively... and the will present it and it will explain more of what they did and why that happened the way it did."
	Assessment	Refers to the nature	[Teacher 6] "So the

Table 4.2 Categories Resulting from Data Analyses – Continued

Category	Codes Sub-Codes	Description	Examples
		of how to assess student's work if technology was utilized.	reason I felt this was more effective was A) it was a more effective way to assess, and B) because rather than going around one at a time, you know, putting a kid on the spot in the middle of the classroom... the could create their own bubble... and feel less pressure."
	Barriers Admin/IT dept. Wisdom of Practice	Barriers due to a lack of IT technical support, or by the school administration. These were also caused by hardware and software related issues.	[Teacher 4] "You know we are running off of computers that were created in 1993 and 1994 you know. And its kind of deceiving you know because you come in here and these kids are like, "Oh brand new computers!" And you know maybe its a nice monitor, but its the thing underneath the table you know?" [Teacher 4] "... and well they were like, we didn't just want to give them to you teachers just because you want

Table 4.2 Categories Resulting from Data Analyses – Continued

Category	Codes Sub-Codes	Description	Examples
			them."
			[Teacher 3] "So when our laptops or our LoggerPro's aren't working that whole lab station is done... So those kids are limited in what they are learning..."
			[Teacher 2] "I like to know what I'm doing before I teach. I don't always try things unless I am confident."
			[Teacher 2] "...and this is a tough year, and it's just not a battle I'm willing to fight."
Integration	TPACK-I	TPACK-I represents a TPACK score that is influence by physical barriers and other pedagogical constraints such as time, classroom management, or by the wisdom of practice.	[Teacher 2] "Currently I would say that my TPACK is about a three. This is not really where I would like to be. My capability of being able to use my TPACK, does not, is not reflected in my lesson plans due to the type of students this year, and the availability of technology."

Table 4.2 Categories Resulting from Data Analyses – Continued

Category	Codes Sub-Codes	Description	Examples
	TPACK-U	TPACK-U represents a TPACK score that is influence by a conceptual understanding of the TPACK framework.	[Teacher 4] "I realized I needed to take an assessment of what they are capable of doing and what they know [technology wise]. And then probing them for information and then giving them a chance to go out and research and find some information on their own... as for my TPACK, I think it would be at a five because I use it you know I really do use it. And I try to really use it in the class."
Research Question 3			
Intentional Integration	Informal Collaboration	Informal collaboration is what occurs between colleagues. Talking with other teachers or professionals allows an educator to be exposed to various ideas and methods that can feed into ones intentional use of technology.	[Teacher 4] "Teacher Tech is that we are not getting professional development, and we are not getting the stuff we need so if we band together we come up with solutions on our own. And we get out of it is that we advance ourselves." [Teacher 1] "Using

Table 4.2 Categories Resulting from Data Analyses – Continued

Category	Codes Sub-Codes	Description	Examples
			Prezi is a really cool thing I never learned about that. I mean another teacher showed me that."
	Professional Development	This codes defines personal commitment to develop as an educator as it relates to implementing technology.	[Teacher 1] "Oh I would say more professional development. I would say more, you know, just keeping up with what is current. You know I think that is most important."
	Administration/IT	These codes identified the types of support that are afforded by Administrative influence or by direct application by the school IT department.	[Teacher 5] "...but I wish there was someone in house I could go to and say, "I have this great idea how can I put this technically put this together?"

CHAPTER 5

SUMMARY

Discussion

This research was designed to explore the relationship between instructional decision-making, and effective technology integration as it relates to the TPACK framework. This chapter provides a summary and interpretation of the findings, evaluation of the methods used to collect and analyze the data, describes the studies contribution to the literature, implications for professional practice, and finally provided recommendations for further study.

