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# Examining Preservice Teachers' Creativity and Use of Mobile Learning Technology Within Instructional Practices

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# EXAMINING PRESERVICE TEACHERS' CREATIVITY AND USE OF MOBILE LEARNING TECHNOLOGY WITHIN INSTRUCTIONAL PRACTICES: AN INTERPRETIVE QUALITATIVE STUDY

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The prevalent use mobile learning technology and the nearly universal access to the Internet have transformed educators' perspectives of how students learn and how teachers teach. In an educational climate where teacher effectiveness is tied to student achievement, it is necessary for teacher educators to identify and respond to factors that contribute to the development of preservice teachers' creativity and effective use of mobile learning technology.

This qualitative study focused on examining preservice teachers' perceptions of the ways creativity is displayed within their instructional practices when mobile learning technology is utilized. The study participants included 30 preservice teachers enrolled in a methods block of courses focusing on teaching in grades 1-4 within an Early Childhood PreK-4$^{th}$ Grade teacher education preparation program at a public university. The researcher utilized the Mobile Learning Technology and Creativity (MLTC) survey, focus group interviews, and collection of written methods courses assignments to collect data.

The data gathered from the instruments suggested that preservice teachers, who are members of the current generation of students known as the Net Generation, perceive themselves to be prolific, knowledgeable, and creative users of mobile learning

technology for improving their instructional practices through modification of existing resources. The data also suggested that they perceived the use of their mobile learning technology as significantly contributing to that creativity.

Qualitative data gathered from the participants' responses to interview questions provided insight into preservice teachers' perceptions about their personal creative abilities, creativity within their instructional practices, and their uses of mobile learning technology. The findings of the data can be used to inform discussions concerning the development of curricula that will strengthen preservice teachers' creativity and applications of mobile learning technology for instructional practice.

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# CHAPTER 1

## DESCRIPTION OF THE STUDY

For the majority of the past century, the creation and utilization of goods was the dominant economic ideology. Many of the world's more developed countries have now entered a post-industrial economy where the importance of manufacturing has lessened. A shift to a knowledge-based and information-based age has occurred (Sawyer, 2006). Information-age ideology focuses on the creation, sharing, and utilization of information (Kampylis, Berki, & Saariluoma, 2009). Knowledge, information, intellectual input, and creativity are the new raw materials (Nell, Drew, & Bush, 2013; Sawyer, 2006).

Employers representing a wide range of fields seek a workforce that has the skills to solve problems, is adept at teamwork, and capable of contributing original thought to tasks (Livingston, 2010; Plucker, Beghetto, & Dow, 2004). Almost every domain has been affected by the need for a workforce that has the technical and professional ability to acquire and manage copious amounts of information. Koole (2009) pointed out that emerging mobile learning technology assists in meeting these needs of employers by providing individuals with tools such as calendars and scheduling applications that enhance organizational skills and demonstrate self-directed learning. She added that communication, collaboration, and knowledge construction through data sharing applications and chat tools are evidence of both an individual and collective ability to consume and create information concurrently.

Life is now intertwined with the Internet and constant connection on a global basis through the use of wireless handheld mobile learning devices including smartphones, cell phones, iPads®, iPods®, netbooks, tablets, eReaders, PDA's, MP3

players, and laptops. The portability of these devices sets them apart from other emerging technologies (Norris, Hossain, & Soloway, 2011). Norris, Hossain, and Soloway (2011) predicted that within five years every student regardless of grade or school will have access to and be using a handheld mobile learning device. The prevalent use of these devices and the nearly universal access to the Internet has transformed educators' perspectives of how students learn and how teachers teach.

## Educational Shift

As the needs of employers change in response to the economic environment, the features of contemporary schools structured around a post-industrial economy are also in need of change (Anwar, Shamim-ur-Rasool, & Haq, 2012; Ayob, Majid, Hussain, & Mustaffa, 2012; Dilworth et al., 2012; Sawyer, 2006). This shift demands that educators think differently about education than they have in the past to better prepare the future workforce. A strong academic knowledge-base of the specific field and applicable practices obtained through traditional learning conditions is still significant. However, education now needs to address employers' desires to see a willingness to increase knowledge and skills through mobile learning opportunities that complement traditional learning such as web-based training courses (Akintola, Ojokoh, & Boyinbode, 2012). Employer expectations of prospective employees is a proficiency with connectivity to mobile learning devices anytime and anywhere while still working to improve their knowledge and performance (Akintola, Ojokoh, & Boyinbode, 2012; Bennett & Maton, 2010; Yeonjeong, 2011).

Information-age ideology drives businesses to acquire a workforce that will seek non-standard methods to approach decision making and a flexibility to think beyond the

here and now (Nell, Drew, & Bush, 2013; Plucker, Beghetto, & Dow, 2004). To meet the needs of employers, this economic and educational shift calls for increased opportunities for students to engage in activities that develop creative thinking skills (Anwar, Shamim-ur-Rasool, & Haq, 2012; Eyadat & Eyadat, 2010; Roberge & Gagnon, 2012; Zhu & Zhang, 2011). However, according to Sternberg (2012) and Šorgo, Lamanauskas, Šašić, S., Kubiatko, Prokop, Fančovičova, & Erdogan (2012), a shift toward creative thinking and innovation is unlikely because conventional schools favor students who are strong in memory and analytical skills and consequently may discriminate against students who display creative strengths.

Sharma (2011) emphasized that school environment has a remarkable impact on the creativity of students in both positive and negative ways. Furthermore, although educators indicated that they value creativity, some teachers may inhibit students with a negative attitude and intolerance of the characteristics and student behaviors associated with creativity (Kampylis, Berki, & Saariluoma, 2009; Kim, 2008). These teacher attitudes are in line with the societal perception of innovators and creative thinkers as being oppositional because they challenge the status quo (Sternberg, 2006). Innovators are often described as people who routinely break existing paradigms through methods that are not in line with conventional, traditional, and established teaching practices. Sternberg (2006) also suggested that society encourages intellectual conformity thereby suppressing potential creativity.

Fullan (2011) asserted that the current education experiences for students are boring, do not reward effort, and focus on low-level skills. He argued that information and communication technology (ICT) including the use of mobile learning technology

has a pivotal role in augmenting creativity and development of problem-solving skills beyond a traditional classroom. He also reported that students having teachers who utilize mobile learning technology and encourage technology use in active learning experiences are in a position to engage in learning more deeply. Given that a primary purpose of education is to engage learners in meaningful learning experiences, the development of creative thinking skills and lifelong learning dispositions compel higher education and professional institutions to nurture student creativity through experiential learning opportunities. The outcomes of these opportunities will inform curricular discussions regarding transferability of skills and employability of graduates (Eyadat & Eyadat, 2010; Higgins & Morgan, 2000; McNeely, 2005; Tillander, 2011; Worley, 2011).

A perspective of education as a process of preparing learners to be successful demands that creativity occupy an important position in that process (Nell, Drew, & Bush, 2013). Teachers in our schools are charged with the responsibility to educate students who will become employees of a future workforce with the ability to creatively solve problems, work independently and collaboratively, and be innovative and technologically proficient. In turn, universities and colleges are charged with the task of increasing those same skills in future educators who will be teaching those students (Kumar & Vigil, 2011; Lei, 2009; Oblinger & Oblinger, 2005; Šorgo et al., 2012). In lieu of this responsibility, Davidovich and Milgrim (2006) advocated increased opportunities for preservice teachers to practice and develop creative thinking skills as a worthwhile endeavor. Review of the literature indicated a group awareness that supported that preservice teacher creativity should be developed through active practice teaching opportunities. Saunders (2004) asserted that teaching is a highly complex activity that

requires application of the science of teaching as well as the exercise of imagination, thus providing numerous potential situations for creativity embedded within the professional act of teaching. Bramwell, Reilly, Lilly, Kronish, and Chennabathni (2011) supported Saunders' assertion by describing the teaching and learning process as a complex, unpredictable, and naturally creative situation. Finally, Jackson (2006) explained that creativity occurs spontaneously during teaching opportunities through the relationships and interactions between teachers and their students. It is apparent that researchers value creativity and advocate for creative teaching training despite the challenges of creativity being a complex construct that has characteristics unique to each individual and his or her environment.

## Defining Creativity

Developing a definition of what it means to "be creative" is a challenge unique to each creativity researcher. Plucker, Beghetto, and Dow (2004) offered a definition of creativity as "...the interaction among aptitude, process, and environment by which an individual or group produces a perceptible product that is both novel and useful as defined within a social context" (p. 90). Marquis and Vajoczki (2012) also stressed the importance of defining and evaluating creativity in relation to the field in which it is operating. The social context, the field in which the population operates, and the purpose of the study are highly influential factors in the development of a definition of creativity for individual studies.

This study was concerned with preservice teachers' perceptions about the ways creativity is displayed within instructional practices when the use of mobile learning

technology is included. In order to examine this, it is essential to develop a definition of creativity applicable to this study.

In 1950, J. P. Guilford proposed a theory of creativity that included descriptions of characteristics of divergent thinking. These four characteristics were developed into his Fluency, Flexibility, Originality, and Elaboration model (FFOE). The characteristics in the model are still widely accepted as skill areas associated with creativity (Puccio, Murdock, & Mance, 2011; Shively, 2011; Shively, 2013).

For the purposes of this study, creativity was defined as demonstration or description of abilities identified within the skill areas in a modified FFOE model (Shively, 2011). In keeping with the Marquis and Vajoczki (2012) recommendation, the descriptions of abilities in each skill area have been modified to include elements of definitions of creativity by researchers relative to the field of education. Table 1 provides a description of the abilities within each skill area in the model.

Table 1

*Skill Areas in Modified FFOE Model*

| | |
|---|---|
| Fluency | Demonstration or description of an ability to offer as many options as possible from different perspectives to open up the possibility for novel ideas (Guilford, 1984; Puccio, Murdock, & Mance, 2011; Shively, 2011; Shively, 2013). |
| Flexibility | Demonstration or description of an ability to combine two or more dissimilar concepts or subjects in the same mental space to form new categories, ideas, and behaviors (Michalko, 2011). Repackaging or combining prior knowledge or strategies in a new way is also described as a characteristic of flexibility (Guilford, 1984; Isenberg & Jalongo, 2001; Tillander, 2011). Flexibility includes a desire to "play devil's advocate" and approach data analysis from an unconventional perspective. (Shively, 2013). |
| Originality | Demonstration or description of an ability to imagine or invent something new, original, unconventional, and desirable to the creator (Guilford, 1984; Isenberg & Jalongo, 2001; Plucker, Beghetto, & Dow, 2004). A critical factor in originality is one of judging it relative to the creator's prior experiences. Judging originality of a six-year-old is considerably different than judging originality of a sixty-year-old (Shively, 2013). |
| Elaboration | Demonstration or description of an ability to flesh out ideas and carry an idea to completion. Elaborators take an original concept and add the details to provide others a way to see the full potential of a creative idea (Guilford, 1984; Isenberg & Jalongo, 2001). Elaboration often takes place in collaboration with others (Puccio, Murdock, & Mance, 2011; Shively, 2011). |

Not all of the abilities described in the skill areas of the modified FFOE model are directly observable. Therefore, to further assist in examining preservice teachers' self-reported abilities in the skill areas, descriptors were developed as further indicators of creativity. A sample list of descriptors is provided in Chapter 3 as well as a description of the process of developing the descriptors.

## Mobile Learning Technology

Keeping creativity in mind, Livingston (2010) and Tillander (2011) indicated that preservice teachers who are members of the current generation of university students already demonstrate creativity through the use of mobile learning devices (e.g. smartphones, cell phones, iPads®, iPods®, netbooks, tablets, eReaders, PDA's, MP3 players, and laptops) as revealed by their collaboration with peers, expertise at researching books, movies, weather, music, and answers to their questions. Schmidt-Crawford, Thompson, and Lindstrom (2012) and Bull, Thompson, Searson, Garofalo, Park, Young, and Lee (2008) stressed the importance of teacher educators understanding preservice teachers' use of technologies in informal situations to promote transferability to formal educational environments. Although commonly agreed upon by educators that technology offers instant access to knowledge building and information gathering, Tillander (2011) described how an ever increasing range of mobile learning technology provides powerful opportunities for creative expression and imagination in pedagogical practices.

However, Dilworth et al. (2012) pointed out that although the emerging technology gives students in formal learning settings the ability to creatively explore concepts in deeper ways, a more meaningful understanding will only happen if educators, including preservice teachers, know how to use the technology effectively. In their qualitative study Chesley and Jordan (2012) conducted focus group interviews with two groups of teachers to examine perceptions of their preservice training effectiveness at the university level. One group, representing seventeen universities, was comprised of thirty teachers with three months to two years classroom experience. The second group

consisted of thirty experienced teachers who were beginning teacher mentors. Both focus groups commonly identified several gaps in teacher training, including the everyday use of mobile technology and its applications for teaching purposes. The beginning teachers disclosed that their familiarity with technology did not compensate for a significant lack of training in the integration of technology for instructional practice. Chesley and Jordan (2012) proposed that designers of teacher preparation programs listen to graduates as they identify areas of weakness including technology use training, and make changes to ensure that in the future, classrooms are led by teachers who have a clear understanding of professional practices concerning mobile learning technology and can implement them from their first day of teaching.

Likewise, Livingston (2010) contended that teacher preparation programs have an obligation to explore ways to support preservice teachers' creativity by celebrating their expertise in regards to everyday use of mobile learning technology and by increasing teaching and learning opportunities for them to apply this proficiency. Livingston's ideas are echoed in the United States Department of Education's National Education Technology Plan (NETP) (2010). The NETP (2010) stressed the importance of utilizing technology in education to develop "inquisitive, creative, resourceful thinkers, informed citizens, effective problem solvers, ground breaking pioneers, and visionary leaders." To accomplish this objective, the NETP contended that technology should be included in learning experiences that mirror students' daily lives. Promoting the use of technology that is commonplace to this generation of university preservice teachers must in turn be supported during field experience opportunities to align with the mission of the NETP of providing students with experience that mirrors daily life (Sternberg, 2012).

To aid in the implementation of new or revised experiences, The International Society for Technology in Education (ISTE) provides both student and teacher standards and performance indicators (ISTE, 2013). The standards are commonly known as NETS:S (students) and NETS:T (teachers) (ISTE, 2007a; ISTE, 2007b). The International Society for Technology in Education (ISTE) is an internationally recognized organization for promoting what teachers, students, and administrators should know about, and what to do with technology in education.

Of particular interest for this study is the focus of Standard One for each group that addresses creativity and innovation to advance student learning (ISTE, 2007). Standard one for students is Creativity and Innovation (ISTE, 2007a). Standard one for teachers is Facilitate and Inspire Student Learning and Creativity (ISTE, 2007b). Preservice teachers are unique in regards to the ISTE standards in that they fall into both categories and can benefit in multiple respects from knowledge of the standards' performance indicators as a student, and application of the standards as a student teacher.

## University Role

As some of the oldest institutions on earth, universities have long been held accountable not only for the education of their students, but also to be adaptive to cultural and societal change. However, Kampylis, Berki, and Saariluoma (2009) and Roberge and Gagnon (2012) contended that awareness concerning creativity development and opportunities for creative practice is limited in presentation by teacher education programs. This contention is troubling considering that universities are in a strategic position to address the understanding and development of creativity of students enrolled in the programs. This position leaves universities poised to provide strategies for creative

classroom practice including the use of mobile learning technology, and to develop the creativity that each student already possesses and uses (Kumar & Vigil, 2011; Livingston, 2010; Marquis & Vajoczki, 2012; Šorgo et al., 2012).

In particular, field experience opportunities within a teacher education program provide universities with a unique opportunity to respond to a new paradigm of employability that emphasizes application of creativity and the integration of mobile learning technology. These practice teaching situations provide university teacher education programs with a valuable venue to support the tenets of the NETP to provide students with experiences that mirror real-life practices (Ayob, Majid, Hussain, & Mustaffa, 2012; U. S. Department of Education, 2010).

The university is a natural setting for new patterns to emerge in pedagogical structure. Even though universities must graduate preservice teachers who can successfully navigate current teacher accountability pressures, higher education also has a mission to provide teacher education students with environments that offer opportunities for students to practice being creative (Livingston, 2010; Roberge & Gagnon, 2012).

## Statement of the Problem

Developing creative thinking skills and lifelong learning dispositions are accepted as goals of education (Eyadat & Eyadat, 2010). To meet these goals, higher education and professional institutions are compelled to nurture creativity through experiential learning opportunities (Eyadat & Eyadat, 2010; Tillander, 2011; Worley, 2011).

Rinkevich (2011) reported that the practice of encouraging creativity among preservice teachers does appear to be a major emphasis within university teacher education programs. Fleith (2000) and Kim (2008) proposed that teacher education

programs should provide opportunities for preservice teachers to receive creativity training for instructional planning. Keeping this in mind, it is also important to remember that the current generation of students entering teacher education programs is often labeled Digital Natives (Prensky, 2001), the Net Generation (Tapscott, 2008), or Millennials (Oblinger & Oblinger, 2005). Access to mobile learning technology and connection to the Internet is ubiquitous in the daily lives of these future teachers. They are confident and proficient users of this technology and do so routinely. As revealed in a study by Jones, Ramanau, Cross, and Healing, (2010) and other reports, this generation has grown up with increasingly more frequent and easier access to the Internet and mobile learning devices such as smartphones, cell phones, iPads®, iPods®, netbooks, tablets, eReaders, PDA's, MP3 players, GPS, and laptops (Worley, 2011; Yeonjeong, 2011). Oblinger (2003) and Tapscott (2008) pointed out that this generation does not consider computers as technology any more than previous generations consider a toaster technology.

Typically, in the later stages of a teacher education program, preservice teachers engage in an experiential learning situation commonly referred to as practice teaching or student teaching. Studies indicate that as teacher education students of the Net Generation they are expected to integrate their instructional and mobile learning technology training into classroom practice both for planning and instructional purposes (Kumar & Vigil, 2011; Lei, 2009).

Studies show that in order to meet the demands of graduates and employers, teacher educators are obligated to design curricula that provide opportunities which align educational approaches to the current technological practices of students. Researchers

recommend combining the use of mobile learning technology and creativity training for instructional planning (Dyson, Litchfield, Lawrence, Raban, & Leijdekkers, 2009; Fleith, 2000). A study by Ewing and Gibson (2007) revealed that planned experiences in the curriculum can serve as models for preservice teachers to encourage creative teaching in their future classrooms that will support their students' creative aptitudes. Examining behaviors and perceptions of Net Generation preservice teachers who link creativity to successful instructional practices that utilize mobile learning technology is paramount to informing discussions surrounding teacher education curriculum design.

Preservice teachers entering the profession face strong teacher accountability mandates (Kampylis, Berki, & Saariluoma, 2009; Rinkevich, 2011). Presently, that accountability is measured through conventional standardized testing which encourages learning and thinking styles that focus on one right answer rather than creative solutions to problems. As Sternberg (2012) said, "Schooling often stops short of encouraging creativity because educators and test creators are content if students have the knowledge to be successful on the test" (p. 4). This is not to say that knowledge is not important, however, knowledge tested by convergent standardized tests may unintentionally lower divergent thinking and potential creativity (Chávez-Eakle, Eakle, & Cruz-Fuentes, 2012; Sternberg, 2012).

Research is prolific regarding students' use of mobile learning technology and creative applications within specialized disciplines such as engineering, science, instructional technology, and art (Bennett & Maton, 2010; Özdemir & Çakmak, 2008; Šorgo et al., 2012; Tillander, 2011). Studies relating to teachers' and students' use of non-mobile instructional technology devices (e.g., desk top computers, computer labs,

SMART Boards®, interactive whiteboards) are also abundant (Downes & Bishop, 2012; Graham, Trip, & Wentworth, 2009; Watson & Pecchioni, 2011). However, research regarding the current generation of university preservice teachers' use of mobile learning technology in situations of practice teaching preparation is minimal (Kumar & Vigil, 2011; Lei, 2009). Eyadat and Eyadat, (2010) also reported a similar gap in studies concerning preservice teachers' perceptions of their personal creativity in regards to pedagogical and instructional practices through use of mobile learning technology.

## Purpose of the Study

The purpose of this study is to examine preservice teachers' perceptions of the ways creativity is displayed within their instructional practices when mobile learning technology is utilized.