Summary and Interpretation of the Findings

The participants in this study were drawn from a group of teachers who work in a rural school district in the Rocky Mountain West. The group of teachers consisted of eighteen K-12 enrolled in a professional development course facilitated by a University in the Rocky Mountain West. The group was introduced to various technologies, and asked to provide evidence that demonstrates the integration of technology in their curricular planning. Nine middle school and high school teachers were purposefully selected to participate in a semi-structured face-to-face interview. Six out of the nine participants were only available to partake in the face-to-face interview. The participants produced a Technology Integration Rationale (TIR) that was scored with a TPACK rubric designed by Harris & Hofer (2012). Participants' responses to interview questions were

analyzed to discern the development of the educators' TPACK and assess their overall implementation of technology as it relates to curricular planning decisions.

Table 5.1 Articulation of Research Questions, Data Sources, and Findings

Research Questions	Data Source	Findings
1. How do educators describe their process of instructional planning?	InterviewQ1: Please briefly describe your planning process. InterviewQ2:What types of resources do you use in lesson planning? InterviewQ3:Has the professional development course affected the way you approach lesson planning? If so how?	1. Process 2. Resources 3. Impact of PD
2. How do educators describe their process of planning instruction that integrates technology?	InterviewQ4:When it comes to including technology in your lesson planning, what are the major factors that influence your decision making process? InterviewQ5:Describe a time when you had success when integrating technology in our lesson plan. InterviewQ6:How have you successfully delivered course content, technologies, and or teaching approaches in the classroom lesson or in planning?	1. Integration
3. How does a teacher's self-reported TPACK align with his or her intention in planning instruction that integrates technology?	InterviewQ7:A semester later where are you on a scale of 1 to 5, where would your rate your TPACK regarding integrating technology into your lesson planning? InterviewQ8:After participating in the professional development course how has this affected your purposeful use of technology in your lesson planning? InterviewQ9:In what ways do you research or discover new or developing technology ideas in education? InterviewQ10:What type of future support would you need in order to continue technology integration in your lesson planning? Technology Integration Rationale (TIR) score	1. Intentional Integration

Technology Rationale & Face-to Face Interview

During a professional development course facilitated by a University in the Rocky Mountain West, each member a cohort of in-service educators wrote a technology integration rationale (TIR). This TIR was a summative type of assessment regarding how an educator might design a lesson that integrates technology based upon the TPACK framework and introduction to other technology rich applications, and discussions.

Each TIR was assessed a TPACK score using an instrument introduced by, Harris, Grandgenett, & Hofer, (2012). The results showed that almost half of the participants were advanced proficient with the remaining members of the cohort proficient or nearing proficient when providing a rationale for integrating technology within their lesson planning process.

In response to the TIR the researcher interviewed educators to get a sense of how, in light of the professional development and the understanding of the TPACK framework, educators approached lesson planning with technology in mind. The face-to-face semi-structured interviews were generally conducted in the school classroom of each educator and lasted approximately 25-35 minutes. Two interviews were conducted off school grounds at a local coffee shop. Each interview was hand transcribed verbatim and then analyzed following protocols suggested by Lincoln & Guba, (1985), and Johnson & Christensen (2012).

In the interest of how the educators described their process of lesson planning, the researcher looked at how a lesson idea was used as a catalyst into developing a full lesson or instructional unit. The data indicates that the decision-making process is paramount to

the integration of technology in the classroom. Findings suggest that not all lessons are born equally, and are subject to many different logistical tests before the central idea becomes a lesson. For some educators this process started with the location of finding available resources, others cited contextual factors that resulted in the development of the idea or not. Resources were materials that ranged from textbooks or other district approved ancillaries to technology. Technology included data collection probes to Internet based applications, bandwidth availability, and functioning up to date equipment.

Contextual factors included classroom behaviors, time, logistical availability of resources, and in some cases district approval to carry out the idea. Other contextual factors included the elements of TPACK. The domains inherent in the TPACK conceptual framework were in general part of the decision making process to go forth with an idea. However, the decisions teachers made regarding the development of an idea into a lesson did not follow a specific pattern. Each educator weighed his or her own unique idea with an individual heuristic, and as a result they were more focused on the learning objectives and student outcomes during this conceptualization phase. This result is consistent with the findings of Shavelson & Stern (1981) although, the findings are more consistent with the work of Harris & Hofer (2009). This conclusion however may be confounded due to the lack of a control group in the study.

Decisions that were made when considering technology during instructional planning focused mainly on barriers that resulted from deficiencies within the school. These deficiencies ranged from insufficient bandwidth to disrepair or outdated equipment. Two educators commented on the time constraints of integrating technology,

and one of these educators remarked that they lacked sufficient knowledge to successfully integrate technology when planning a new lesson. This also was reflected in the educator's TPACK score in both the rationale and in their response to the TPACK interview question.

In regards to how an educators TPACK score aligned with their self-assessment there were many different variables that affected sufficient reporting. Most educators found that two scores were needed. The first satisfied their understanding of the conceptual framework and philosophy of TPACK, and a second score satisfied a professional assessment of how one was performing or meeting the suggestions within the conceptual framework. This second account seemed to be more of a technocentric (Papert, 1987) evaluation than looking at one's decisions regarding lesson planning.

The central focus on Technocentrism is defined as, "the fallacy of referring all questions to the technology," and this dominated much of the interview process (Papert, n.d.). The interviewer repeatedly would have to clarify the question or refocus a response to think about the decisions made and not the technology used.

Teacher Six is a good example of this dichotomy:

> [Person 6] Okay so three and half on my answer, to be able to answer the question, why or why not integrate given technology based on TPACK. I think I might go with a two on, you know, how often I am actually taking it to that level. So in another words two being, I'm saying to myself I am not doing this often enough.

An educator's TPACK score was also reduced when issues of transparency, or when the use of technology seemed diminished in the eyes of the educator. Technology in this sense was deemed as an ancillary part of the curriculum. In such cases technology

reached full its full acceptance or adoption within the pedagogical tools available to the educator.

Finally, the analysis demonstrates the importance of sustained professional development in technology integration, and in the educator's own development as a professional. Teacher's whose TPACK score was 12 or better commented that they consistently were watching educational trends or accessing blogs or journals that implemented purposeful applications of technology in lesson plans or pedagogies. These educators consistently demonstrated a natural curiosity toward applying technology to their own practice.

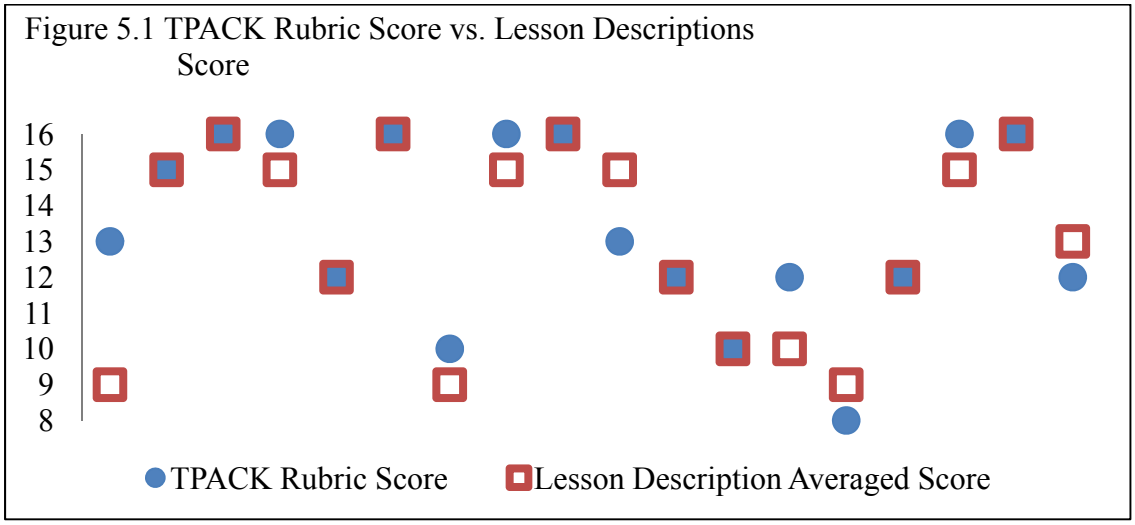
Evaluation of Methods Used to Collect and Analyze Data