## Research Questions

The results of this study will contribute to and extend the current understanding of preservice teacher creativity relative to the use of mobile learning technology. Gaining a greater understanding of this component of preservice teacher development will further teacher educators' capacity to design curricula embedded with opportunities that support preservice teacher creativity including the use of mobile learning technology (Kumar & Vigil, 2011; Schmidt-Crawford, Thompson, & Lindstrom, 2012). To further this understanding, the following research questions guided this study:

1. In what ways do preservice teachers use mobile learning technology?
2. What perceptions do preservice teachers have of the ways their personal creativity is displayed in their instructional practices?

3. What perceptions do preservice teachers have regarding the influence mobile learning technology has on the ways creativity is displayed in their instructional practices?

## Significance of the Study

In seeking to address a gap in the literature, this study extended the current research findings of technology-savvy preservice teachers' perceptions regarding creativity while using mobile learning technology. As employer demands increase for a workforce that can be innovative and technologically collaborative, educators are compelled to design experiential learning opportunities for preservice teachers to engage in creative practices using mobile technology tools (Bull et al., 2008; Kumar & Vigil, 2011; Livingston, 2010; Tillander, 2011).

This study's significance to learners includes extending educators knowledge base about creativity and current student uses of mobile learning technology. A mixed method study conducted by Dyson, Litchfield, Lawrence, Raban, and Leijdekkers (2009) was designed to examine students' variances in their depth of learning when integration of mobile learning technology was incorporated into fieldwork and courses. The results of the study indicated that mobile learning technology is well suited for use in accomplishing complex tasks within experiential learning situations that mirror daily life as recommended by the NETP (Dyson, Litchfield, Lawrence, Raban, & Leijdekkers, 2009; U.S. Department of Education, 2010). Also significant to learners is developing educators' awareness of what Kant (2012) described as addressing an authentic learning need in that "Handheld devices are often an everyday part of business, so learning can contribute directly to enhancing employability, life skills and work practices" (p. 3).

Of significance to designers of teacher education curricula is that emerging mobile technologies have the capacity to offer teacher education programs an opportunity to align educational approaches with the current technological practices of students (Dyson, Litchfield, Lawrence, Raban, & Leijdekkers, 2009). This is significant to curriculum designers who seek to determine the kinds of additional creative opportunities to include in teacher education programs and their effectiveness for preservice teacher development (Danielson, 2008; Dyson, Litchfield, Lawrence, Raban, & Leijdekkers, 2009).

The significance of this study to educators is also found in the extension of research that pertains to the use of mobile learning technology for providing immediate feedback to learners, increased accessibility to instructional materials, improved access to educational opportunities for socially marginalized or disadvantaged groups, differentiating instruction, and rethinking teaching methods (Kant, 2012).

## Theoretical Framework

If, as many scholars have suggested, creativity is an essential tool for individuals and society to blossom and thrive in the current economic ideology, then educators have a responsibility to support students' creative aptitudes through experiential learning that does not promote student acquisition of passive knowledge (Hook & Ditzler, 2013; Marquis & Vajoczki, 2012; Sternberg, 2012). According to Sternberg's Investment Theory of Creativity (2012) an individual makes a decision to exercise creativity and in doing so takes a risk. Few people make the decision to take the risk, and fewer still persist to pursue it in fear of rejection. To provide society with a workforce that is innovative and is willing to embrace and incorporate technological change requires

educational entities to increase the rewards of creative behavior, thereby decreasing the investment risk for those individuals willing to embrace opportunities to defy conventional thinking (Sternberg, 2006).

**Understanding Creativity**

Creativity is an elusive term to define. The current approach to the understanding of creativity is supported largely by the work of E. Paul Torrance and J. P. Guilford. Contributions to the research are also attributed to Joan Erikson and Mihaly Csikszentmihalyi (Althuizen, Wierenga, & Rossiter, 2010; Anwar, Shamim-ur-Rasool, & Haq, 2012; Nell, Drew, & Bush, 2013; Sternberg, 2006; Sternberg, 2012; Villalba, 2008).

Marquis and Vajoczki (2012) pointed out that it is important to remember that creativity should be primarily defined and evaluated in relation to the field in which it is operating. Furthermore, the definition of creativity changes with the cultural climate (Tillander, 2011). Researchers also agreed that when assessing creativity, care should be taken to ensure that the evaluations are administered for domain-specific endeavors to ensure validity and reliability (Carson, Peterson, & Higgins, 2005; Zeng, Proctor, & Salvendy, 2011).

In placing creativity within the context of education, Livingston (2010) promoted implementation of creative opportunities around objectives that support general welfare, social justice and causes that benefit humankind. It is important to consider that creativity is a value-neutral term until it is placed in a social context. A trend towards creativity as part of a category of positive educational terminology does not preclude a singular role for creativity. For example, using the currently accepted definitions, Adolf

Hitler, Osama Bin Laden, and Ted Bundy could be considered just as creative as Wolfgang Mozart, Rembrandt, and Steve Jobs.

The word *create* comes from the Latin word *creare,* which means to "create, make or produce; bring into existence something new; to produce or bring about by a course of action or behavior" (Isenberg & Jalongo, 2001, p. 5). Some authors define creativity as the ability to produce novel (original or unexpected) work that is high in quality and is appropriate (useful) (Das, Dewhurst, & Gray, 2011; Isenberg & Jalongo, 2001; Marquis & Vajoczki, 2012; Plucker, Beghetto, & Dow, 2004; Teo & Waugh, 2010; Tillander, 2011; Zeng, Proctor, & Salvendy, 2011; Zhu & Zhang, 2011). Other researchers approach the definition of creativity from procedural and behavioral perspectives rather than a product perspective. This definition is described as combining two or more dissimilar concepts or subjects in the same mental space to form new categories, ideas, and behaviors (Isenberg & Jalongo, 2001; Kampylis, Berki, & Saariluoma, 2009; Livingston, 2010; Michalko, 2011; Özdemir & Çakmak, 2008; Plucker, Beghetto, & Dow, 2004; Sternberg, 2006; Torrance, 1993; Zhu & Zhang, 2011).

Creativity is a broad topic and has widespread implications at the individual and societal level (Higgins & Morgan, 2000). Creativity at the societal level is vital to new innovations, scientific findings, and social reforms. Individual creativity is paramount to dealing successfully with new situations in life including non-traditional ideas for solving problems (Anwar, Shamim-ur-Rasool, & Haq, 2012; Robinson, 2011; Zhu & Zhang, 2011).

**Investment Theory of Creativity**

There are a number of approaches researchers can take to understand creativity. The Investment Theory of Creativity by Sternberg (2012) provided the foundation for this study. This framework assisted in conceptualizing the study and situated it within the context of increasing preservice teacher effectiveness through creativity development. This theoretical framework served as a lens to view the broad scope of preservice teacher creativity development while using mobile learning technology. It also provided a common language to discuss creativity as well as offer a guide to interpret the results of the study (Camp, 2001; Merriam, 2009).

The investment component of Sternberg's (2006) theory is derived from the concept of creativity as an investment by the creator in presenting an idea or view that initially has little value to others. The creator invests time and effort through various means in convincing those in the environment that the idea is useful. If the idea is accepted then the personal cost of the investment is decreased thereby increasing the probability of the individual taking additional creative risks. Sternberg (2012) added that creativity is habitual. It is not an exceptional act that happens in exclusion. He described creative individuals as having an attitude towards life that promotes a response to challenges in ways that are fresh and innovative. He put forth three conditions as significant for individuals to take the risk to exercise creativity (Sternberg, 2012, p. 3):

1. Creativity can be encouraged or discouraged by the opportunities presented to engage in creativity.
2. An individual who takes those opportunities must be encouraged to engage.
3. An individual must also be rewarded for responding to the opportunity.

Sternberg (2006) described his Investment Theory of Creativity as a confluence of six interrelated resources: intellectual abilities, knowledge, thinking styles, personality, motivation, and environment. The theory components are a *confluence* rather than a *sum* of an individual's level of the components. Individuals may demonstrate one or more component that is stronger or weaker than another. Where one component may be weaker, another may be strong enough to compensate for the weakness. He indicated that although this may be the case, in some instances creativity may not be possible if certain levels are too low for other components to make up the difference. This is especially true for the knowledge component. Sternberg (2006) postulated that without enough knowledge of a subject, the other components cannot compensate enough to allow creativity.

The interrelated resources of the Investment Theory of Creativity are relevant to this study in regards to preservice teacher training and application of skills during practice teaching experiences. The interrelated resources will be used to examine the participants' perceptions of creativity and align them with specific creative processes and products within instructional practices. The intellectual abilities resource addresses the theoretical bases directly related to individuals' application of the resources put forth by Sternberg (2012). He argued that the additional interrelated resources are put in motion *after* the intellectual abilities resources. For this study, the participants' knowledge of the functions and proficiency with their mobile learning technology will be established before selection in the study.

The Investment Theory of Creativity provided a flexible framework to explore how creativity and the use of mobile learning technology is perceived and realized by

preservice teachers. The interrelated resources provided a direction to explore how the theory plays out in the practice of preservice teachers. For example, the knowledge resource can be used to explore participants' content knowledge levels for planning instruction and the thinking style resource can be used in examining participants' preferences for applying their skills and abilities. The personality resource consists of attributes to gauge participants' risk taking propensities and self-efficacy levels. Motivation and the environment resources of Sternberg's (2006) theory show characteristics within the framework that align to individual perceptions of motivation and uniqueness of teaching experiences.

Increased student success has long been and continues to be an objective among educators. The focus on encouraging creativity development as one possible option for meeting that objective is a concept that is gaining momentum in light of discussions about the need for change in school structure to reflect an economic shift to the information-age.

## Methodology

A qualitative research design with an interpretive approach was selected for this study. An interpretive approach provides researchers with a structure for in-depth study of a problem, the contexts of which the problem is situated, the issues within the problem, and capturing the common experiences of the participants (Creswell, 2013). This approach provides the researcher with a method to examine commonalities in the experience regardless of the individual diversity or environmental differences.

The study sample included students enrolled in an Early Childhood Pre-K- Grade 4 teacher preparation bachelor degree certification program at Goldcup University

(pseudonym). Purposeful sampling was used to secure an adequate sample size to provide data that support the objectives of the study and accurately inform the study understandings. The Early Childhood Pre-K-Grade 4 teacher preparation program at Goldcup University includes three blocks of instructional and content methods courses in this prescribed sequence: Pre-K-Kindergarten, Special Education (optional), and Grades 1-4. A purposeful sampling strategy was employed to select the cohort enrolled in the Grades 1-4 methods block to provide the researcher with an adequate number of study participants who have the commonalities of:

a.) having completed assignments with a focus on instructional practices and

b.) having participated in at least one field experience where they were required to implement instructional practices integrating the use of mobile learning technology.

Thirty eligible students were invited to participate in the study. Participants were notified that there are no known risks for participating in the study and that participation in the study is voluntary and may be revoked by notifying the principal investigator or by disengaging from the survey or focus group at any time. The following instruments were utilized for data collection:

1. Mobile Learning Technology and Creativity (MLTC) Survey.
2. Focus Group Interview Protocol.
3. Methods Course Written Assignment Submission.

## Limitations of the Study

Limitations of this study stem from two areas: the study sample and the methodology for the study. It is possible that selection bias may occur. Participants who

elect to take part in the study may differ in some way than those who elect not to participate. Also, voluntary participation in the data collection for this study may have possible effects on receiving an adequate number of responses to analyze. Also a possible limitation is that in selecting a qualitative approach for this study, the researcher may exhibit bias in the data analysis due to familiarity with the curriculum, instructional practices, and field experience processes of the program in which participants are enrolled.

An additional limitation is the possibility of an effect of participants' feelings of obligation to respond in a way that they believe the researcher wants them to respond. This phenomenon is known as the *Hawthorne Effect* in which people have been observed changing their behavior when they feel they are being singled out or made to feel important (McCarney, Warner, Iliffe, van Haselen, Griffin, & Fisher 2007).

Preservice teachers' experiences with instructional practices may be a limitation for this study. Factors regarding practice teaching experiences in various grade levels and developmental stages may also be a limitation. Additionally, participants' description of personal creative abilities is a limitation in regards to the challenge of identifying and defining creativity.

The researcher acknowledges that additional limitations may affect this study. The population for the study will be limited to one specific university in western Pennsylvania in the spring semester of 2014. The study sample will be limited to members of one cohort of Early Childhood Education preservice teachers enrolled in a teacher certification program who have had at least one block of methods courses incorporating a practice teaching experience lasting four weeks or longer. The study

results are not generalizable to other preservice teacher cohorts within the university or to groups of preservice teachers beyond the study university.

## Definition of Terms

The following definitions inform this study:

Classroom Practices: A set of behaviors that teachers incorporate into their daily professional practice. Including but not limited to: planning, developmentally appropriate instruction, selection of instructional strategies, classroom management strategies, environment arrangement, understanding of content knowledge, understanding of assessment, and reflective practitioner practices (Danielson, 2008).

Confluence: A coming or flowing together, meeting, or gathering at one point. In educational settings the term is used to describe the process of holistic learning, involving body, mind, emotion, and spirit (Johnson, 1997).

Creativity: For the purposes of this study, creativity is defined as demonstration or description of abilities identified within the skill areas of a modified Guilford FFOE model (Fluency, Flexibility, Originality, and Elaboration) (Shively, 2013). The skill area of Fluency includes ability to offering many options for solutions and ideas from different perspectives (Puccio, Murdock, & Mance, 2011). Flexibility includes ability to combine two or more dissimilar concepts or repackage prior knowledge in new ways (Michalko, 2011). Originality includes ability to imagine or invent something new and valuable to the creator (Isenberg & Jalongo, 2001). Elaboration includes ability to add details to a concept and carry out an idea to completion (Isenberg & Jalongo, 2001; Shively, 2011).

Digital Native: The term used to describe the group of people born after 1980 (Prensky, 2001).

Field Experience: An independent practice teaching experience in which the preservice teacher assumes the responsibilities of all roles and duties of the cooperating professional including but not limited to observing, assisting, tutoring, instructing, and conducting research; a variety of systematic P-12 classroom-based opportunities. Field experiences generally occur in schools but may also take place in other settings such as community based agencies, home based education, and child care facilities (Capraro, Capraro, & Helfeldt, 2010).

Instructional Practice: Includes but is not limited to the processes used by preservice teachers for preparing lessons, selecting content, individualizing instruction, selecting instructional strategies, implementing instruction, monitoring understanding, student grouping, social interaction, and processes used for assessing mastery of content and concepts (Bredekamp, 2011; Kauchak & Eggen, 2012; Valentine, n.d.)

Instructional Technology Devices: Including but not limited to desk top computers, computer labs, SMART Boards®, and interactive whiteboards (Downes & Bishop, 2012; Graham, Trip, & Wentworth, 2009; Watson & Pecchioni, 2011).

Millennials: The term used to describe the group of people born in or after 1982 (Oblinger, 2003).

Mobile Learning Technology Devices: Including but not limited to smartphones, cell phones, iPads®, iPods®, netbooks, tablets, eReaders, PDA's, MP3 players, GPS units, assistive technology, and laptops (Livingston, 2010; Tillander, 2011; Yeonjeong, 2011).

Net Generation: The term used to describe the group of people born after January 1977 (Tapscott, 2008, p. 16).

Preservice teachers: Students enrolled in a teacher education program.

Psychometric: The branch of psychology that deals with the design, administration, and interpretation of quantitative tests for the measurement of psychological variables such as intelligence, aptitude, and personality traits (www.thefreedictionary.com).

Student Teaching: An independent practice teaching experience in which the preservice teacher assumes the responsibilities of all roles and duties of the cooperating professional including but not limited to observing, assisting, tutoring, instructing, and conducting research. A variety of systematic P-12 classroom-based opportunities (Capraro, Capraro, & Helfeldt, 2010).

## Summary

Wireless, handheld, mobile learning devices and nearly universal access to the Internet has transformed educators' perspectives of how students learn and how teachers teach. To meet the demands of employers for a workforce that will seek non-standard methods to approach decision making and a flexibility to think beyond the here and now (Nell, Drew, & Bush, 2013; Plucker, Beghetto, & Dow, 2004), an educational shift calls for increased opportunities for preservice teachers to engage in activities that develop creative thinking skills (Anwar, Shamim-ur-Rasool, & Haq, 2012; Zhu & Zhang, 2011). Combining the use of mobile learning technology and creativity training for instructional planning will align educational approaches to the current technological practices of students (Fleith, 2000; Kim 2008).

The purpose of this study was to examine preservice teachers' perceptions of the ways creativity is displayed within their instructional practices when mobile learning technology is utilized. Participants in the study were preservice teachers enrolled in a western Pennsylvania public university PreK-4$^{th}$ Grade teacher education program. Data was collected through a survey, focus group interview, and submission of a written assignment. This study informs discussions of teacher educators surrounding curriculum design to include planned experiences that will serve as models to encourage creativity in preservice teachers.

Chapter 2 is a review of the literature related to theories surrounding the nature of creativity within the contexts of individual, societal, and educational areas. Also included in the next chapter is a review of the literature regarding users of mobile learning technology and impacts on preservice teacher instructional planning.

# CHAPTER 2

## REVIEW OF THE RELATED LITERATURE

Studies indicate that opportunities for preservice teachers to increase and develop creativity are increasingly important in regards to an educational shift that supports developing a workforce for an intellectual, knowledge-based, and information-based economy (Anwar, Shamim-ur-Rasool, & Haq, 2012; Eyadat & Eyadat, 2010; Roberge & Gagnon, 2012; Zhu & Zhang, 2011). A pivotal factor in this economic ideology is the use of mobile learning technology such as wireless handheld devices including smartphones, cell phones, iPads®, iPods®, netbooks, tablets, eReaders, PDA's, MP3 players, and laptops. Current preservice teachers are members of a generation for whom personal technology is a predominant method of communication and is incorporated into their daily routine. The result is an inseparable link between mobile learning technology and educational responsibilities, work responsibilities, entertainment, and social interactions, which in turn provides copious opportunities for use of the technology in creative and imaginative ways. The purpose of this literature review is to comprehensively address the aspects of preservice teacher creativity that are influenced by the use of mobile learning technology.

This literature review includes a description of Sternberg's Investment Theory of Creativity (2006) and evaluates its components of intellectual abilities, knowledge, thinking styles, motivation, personality, and environment in regards to preservice teachers' perceptions of creativity within their instructional practices. Those practices include but are not limited to the processes used by preservice teachers for preparing lessons, selecting content, individualizing instruction, selecting instructional strategies,

implementing instruction, monitoring understanding, student grouping, social interaction, and processes used for assessing mastery of content and concepts (Bredekamp, 2011; Kauchak & Eggen, 2012; Valentine, n.d.)

Second, this chapter will provide an overview of the research concerning the nature of creativity, the historical background of creativity, and the pedagogical perspective of mobile learning technology. Third, this chapter will synthesize the literature regarding creativity within education and teacher education as well as identifying characteristics of individual and collective creativity, the development and assessment of creativity, and its importance to individuals and society. The review will also provide a composite of the literature regarding mobile learning technology devices, the users, prevalence of use, and the reported purposes of use within individuals, society, education, and teacher education programs.

## The Nature of Creativity

A quick search of databases and online search engines nets over 10,000 results for papers published with the word 'creativity' in the title, not to mention the scholarly journals and books that focus on creativity. Every conceivable discipline seems to have explored the topic in relation to its domain at some point in time.

The current approach to the field of creativity exists largely from the work of E. Paul Torrance and J. P. Guilford (Althuizen, Wierenga, & Rossiter, 2010; Anwar, Shamim-ur-Rasool, & Haq, 2012; Sternberg, 2006; Sternberg, 2012; Villalba, 2008). Torrance (1993) described the purpose of his research as having a focus on the process of creativity stemming from his background as an educational psychologist who is concerned with processes of learning, creativity, personality development, teaching, and

thinking. His main interest was in uncovering the qualities that allowed individuals (especially children) to express their creativity to the fullest potential. He focused on the kinds of environments that supported creativity, the products resulting from successful creativity, and the kind of person one has to be to be creatively successful. Torrance's description of creative thinking included processes of identifying a problem, the missing elements, or the feeling of something awry then formulating a hypothesis and testing it and reporting the results.

Although assessment of creativity was not Torrance's goal, the scientific community required a measurable way to evaluate creativity, thus, he developed The Torrance Tests of Creative Thinking (Hebert, Cramond, Neumeister, Millar, & Silvian, 2002). The Torrance Tests of Creative Thinking are the most widely used creativity testing assessment (Althuizen, Wierenga, & Rossiter, 2010; Sternberg, 2006; Villalba, 2008). According to Sternberg (2006), both Torrance and Guilford approached the nature of creativity and how to measure it from a psychometric angle (i.e. measuring types of personality traits, abilities, and attitudes). Sternberg (2006) continued describing Torrance's tests as concentrating on divergent thinking skills or generating creative ideas through many possible solutions (e.g. brainstorming, concept mapping, subject mapping, journaling, artwork). Despite developing the test to measure divergent thinking, Torrance (1993) emphasized that his definition of creativity was rooted in everyday human experiences that required individuals to constructively respond in a unique manner to a situation rather than just adapt to it. Sternberg (2006) and others acknowledged Torrance's preeminence in the field and agreed there was more to the nature of creativity and assessment of it than the singular measurement of divergent thinking. The studies

Sternberg conducted supported Torrance's research in that they were oriented towards the creative thinking tasks that people do in school and in the real world.

**Recognizing and Defining Creativity**

In his book *Creative Thinkering*, Michael Michalko (2011) offered an explanation of creative thinking as unconventional thinking which he described as forcing connections between two remotely different subjects. He also described creative thinking as a blending of two or more dissimilar concepts in the same mental space into a new idea. Michalko explained that the mind has intolerance for ambiguity because it reduces the complexities of living. This intolerance results in the mind not processing more than one construct into one category at a time. This concept was introduced by Torrance (1993) in his research also. Torrance (1993) contended that when human-beings experience a sense of cognitive incompleteness, tension arises and a strong need to relieve that tension through investigating the problem and working towards a solution results in the creative thinking process. These biological tendencies have long been accepted among educators within Jean Piaget's Cognitive Development Theory (Crain, 2011) as assimilation, accommodation, and organization. The process of assimilation is simply the taking in of information. Accommodation is the process of making changes within the mental structure to store new information and organization is the process of putting ideas into coherent systems (Crain, 2011). The concepts of assimilation, accommodation, and organization align well with conventional teaching practices that support analytical thinking. However, Torrance (1993) stressed that the creation of a new or unique response rather than adaptation was true creativity and that the tension relieved through the process was not complete until the new idea or discovery was shared with

another person. This tenet of Torrance's research is extended in Sternberg's (2006) Investment Theory of Creativity component of risk-taking through investing in the sharing of new ideas at the risk of rejection.

**Characteristics of Creativity**

Treffinger, Young, Selby, and Shepardson (2002) addressed the challenge of recognizing and assessing creativity. They stressed that assessment cannot begin without a specific definition of creativity to measure. Sternberg (2012) echoed the importance of understanding the nature of creativity and how to recognize and identify it through individual characteristics. Treffinger, Young, Selby, and Shepardson (2002) proposed a list of creative characteristics sorted into four categories: *generating ideas, digging deeper into ideas, openness,* and *courage to explore ideas,* and *listening to one's inner voice.* They offered a description of the characteristics within these four categories. The category of generating ideas refers to what is commonly known as divergent thinking or creative thinking abilities. Digging deeper into ideas refers to convergent or critical thinking. Openness and courage to explore ideas explores personality traits related to personal interests, experiences, attitudes, and self-confidence. The listening to one's inner voice category describes people who have a personal understanding of who they are, a vision of where they want to go, and the commitment to get there (Treffinger, Young, Selby, & Shepardson, 2002). Treffinger, Young, Selby, and Shepardson (2002) reiterated that not everyone possesses all the characteristics due to varying cognitive abilities and past experiences. These characteristics also continue to develop during a lifetime. Additionally, not all characteristics manifest themselves in positive outcomes. Table 2 reviews these four categories and the characteristics commonly associated with each.

Table 2

*Creativity Categories and Common Characteristics*

| **Creativity Categories** | **Common Characteristics** |
|---|---|
| Generating Ideas | Fluency; flexibility; originality; elaboration; metaphorical thinking |
| Digging Deeper Into Ideas | Analyzing; synthesizing; reorganizing or redefining; evaluating; seeing relationships; desiring to resolve ambiguity or bringing order to disorder; preferring or understanding complexity |
| Listening to One's Inner Voice | Awareness of creativeness; persistence or perseverance; self- initiated; non- conformity; does not fear being different; reflective; absorption in work; energetic |
| Openness & Courage to Explore Ideas | Problem sensitivity; high levels of curiosity; sense of humor; playfulness; capacity for imagination; risk-taking; tolerance for ambiguity; openness to experience and ideas shows emotional sensitivity; adaptability; willingness to grow |

*Note.* Table contents based on "Assessing Creativity: A Guide for Educators," by D. J. Treffinger, G. C. Young, E. C. Selby, and C. Shepardson, 2002, pp. 9-18.

**Guilford FFOE Model**

Psychologist J. P. Guilford was one of the first creativity researchers to describe divergent thinking in terms of characteristics over forty years ago (Puccio, Murdock, & Mance, 2011). He proposed a theory of creativity as sensitivity to problems in 1950. He added to it the element of divergent thinking in 1959 which he developed into a model as the main ingredient of creativity. The characteristics of Fluency, Flexibility, Originality, and Elaboration in his model (FFOE) are still widely accepted as skill areas within creativity (Markov, 2013). According to Markov (2013) Guilford identified four skill areas and defined them as follows:

1. Fluency is the ability to produce great number of ideas or problem solutions.
2. Flexibility is the ability to propose a variety of approaches to a specific

problem.

3. Originality is the ability to produce new and original ideas.
4. Elaboration is the ability to systematize and organize the details of an idea and carry it out.

A comparison of the attributes and characteristics that researchers have included within their creativity descriptions reveals that many of the characteristics overlap and are agreed upon to be important in recognizing and measuring personal creativity.

Other approaches in regards to recognizing creativity stem from a domain angle rather than a personal characteristic perspective. Researchers proposed that individual creativity is developed through various domains and dimensions within a lifetime. Ivcevic (2007) described recognizing creativity by distinguishing between every day and artistic types rather than personal attributes. Similarly, Kaufman and Beghetto (2009) further explained a continuum of four dimensions of creativity in their Four C Model of Creativity in which creativity is examined in regards to the individual's area of expertise ranging from everyday creativity to renowned creativity.

In response to the plethora of literature about creativity that could not identify what creativity really is, Kaufman and Beghetto (2009) offered a conceptual model to help frame and more accurately describe the nature of creativity. Whereas Sternberg's Investment Theory of Creativity is specific in determining *attributes* of people that indicate creative potential, Kaufman and Beghetto's (2009) Four C Model of Creativity described four *dimensions* of creativity. Creativity research tends to take two directions according to the authors. One direction is that of renowned creativity or the Big-C creativity as is evidenced in works of art, books, science, and music. Big-C creativity

requires a degree of time. Most geniuses are rarely recognized in their own time and often their work is not appreciated until well after their death. The other predominant direction is that of everyday creativity or the little-c creativity in which the average person participates every day. Research surrounding the little-c model emphasizes how creative potential is distributed over a wide range of people and underscores the importance of nurturing creativity in everyday settings such as schools and classrooms (Kaufman & Beghetto, 2009; Torrance, 1993). Kaufman and Beghetto (2009) acknowledged the importance of these two levels but indicated that limiting research to this dichotomy impeded studies within the nuances of creativity. They added two more dimensions within creativity; mini-c and Pro-C. Mini-c was designed to include the creativity within the learning process. Mini-c covers the areas of interpretation and insights that happen during learning. Central to the mini-c model is the process of constructing personal knowledge within a particular sociocultural context (Kaufman & Beghetto, 2009). Mini-c is useful when considering the creativity in young children and elementary students. Students who do not have the experience or ability to express thoughts may have creative ideas that are overlooked in favor of students who more adept at communication. The mini-c model is a key to protecting those students' personal insights and interpretations from being lost (Kaufman & Beghetto, 2009). Mini-c helps to broaden the insight of the nature of creativity by recognizing that personal insight during the learning process is still a creative act.

The Pro-c component of the Four C Model is used to examine creators who are a step above little-c but have not yet reached Big-C status. Kaufman and Beghetto (2009) identified this as another category that lacked a path to recognition. The Pro-c concept is

consistent with the idea of acquiring expertise. An approximate time frame put forth by Kaufman and Kaufman (2007) for acquiring expertise is ten years. There is evidence that it can take up to ten years to learn the mechanics of a field but much more time to reach a level of expertise accepted by the particular domain. The position occupied by those in this level is shortchanged by a simple Big-C, little-c dichotomy to understand the nature of creativity. It fails to acknowledge the professional creative contributions by people who work very hard during this period of time to acquire expertise in their field.

The Pro-c model addresses the gap between Big-C and little-c. Kaufman and Beghetto (2009) did not put the Four C Model of Creativity as a method for attaining Big-C status, rather, it offers a way to classify levels of creative maturation experienced over a lifetime.

## Investment Theory of Creativity

Sternberg (2006) described his Investment Theory of Creativity as a way to assess and understand the nature of creativity. The theory provides a theoretical basis for assessing creative thinking skills to gain a fuller understanding of a learner's abilities regardless of age or intellectual ability. In a conventional schooling environment that focuses on analytical assessments, the addition of assessment methods that provide learners with opportunities for creative responses in regards to typical content knowledge questions has the potential to enhance student learning as well as provide a more complete picture of a learner's grasp of concepts. In regards to his theory, Sternberg (2006) maintained that "One can teach students to think more creatively" (p. 93), but pointed out that creativity is not one concept, it is a system of concepts.

In a more recent work, Sternberg (2012) expanded upon his definition of creativity by describing it as a habit or way of life. He proposed that people who are

creative may not even realize that they are because it is the attitude they have toward life, not a conscious action or decision. This somewhat contradicts his earlier works espousing creativity as a series of decisive behaviors and choices, however, he and Torrance (1993) both advocated for creativity and creative thinking processes to be assessed as a habit of ordinary life. Both recognized that a constructive response to new situations or problems within existing situations is a process used for daily living.

Sternberg (2006) began by stating, "Creativity, according to the investment theory, is in large part a decision" (p. 90). This suggestion that creativity can be taught, enhanced, or developed through a conscious decision to formulate an idea, evaluate the idea, and then share it with others is supported by several researchers (Eckhoff & Urbach, 2008; Kaufman & Beghetto, 2009; Michalko, 2011; Shaheen, 2010; Torrance, 1993). Other researchers have upheld that the result of this increased creativity on the part of the learner leads to higher levels of achievement. This is especially true for learners who have teachers who provide instruction that offers opportunities for creativity in response to classroom activities, assignments, and assessments (Anwar, Shamim-ur-Rasool, & Haq, 2012; Eckhoff & Urbach, 2008; Leahy & Sweller, 2008; Palaniappan, 2008; Rinkevich, 2011; Schacter, Yeow Meng, & Zifkin, 2006; Sternberg, 2006). Teacher educators can also apply the theoretical bases found in the Investment Theory of Creativity to support and evaluate the creativity of preservice teachers. Additionally they can offer instruction for self-evaluation based on the theory characteristics, which will encourage preservice teachers to support the creativity of learners and potentially, the achievement of learners in their classrooms.

Within the Investment Theory of Creativity, Sternberg (2006) described a convergence of six distinct but interrelated resources: intellectual abilities, knowledge, styles of thinking, personality, motivation, and environment. As would be expected in any behavioral indicators, individual differences are demonstrated within each resource. An important factor to remember is that the decision to use a particular resource may be a more significant indicator of individual differences than the level attained by the individual when applying the resources (Sternberg, 2012). Furthermore, not all of the interrelated resources are used with every creative project. Factors such as duration of a project significantly influence the choice of resources (Zhang & Sternberg, 2011). Table 3 synopsizes the interrelated resources and associated characteristics (Sternberg, 2006).

Table 3

*Investment Theory of Creativity Interrelated Resources and Common Characteristics*

| **Interrelated Resource** | **Common Characteristics** |
|---|---|
| Intellectual Abilities | Synthetic: See problems in a new way<br>Analytic: Recognize ideas worth pursuing<br>Practical: Persuades others of value of ideas |
| Knowledge | Knowledge of the field<br>Knows when to use past knowledge to prevent hindering new ideas |
| Thinking Style | Preferred ways of using skills and abilities<br>Deciding how to use the skills available<br>Recognizing which questions are important |
| Personality | Willingness to take sensible risks<br>Willingness to tolerate ambiguity<br>Willingness to defy conventional wisdom |
| Motivation | Love what work they do<br>Intrinsically motivated |
| Environment | Needs to be supportive<br>Needs to reward creativity<br>Can hinder creativity through evaluators |

The following sections will expand on each of the interrelated resources within the Investment Theory of Creativity.

**Interrelated Resource: Intellectual Abilities**

Sternberg (2006, p. 88) outlined three distinct intellectual abilities:

1. Synthetic: The ability to see a problem in a new way.
2. Analytic: The ability to recognize which ideas are good ones and which are not.
3. Practical: The skill of knowing how to persuade other people that the idea is a good one.

Just as Sternberg (2012) described creativity as a confluence of the six interrelated resources, he pointed out the importance of the three intellectual abilities as a confluence also. He contended that creativity is not present when the intellectual abilities are used individually. He also pointed out that although the intellectual abilities are a necessity for creativity, they are not completely sufficient for demonstrating creativity (Zhang & Sternberg, 2011). Figure 1 shows a comparison of the individual use of intellectual abilities to the collective use of the abilities.

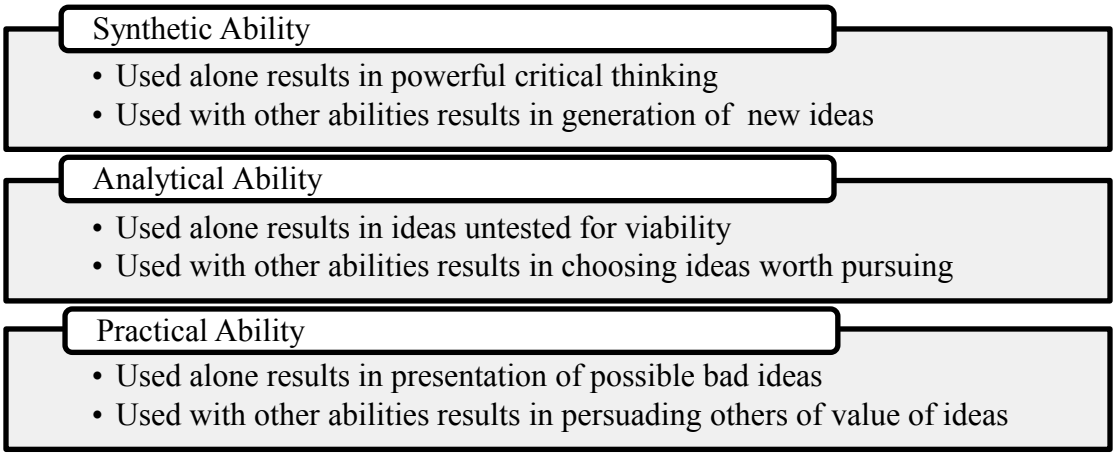


*Figure 1.* A comparison of individual and collective use of the Investment Theory of Creativity interrelated resource: intellectual abilities. Figure contents based on "The Assessment of Creativity: An Investment-Based Approach," by R. J. Sternberg, 2012, *Creativity Research Journal, 24*(1), p. 5.

**Interrelated Resource: Knowledge**

Sternberg (2006) proposed that to be able to move a field or discipline forward, one has to have enough knowledge of the field. However, he also pointed out that knowledge can hinder creativity through establishing an outlook that may lead an individual unable to see past the way things have always been done. He contended that there is a relationship between knowledge and the application of the analytical intellectual ability of determining what is important to know (Sternberg, 2012). The phenomenon of knowledge hindering development within a discipline is not unique to any specific domain. Ramsey (2010) described a situation concerning this issue in the terminology and definitions within geochemistry that he reported had prevented the development of new concepts. He postulated that people within this field have been reluctant to risk sharing new ideas due to the ambiguity of definitions of concepts which encourages continued acceptance of the status quo. Other studies have detailed the problem of knowledge overload in which experts' knowledge of a field prevents them from approaching a problem if it requires a major shift from highly accepted and typical behaviors (Gill, 2012; Mehta, Hoegg, & Chakravarti, 2011).

**Interrelated Resource: Thinking Styles**

Thinking styles is a choice in the way a person prefers to apply his or her intellectual abilities. This is an example of the decisive factor of creativity according to Sternberg (2006). He emphasized the importance of a legislative thinking style in the process of creativity. He defined a legislative thinking style as one that demonstrates thinking and doing things in your own way and making conscious decisions to think in ways that others do not (Sternberg, 2006; Zhang & Sternberg, 2011). Sternberg had

previously identified thirteen thinking styles through development of his theory of mental self-government (Zhu & Zhang, 2011). Zhu and Zhang (2011) reorganized these thirteen styles into three types. Type 1 thinking styles describe individuals who demonstrate more creativity generation and indications of higher cognitive complexity. Type 2 thinking styles describe individuals as those favoring given tasks and preference for attention to details. Type 3 thinking styles describe those who work on several tasks at a time with no priority or who prefer to work spontaneously on tasks that arise. Included within Type 1 is the category of legislative thinking that both Zhu and Zhang (2011) and Zhang and Sternberg (2011) stressed as important for creativity. Zhang and Sternberg (2011) indicated the significance of global thinking (i.e. looking at the big picture to determine what smaller problems are important to solve) and liberal thinking (i.e. willingness to break with established ways of thinking and doing things) as key to creative processes. Legislative thinkers tended to be better students especially if they were in an environment that valued creativity, which has been previously established is not a typical conventional classroom. Zhu and Zhang (2011) contended that Type 1 legislative thinkers have a more complex cognitive ability and noted the increased achievement of learners who were taught by teachers who had the same thinking styles (Sternberg, 2006; Zhang & Sternberg, 2011). Adding to the challenge of determining a relationship between thinking styles and creativity is the known factor that individuals change their thinking styles in response to the problem they are trying to solve which goes back to their proclivity for global thinking. Researchers also stressed the importance of personality attributes influence on individuals thinking styles as discussed

in the following section (Sternberg, 2006; Zhang & Sternberg, 2011; Zhu & Zhang, 2011).

**Interrelated Resource: Personality**

Personality has been studied as part of creativity research for decades. Some of the research has pointed to a general consistency of characteristics among creative people and some indicated significant changes in those characteristics over the course of the studies (Chávez-Eakle, Eakle, & Cruz-Fuentes, 2012). As previously stated, the characteristics attributed to creative individuals and the resources they choose to use are not fixed, a decision is made to implement or apply the abilities (Zhang & Sternberg, 2011). Sternberg cited the results of many of his own studies supporting the importance of certain personality traits within creativity. His description of personality attributes within the Investment Theory of Creativity are those of willingness to take risks, to defy conventional wisdom, to overcome obstacles when others give in, to tolerate ambiguity, and self-efficacy (Sternberg, 2006). Personality involves the way an individual acts on a daily basis and is often identified as traits or habits performed without conscious intention (Chávez-Eakle, Eakle, & Cruz-Fuentes, 2012; Da Ros-Voseles & Moss, 2007). An additional concept concerning personality is the idea that there are two components within personality. The biologically inherited traits are known as temperament and the attributes acquired through social interaction and environments are known as character (Chávez-Eakle, Eakle, & Cruz-Fuentes, 2012).

Even though Sternberg (2012) asserted that choosing the interrelated resources of the Investment Theory of Creativity is part of making a decision to creatively approach a problem, personality is not a resource that a creative person *decides* to use but rather

influences his or her responses and actions. Because personality drives individuals to think in ways that are outside typical thought processes, they make choices that result in a confluence of the resources during the creative process (Chávez-Eakle, Eakle, & Cruz-Fuentes, 2012; Sternberg, 2006; Zhang & Sternberg, 2011). Chávez-Eakle, Eakle, and Cruz-Fuentes (2012) contended that educators have an obligation to consider personality when designing curriculum and policies. They reported that a voluminous amount of research points to the continual development of individual personality through a lifetime. It is not confined to early childhood, adolescence, or adulthood and as such has a major impact on the potential personal creativity of each individual. A more thorough understanding of the personality attributes associated with creativity can be extended to a better understanding of the needs of highly creative learners in educational settings to better serve the needs of all students.