The evaluation methods used to collect data were two fold. One process was to score professional development rationales of 18 in-service educators. Each TIR was scored using the Technology Integration Scoring Rubric created by Harris et. al. (2012). This assessment of each TIR produced a TPACK score based on the four dimensions as specified by Harris & Hofer (2012). Each TIR was assessed using the same methodology as the described by Harris et. al.(2012) in an effort to uphold the validity of the rubric.

The researcher then employed a creative methodology to limit scoring bias in the use of the rubric. Using the TPACK Interview Protocol (Harris et. al., 2012), the researcher developed a Likert scale of 1 to 4 in which a score of 4 was strong evidence of TPACK and a score of 1 was weak evidence of TPACK. The questions were used to validate the decisions made on the scoring rubric as each question in the Interview

Protocol relates to the four dimensions of the Technology Integration Scoring Rubric.

The results between the mean rubric score and the mean interview score showed that there was a negligible difference in the scores for each teacher as shown in Figure 5.1. This is not evidence of correlation between the two instruments nor does it provide accuracy in measuring bias. However, it does provide some evidence that when the TIRs were scored twice using two different instruments by the same rater, the scores were relatively similar.



In evaluating the face-to-face semi-structured interviews the notion of technocentricity was readily apparent with each educator interviewed. The interviewer had to consistently ask the educators to disregard technology and focus on the words of the question. Since the participants had prior knowledge to the nature of the interview it may have created a hidden bias to the way an interviewee may have responded.

Analysis of the interview data followed standard qualitative research protocols as articulated by Johnson & Christensen (2012) and the work of Lincoln & Guba (1985).

Due to the nature of the open-coding and co-occurring codes the research would have benefitted from a collaborative effort from other researchers. However, the results provided many consistent themes that are inherent in technology integration literature. The various types of barriers, time constraints, and the necessity of ongoing professional development are central themes in the cannon of literature (Buckenmeyer, 2008, Walker & Sheppard, 2010).

Contribution to the Literature

Alignment with Previous Research

The data collected and its analysis aligns with many different aspects of research interested in technology integration as it relates to the broad field educational research. Its articulation with past research encompasses several different research areas. At its heart is the interest of the research community in regards to the TPACK conceptual framework (Koeler & Mishra, 2006). This educational theory is gaining traction in many different communities. The budding research community regards technology integration and TPACK in public schools as a necessary and viable element to student outcomes and career readiness. This research aligns with the cannon of literature that is focused on decision-making as it relates to educator and student learning objectives, curriculum development, and associated pedagogical potentials that are inherent through purposeful integration of technology (Xiaoyu & Kang 2010).

This paper is also aligned with previous research regarding professional development in its many manifestations including educator and administrator efficacy, barriers such as accessibility, hardware related deficiencies, lack of help desk support,

and lack of sufficient time to plan or research new developments regarding technology and its proper use in the classroom (Collins & Halverson, 2009, Ertemer, 2010, Moersch, 2011, Buckenmeyer, 2008).

The many facets of adoption (Everett, 2003) as it relates to introducing technology into the decision making process of educators (Shavelson & Stern, 1981) is also found in this study. The work of Shulman (2006; 2007) in regards to the various types of rationales that encompass the planning process is also at the heart of this research. Shulman's influence touches many different papers that research the domains inherent in the types of teacher knowledge necessary in the decision, and planning process. One major influence can be found in the growing body of TPACK literature (Harris et al. 2009, 2010, 2011, 2012, Koehler & Mishra, 2006, 2008, Koeler, 2010).