**Interrelated Resource: Motivation**

Sternberg's Investment Theory of Creativity includes a component of motivation. The research supports a direct link between how motivated individuals are to complete a task and how creative they are in the task. Specifically, intrinsic (i.e. internal) motivation is essential to creativity (Hennessey, 2003; Sternberg, 2012). Interestingly, Sternberg also argued that motivation is not an inherent characteristic and that it is a conscious decision to be motivated to do a task. Hennessey (2003) added that motivation and the environment are inextricably linked to the level of creativity expressed by individuals. Creative individuals love their work. The do not look for extrinsic (i.e. external) rewards to stimulate their creativity. Their work is the reward; they do the work for the sheer enjoyment of it. Amabile, Hill, Hennessey, and Tighe (1994) conducted a quantitative

study to examine intrinsic and extrinsic motivation among 1,363 undergraduate students and 1,055 working adults. The results of their study conducted over eight years indicated that intrinsic motivation encourages creativity and extrinsic motivation hampers creativity. This construct has been widely accepted because of the volume of research completed that supports this as a "...defining principle of creativity" (Hennessey, 2003, p. 255). However, Hennessey (2003) pointed out that after many years of continued investigation, there is an awareness of a model that supports the concept of sometimes rewards can indeed increase motivation without any major negative impact on the individual's creativity. She cited one example of a group of college students who were able to convince themselves that an external reward for completing an assignment was more of a bonus than a reward and therefore did not exert any control over their actions.

Considering that a significant attribute of creative individuals is that of a legislative thinking style in which persons prefer to do things their own way, and do not like being under control of anyone else, the idea of an individual being able to convince himself of a reward not being a reward so that he can still approach a problem creatively is fascinating. This would seem to support Sternberg's (2006) assertion that creative thinkers can find a way to identify some part of any task that interests them enough to get the work done, even if it is not something they are particularly interested in doing, which is in contrast to the research that indicates most creative people love what they do and that is why they do it creatively. Perhaps the most revealing concept of the literature surrounding personality research is simply that researchers have agreed that they, and the people they study cannot always explain why they do the things they do.

**Interrelated Resource: Environment**

The final component of the Investment Theory of Creativity is environment. Because creative thinkers tend to defy conventional wisdom with the introduction of novel ideas, Sternberg (2006) disclosed that a supportive and rewarding environment is crucial to creative development. However, the majority of environments are not supportive of creativity. Even if all the other resources are in place, without a supportive and encouraging environment an individual's creativity may never have the opportunity to be presented. Cultural differences must be considered within environments also. Hemlin, Allwood, and Martin (2008) outlined their concept of the *Creative Knowledge Environment* or CKE as a framework for evaluating groups and individuals interactions within environments to determine if there are factors in the environment that are affecting creativity. They asserted that understanding these factors can assist in planning environments that are more conducive to encouraging and supporting creativity.

As previously discussed, an individual's personality and thinking style will propel a person forward to challenge the opposition in the environment or it could stop the creative process completely (Liu, Lin, Jian, & Liou, 2012). In two recent studies of university students, (one group in a technology course and the other group in an engineering program) researchers reported that the construction of a learning environment that supported creativity increased students self-efficacy and abilities to approach a task with more confidence (Ayob, Majid, Hussain, & Mustaffa, 2012; Liu, Lin, Jian, & Liou, 2012). Students reported feeling increased satisfaction with their work and increased creativity through the freedom, support, and encouragement provided within the course environment. The effects of a supportive and encouraging environment

on the increased creativity of individuals extend to the learning environments of preservice teachers in teacher education programs, which in turn will be extended to the students in their classrooms, potentially increasing the creativity and achievement levels of all learners.

Sternberg (2006) contended that creativity is a combination of these six interrelated resources working together. Where an individual may be stronger in one resource than another, compensation occurs to support the weaker resource. Additionally, not all resources need to be used for every creative project. Sternberg (2006) reminded educators that the creative process is the result of many decisions. An important part of creativity is an individual's ability to switch between conventional and unconventional thinking. This switching aspect ability is proposed as one of the reasons some people are not creative. They make the decision to never operate outside a familiar domain and therefore are not challenged to think beyond what they already know (Sternberg, 2012). Sternberg (2006) has provided a series of studies within his framework that have yielded support for the model that suggested that teaching for creative thinking as well as practical and analytical thinking is very worthwhile. Not all learners can profit from conventional instruction, but potentially could be more successful with an expanded curriculum that includes opportunities for creative thinking (Sternberg, 2006).

## Domains of Creativity

### Societal and Individual Creativity

American economist and urban studies theorist, Richard Florida (2006b) contended that the best asset for economic growth is human capital. Natural resources

and physical capital have been replaced as the drivers of economic growth by human creativity (Florida, 2006a). Consequently, central to an economic future that depends upon intellectual input is the development of human creativity (Florida, 2006b; Grierson, 2011; Zhu & Zhang, 2011). The creative sector of the economy encompasses the following areas (Florida, 2006b; Grierson, 2011; Zhu & Zhang, 2011):

- science and technology,
- arts and culture,
- law and finance,
- health care,
- education,
- media and publishing,
- music and performance,
- fashion, and,
- Web design.

Grierson (2011), Florida (2006a) and Parjanen (2012) agreed that these are the fastest growing sectors of the economy in technological societies. Florida (2006a) reported that these sectors employed over 40 million people in 2006 and were expected to increase to over 50 million by 2014. The salaries earned by employees in these sectors totaled more than manufacturing and service industries combined. Grierson (2011) and Florida (2006a) asserted that it is imperative that the approach to learning within these industries include creativity. In particular, Florida (2006a) addressed the role of universities. He explained that universities are significant to the economic growth of communities and regions in which they are situated. He asserted that collaboration between the university

and the community is vital to regional creativity and subsequently the increase in growth that provides opportunities for graduates to stay in the region and continue to build upon that creativity.

Roberge and Gagnon (2012) described the importance of creativity development to individuals from the standpoint of enhancing mental dimensions for the purposes of investigating new or previously explored concepts. They also reported that as a result of technological progress changing our way of life and the knowledge base of all domains constantly expanding, individuals must challenge themselves to be innovative to meet the demands of society.

Individual creativity and societal creativity are inextricably linked. The healthcare and science and technology sectors serve as an example of this link. Individual creativity demonstrated by scientists through the development of new surgical techniques, drug treatments, bioengineering advances, and organ transplant techniques benefits society, but at the same time creates problems of moral and ethical dimensions that require society to creatively address; thereby ensuring that individual creativity continues to positively serve humanity (Runco & Nemiro, 2003).

In other sectors, organizations are seeking employees who can contribute to the process of creating and constructing new products, find methods to address gaps in production or marketing, and effectively provide a competitive advantage (Grierson, 2011; Parjanen, 2012; Roberge & Gagnon, 2012). Also of significance to society is organizational creativity which requires a blend of individual creativeness and collective creativity. Collective creativity necessitates that people work within groups as they push

organizations forward into new areas or provide a new focus or reenergize the focus on a previous problem (Hernandez, 2012; Parjanen, 2012).

**Creativity Assessment**

Assessing creativity is a very complex construct. In as much as it has been studied, there is still not agreement upon a singular assessment instrument. Over two hundred instruments are currently available for use (Villalba, 2008). They range from simple inventories that are lists of activities commonly associated with creativity to relatively more complex Likert-type scale instruments that weigh scores against levels of creativity to very complex, lengthy divergent thinking assessments (Eyadat & Eyadat, 2010; Hocevar, 1980; Treffinger, Young, Selby, & Shepardson, 2002). Some instruments are designed to measure creativity at specific moments in time and others such as the Creative Achievement Questionnaire are useful for longitudinal studies (Carson, Peterson & Higgins, 2005). Two relatively new tests include a shortened version of the Torrance Tests for Creativity known as the Abbreviated Torrance Test for Adults (ATTA) and the Abedi Test of Creativity (ATC) (Althuizen, Wierenga, & Rossiter, 2010). The deciding factor in which assessment to use lies in the specific definition of creativity by the researchers within the domain they propose to study and the duration of the study.

Treffinger, Young, Selby, and Shepardson (2002) offered a guide to identifying, locating, and evaluating creativity assessments. To design this guide the authors developed a plan to assess creative abilities, strengths, skills, or potentials by combining four data sources and four levels of performance. As defined by Treffinger, Young, Selby, and Shepardson (2002), behavior or performance data are first-hand observations

in real-life settings. The data sources included self-reported data in the form of inventories; attitude surveys, or checklists completed by the participants; rating scales by teachers, parents, mentors, or other adults; and tests designed for responses to a structured set of questions or tasks administered under standardized conditions. Zeng, Proctor, and Salvendy (2011) also included divergent thinking tests, biographical inventories, review of productions, achievements, and self-reported creative activities as performance data.

Treffinger, Young, Selby, and Shepardson (2002) pointed out that measurements of creativity cannot comprehensively be determined by any single instrument or procedure. They also pointed out that some elements of creative thinking can be documented across disciplines while others may be unique or distinct to particular domains thereby requiring alternative methods of measurement or assessment. They stressed that creativity is dynamic and changes over time as do levels of achievement. Thus, the reliability and validity of creativity assessments are often challenged (Treffinger, Young, Selby, & Shepardson, 2002).

Zeng, Proctor, and Salvendy (2011) addressed the use of divergent thinking assessments. They questioned whether divergent thinking assessments can measure or predict creativity in natural settings. They described the prevalence of using divergent thinking tests to measure individuals' creativity, however, these instruments have been criticized over the years as being somewhat unreliable.

The most often used divergent thinking assessment instrument is the Torrance Tests of Creativity (Althuizen, Wierenga, & Rossiter, 2010; Hebert, Cramond, Neumeister, Millar, & Silvian, 2002; Torrance, 1993; Zeng, Proctor, & Salvendy, 2011).

Divergent thinking assessments generate observable and quantifiable measures representing an individual's creative potential. Torrance designed his test with specific parameters in mind. Torrance's test has been taken by millions of participants and is available in over 50 languages (Hebert, Cramond, Neumeister, Millar, & Silvian, 2002; Torrance, 1993). In creating this assessment Torrance asserted that creativity should be assessed as part of the natural process of life for everyday people, that it was possible at any age, and that it arises from a human need to resolve an outstanding problem. According to Hebert, Cramond, Neumeister, Millar, and Silvian, specific criteria determined for the test included (2002, p. 14):

- the activities being measured had to be part of everyday life,
- be suitable for all ages and educational levels,
- be easy enough to elicit creative responses from the very young or disabled, but challenging for the most intellectually able,
- be free from gender or race bias,
- have open-ended questions, and,
- be fun.

It is highly recommended that creativity measurement be conducted in a domain-specific manner and that recognition of an achievement should be determined by an expert within that domain, because in the natural world, creativity relies on domain-specific expertise (Carson, Peterson, & Higgins, 2005; Zeng, Proctor, & Salvendy, 2011). In keeping with the focus of this study, the relationship between creativity and the domain of education is explored in the next section.

**Creativity and Education**

Michalko (2011) did not subscribe to ideas that creativity is genetic or based on a level of education or intelligence. He contended that creative people are simply willing to accept the possibility of putting two things or ideas together that would not normally be found in the same mental construct. In explaining unconventional thinking, he described ways that education forces students to be analytical thinkers by making associations between related subjects, as opposed to the hallmark of unconventional thinking which is making associations between unrelated subjects. He proposed that once a person learns to process information in an analytical way to know how to get an answer, that person stops thinking about alternative answers. Michalko (2011) explained that education teaches children how to reproduce what someone else has already thought rather than look for a different approach that might question the prevailing wisdom. He described how this process limits ability to be creative by teaching the brain to put mental barriers between unrelated subjects and concepts. He claimed that education teaches people to segregate information rather than integrate information. Cautioning that the intention is not to generalize that developing analytic thinking skills is all negative, Hennessey (2003) pointed out that analytical skills provide people with the ability to rapidly and accurately do a job or perform an action instantly. Developing patterns or habits allows people to react quickly in the environment while doing tasks such as driving a car. These skills simplify life.

Shaheen (2010), Michalko (2011), and Florida (2006b) argued in support of the importance of early childhood education in developing creativity in the building of human capital. Michalko (2011) used the example of a child with a cardboard box to

demonstrate this idea. A child with a cardboard box does not see just a box; they enjoy the process of exploring different ways of thinking about something as simple as a box and the possibilities of what it could become. The life of Leonardo DaVinci was also offered as an example. DaVinci was well known in his day as a painter, sculptor, architect, musician, scientist, mathematician, engineer, inventor, anatomist, geologist, cartographer, botanist, and writer. According to Michalko (2011) DaVinci was a child born out of wedlock and as such was not permitted to attend university. He was never trained to think analytically or in ways that segregated ideas and concepts as evidenced by the many areas of interest in his life that overlapped and combined into creative genius. Michalko offers this as a scenario for the way education may negatively affect creative learners. Kim (2008) detailed the academic journey of Albert Einstein to corroborate the contention that traditional school settings do not support student creativity. Einstein caused so much trouble in his high school through his nonconformity that he was asked to leave. He was much more successful through self-study and laboratory work. Likewise, Hennessey (2003) agreed that educational environments are organized in ways that limit intrinsic motivation and creativity, if not completely destroy them.

Tied to motivation is the tenet of creative thinkers to find ways to decide how to respond to challenges in the environment. Hennessey's (2003) report supported the significance of motivation and environment for creative development regardless of age. She identified five destroyers of motivation and creativity as "expected reward, expected evaluation, surveillance, time limits, and competition" (p. 263). She claimed this list might as well be labeled as a typical classroom.

Another recurring theme in creativity literature is the claim that one of the hallmarks of creative people is their ability to accept ambiguity in their life. Creative people effortlessly tolerate the unknown, having things out of place, and inconsistency (Michalko, 2011; Rinkevich, 2011; Sternberg, 2012; Torrance, 1993). This aligns to suggestions that these traits influence some teachers to not support creativity because it can create an environment that is challenging to manage (Kampylis, Berki, & Saariluoma, 2009; Kim, 2008; Rinkevich, 2011). Beghetto (2013) added that students' unexpected responses in the classroom are often interpreted by the teacher as disruptive and may encourage conflict. Teachers' responses typically tend towards redirecting learners instead of exploring the idea further. This soft dismissal of leaners' ideas undermines their confidence and potentially their achievement. Beghetto (2013) described these unexpected opportunities for new possibilities to emerge as *creative micro-moments* where the curriculum that has been planned meets the curriculum as lived by learners. He challenged teachers to adjust their management strategies to take advantage of these creativity rich moments. The concept of creative people as those who routinely break existing paradigms through methods that are not in line with conventional, traditional, and established teaching practices is a common theme in the literature.

**Creativity and Student Achievement**

The research presented pertaining to societal and individual creativity for the purpose of developing innovative human capital lends itself to a progression into research regarding instruction that generates students who demonstrate high achievement. Torrance (1993) proposed that all people have creative potential and that it can be

strengthened by learning. However, one of the most controversial aspects of creativity research is the suggestion by researchers that student achievement can be influenced by instruction that promotes creative thinking (Anwar, Shamim-ur-Rasool, & Haq, 2012; Eckhoff & Urbach, 2008; Leahy & Sweller, 2008; Palaniappan, 2008; Rinkevich, 2011; Schacter, Yeow Meng, & Zifkin, 2006; Sternberg, 2006). Eckhoff and Urbach (2008) described imaginative thought as a cognitive process and asserted that it is crucial to education. They speculated that although not everyone continues to develop their imagination, those who do encourage the process have the potential to become more creative. The authors emphasized that the purpose of education is to provide learners with an environment that stimulates the development of creativity and imagination which in turn encourages the learner to become better at problem solving and creative thinking to find innovative ways to approach and solve problems in the future.

Research studies have been conducted to investigate the possibility of a relationship between students' achievement and their creativity levels. One theme that emerged from the review of these studies is that in attempting to link creative thinking to achievement levels, the type of instruction provided to students is highly significant. The review of several articles indicated that students who had teachers who provided instruction that taught the processes of and encouraged creative and imaginative thinking demonstrated gains in achievement as measured on both analytical and performance assessments (Schacter, Yeow Meng, & Zifkin, 2006; Sternberg, Torff, & Grigorenko, 1998). This would support the premise that teacher training in creative thinking processes is critical for development of an innovative future workforce.

Sternberg, Torff, and Grigorenko (1998) described their studies of 213 third graders who were taught social studies and 141 eighth graders who were taught psychology under three conditions:

- Condition 1: The basic course with no changes.
- Condition 2: The course was taught in a way that emphasized analytical thinking.
- Condition 3: The course was taught emphasizing analytical, practical, and creative thinking.

All the students were evaluated using both memory assessments and performance assessments. Analysis of the quantitative data in this study revealed that all the students taught under the third condition scored higher on the performance assessments (Sternberg, Torff, & Grigorenko, 1998). They postulated that perhaps the result was due to the *way* they were taught but regardless, the results of the study showed that teaching for creative thinking was successful. They also indicated that a more important result of the study was that students taught in the third condition also scored higher on the memory assessments (a typical multiple-choice test) than students who were taught under condition two that emphasized analytical thinking. This suggested that teaching for creative thinking results in superior achievement even on analytical type assessments.

Although the suggestion has been made that teaching for creative thinking results in higher achievement, this cannot be generalized to all students without consideration of additional factors. Palaniappan (2008) conducted a study to explore the possibility of cultural influences on creativity and academic achievement. This quantitative study compared 40 Malaysian tenth grade students to 32 American students using the Torrance

Tests of Creative Thinking, intelligence assessments, and results of standardized tests conducted during the two months before the study. In discussing the results of the study, Palaniappan pointed out that Malaysian students are subject to a much more constrained lifestyle and test oriented curriculum than their American counterparts which may influence their creative abilities for generating ideas and making connections between unrelated ideas and concepts. The American students demonstrated higher scores on the figural creativity sections of the test, but overall, the correlation between the Malaysian students' creativity assessment scores with academic achievement was significantly higher than the American students. The study results also showed that academic achievement was influenced by creativity at higher intelligence levels for both American and Malaysian students. Palaniappan suggested that cultural influences may have affected individual aspects of Malaysian students' creativity, but added that providing creative activities for them may result in higher academic achievement than it would for American students (Palaniappan, 2008).

In examining the relationship between student achievement and creative teaching behaviors, Schacter, Yeow Meng, and Zifkin (2006) conducted a quantitative study in which the participants were 48 teachers and 816 students ranging from third grade through sixth grade. The study results indicated that teachers who implemented teaching behaviors that encouraged student creative thinking and imagination had students who generated substantial gains in achievement. They also pointed out that these results run counter to the current high-stakes accountability approach of educational instruction and assessment through standardized testing.

A second theme emerged from Schacter, Yeow Meng, and Zifkin's (2006) study suggesting that low and underachieving students are provided with significantly less creative teaching and learning opportunities. This was disappointing in the light that the body of research concerning creativity points to the benefits of developing intellectual capability through creative thinking regardless of student intellectual capability or identified achievement level. Interestingly, in Kim's (2008) report, those underachievers were students identified through traditional IQ testing as gifted. Kim posited that underachievement may be the result of a high level of creativity for a gifted student who is expected to perform in a manner associated with high levels of intelligence but cannot conform to the rigidity of a traditional classroom. Kim (2008) concluded that the same kind of instruction aimed at encouraging and developing creativity and creative thinking opportunities for traditional learners may increase achievement or at least begin to reverse the underachievement of gifted students. Palaniappan's (2008) study results also indicated that creative activities had a significant effect on academic achievement for students with higher intelligence scores. This would support Kim's conclusion regarding the positive outcomes for gifted underachievers by instruction that is inclusive of creative endeavors.

A third theme emerged from the review of the research pointing to an independence of creative thinking abilities apart from achievement levels. As evidenced by Kim's (2008) report about underachieving gifted students, no significant difference was noted between the creative thinking abilities of low and high achievers. This would indicate an even stronger call for support of increased preservice teacher training in

teaching strategies and methods that enhance and encourage the creativity of students of all achievement levels.

A review of the literature disclosed that creativity is significant to student achievement and attainment of educational skills. Of major significance is the kind of instruction provided that influenced student achievement and thus, is directly linked to the impact of preservice teacher training in creative thinking and teaching methods. The ability to cope with and make sense of information in a swiftly changing economic ideology demands that preservice teachers are provided with instruction in teaching creative thinking skills which in turn has the potential to increase the academic success of all learners (Anwar, Shamim-ur-Rasool, & Haq, 2012; Ewing & Gibson, 2007; Schacter, Yeow Meng, & Zifkin, 2006; Sternberg, Torff, & Grigorenko, 1998).

**Creativity and Teacher Education**

What characteristics are attributed to the individuals who make the choice to become teachers? In addition to acknowledging the benefits of creativity development indicated in the professional literature, teacher educators have increasingly adopted strategies to foster positive dispositions including creativity in response to the National Council for Accreditation of Teacher Education mandates for evaluating teacher candidates' dispositions (Da Ros-Voseles & Moss, 2007).