This extension of pedagogical content knowledge with the addition of technological knowledge is the foundational kernel in guiding this research. This study not only examined decision-making as it relates to technology integration, but also looked at the influence of professional development and purposeful application of the TPACK framework in curriculum planning and decision making.

Extending Previous Research

This paper contributes to the cannon of literature in that it raises a significant question regarding TPACK and the need to develop an instrument that safeguards against the bias of ubiquitousness in research data. It became prevalent during the transcribing of the interviews that technological transparency was emerging as a central theme as a barrier to self-assessing one's TPACK score.

This raises an interesting question in the light of the growing literature on technology integration. Is technological knowledge really a separate domain, or is it really an aspect of Shulman's original concept of pedagogical content knowledge? This theoretical shift may change the way all stakeholders view technology research and education. This change of focus would give validity to Xiaoyu & Kang's (2010) critique of what they regard as a stasis in technology integration and research. They explain that, "experts would conduct research on educational technology, but many at times would neglect the second matter of looking at their research in lieu of their own curriculum" (p. 273).

In defense of TPACK the many collaborators to this theory have followed the suggested methodology of Xiaoyu & Kang (2010). However, once the adoption phase of integration is realized, theory and practice may begin to affect the entire knowledge process as Xiaoyu & Kang (2010) see the integration of technology as a cognitive tool that promotes students to create their own personal learning environments (p. 273).

Implications for Professional Practice

The implications for professional practice regarding technology integration have been written about extensively in the literature. The findings from this study indicate that in-service educators need sustained and purposeful technology integration development. The increase of personal or intrinsic motivation of an educator, in regards to increasing technological knowledge, had a significant effect on an educator's integration of technology. This was evident in the data collected, as when teachers described their

decision-making process to use technology, those decisions were influenced by personal research and past professional development. Also, teachers who spoke of sustained research and their involvement in their own professional development spoke of technology as becoming more transparent, and regarded various technologies as another ancillary resource to their pedagogy and curriculum.

The evidence also suggests that as an educator's TPACK understanding increases, the conceptual notion of technology becomes less techno-centric. Among those who continue to further their knowledge base of best practice methodologies in informational technology, and its practical implementation in education, there is a noticeable difference in an educators TPACK score.

This type of personal philosophy would greatly enhance the integration process of technology. Increases in technological knowledge among gatekeepers, Everett (2003) or school administrators may significantly lesson internal pressure to approve more technology integration as, "a change agency's reputation and credibility in the eyes of its clients rests on only recommending innovations that will have beneficial consequences for adopters (p. 156). The professional application of an administrator's TPACK would greatly influence the adoption process of technology and address issues such as barriers to integration, such as bandwidth, hardware, professional development, and increased articulation with standards as were discussed in the interviews.

Recommendations for Further Study

In the interest of planning and the development of TPACK one finding that was of interest was how an individuals self-assessed TPACK score could be confounded by the repetitive use of a technology. In a sense, technology ceases to be technology when it becomes an integral part of ones life. As a technology becomes familiar to the individual it becomes more seamless and less obtrusive (Poslad, p. 12). This less obtrusive nature in technology integration as it relates to decision making and planning caused intellectual turmoil in many educator's when self-assessing their TPACK score.

In regards to recommendations on further research, this researcher would welcome more studies focused on the phenomenon of transparency as it relates to the TPACK framework. This specific type of research could potentially shed light on how the ubiquitous nature of technology may manifest its self in a variety of ways. Longitudinal studies of transparency could be studied within the various aspects of the TPACK literature: adoption practices, teacher efficacy, curricular decision-making, and pedagogical methodologies.

The development of a transparency instrument may also be of importance in guiding institutions or individuals to better gauge their placement in the stages of technology integration. This instrument would also be important in gauging what types of professional development may be necessary in administrative or staff development.