In one quantitative study conducted by Decker and Rimm-Kaufman (2008), over the course of three years, 397 preservice teachers were asked to describe their personality traits based on two measures. The first measure was a five factor personality inventory and the second measure was an exercise to assess the preservice teachers' beliefs about discipline, classroom practices, and children. They reported that the group had a

significantly higher rating on all five traits of the personality inventory than the comparative normal sample. The five traits measured were (Decker & Rimm-Kaufman, 2008, p. 47)

- extraversion which shows high levels of social interaction,
- openness that demonstrates flexibility,
- agreeableness or an ability to get along with others,
- neuroticism or being concerned about an ability to succeed, and,
- conscientiousness or goal oriented, and striving for excellence.

Colker (2008) explained that often the terms *personality traits* and *professional dispositions* are used interchangeably when in reality they are very different. According to Da Ros-Voseles and Moss (2007), personality traits or habits are behaviors performed without conscious intention. Skills and abilities such as classroom management, content knowledge, and instructional strategies are also not teacher characteristics. Dispositions or characteristics indicate a conscious, frequent, choice of behavior including resourcefulness, curiosity, enthusiasm, and persistence (Colker, 2008; Da Ros-Voseles & Moss, 2007). In her qualitative study, Colker (2008) interviewed 43 early childhood teachers and proposed a list of twelve characteristics or dispositions identified by the teachers as crucial for successful teaching. The list included passion for children and teaching, perseverance, risk-taking, pragmatism, patience, flexibility, respect, creativity, authenticity, love of learning, high energy, and a sense of humor.

Both the attributes of personality traits and dispositions in the aforementioned studies align with traits of creative teachers identified by Rinkevich (2011). She too acknowledged characteristics of persistence, self-confidence, a sense of humor, and a

willingness to take risks, push boundaries, and adapt teaching styles in regards to specific groups of learners. Educators agreed that preservice and inservice teachers can learn, acquire, and enhance positive professional dispositions through classroom experiences and environments that emphasize creative and imaginative thinking, and supportive interaction with peers (Da Ros-Voseles & Moss, 2007; Eckhoff & Urbach, 2008; Ewing, & Gibson, 2007).

Creativity has been described as a technique or skill that can be acquired, learned, and refined over time and expands preservice teachers' development of empathy and increased cognitive growth (Ewing & Gibson, 2007; Livingston, 2010; Marquis & Vajoczki, 2012). Simply stated, "Increasing creativity in teaching begins with teacher education" (Rinkevich, 2011, p. 220). Marquis and Vajoczki (2012) also contended that it is "essential for institutions of higher education to foster creativity in their students" (p. 1). Livingston (2010) echoed the same sentiment, "We do have an obligation to explore the means by which we may anchor creativity in the mission of our education institutions" (p. 59). Ewing and Gibson (2007) described creative and imaginative thinking development for preservice teachers as essential to increased cognition and enhanced development of empathy.

Marquis and Vajoczki's (2012) mixed method study of six faculty groups within one university revealed that over half believed that creativity could be taught within their discipline. Even more revealing was that between 70 % and 100 % of the respondents within specific discipline groups in the study agreed that "Creativity is a teachable phenomenon" (Marquis & Vajoczki, 2012, p. 9), even though the definitions of creativity varied within each discipline. Recommendations for teacher education programs include

supporting and increasing preservice teachers' creativity and imaginative thinking processes, providing training in specific instructional strategies to support *their* students' creativity, instructional planning training, and strategies for classroom management when engaging students in creative work (Fleith, 2000; Kim, 2008; Šorgo et al., 2012).

An example of successful implementation of these recommendations was revealed in Ewing and Gibson's (2007) qualitative case study of innovative practice in which preservice art teachers were encouraged to use a variety of art mediums to explore their own preservice teacher identities. Students were encouraged to examine how the act of using the method and the specific medium itself might impact their teaching thus, providing a method of supporting individual creativity while also providing training in positive dispositions and teaching skills (Ewing & Gibson, 2007).

Torrance's (1993) suggestion that the creativity of all people can be strengthened through learning environments also extends to higher education. Furthermore, strengthening the creativity of preservice teachers is vital to the education of a future workforce, including educators, that has the creative thinking skills to meet the demands of a knowledge-based society through innovative solutions to pressing problems.

The literature regarding creativity and its significance to individuals, society, and education is best summarized by Chavez-Eakle, Eakle, and Cruz-Fuentes (2012), in that "Creativity is crucial to what it is to be human; it enhances our adaptation to the environment and circumstances allowing us to transform them" (p. 76).

## Mobile Learning Technology

As discussed in Chapter 1, an ever increasing selection of mobile learning technology including smartphones, cell phones, iPads®, iPods®, netbooks, tablets,

eReaders, PDA's, MP3 players, GPS units, assistive technology, and laptops provides a myriad of opportunities for creativity and imaginative thinking in pedagogical practices (Kant, 2012; Livingston, 2010; Tillander 2011). The popularity of mobile learning technology has radically changed life educationally, economically, and socially. Although increasing teacher educators' understanding of preservice teachers' typical patterns of technology use has the potential to enhance the transferability of skills and abilities to the formal educational environment of higher education, the functionality of mobile learning devices is applicable on so many levels that education is increasingly losing the boundaries of the traditional classroom (Akintola, Ojokoh, & Boyinbode, 2012; Kant, 2012; Traxler, 2007). The use of mobile learning technology provides learners with a way to bypass the traditional boundaries of education by granting access to coursework anytime and anywhere, successfully integrating education, work, and life (Kant, 2012). Learners connect to the world around themselves by constructing personal learning environments that include networks to frequently used tools, sources, social networks, and online collaborations (Hook & Ditzler, 2013). Norris, Hossain, and Soloway (2011) conjectured that "The method of learning matters; the instrument of learning does matter" (p. 24), in their argument for mobile learning technology as tools for learning and teaching. Kant (2012) also emphasized that integration of mobile learning technology will not stop and institutions have a responsibility to ensure that this change within educational environments can provide better equality in education.

If, as researchers have contended, the result of increased creativity on the part of learners leads to higher levels of achievement, especially those learners who have teachers who provide opportunities for creative responses to instruction, then it is vital to

encourage preservice teachers' creative applications of mobile learning technology (Anwar, Shamim-ur-Rasool, & Haq, 2012; Eyadat & Eyadat, 2010; Hook & Ditzler, 2013; Leahy & Sweller, 2008; Palaniappan, 2008; Rinkevich, 2011; Schacter, Yeow Meng, & Zifkin, 2006; Sternberg, Torff, & Grigorenko, 1998). Other technology laden domains such as engineering, science, instructional technology, and art have long been associated with creativity (Bennett & Maton, 2010; Özdemir & Çakmak, 2008; Šorgo et al., 2012; Tillander, 2011). But, as previously pointed out, creativity has been linked with behaviors that are not supported by traditional educational environments, and thus teacher education programs have not been afforded the encouragement to cultivate creativity as within other disciplines. More importantly, even though mobile learning technology may offer learners in formal learning settings the ability to explore concepts in-depth, an increased understanding of those concepts, which could potentially lead to increased student achievement, will only happen if educators know how to effectively and creatively use the mobile learning technology available to both themselves and learners (Bull et al., 2008; Dilworth et al., 2012; Eyadat & Eyadat, 2010; Rinkevich, 2011; Schmidt-Crawford, Thompson, & Lindstrom, 2012; Tillander, 2011). It is no longer sufficient to have access to technology without knowledge of how to use it effectively and successfully however, Kant (2012) cautioned that the use of mobile learning technology could promote information *grazing* where small chunks of information are gathered and deeper understanding of content is not sought after (p. 5). He recommended that teacher education programs include technical training as well as pedagogical training in the use of mobile learning technology to increase preservice teachers' expertise in instructional planning, sharing resources, and continued personal learning. From another

position, Khaddage and Knezek (2012) asserted that mobile learning technology can promote deeper understanding of concepts through self-discovered learning that is supported in research based theoretical bases for learning such as constructivism.

Given that current preservice teachers are members of a generation for whom using and adapting to new advances in technology is an everyday occurrence, their expertise in the use of the features, software, applications, and functions of the technology encourages a shift in teacher education thinking that focuses on the pedagogical and student learning centered contexts of mobile learning technology rather than a device operation focus (Kumar & Vigil, 2011; Niess, 2011). Questions and challenges that have risen from the incorporation of digital technology into 21st century learning have been addressed in a framework known as Technology, Pedagogy, and Content Knowledge (TPACK) (Mishra & Koehler, 2006). This framework outlines the knowledge teachers should acquire for instructional purposes and curricular decisions regarding the effective use of digital technology to support learners thinking and learning in various content areas and how they can develop this knowledge (Mishra & Koehler, 2006; Niess, 2011).

As the use of mobile learning technology increases, the role of educators must shift from being knowledge transmitters to include collaboration, mentoring, and facilitating active student learning within combined informal and formal learning environments (Akintola, Ojokoh, & Boyinbode, 2012; Norris, Hossain, & Soloway, 2011). Frameworks such as TPACK provide guidance in designing programs that meet the needs of teachers as they adjust to this shift (Mishra & Koehler, 2006).

**m-Learning**

Worldwide, a shift in learning has occurred through the everyday use of m-Learning (Kant, 2012). m-Learning or mobile learning technology is described as participation in learning activities through the use of wireless hand held devices and technologies that enhance student outcomes (Rossing, Miller, Cecil, & Stamper, 2012). Distinct features of m-Learning are the portability of the devices and the mobility of learners (Traxler, 2007; Yeonjeong, 2011). Akintola, Ojokoh, and Boyinbode (2012) and Kant (2012) described m-Learning as including technology that incorporates the practices, tools, applications, and strategies of a discipline to support individual or collaborative anywhere, anytime learning. Furthermore, according to Yeonjeong (2011), m-Learning promotes learning across contexts and possibilities for working in ways that were previously not available. Also, m-Learning provides freedom from traditional school environments by the flexibility it offers. Learning no longer has to be confined to a fixed, predetermined physical location. Ownership of mobile technology devices appeared to improve student involvement in the learning process as opposed to the outcomes of several students sharing a form of digital technology (Akintola, Ojokoh, & Boyinbode, 2012; Kant, 2012). m-Learning is considered to be the second phase of a change in electronic learning technology. The initial phase was e-Learning. e-Learning is characterized by the individual use of technology that is hardwired or tethered to a physical place such as desktop computers and computer labs, has a one-to-one relationship, and is often associated with distance or online learning. e-Learning technology traditionally has a reputation of being more powerful than m-Learning technology but competition between manufacturers has propelled rapid advances in

technology resulting in a significantly narrowed gap between the two (Kant, 2012; Traxler, 2007; Yeonjeong, 2011). The third phase of electronic learning technology is called ubiquitous or u-Learning where the learning environment provides learners with access to a variety of mobile learning technologies and connection to the Internet so that the devices are no longer noticed or focused upon as a separate part of the environment (Yahya, Ahmad, & Jalil, 2010; Yeonjeong, 2011). The forms of electronic learning technologies are not specifically confined to educational settings but are also observable within work environments where the right information at the right time is critical to increased productiveness (Yahya, Ahmad, & Jalil, 2010).

The development and implementation of e-Learning, m-Learning, and u-Learning technologies have altered the nature of knowledge acquisition. Mobile learning technology has certainly provided unbridled access to information. Even though the acquisition of information has been significantly changed through the use of mobile learning technologies and is now often defined in terms of m-Learning as *finding* knowledge rather than possessing it, teachers and professionals have a responsibility to guide learners' construction of meaning and knowledge from that information (Rossing, Miller, Cecil, & Stamper, 2012; Traxler, 2007).

**Mobile Learning Technology Users**

In order to more fully understand the scope of who is using mobile learning technology and the purposes associated with that use, the literature selected for review in this section was chosen for relevance to the respondents' positions within various educational environments. Figure 2 provides a comparison of studies by Chen and deNoyelles (2013), Dahlstrom (2012), and PBS (2010) regarding mobile learning

practices of teachers, undergraduate, and graduate students in various learning environments.

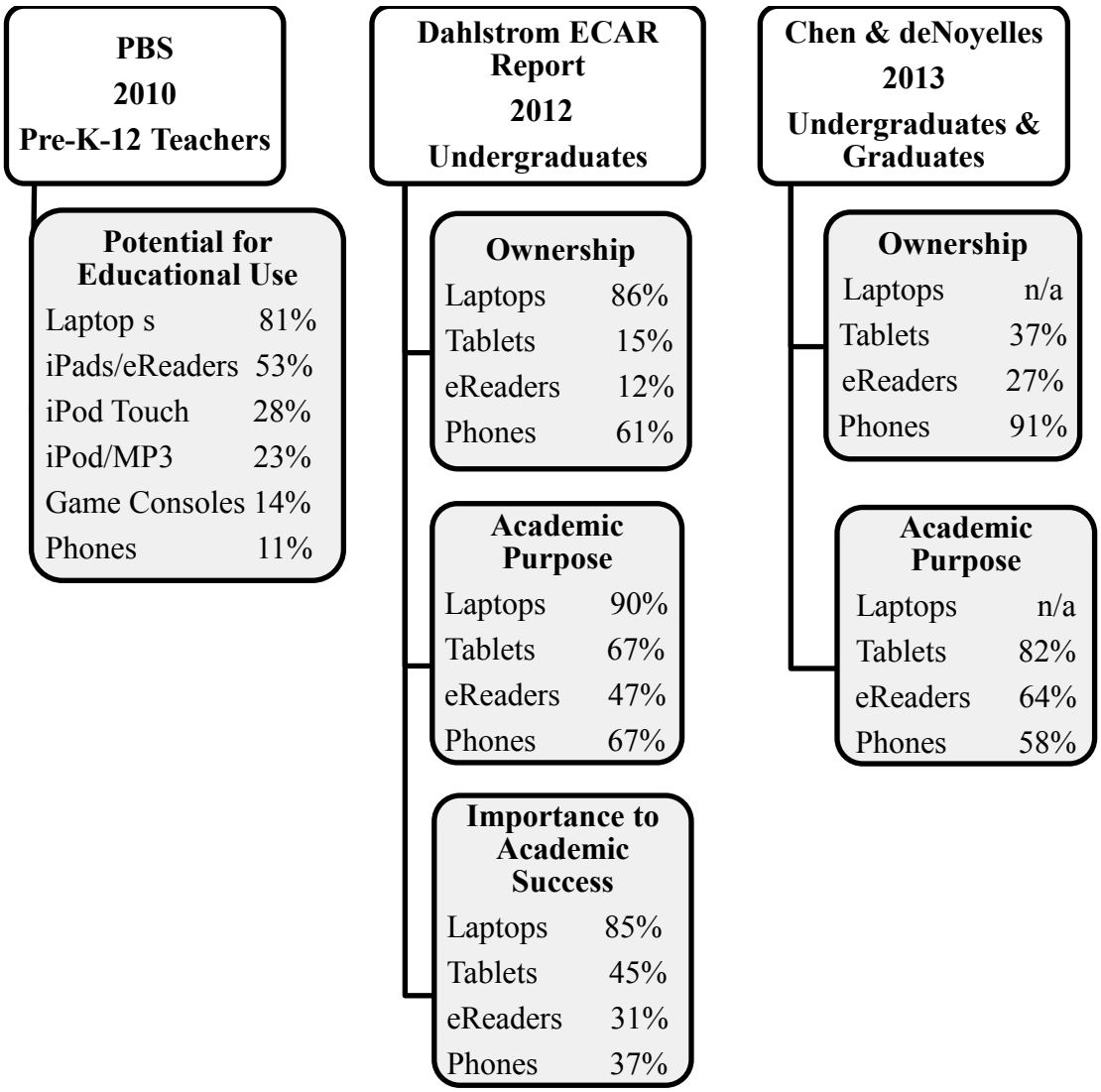


*Figure 2.* A comparison of three studies concerning mobile learning practices.

This review begins with a report commissioned by the Public Broadcasting System (PBS) and administered by Grunwald Associates, LLC in 2010. A list of technology was generated that teachers indicated had the greatest potential for educational purposes. The respondents included over 1,400 Pre-K through grade 12 teachers in both public and private schools. As indicated in Figure 2, laptops were the

top choice of mobile learning technology for educational use as determined by this group of teachers. Fifty-three percent of the teachers placed tablets and eReaders as having potential for educational purposes, which is significant considering that the tablet format was introduced the year the study was conducted. eReaders had been in use for several years in 2010. The teachers who participated in the study designated mobile phones as having the least potential for use within education.

Two years later, Dahlstrom (2012) summarized the Educause Center for Applied Research (ECAR) report "ECAR Study of Undergraduate Students and Instructional Technology 2012." This research study of over 10,000 undergraduate students was conducted in one hundred eighty-four universities across the United States. In comparing the PBS (2010) study results for educational potential of mobile learning technology to the ECAR report category of devices that undergraduate students indicated most important to academic success, it appears that laptops remained as the tool most often chosen by teachers and students. Dahlstrom (2012) pointed out that students viewed laptops as more useful because of the screen size compared to phones and tablets but that the improvements in tablets were increasing their usability factor closer to that of laptops. The tablet and eReader categories were relatively close in the importance for educational use as determined by teachers and students. However, a marked difference is apparent in the teachers and undergraduates beliefs about the educational importance of phones with an increase from 11 % of teachers to 37 % of undergraduate students between 2010 and 2012. Even more significant is the increase in phone ownership of undergraduates and graduate students in one year between 2012 and 2013 as reported in the Chen and deNoyelles (2013) study. In 2013, 30 % more students owned phones than in 2012, and

Dahlstrom reported that 67 % of students used their phones and tablets for academic purposes which were double the percentage reported in the 2011 ECAR report.

Chen and deNoyelles' (2013) study was limited to one university and included undergraduates and graduate students. A significant increase in tablet ownership was noticed by the researchers and they pointed out that graduate students ownership outpaced undergraduates. Chen and deNoyelles (2013) asserted that the 82 % usage reported by students for academic purposes indicated that tablets have become a powerful learning tool. Their study also revealed that eReader ownership at this university was double that of the national study by Dahlstrom and the usage percentage was significantly higher. The use of phones for academic purposes was slightly lower than the national study reported but could be conjectured to be a result of the increase in tablet and eReader usage. An additional component of the Chen and deNoyelles (2013) study was data collected regarding the students' use of academic apps. The students indicated that the apps used most often were for information, reference, university specific, and resource management. In regards to all applications used, by far the most often used apps were for social networking purposes with 75 % of students reporting they used them the most often.

The outcome of all three studies (Chen & deNoyelles, 2013; Dahlstrom, 2012; PBS, 2010) revealed that undergraduate students, graduate students, and teachers believe in the benefits of technology. Students' beliefs held that technology assists in the following (Dahlstrom, 2012, p. 9):

- achieving academic outcomes, 75 %,
- preparing future plans, 74 %, and,

- preparing for employment, 63 %.

Teachers in the PBS study believed that technology assists in the following (2010, p. 9):

- obtaining information, 76 %,
- exchanging resources, 77 %, and,
- developing professional connections, 49 %.

As the beliefs of teachers and students outlined in these studies indicated, increased application of mobile learning technology is supported by both students and teachers.

**Impacts of Mobile Learning Technology**

Two major perspectives concerning the impacts of mobile learning technology become apparent in the literature. One perspective is that of increasing student achievement and the other is from a stance of enhancing students' engagement in the learning process.

Mobile learning technology use in higher education is one focus within current literature. Rossing, Miller, Cecil, and Stamper, (2012) reported the results of their mixed methods study conducted to explore iPad® use in a higher education classroom. Eight instructors (in different disciplines) and a total of two hundred undergraduate students participated in the study to determine students' perceptions of whether or not engagement and achieving course outcomes was increased by the use of iPads®. Results of the study indicated that students reported positive attitudes towards the ability to customize instruction through the use of tools on the iPad® to meet their needs, expanding knowledge beyond the classroom, increased interaction and participation in class discussions, a chance to use new technology, suitability for individual learning styles, and convenience and portability. The students also reported there were drawbacks to using

the technology that included the temptation to be distracted by social networking apps, chat features, email, connectivity issues, ineffective or inoperable apps, a technological learning curve that was more pronounced for some students, and the touchscreen keyboard design was frustrating for some students. The researchers concluded from the study results that the participants in the study perceived using the technology as beneficial for several reasons including immediate access to information and course resources, for application to real-life situations, and for the ability to be involved in the learning process without time or physical boundaries.