Other research on how TPACK affects the meta-cognitive decision-making process would also be beneficial in further validating the growing prominence of the theory. This research would focus on the decision-making pathways that are inherent in

developing a lesson concept into a viable piece of curriculum that better serves the goals and objectives of the educator. One such area would be to examine the recognition-primed decision (RPD). This type of decision-making may be of importance as it relates to how educators make quick decisions when weighing technological interventions or practices. Klein, Calderwood, & Clinton-Cirocco (2010) present a compelling view of this type of research in, "which decisions are made by highly proficient personnel, under conditions of extreme time pressure, and in environments where the consequences of the decisions could affect lives and property" (p. 186). Educators face a similar type of importance in regards to student outcomes, and administrative allocation of resources.

Finally, a larger study of the present research may aid in developing a specific qualitative coding protocol that would allow researchers to transcribe interviews. The developed protocol would aid researchers in developing more insight into transparency, TPACK decisions, and how particular technologies are selected in an educational setting.

Conclusion

The purpose of this study was to examine how in-service teachers describe their decision-making process as it is informed by professional development and evident in written artifacts and personal interviews connected to the TPACK framework. The study set to answer three questions as they relate to how educators describe the process of instructional planning, how educators describe their process in planning instruction that integrates technology, and how does an educators self reported TPACK score align with his or her purposeful intention to plan instruction that integrates technology?

To answer these questions the researcher conducted a baseline understanding of the studies participants' understanding of the TPACK framework by scoring a TIR from each member. It was found that the median TPACK of the educators in question was a score of thirteen. This result conferred with the literature in regards to an acceptable level of proficient technology integration. It also speaks to the other two questions in that a proficient TPACK score can provide evidence to verify an educators purposeful use of technology and give evidence to the decisions needed to create a successful lesson plan that incorporates technology and aligns with curricular goals.

Finally the personal interviews concluded that lesson planning is situational, and governed by many different factors. Each educator that was interviewed described the necessary steps to mold an idea into an engaging lesson that integrated technology. This decision pathway was slightly different for each educator, but each shared aspects of the same process. Each member described in somewhat similar terms their process as, alignment of resources, defining learning objectives, meeting standards. The participants also articulated that the purposeful use of technology must aid in student engagement and achievement as lessons are assessed formatively and summatively.

"Optimally, teachers' planning, instructional actions, interactions with students, and reflections upon those actions and interactions should *all* be examined to determine the nature and extent of their TPACK" (Mishra, et al., p. 2, 2012). It is the hope of this researcher that the inclusion of decision-making as it relates to TPACK framework be also included within the esteemed authors list. As decision-making forms the nexus from which educators create references that often determine how technology will be integrated.

This is naturally dependent on an educator's skill at recognizing the utility of technology, as expressed through continued professional development, and further study and practice with the purposeful application of the TPACK framework.

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APPENDICES

APPENDIX A

INTERVIEW QUESTIONS

Instructional Planning Process:

Planning instruction that integrates technology

1. When it comes to including technology in your lesson planning, what are the major factors that influence your decision making process?
2. Describe a time when you had success in integrating technology into your lesson plan?
3. How have you successfully delivered course content, technologies, and teaching approaches in a classroom lesson or in planning (Schmidt et al., 2009)?
4. Describe a time when you had some challenges integrating technology into your lesson plan?

TPACK score alignment with Technology Rational and intention to plan and integrate technology

5. A semester later where are you on a scale of 1 to 5 where would you rate your TPACK regarding integrating technology in your lesson plans?
6. After participating in the professional development course, how has this affected your purposeful use of technology in your lesson planning?
7. Since the course do you continue to learn or access information about integrating technology in your lesson planning? If so how?
8. In what ways do you research or discover new or developing technology ideas in education?
9. What type of future support would you need in order to continue technology integration in your lesson planning?