Acknowledging the student achievement perspective, Norris, Hossain, and Soloway (2011) reported the results of their qualitative study in which a class of third graders and their teacher used smartphones as the primary instrument for lesson delivery. Smartphones were provided to the teacher and students with software that allowed the entire lesson to be developed and enacted using the phone. Students were exposed to 21 weeks of lessons in various content areas designed specifically for use with smartphones. Test results in science content showed significantly higher scores for students in the class using the smartphones than in the other classrooms (Norris, Hossain, & Soloway, 2011). Norris, Hossain, and Soloway (2011) asserted that increasing student achievement will only happen if technology is integrated into the curriculum, not as a supplement to instruction, but as a prevailing instrument for instruction. They contended that the educational domain needs to develop appropriate and useful applications, and implement 21st century technology as an essential tool just as businesses and other 21st century workers have done. Both studies showed positive results for including mobile learning

technology in situational learning environments, however, they are indicative of only a small portion of much larger and more complex constructs of education and pedagogy.

Emerging from review of the literature regarding the impact of mobile learning technology within education are three areas for consideration:

- supporting conceptions of teaching,
- challenges to teaching and learning, and
- the impact on learning types and environments.

Specific disciplines have different conceptions of teaching and learning that are traditionally accepted as relevant to the discipline. Those conceptions range from methods for delivery of content to supporting learning of students. In making the case for mobile learning, many similarities concerning advantages and disadvantages emerged from the research. Table 4 synthesizes factors of mobile learning technology that impact learning and teaching conceptions based on reports by Akintola, Ojokoh, and Boyinbode (2012), Kant (2012), Traxler (2007), and Yeonjeong (2011).

Table 4

*Impact of Mobile Learning Technology on Learning and Teaching Conceptions*

| **Supporting Conceptions of Teaching** | **Challenges to Teaching and Learning** | **Impact on Learning Types and Environments** |
|---|---|---|
| • Individualized Authentic Situations<br>• Promotes Active & Lifelong Learning<br>• Opportunities for Exploration & Inquiry<br>• Immediate Feedback<br>• Encourages Global Intercultural Perspective | • Possible Cheating<br>• Advantageous to Tech-Savvy Students<br>• Rapid Changes in Technology<br>• Realignment of Assessments<br>• Unequal Access Due to Financial Issues<br>• Privacy and Security Issues | • Promotes Learner Participation<br>• Transfers Skills to Work & Learning Environments<br>• Encourages Collaboration<br>• Enhances Creation of Learning Materials within Situational Learning |

Gaining an understanding of m-Learning relevance to conceptions of teaching and learning is extended through research by Akintola, Ojokoh, and Boyinbode (2012) who presented six major learning types and offered suggestions of how adaptations for implementing mobile learning technology can easily be connected to learners' situations. The authors identified the learning types as (a) behaviorism, and suggested that providing quick feedback could be facilitated through the use of mobile learning technology, (b) constructivism that could be supported through the implementation of simulators and learning situations that immerse the learner in authentic experiences, (c) situated learning where mobile learning technology devices are used in context of real world experiences, (d) collaborative learning in which mobile learning technology devices can be used for information gathering and sharing as well as communication between learners, (e) informal and life-long learning where the devices are used as everyday tools and provide learners with access to social networks that support career oriented goals, and (f) support and coordination that is supported by learners use of mobile learning technology for access to resources such as communication, planning, calendars, address books, news, and weather (p. 108).

Review of the literature regarding mobile learning technology is not without description of limitations and challenges associated with m-Learning (Akintola, Ojokoh, & Boyinbode, 2012; Kant, 2012; Yeonjeong, 2011). Several operations related themes appeared in the research including issues of (Kant, 2012, p. 5; Yeonjeong, 2011, p. 82):

- device reliability,
- connectivity problems and costs,
- short battery life,

- small viewing screens,
- inadequate memory space,
- rapid change in apps and operating systems,
- ability to purchase updated versions,
- interruptions during use in public spaces, and,
- privacy and security problems.

Several researchers discussed an additional factor of *instructor mobility* that influences creativity as learning materials get created in response to real-life situations and situational learning environments. This increased teacher mobility will require teacher education programs to design curriculum that provides both technological and pedagogical instruction in teaching creatively using mobile learning technology from a variety of environments (Akintola, Ojokoh, & Boyinbode, 2012; Kant, 2012; Rossing, Miller, Cecil, & Stamper, 2012; Schmidt-Crawford, Thompson, & Lindstrom, 2012). Likewise, an approach to teaching and learning through mobile learning technology connects learners within a social context where communication and knowledge sharing is a typical occurrence and supports creativity as knowledge is constructed through discovery learning (Khaddage & Knezek, 2012).

## Summary

In this chapter, the literature surrounding mobile learning technology, the nature of creativity, and their roles within individual, societal, and educational domains was reviewed. A review of the literature denoted a call for significant changes within teacher education programs to support technology savvy-preservice teachers' creativity.

Given that among the many purposes identified for education is an expansion of learners thinking processes, not all learners can profit from conventional instruction. The potential exists for learners to be more successful with an expanded curriculum that includes opportunities for creative thinking (Sternberg, 2006).

Indications of the literature also include the belief of university students that using technology is important to their academic success (Chen & deNoyelles, 2013). Eyadat and Eyadat (2010) claimed, "The technology-based learning approach appears to be the most effective teaching-learning tool that enhances creativity" (p. 89). Revealed in the literature review is that increased student achievement, engagement in the learning process, and creativity can be achieved through the use of mobile learning technology devices (Eyadat & Eyadat, 2010; Norris, Hossain, & Soloway, 2011; Rossing, Miller, Cecil, & Stamper, 2012). Increasingly vital to supporting a future workforce, including educators, is the strengthening of preservice teachers' creative abilities as well as a transfer of mobile learning technology skills from daily use to creative academic and pedagogical purposes. Thus, the purpose of this study is to examine preservice teachers' perceptions of the ways creativity is displayed within their instructional practices when mobile learning technology is utilized. Chapter 3 will describe the methodology, instruments, and procedures for this interpretive qualitative study.

# CHAPTER 3

# METHODOLOGY

This chapter describes the design and methodology of this study. An interpretive qualitative approach was used to inform and respond to the research questions.

The chapter provides the purpose of the study and the research questions. The criteria for the sample are described and the sampling procedure is detailed. The setting for the study is identified and the procedures for data collection, instruments developed for the study, data analysis methods, and validation strategies are addressed.

## Purpose of the Study

The purpose of this study was to examine preservice teachers' perceptions of the ways creativity is displayed within their instructional practices when mobile learning technology is utilized.

## Research Questions

Wright and Wilson's (2005) mixed method study indicated that the transfer of preservice teachers' technology skills to university classrooms and practice teaching situations is beginning. They disclosed that teacher education programs are increasingly providing opportunities for preservice teachers to infuse their daily technology use into university coursework and field experiences. Worley (2011) added that mobile learning technology users appear to be multitaskers who have developed faster thinking and response skills, and have increased their exposure to cultural diversity through enlarged communication networks. The expectation of instant results through the use of mobile learning technology has developed their viewpoint of learning as a creative process for solving problems rather than a linear process (Worley, 2011).

Livingston (2010), Bennett and Maton (2010), and Tillander (2011) also described ways that preservice teachers currently display creativity while using mobile learning technology to actively participate in accessing information, self-directed learning opportunities, data sharing through collaboration with peers, and content creation.

Citing the positive potential increases in both pedagogical creativity and student achievement, researchers advocate for teacher preparation programs to strengthen mobile technology use by the current generation of preservice teachers (Kant, 2012; Norris, Hossain, & Soloway, 2011; Rossing, Miller, Cecil, & Stamper, 2012).

This interpretive qualitative study contributed to the body of research surrounding this call for change by examining preservice teachers' creativity and the ways it is displayed in their instructional practices when mobile learning technology is utilized. Therefore, this research study explored the following questions:

1. In what ways do preservice teachers use mobile learning technology?
2. What perceptions do preservice teachers have of their personal creativity?
3. What perceptions do preservice teachers have regarding the influence mobile learning technology has on the ways creativity is displayed in their instructional practices?

## An Interpretive Qualitative Design

An interpretive qualitative approach to research aims to describe the perceptions and experiences of study participants. It is characterized by inductive investigative strategies that assist the researcher's search for meaning and understanding that people assign to the study problem (Creswell, 2013; Merriam, 2002). The resulting outcomes are in-depth, highly descriptive, and include the voices of the participants (Creswell,

2013; Merriam, 2002; Neergaard, Olesen, Andersen, & Sondergaard, 2009) Interpretive qualitative research provides the researcher with a method to uncover or discover commonalities in a shared experience regardless of the individual diversity or environmental differences (Creswell, 2013; Leedy & Ormrod, 2010). An interpretive approach is useful for researchers who seek to understand, describe, and interpret the lived experiences shared by several individuals to develop a deeper awareness that can be applied when making decisions concerning practices associated with the study discipline (Creswell, 2013; McMillan & Schumacher, 2010).

This study employed an interpretive approach to examine preservice teachers' perceptions about the ways creativity is displayed in their instructional practices when mobile learning technology is used. This approach to research aided the researcher in exploring creativity within instructional practices, and focus on understanding the participants' perspectives.

Interpretive qualitative research is characterized by an intimate relationship between the participants and the researcher (Rowland, 2005). The researcher becomes the primary instrument of data collection and analysis (Creswell, 2013; Merriam, 2002). Utilizing an interpretive qualitative approach for this study assisted the researcher in developing a relationship that promoted participants' willingness to reveal their experiences and elaborate on personal perceptions in a detailed manner. An interpretive qualitative approach for this study supports the researcher's quest to show robust, fair, and rigorous representation of the data to facilitate broadening the body of research concerning preservice teachers' creativity and mobile learning technology use (Stake, 2006; Yin, 2009).

Three forms of data collection provided support and strengthened understanding of the participants' perceptions. Collecting more than one form of data increased the depth of understanding (Creswell, 2013; Mertler & Charles, 2011). An interpretive perspective of qualitative research provided the researcher with a platform to explore participants' thoughts concerning how they are making sense of events during this time, what is happening in particular situations, what responses are taking place, and what factors influence those responses. The data collection instruments included the Mobile Learning Technology and Creativity Survey, focus group interviews, and submission of a written methods course assignment. Table 5 aligns each research question to the corresponding data collection instruments.

Table 5

*Research Questions Matrix*

| **Research Question 1**<br>In what ways do preservice teachers use mobile learning technology? | |
|---|---|
| **Focus Group Interview Protocol** | **Mobile Learning Technology and Creativity Survey** |
| 1. In what ways are you using/ have you used mobile learning technology?<br><br>a. Describe how you use the information you gather through mobile learning technology. Do you use the information without altering it or do you creatively adapt the information to suit your needs? (e.g. content knowledge, instructional strategies, lesson plans, find something on Pinterest and use it, download a presentation and use it to teach a lesson, download an app and use it, use a website for teaching) | (5). Were you permitted to access and use your mobile learning technology for professional purposes while interacting with the children during your last field experience?<br><br>(6). Which mobile learning technology device(s) do you currently use? (Mark all that apply)<br><br>☐ Tablet Device (iPad®, android, or similar)<br>☐ Laptop<br>☐ Smartphone<br>☐ Cell Phone<br>☐ iPod®<br>☐ eReader (Kindle®, Nook®, or similar)<br>☐ other_____<br><br>(7). Rank the mobile learning technology device(s) |

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| 3. Based on your previous practice teaching experiences, describe your expectations for using mobile learning technology within your instructional practices.<br><br>6. How would you describe the significance of having access to your mobile learning technology for instructional practices? | you use in order of frequency.<br>(1 being the most used)<br><br>_____ Tablet Device (iPad®, android, or similar)<br>_____Laptop<br>_____Smartphone<br>_____Cell Phone<br>_____iPod®<br>_____eReader (Kindle®, Nook®, or similar)<br>_____other_____<br>(8). What was the first mobile technology device you owned?<br><br>(9). What is your earliest memory of using a form of technology?<br><br>(10). How old were you when you got a cell phone?<br><br>(11). What was the last technology device you purchased or received?<br><br>(13). List three of your typical everyday uses of the mobile learning technology device you use most frequently.<br><br>(14). How much time do you estimate you spend each day (24 hours) using mobile learning technology for the following purposes:<br><br>a. Personal<br>b. Recreational<br>c. Academic (coursework)<br>d. Pedagogical (teaching)<br><br>(16). Which mobile technology device could you "not live without"? |
| **Research Question 2**<br>What perceptions do preservice teachers have of the ways their personal creativity is displayed in their instructional practices? | |
| **Focus Group Interview Protocol** | **Mobile Learning Technology and Creativity Survey** |
| 2. Do you believe you use your mobile learning technology more creatively for personal or professional purposes? | (17). For each statement place an "X" in the column that best describes you.<br>(Completely True, Somewhat True, Somewhat True or False, Somewhat False, Completely False) |

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| a. If you believe you use it more creatively for one purpose than the other can you describe what you do that you feel makes it more creative for that purpose?<br><br>5. Think of a time when you were unable to use mobile learning technology to address a problem and describe what needed to be done.<br><br>d. Describe your reaction to the inability to use your mobile learning technology.<br><br>**Written Methods Course Assignment Submission**<br><br>1. What parts of this assignment demonstrate that I used my mobile technology in a creative way?<br><br>2. What makes me feel that the way I approached and completed this assignment is creative based on the definitions/descriptions for this study? | When faced with a problem, I try to look at it from different angles in order to come up with the best solution.<br>I have complete faith in my capabilities/skills.<br>Change in general makes me uneasy.<br>When others get stuck, I am able to think of new solutions to problems.<br>I don't think it's necessary to come up with new solutions to a problem if the one I've used in the past was successful.<br>I like learning new things.<br>When faced with a difficult problem I tend to get discouraged easily.<br>I enjoy trying/using new things.<br>I'm the type of person who thinks "outside the box."<br>Making "on the spot" decisions makes me uncomfortable.<br>I don't mind if my life has aspects that are open-ended with no end in sight. I tolerate things being ambiguous or messy.<br><br>(18). Provide your personal definition of creativity. |
| **Research Question 3**<br>What perceptions do preservice teachers have regarding the influence mobile learning technology has on the ways creativity is displayed in their instructional practices? | |
| **Focus Group Interview Protocol** | **Mobile Learning Technology and Creativity Survey** |
| 1. In what ways are you using/ have you used mobile learning technology?<br>d. In what ways do you use it for professional purposes that differ significantly from personal uses? Using a percentage, can you compare how much you use it for each?<br><br>2. Do you believe you use your mobile learning technology more creatively for personal or professional purposes? | (12). Describe any reasons you use a particular mobile device more than another.<br><br>(13). List three of your typical everyday uses of the mobile learning technology device you use most frequently.<br><br>(15). Describe the kind of information you gather through mobile learning technology for personal or professional use. Do you use the information without altering it or do you creatively adapt the information to suit your needs? |

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| 4. Think of a time when you have creatively used mobile learning technology and describe how you interpreted what needed to be done and what technology you chose to use (this can include classroom management strategies and rewards).<br><br>5. Think of a time when you were unable to use mobile learning technology to address a problem and describe what needed to be done.<br><br>6. How would you describe the significance of having access to your mobile learning technology for instructional practices?<br><br>7. Do you believe that using mobile learning technology makes a significant difference in the creativity and quality of your instructional practices?<br>a. If so, why, and in what ways?<br>b. If not, why?<br><br>8. Describe your beliefs regarding potentially increasing your students' engagement and achievement by creatively using mobile learning technology within your instructional practices.<br><br>9. Based on your experiences, describe any changes to your expectations and plans for using mobile learning technology within your instructional practices as you begin your professional teaching career. | **Written Methods Course Assignment Submission**<br><br>1. What parts of this assignment demonstrate that I used my mobile technology in a creative way?<br><br>2. What makes me feel that the way I approached and completed this assignment is creative based on the definitions/descriptions for this study? |

## Context of the Study

After obtaining approval to conduct this study from the Institutional Review Board (IRB) at Indiana University of Pennsylvania (IUP), and the study site, the researcher began the process of securing participants for the study from Goldcup University in western Pennsylvania. The university website of the Office of Information Management and Institutional Research provides demographic data for the university as of the fall 2013 semester. According to the university fact book, this is a public university with a total enrollment of 5199 undergraduate students and 881 graduate students. The gender of the students is reported as 2128 males and 3952 females. The fact book lists seventeen undergraduate education majors within the College of Education and Human Services with a total enrollment of 781 students. One graduate degree is listed with an enrollment of 114 students.

The researcher petitioned participants from a pool of preservice teachers at Goldcup University who are enrolled in the Early Childhood Pre-K-Grade 4 teacher certification preparation program for the spring semester of 2014. Goldcup University preservice teacher cohorts move through a series of program courses that each incorporate field experiences of increased length, various ages, diverse developmental stages and abilities, and different grade levels. Table 6 outlines the sequence of methods courses for Early Childhood PreK-4/Special Education (ECSP) majors and Early Childhood PreK-4 (ECH) majors. Field experience within each course in the program intensifies preservice teachers' levels of engagement with learners. The capstone project in the program is participation in a field experience of full time practice teaching for fourteen consecutive weeks.

Table 6

*Goldcup University Sequence of Methods Courses*

| Junior Sem. 1 | Junior Sem. 2 | Junior Sem. 2 | Senior Sem. 1 | Senior Sem. 2 |
|---|---|---|---|---|
| ECSP (10 weeks in class 4 weeks in field) | ECSP (10 weeks in class 4 weeks in field) | ECH (10 weeks in class 4 weeks in field) | ECSP/ECH (10 weeks in class 4 weeks in field) | ECSP/ECH (15 weeks in field) |
| ECH 301 PreK-K | SPED 411 | ECH 301 PreK-K | ECH 414 1-4 | Student Teaching |
| ECH 310 PreK-K | SPED 472 | ECH 310 PreK-K | ECH 415 1-4 | |
| ECH 322 PreK-K | SPED 422 | ECH 322 PreK-K | ECH 416 1-4 | |
| ECH 323 PreK-K | SPED 444 | ECH 323 PreK-K | ECH 417 1-4 | |
| ECH 325 PreK-K | SPED 446 | ECH 325 PreK-K | ECH 418 1-4 | |
| | | | ECH 410 1-4 | |

The researcher's decision to include preservice teachers from this particular university is based upon the researcher's alumna status and past employment at the university in the teacher education program during which the researcher's interest in the focus of the study emerged. The researcher also has a familiarity with the field experience component of the program having served as a former preservice teacher supervisor at Goldcup University.

## Sampling Procedure

Purposeful sampling was used to achieve an adequate sample size to provide data that support the objectives of the study and accurately inform the study understandings. This study sample included approximately 30 preservice teachers drawn from a population of approximately 400 students enrolled in an Early Childhood Pre-K-Grade 4 teacher preparation bachelor degree certification program at Goldcup University.

The Early Childhood Pre-K-Grade 4 teacher preparation program at Goldcup University includes three blocks of instructional and content methods courses. According to the registrar's published schedule, a cohort comprised of approximately 30 preservice teachers is enrolled in each block of methods courses for the spring semester of 2014.

Purposeful sampling was employed in selecting the cohort enrolled in the Grades 1-4 methods block to provide the researcher with an adequate number of study participants who have the commonalities of:

a). having completed assignments with a focus on instructional practices and

b). having participated in at least one field experience where they were required to implement instructional practices integrating the use of mobile learning technology.

The members of this cohort range in age from 22 to 40 years old, and include three males and 27 females. Although 'digital native' has been defined as those individuals born after 1980 (Prensky, 2001), all preservice teachers in the cohort were invited to participate regardless of age so that a thorough analysis of the data can be assured (Creswell, 2013).

The researcher sought cooperation from a former colleague who is currently an instructor in the Early Childhood Education (ECE) Grades 1-4 methods block to provide access to this cohort. Due to the researcher's home location in Kentucky, arrangements were made for a Skype session during the cohort's science method class period for an introduction and explanation of the intent of the study. Provided by the researcher, the Goldcup instructor proctored the presentation of a packet containing a letter introducing the researcher and the intent of the study to potential participants. Also included in the packet were informed consent documents, the Mobile Learning Technology and Creativity Survey, the focus group interview protocol, and instructions for the submission of the Written Methods Course Assignment. The information letter also contained the date, time, and place for the focus group interview.

One signed consent form was placed in a researcher provided envelope by the participants and a second consent form was kept in the participants' possession. The envelope was sealed and witnessed by both a participant and the instructor with a signature across the envelope flap, and returned via mail to the researcher. The data to be gathered and included in this study does not include the names or identifying information of any of the participants, the university, university personnel, or the methods course instructor. The researcher assigned a pseudonym to each participant for data collection purposes and for the narrative reporting of focus group interview data to ensure confidentiality.