APPENDIX B

CODING FORMATTING

Coding Formatting:

1. Times New Roman 12-point face-font

2. One-inch top, bottom, right, and left margins

3. All text shall begin at the left-hand margin (no indents)

4. Entire document shall be left justified

Transcript Coding:

Location:

Date:

Participant Code:

Name of Transcriber:

Length of Interview:

□□□

APPENDIX C

INTERVIEW PROTOCOL

This interview protocol was used to assess both the TIR's and the interview transcriptions in this study. The "Lesson Description" and the "TPACK-Specific Questions" were used as a validation tool to discern how the wording of the Technology Rational validated against the TPACK scoring rubric. A Likert scale was applied to the Lesson Description portion of the scoring rubric and in the TPACK Specific Questions found in Harris et al. (2010; 2012).

The following protocol and scoring rubric as depicted in Table 6.1, was used by Harris et al. (2010, 2012) to assess both a TIR and TPACK interviews as they relate to in-service educators.

Lesson Description - Technology Rationale Likert Scale

1. Describe the content and/or process topic(s) for the lesson.
   4 3 2 1
2. Describe the student learning goals/objectives addressed in the lesson. (These will not necessarily be state or national standards. Participants should describe these in their own words.)
   4 3 2 1
3. Describe your students (e.g. grade level, and specific learning needs/preferences).
   4 3 2 1
4. Walk me through the lesson/project as it unfolded in the classroom.
   4 3 2 1
5. What educational technologies (digital and non-digital) did you use and how did you and/or your students use them?
   4 3 2 1
6. Describe any contextual information (e.g. access to a computer lab, materials and resources available; particular departmental/school-wide initiatives) that influenced the design or implementation of the lesson/project.
   4 3 2 1

TPACK –Specific Questions

1. How and why do the particular technologies used in this lesson/project "fit" the content/process goals?
   4 3 2 1
2. How and why do the particular technologies used in this lesson/project "fit" the instructional strategies you used?
   4 3 2 1
3. How and why do the learning goals, instructional strategies, and technologies used all fit together in this lesson/project?
   4 3 2 1

APPENDIX D

TECHNOLOGY INTEGRATION ASSESSMENT RUBRIC

Table 6.1 TPACK Scoring Rubric[1234]

Criteria	4	3	2	1
Curriculum Goals & Technologies (Curriculum-based technology use)	Technologies selected for use in the instructional plan are strongly aligned with one or more curriculum goals.	Technologies selected for use in the instructional plan are aligned with one or more curriculum goals.	Technologies selected for use in the instructional plan are partially aligned with one or more curriculum goals.	Technologies selected for use in the instructional plan are not aligned with any curriculum goals.
Instructional Strategies & Technologies (Using technology in teaching/ learning)	Technology use optimally supports instructional strategies.	Technology use supports instructional strategies.	Technology use minimally supports instructional strategies.	Technology use does not support instructional strategies.
Technology Selection(s) (Compatibility with curriculum goals & instructional strategies)	Technology selection(s) are exemplary, given curriculum goal(s) and instructional strategies.	Technology selection(s) are appropriate, but not exemplary, given curriculum goal(s) and instructional strategies.	Technology selection(s) are marginally appropriate, given curriculum goal(s) and instructional strategies.	Technology selection(s) are inappropriate, given curriculum goal(s) and instructional strategies.
"Fit" (Content, pedagogy and technology together)	Content, instructional strategies and technology fit together strongly within the instructional plan.	Content, instructional strategies and technology fit together within the instructional plan.	Content, instructional strategies and technology fit together somewhat within the instructional plan.	Content, instructional strategies and technology do not fit together within the instructional plan.

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3. Adapted from: Britten, J. S., & Cassady, J. C. (2005). The Technology Integration Assessment Instrument: Understanding planned use of technology by classroom teachers. Computers in the Schools, 22(3), 49-61.
4.