**Protection of Participants**

To maintain the confidentiality of individuals participating in the study, pseudonyms were used in reporting data and no information was provided that would identify any personal information or field experience placement site of the participants. No information was provided that will identify the participating university or any personnel associated with the university during this study. All participants in the study are adults and there are no known risks to participants as a result of engaging in the study investigation. The researcher is not a faculty member at the participants' university and has no influence upon grading policies of course instructors thereby releasing the participants from any sense of obligation to participate in the study. All participants were provided with an informed consent document including a statement that recognized the voluntary participatory nature of the study and emphasized the option of withdrawal from the study at any time by contacting the principal researcher, choosing not to respond to the demographic survey, or by physical withdrawal from focus group participation at any

time. The informed consent document provided participants with the procedures in place to assure confidentiality, storage of recorded data, procedures to withdraw from the study if desired, and assurance that there are no known risks to participating in the study. All data collected during the study will be kept in a locked file in the researcher's home in Kentucky for the required time period of three years.

## Instrumentation

### Instrument 1: Mobile Learning Technology and Creativity (MLTC) Survey

The researcher-created MLTC is a survey (See Appendix C) designed to collect qualitative data and is comprised of eighteen questions related to preservice teachers' use of mobile learning technology and self-perceptions of personal creativity. The survey was created to collect qualitative data based on the literature reviewed for the study and review of surveys in the public domain available on the Internet (Behance, n.d.; Psychology Today, n.d.; Ulive, n.d.).

Qualitative data regarding preservice teachers' history of ownership of mobile learning technology, their preferred devices, and the time spent using devices for personal, recreational, educational, and pedagogical purposes will be collected (questions 6-16). Demographic data was collected concerning preservice teachers' age, gender, and field experience placements (questions 1-5). Questions 17 and 18 addressed participants' perceptions of personal creativity. The qualitative data generated by this survey supported the focus group interview data and provide a more comprehensive summary of the participants' experiences.

Examples of survey questions included:

1. Which mobile learning technology device(s) do you currently use?

(Mark all that apply)

- ☐ Tablet Device (iPad®, android, or similar)
- ☐ Laptop
- ☐ Smartphone
- ☐ Tablet
- ☐ iPod®
- ☐ eReader (Kindle®, Nook®, or similar)
- ☐ other_____

2. Rank the mobile learning technology device(s) you use in order of frequency. (1 being the most used)

- ☐ Tablet Device (iPad®, android, or similar)
- ☐ Laptop
- ☐ Smartphone
- ☐ Tablet
- ☐ iPod®
- ☐ eReader (Kindle®, Nook®, or similar)
- ☐ other_____

3. Describe any reasons you use a particular mobile device more than another.

_____

**Instrument 2: Focus Group Interview Protocol**

Conducting interviews is agreed upon by some qualitative researchers as the most often used data collection method (Creswell, 2013; Flood, 2010; Leedy & Ormrod, 2010). Conducting interviews is one method of collecting data within interpretive

research that promotes in-depth understanding (Creswell, 2013; Flood, 2010). The focus group interviews in this study assisted in examining the participants' perceptions to provide in-depth understanding of the nature of their experiences (Creswell, 2013; Leedy & Ormrod, 2010; Merriam, 2009).

The focus group interview for this study included a series of questions designed to gain the perspectives of preservice teachers about their uses of mobile learning technology and the ways that creativity is displayed within their instructional practices. This qualitative data added depth to the data collected in the MLTC survey. The focus group interview format was chosen to provide opportunities for participants to describe their experiences in detail in an environment that encourages interaction between participants. This format also maximizes collection of information in a short period of time. Focus group interviews provide participants a chance to reflect upon experiences of other group members and then contribute their own insights and perspectives to elaborate on the experience. Participants who may be reluctant to initiate describing an experience are more inclined to contribute to a discussion when given the time to formulate their point of view and develop a better knowledge about their own ideas (Acocella, 2012). Focus group interviewing provides validation of points raised in discussion as shared experiences while preserving individual perspectives (Bradbury-Jones, Sambrook, & Irvine, 2009).

A purpose of conducting focus group interviews in this study was to gain in-depth understandings of preservice teachers' perspectives about their use of mobile learning technology, perceptions of their personal creativity, and their perceptions about the ways creativity is displayed in their instructional practices when they use mobile learning

technology. Although the focus group interview protocol was scripted, it was expected that the researcher would deviate from the script when necessary to facilitate elaboration on particular points relevant to the study or to redirect the discussion focus to the study. Thirty participants were invited and six chose to participate. Examples of focus group interview questions included:

1. Think of a time when you have creatively used mobile learning technology.
    a. Describe how you interpreted what needed to be done and what technology you chose to use.
    b. What specific actions did you take that were successful and how do you know they were?
    c. What factors do you think contributed to you creatively using mobile learning technology to solve the problem?
2. Do you believe that using mobile learning technology makes a significant difference in the creativity and quality of your instructional practices?
    a. If so, why, and in what ways?
    b. If not, why?
3. Do you believe you use your mobile learning technology more creatively for personal or professional purposes?
    a. If you believe you use it more creatively for one purpose than the other can you describe what you do that you feel makes it more creative for that purpose?
4. How would you describe the significance of having access to your mobile learning technology for instructional practices?

### Instrument 3: Methods Course Written Assignment Submission

Participants were asked to submit a methods course assignment incorporating the use of mobile learning technology that they feel represented a creative product. These assignments were required in courses that participants had completed or were enrolled in currently. Volunteers were sought to include a short video response for this method using a form of mobile learning technology, but none chose to participate. A list of methods courses and the corresponding assignments that indicate an integration of mobile learning technology is included in Appendix F.

## Pilot Study

A pilot study was conducted to evaluate the effectiveness of the study's data collection instruments as recommended by McMillan and Schumacher (2010). A pilot test of the instruments gave the researcher an opportunity to determine if the research process would provide the data that is needed to answer the study questions. The pilot study also assisted the researcher in developing and refining the focus group interview questions, examine biases, practice interviewing skills, and assess the length of the focus group interview session. A pilot study of the Mobile Learning Technology and Creativity Survey assisted the researcher in determining if the instructions for completing the survey were clear or if the survey questions needed clarification or revision to provide responses that can inform the study research questions.

The pilot study participants included former students of the researcher who attended a university not affiliated with this research study. These former students were not included in the research study but closely represented the study sample. Participants in the pilot study were asked to take the survey and critique both the survey questions and

the focus group interview questions. Volunteers who agreed to take part in a pilot focus group interview responded to the questions of the interview protocol. The pilot study participants were asked to comment on the order of questions, the format of the survey, and the wording of the questions in both the survey and the interview protocol.

In seeking to assure a high quality focus group interview protocol and survey responses that address the study research questions, the researcher used the pilot study results to gather suggestions from participants to make changes to the survey tool and focus group interview protocol. One suggestion from the pilot study participants included addressing the wording of questions in the interview protocol to add clarity for preservice teachers who have a limited amount of instructional experience. In response to this suggestion, the researcher added examples within the questions. Several editorial changes were also made in response to the participants' suggestions. Another participant suggested a change in a survey question to clarify past or present use of mobile learning technology. Overall, participants who took the survey indicated that the questions addressed the research questions, were easy to understand, and that the length of the survey was reasonable. They also indicated that the interview questions would elicit sufficient responses that would generate a substantial amount of data in regards to answering the research questions. The pilot study confirmed that the research methodology and instruments were effective and appropriate for use in the formal study.

## Procedures

### Contacting Participants

In March 2014, the researcher sought cooperation from a former colleague who is currently an instructor in the Early Childhood Education (ECE) Grades 1-4 methods

block to provide access to this cohort. The researcher established contact with the cohort during their science method class period. The following steps were taken:

1. Preservice teachers enrolled in the ECE Grades 1-4 cohort participated in a Skype session with the researcher to serve as an introduction and opportunity to explain the purpose of the study and the significance of their participation.
2. Provided by the researcher, the Goldcup instructor distributed a packet containing a letter providing details regarding the data collection methods, the scope of participation required, and consent forms (See Appendices A: *Letter to Participants* and B: *Informed Consent Form)*.

   The letter informed participants of the date, time, and place of the focus group interview. The letter also described the procedures in place for maintaining the confidentiality of data collected during the study, future use of the data, and withdrawal from the study. Care was taken to ensure that potential participants understood that they were not obligated to participate in the study and did not feel coerced into participating (See Appendix A: *Letter to Participants)*.

   The researcher offered participants an opportunity to review the documents and ask questions, then directed participants' attention to the information letter and consent forms.
3. Cohort members were provided with two copies of the informed consent document to indicate their agreement to participate in the study.

   Consent to participate in the Mobile Learning Technology and Creativity (MLTC) Survey, the focus group interview, the submission of a written

methods course assignment, or all were selected. Participants placed one informed consent document in an envelope which was sealed by and witnessed by a participant and the instructor with a signature across the sealed flap. Participants also kept a copy of the consent form for their own files. The envelope was returned to the researcher via mail per an arrangement. (See Appendix B: *Informed Consent Form)*.

4. The packet also contained the Mobile Learning Technology and Creativity (MLTC) Survey (See Appendix C: *Mobile Learning Technology and Creativity Survey)*, Focus Group Interview Protocol (See Appendix D: *Focus Group Interview Protocol*, and the directions for submission of a Written Methods Course Assignment (See Appendix E: *Methods Course Written Assignment Description)*.

All consent documents will be held in the researcher's possession and locked in a secure file in the researcher's home office in Kentucky for three years.

**Collecting Mobile Learning Technology and Creativity (MLTC) Survey Data**

The following steps were taken for those participants who elected to participate in the MLTC survey which contains demographic and qualitative questions regarding participants' technology ownership and perceptions of personal creativity:

1. On the same day that the initial Skype session took place and after the signed informed consent documents were deposited in an envelope and sealed to protect participants' identities (see the section: Consent Process), the Goldcup instructor directed all members of the cohort to the survey

contained in the packet. All cohort members were provided with the documents so that the Goldcup instructor would not be able to readily detect who participated in the survey. The instructor was asked to busy himself elsewhere in the classroom to ensure participants' privacy in choosing to complete or not complete the survey portion of the data collection. Participants chose to complete or not complete the survey at this time. The instructor indicated a researcher provided envelope and requested that all cohort members deposit surveys to ensure confidentiality.

2. Participants placed the surveys in the envelope which was sealed and witnessed by a participant and the instructor with a signature across the sealed flap.
3. The instructor returned the surveys to the researcher via mail per an arrangement.

**Collecting Focus Group Interview Data**

Working in collaboration with the course instructor, the date for the focus group was established before the initial Skype session to facilitate planning the sequence of data collection. The time was established as immediately following the participants' science methods course class period (Monday and Wednesday from 11:00AM to 12:15PM) to reduce the inconvenience for participants returning to campus at another time. Preservice teachers in this cohort do not have any other classes scheduled on Monday and Wednesday after the science methods course time period. The focus group interviews took place in the science methods course classroom. This classroom is situated at the end of a hallway with no visibility into the room from the hall which will ensure the privacy

of the participants during the interviews. It was determined that this room is not scheduled to be used by any other instructor or group after 12:15PM on Monday and Wednesday. The letter that will was provided to participants during the initial Skype session provided the date, time, and location of the focus group interview.

The following steps were taken for those participants who consented to participate in the focus group interviews:

1. Upon receipt of participants' consent forms, the researcher assigned each participant a pseudonym to ensure confidentiality. The researcher formed the focus group from the participants who checked the box on the consent form indicating willingness to take part in the focus group interviews. Email addresses were provided by participants on the consent form.
2. The researcher provided participants with an email confirmation (provided on the consent form) as a reminder of the date, time, and location for the focus group interview. Participants were also reminded, as stated in the information letter and consent form, that the interview would be video recorded for transcription at a later time. The email also provided an attachment containing the interview protocol to provide participants with an opportunity to reflect on responses before the focus group.
3. The day of the focus group interview, the researcher informed participants of the option to withdraw from the focus group interview at any time by leaving the classroom and that their responses up to that point would be discarded. Participants were also advised of the future use of the data

collected during the interview and that a copy of the transcripts will be provided upon request.

4. Participants were given the opportunity to withdraw from the study before interviewing began by exiting the room. They were reminded that the interview process may take one to two hours and that they were under no obligation to the researcher to participate. The interview protocol contained nine open-ended questions and fifteen follow-up questions. Although the interview protocol was scripted, the researcher deviated from the script when necessary to facilitate elaboration on particular points relevant to the study or to redirect the discussion focus to the elements of the study. Participants were reminded that they were not required to add to the discussion and were not coerced in anyway by the researcher to contribute.

All data collected during the interviews will be held in the researcher's possession to ensure the confidentiality of participants, the university, and university personnel concerning their participation in the research study. All digital and physical data will be kept in a locked file in the researcher's home office in Kentucky for three years, after which time it will be securely destroyed.

**Collecting Methods Course Written Assignment Submission Data**

To provide an additional source of data to examine participants' perceptions of creativity in their instructional practices, the researcher reviewed the catalog descriptions of methods courses and the Goldcup education department website for descriptions of assignments associated with those courses that indicate inclusion of the application or utilization of mobile learning technology (See Appendix F: *Methods Courses and*

*Corresponding Assignments)*. A list was compiled and was provided to participants as part of the instructions for this data collection method. Participants were asked to select an assignment from the list and answer two questions included in the instructions. The researcher provided an option for participants to answer the questions through a video using mobile learning technology. The researcher contacted Goldcup methods courses instructors to verify the constructed list of possible assignments for this data collection method. Adjustments to the list based on instructors' feedback were made accordingly for the spring semester before being provided to participants. The following steps were taken for those participants who elected to participate in the Methods Course Written Assignment Submission:

1. Participants were provided the instructions for submitting a previously completed methods course assignment chosen from a provided list of options. The instructions were provided in the packet delivered to participants on the day of the initial Skype session and signing of consent forms.
   Participants were asked to select an assignment from the list and answer two questions included in the instructions. An option for participants to answer the questions was to provide a video using mobile learning technology.
2. Participants emailed a selected assignment and answers to the associated questions to the researcher. Participants chose to video record the answers to the questions or word process them and send them to the researcher.

All assignments submitted for this data collection method will be held in the researcher's possession to ensure the confidentiality of participants, the university, and university

personnel concerning their participation in the research study. All digital and physical data will be kept in a locked file in the researcher's home office in Kentucky for three years, after which time it will be securely destroyed.

## Data Analysis

The researcher considered development of the instruments for data collection in this study with regards to the information that each would provide to develop detailed descriptions of participants' experiences that would support addressing the research study questions and increase credibility of the findings.

As indicated in Chapter 1, creativity was defined in this study as demonstration or description of abilities identified within the skill areas of a modified Guilford FFOE model. The skill areas of the model are identified and described in detail in Table 1. This definition and the corresponding descriptions of the abilities within the skill assisted the researcher in the analysis of data collected during the study. The four skill area abilities included:

1. Fluency, which is a demonstration or description of an ability to offer as many options as possible from different perspectives.
2. Flexibility, which is demonstration or description of an ability to combine two or more dissimilar concepts or subjects in the same mental space to form new categories, ideas, and behaviors.
3. Originality, which is demonstration or description of an ability to imagine or invent something new, original, unconventional, and desirable to the creator.
4. Elaboration, which is demonstration or description of an ability to flesh out ideas and carry an idea to completion.

The abilities described in the skill areas of the modified FFOE model are not all directly observable. To aid in examining the participants' responses regarding creativity within the survey, the focus group interview questions, and the submission of a written assignment, descriptors were decided upon as additional indicators of creativity. The process of developing the descriptors began by comparing the abilities identified in the modified FFOE model to the common characteristics of the Interrelated Resources (Table 3) in Sternberg's Investment Theory of Creativity (2006), and the common characteristics found in the Creativity Categories (Table 2) outlined by Treffinger, Young, Selby, and Shepardson (2002). Also considered in the development of the descriptors was review of a qualitative case study of middle school students in a technology class (Vandeleur, Ankiewicz, de Swardt, & Gross, 2001) in which the researchers identified direct and indirect indicators of creativity. Several of these indicators aligned to the skill areas of the FFOE model or the common characteristics of the Treffinger, Young, Selby, and Shepardson (2002) Creativity Categories, and Sternberg's (2006) Interrelated Resources. The commonalities found within the characteristics and abilities of these four resources were refined into individual descriptors (e.g. clever, useful, appropriate, evocative, insightful, enjoyable, complex, knowledgeable, humorous, and relevant). These descriptors will be applied as further indicators of creativity within the abilities of the modified FFOE skill areas. Descriptors were not assigned to specific skill areas as it is expected that indicators of creativity will overlap between areas. Table 7 provides a summary of the common characteristics, abilities, and indicators of the four resources used to develop the creativity descriptors for this study.

Table 7

*Summary of Resources Used to Develop Descriptors*

| **Guilford (1984) FFOE Model: Skill Area Abilities** | **Sternberg (2006) Interrelated Resources : Common Characteristics** | **Treffinger, Young, Selby, and Shepardson (2002) Creativity Categories: Common Characteristics** | **Vandeleur, Ankiewicz, de Swardt, & Gross, (2001) Direct and Indirect Indicators of Creativity** |
|---|---|---|---|
| **Fluency:** Ability to offer as many options as possible from different perspectives. | **Intellectual Abilities:** Synthetic: See problems in a new way Analytic: Recognize ideas worth pursuing Practical: Persuades others of value of ideas<br><br>**Environment:** Needs to be supportive; Needs to reward creativity; Can hinder creativity through evaluators | **Digging Deeper Into Ideas:** Analyzing; synthesizing; reorganizing or redefining; evaluating; seeing relationships; desiring to resolve ambiguity; understanding complexity | **Direct Indicator:** Critical thinking: recognizing a problem to solve, determining how to proceed, and evaluating the value of the created product.<br><br>**Indirect Indicator:** Cultural influences and values; Motivation, self-esteem |
| **Flexibility:** Ability to combine two or more dissimilar concepts or subjects in the same mental space. Repackaging or combining prior knowledge or strategies in a new way. | **Knowledge:** Knowledge of the field. Knows when to use past knowledge to prevent hindering new ideas | **Generating Ideas:** Flexibility; originality; Metaphorical thinking | **Direct Indicator:** Ideational Mobility: being able to reformulate the problem; create analogies; make the problem more abstract or more specific |
| **Originality:** Ability to imagine or invent something new, original, unconventional, and desirable to the creator. | **Thinking Styles:** Preferred ways of using skills and abilities Deciding how to use the skills available Recognizing which questions are important | **Listening to Ones Inner Voice:** Awareness of creativeness; self-initiated; non-conformity; absorption in work; energetic | **Direct Indicator:** Originality: produce novel ideas; use things in an unusual manner |
| **Elaboration:** Ability to flesh out ideas and carry an idea to completion. Elaborators take an original concept and add the details to | **Personality:** Willingness to take sensible risks; Willingness to tolerate ambiguity; Willingness to defy conventional wisdom | **Listening to Ones Inner Voice:** Persistence or perseverance; self-initiated; non-conformity; does not fear being different; | **Direct Indicator:** Persistence; Experimenting; Risk-taking; accepts failure as normal part of process |

| | | | |
|---|---|---|---|
| provide others a way to see the full potential of a creative idea. | | reflective.<br><br>**Openness and Courage to Explore Ideas:** risk-taking; tolerance for ambiguity | **Indirect Indicators:** Influences: Group interaction; pre-knowledge, cultural influences and values |
| | **Motivation:** Love what work they do; Intrinsically motivated | **Openness and Courage to Explore Ideas:** Problem sensitivity; high levels of curiosity; sense of humor; playfulness; capacity for imagination; absorption in work; energetic openness to experience and ideas shows emotional sensitivity; adaptability; willingness to grow | **Direct Indicator:** Enjoyment and regard for aesthetics; Clarification: looking at work to assess progress;<br><br>**Indirect Indicator:** Motivation, self-esteem |

A goal of qualitative data analysis is to identify patterns that emerge from the data. The analysis of the data occurs during the data collection as well as after data collection. The methods chosen for qualitative data analysis should be flexible and responsive to the content. These factors most clearly distinguish qualitative data analysis from quantitative data analysis (Fossey, Harvey, McDermott, & Davidson, 2002; McMillan & Schumacher, 2010; Mertler & Charles, 2011).

In choosing an interpretive qualitative approach to examine preservice teachers' displays of creativity when they used mobile learning technology for instructional practice, the researcher chose to administer a survey, conduct focus group interviews, and collect written assignments. Collection of data from multiple methods affords the researcher a manner to understand, compare, and validate the situational and experiential complexities of the phenomenon (Creswell, 2013; Fossey, Harvey, McDermott, &

Davidson, 2002; Mertler & Charles, 2011). A rich description afforded by analysis of multiple data collection methods assists the researcher in finding regularities in the data with the intent of confirming that interpretations of the data are representative of the participants' responses (Creswell, 2013; Leedy & Ormrod 2010; McMillan & Schumacher, 2010).

Data analysis in qualitative research takes many forms. Qualitative research demands the generation of voluminous, complex data. In order to arrive at explanations about the study problems, researchers must begin by reducing the complexity of the data to prepare it for analysis (Creswell, 2013; Glaser & Laudel, 2013). For this study, a process of inductive analysis was used to move large quantities of specific data to emergent, general categories and patterns (McMillan & Schumacher, 2010; Mertler & Charles, 2011).

Two data analysis methods were used in examining the data collected during this study. Qualitative content analysis was applied to accurately describe participants' responses within the data generated by the Mobile Learning Technology and Creativity (MLTC) Survey and the written assignment submission. A detailed description is important to detecting words and concepts for making inferences about the messages contained in the data. Content analysis assists in organization of the information in the data framed around the research questions (Glaser & Laudel, 2013).

Based on Glaser and Laudel's (2013) and McMillan and Schumacher's (2010) recommendations for analyzing theory-guided qualitative studies, the process of extracting information from the data began with the researcher developing an initial set of categories based on the theoretical framework that guided the data collection. Extraction

of information is a process of constant interpretation by the researcher in identifying relevant information, rephrasing the information into short, concise statements, and placing it into the matching categories (Glaser & Laudel, 2013). Although some categories were predefined, the researcher was open to the possibility of modifying the dimensions within the categories, and the emergence of additional categories as relevant information was identified (Creswell, 2013; Glaser & Laudel, 2013). The result of this process was an information base that took into consideration the theoretical framework of the study and the empirical information generated.

The categorized information extracted from the data was then classified into themes that form common ideas structured around answering the study research questions. The researcher's goal was to move from a description of the data in the survey and written assignments to presenting a narrative that included the evidence and an interpretation of meaning within the construct of the study.

To analyze the data generated during the focus group interviews, the researcher applied an open-coding process. Qualitative content analysis and coding techniques reduce and produce information that must be further analyzed to answer the research questions. Both methods enable the analysis of data from theory-guided qualitative research approaches (Glaser & Laudel, 2013). For analysis of qualitative data in which interpretation of participants' perspectives and voices is vital to answering the study research questions, several authors recommend using a coding technique as opposed to content analysis (Creswell, 2013; Glaser & Laudel, 2013; McMillan & Schumacher, 2010).

The researcher conducted a focus group interview with participants from the sample who volunteered their willingness to participate on the consent form. The interview lasted approximately one and a half hours. This data collection method was chosen to generate insights and expand understandings of preservice teachers' perceptions about the ways they display creativity in their instructional practice when mobile learning technology is used. The interviews were scheduled immediately following the participants' science methods course, in the same classroom, to facilitate ease of participation. The interview was video-recorded and transcribed. After transcription, the researcher read through the transcript to begin identification of commonalities within the interviewees' responses related to the research questions. To increase reliability and accuracy, the researcher read the transcript twice before beginning the process of exercising an open-coding strategy.

The function of a code is to indicate what is revealed in a segment of the text and results in the raw data being transformed into a type of index. This index facilitates the researcher's ability to sort and search through data during analysis (Creswell, 2013; Glaser & Laudel, 2013). Upon the third reading of the transcript, relevant segments of the data were identified and highlighted. A code (i.e. a label that provides meaning) was assigned to each highlighted segment. The codes were reviewed for duplication or closely overlapping descriptions. After a complete coding of the dataset, based on the content of the segment, some of the initial codes were recoded. Some segments were assigned multiple codes.

To test the reliability of the researcher's coding technique, a test-retest method was applied. The test-retest procedure assesses the consistency of a measuring method.

The researcher coded the dataset once, and then recoded the dataset a second time (applying the codes already developed) without reviewing the results of the first coding. This method ensured that the coding system was effective when the results of the two coding sessions are compared (Multon, 2010). It was determined that the coding method for this study was effective.

The segments were then grouped together by codes forming categories which were then assigned a symbol. Each category was assigned a name that embodied the essence of the information contained in the codes. This represents the first level of induction by the researcher (McMillan & Schumacher, 2010). The researcher preconfigured some categories based on the theoretical considerations of the study. Categories that emerged during the analysis of the MLTC survey and the written methods course assignment submissions were also used as foundations for analysis of the interview data. The content analysis of the MLTC survey, the written methods course assignment submissions, and the coding of the interview transcripts went through much iteration. Each rereading of the datasets resulted in progressive reevaluation of the categories and codes until a final decision was made on the specific descriptions. This assisted the researcher's review of characteristics of the categories in determining the connections being made between the data and its' ability to address the research questions (Mertler & Charles, 2011). Aspects of data within the categories that assisted in interpreting the participants' perspectives were closely examined. The final step in analyzing the interview data was to examine the categories for relationships to establish and identify any patterns that existed. At this point, the researcher moved to a deductive

mode to compare codes, categories, and patterns to confirm the findings of the data analysis (McMillan & Schumacher, 2010).

## Data Quality

### Validity

Much has been written about consideration of judging the soundness of qualitative research. Although most frequently associated with external validation of quantitative research, Lincoln and Guba (1985) claimed that replication can be conducted within social research to an extent. They argued that true replication of any study is suspect because the investigation must be conducted in exactly the same way with the same subjects; a feat they claimed cannot happen with human subjects. The recommendation by Lincoln and Guba (1985) and McMillan and Schumacher (2010) is for qualitative researchers to strive for credibility through transparency in their research. Richly detailed descriptions of the evidence that justifies the results and conclusions as well as a sound strategy for choosing the sample provides trustworthiness in the study (Creswell, 2013; Fossey, Harvey, McDermott, & Davidson, 2002; Leedy & Ormrod, 2010; Lincoln & Guba, 1985; McMillan & Schumacher, 2010; Mertler & Charles, 2011). Credibility is also established through descriptions of how the study findings match reality (Merriam, 2009).

Deliberately choosing a strategy of using multiple methods of data collection provided the researcher with numerous opportunities to interpret the participants' responses in depth. This method of using different sources afforded the researcher a manner to understand, compare, and validate the situational and experiential complexities within a study (Creswell, 2013; Fossey, Harvey, McDermott, & Davidson, 2002; Mertler

& Charles, 2011). Cross-validation among multiple sources of data is a process described as triangulation that researchers use in seeking a convergence of the data that supports emerging themes and conceptions within a study. Sources may include multiple participants, different data collection methods, and multiple data collection sites to find regularities in the data with the intent of confirming that interpretations of the data are representative of the participants' responses (Creswell, 2013; Leedy & Ormrod 2010; McMillan & Schumacher, 2010). A test-retest process was applied to the coding system for the analysis of the focus group interview data to increase the validity of the data. Field notes taken during the focus group interview were also used by the researcher to record participants' reactions and mannerisms. These notes were reviewed during the analysis of the video recording in an effort to set aside personal feelings and beliefs about the study topic and increase the objectivity of reported data. Triangulation also increases trustworthiness of the data through the admission of the researcher's assumptions and beliefs, and recognition of the study's limitations (McMillan & Schumacher, 2010). For this study, the analysis of the MLTC survey results, the transcripts from the focus group interviews, and the written assignment submissions were triangulated to increase reliability of the study findings through cross-validation and reduction of investigator bias (Creswell, 2013).

The overall findings and conclusions of this study were combined into a narrative that utilized an interpretive lens to draw together preservice teachers' experiences and perceptions of how creativity is displayed in their instructional practices when they include mobile learning technology (Creswell, 2013; McMillan & Schumacher, 2010).

## Trustworthiness

In qualitative research, the role of the researcher as the sole data collector demands that the researcher identify her biases, assumptions, and values at the beginning of the study. The researcher's background as a university preservice teacher educator enhanced her knowledge and awareness of the topic of this study. The researcher is certain to bring biases to the investigation through classroom experiences and field experience supervision, however, effort was made to ensure awareness of these biases and objectivity during the course of the investigation. The researcher attempted to accomplish this through a process of 'bracketing' (Creswell, 2013, p. 83), in which previous experiences are reviewed and described to allow for a fresh perspective (McMillan & Schumacher, 2010). In attempting to maintain a neutral position, the researcher's goal was to engage the participants in revealing their perspectives without searching for approval or confirmation from the researcher. One method involved asking open-ended questions during the focus group interview in a way that did not endorse a particular response. Evidence in the report shows that the researcher has learned from the study, and that the participants' views are accurately reported.

## Summary

This chapter described the design and methodology used to examine preservice teachers' perceptions of the ways creativity is displayed in their instructional practices when mobile learning technology is utilized. An interpretive qualitative approach for this study was chosen to provide an in-depth examination of the participants' perceptions.

This research study focused on participants who are preservice teachers enrolled in a Grades 1-4 block of methods courses within an Early Childhood PreK-4$^{th}$ Grade

teacher education program. Data was collected through a researcher-created Mobile Learning Technology and Creativity (MLTC) Survey, a focus group interview, and submission of a written assignment completed during a methods course.

Participation in this study was completely voluntary. Participants had complete control over the information they choose to share during data collection. Data collected during the study was coded with a pseudonym and kept confidential. Chapter 4 will reveal the results of the data collection and analysis to establish the connections between the problem, purpose, and research questions of the study.

# CHAPTER 4

## DATA ANALYSIS AND FINDINGS

This study was designed to examine preservice teachers' perceptions of their creativity within their instructional practices when mobile learning technology was utilized. Data were collected utilizing a qualitative research process to provide the researcher with the perspectives of current preservice teachers. This chapter presents a qualitative analysis of the data and the findings of the study as they pertain to the research questions that guided the study:

1. In what ways do preservice teachers use mobile learning technology?
2. What perceptions do preservice teachers have of the ways their personal creativity is displayed in their instructional practices?
3. What perceptions do preservice teachers have regarding the influence mobile learning technology has on the ways creativity is displayed in their instructional practices?

The data were collected using the Mobile Learning Technology and Creativity survey (MLTC), a focus group interview, and submission of written assignments. Some survey questions were delivered in a semi-structured, open-ended interview format to elicit responses that gathered information regarding the participants' use of mobile learning technology and self-perceptions of personal creativity. Twenty-nine students voluntarily participated in the survey, while only six chose to participate in the focus group interview.

One purpose of the focus group interview was to gain an understanding of preservice teachers' uses of mobile learning technology relative to their instructional

practices. The second purpose of the focus group interview was to reveal participants' perceptions about personal creativity and the factors that influence their creativity, especially when mobile learning technology is utilized. The researcher also collected data in the form of written assignments that were previously completed during field experience or as a class assignment. Participants were given a list of suggested assignments to submit and four voluntarily submitted written methods course assignments. The purpose of this data collection method was to collect participants' self-selected examples of creativity within instructional practices that included using mobile learning technology. The findings of this study are presented by the data analysis of each collection instrument relative to each research question.

## Description of Participants

The participants in this study included 29 early childhood preservice teachers (PreK-4$^{th}$ Grade and PreK-4thGrade/Special Education) enrolled in the Grades 1-4 block of methods courses during the spring semester of 2014 at Goldcup University (pseudonym), a public university located in western Pennsylvania. The sample represented approximately 10% of the total student enrollment in the bachelor degree early childhood teacher education program. The gender distribution for the sample was distributed unevenly with 26 female and 3 male participants. The dominant age range of 79% of the participants was 18-22 years of age, 14% of the sample reported in the 23-27 year old range, and 7% of the sample indicated the 31-40 year old range. The majority of the sample was born within the time frame established for digital native or Net generation status (Oblinger & Oblinger, 2005; Prensky, 2001). Tables 8 and 9 describe the general

characteristics for the sample gender and age based on responses from the Mobile Learning Technology and Creativity survey.

Table 8

*Summary Statistics for Participants' Gender*

| Response | Frequency | Percent |
|---|---|---|
| Female | 26 | 89.66% |
| Male | 3 | 10.34% |
| Total | 29 | 100.00% |

Table 9

*Summary Statistics for Participants' Age*

| Response | Frequency | Percent |
|---|---|---|
| 18-22 | 23 | 79.31% |
| 23-27 | 4 | 13.79% |
| 28-30 | 0 | 0% |
| 31-40 | 2 | 6.9% |
| 41-50 | 0 | 0% |
| Total | 29 | 100.00% |

To provide data related to the purpose of the study about preservice teachers' practical experience implementing instructional practices, the sample was asked to describe the field experience they had completed within parameters of methods blocks. Participants indicated that 16 had completed two methods block experiences in previous semesters and 13 participants had completed one methods block experience. Of the 29 participants, 24 interacted with ten or more children during their previous field experiences while five participants interacted with five or fewer children. During field experience, 21 participants completing the MLTC (Mobile Learning Technology and Creativity) survey reported that they were permitted to use mobile learning technology.

Question 6 of the MLTC survey asked participants to identify the first mobile technology device that they owned. The participants' responses showed that every

participant currently owned a mobile phone. The response to the question regarding the first mobile device ownership was some form of mobile phone for 80% of the respondents. The remaining 20% indicated initial mobile technology ownership of iPods, laptops, and game systems. Additionally, 93% indicated they were between the ages of 12 and 18 when they got their own cell phone. Only two of the participants were over the age of 18 when they received a cell phone. The mobile learning technology device most recently acquired by 17 participants was a smartphone. The 12 respondents who indicated acquisition of a different device listed Kindles®, iPads®, laptops, and iPods®.

## Research Question One

*In what ways do preservice teachers use mobile learning technology?*

The MLTC survey and the focus group interview were the instruments used to address this research question. Figure 3 illustrates the steps the researcher took in analyzing the data from the MLTC survey questions 7 through 16.


*Figure 3.* Diagram illustrating researcher process of data analysis of MLTC survey questions 7-16.

### Results From the MLTC Survey

Question 7 of the MLTC survey asked participants to describe their earliest memory of using any form of technology. Over half of the respondents chose school computers as their first experience with technology.

Question 10 addressed the variety of mobile learning technology that participants currently use. Figure 4 illustrates the responses to this question.

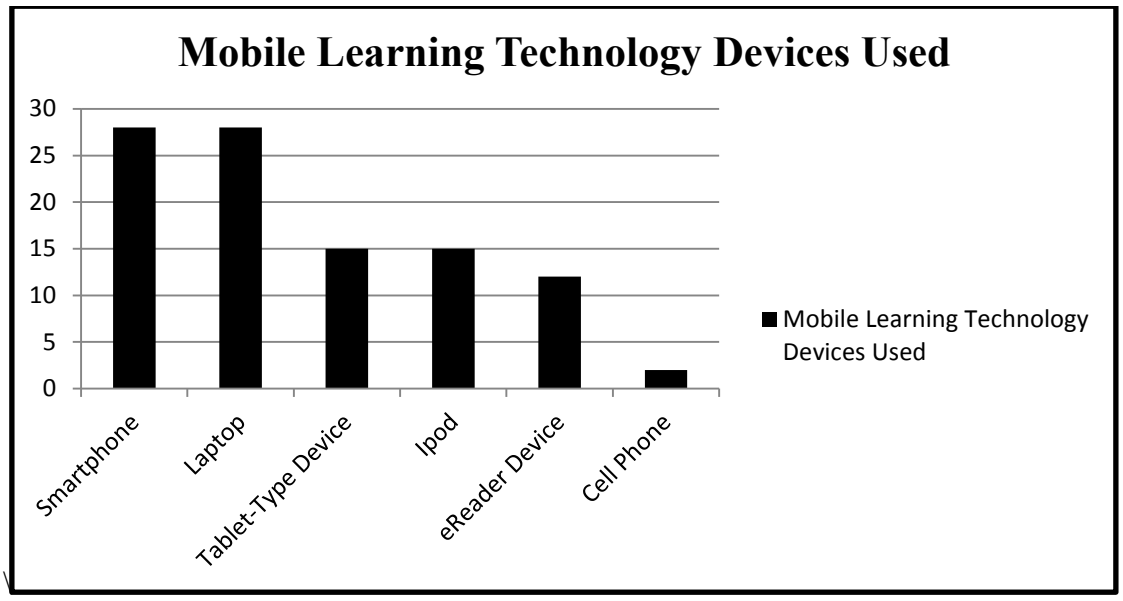


*Figure 4.* Mobile Learning Technology Devices used by preservice teachers as reported in Question 10 of the MLTC survey.

After indicating which devices they used, question 11 asked participants to rank the devices they used in order of frequency. All 29 participants responded in ranking their top three devices. Smartphones were the most frequently used device with 26 of the participants ranking it number one. Laptops were ranked by 24 of the respondents as the second most frequently used device. A tablet-type device was ranked third most often used by nine of the participants. Figure 5 shows the percentages of participants' ranking of the most frequently used mobile learning devices.

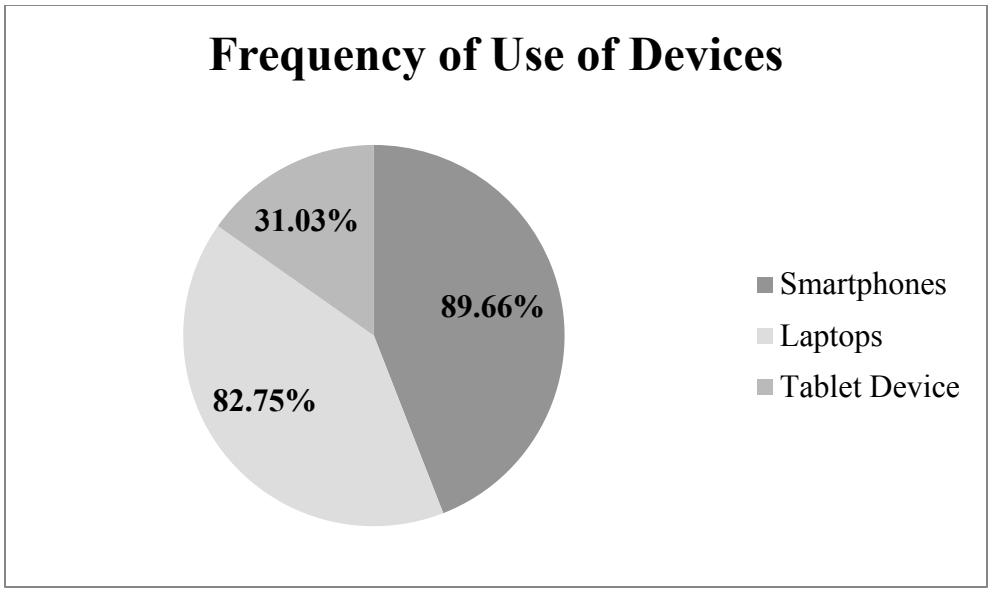


*Figure 5.* Frequency of use ranking by participants as indicated in question 11 of the MLTC survey.

Question 12 of the survey was an open-ended response that asked participants to describe the reasons they used any particular device more than another. Five categories emerged from the data as reasons for participants' preferences as shown in Table 10. Accessibility and the device serving as the participants' primary method of communication were shown to be the main reasons that a device was used more than another.

Table 10

*Categories of Compared Device Usage*

| Category | Responses |
|---|---|
| Accessibility | 18 |
| Primary Communication | 6 |
| Ease of Use/Familiarity/Portability | 5 |
| All In One Use | 4 |
| School Purposes | 3 |

Question 13 of the MLTC survey addressed participants' typical uses of mobile learning technology. The researcher grouped responses into five categories of use:

- Communication
- Academics
- Social Media
- Recreational Use
- Internet Access

Communication included participants' responses pertaining to email, texting, and phone calls which were listed 34 times. Academics included 17 responses pertaining to teaching ideas, submitting assignments, using the course management system for checking grades, searching for lesson plan ideas, web based assignments, and searching for educational apps. Accessing social media was also reported by 17 participants as one of their top three uses. Internet access was chosen by eight participants as a typical use for their mobile learning technology. Recreational use included viewing videos, listening to music, and using a camera. This category had ten responses.

The most often reported use of mobile learning technology was for communication purposes, followed by academic purposes, and social media. Figure 6 shows the results of the participants' responses to question 13 regarding their typical uses of mobile learning technology devices.

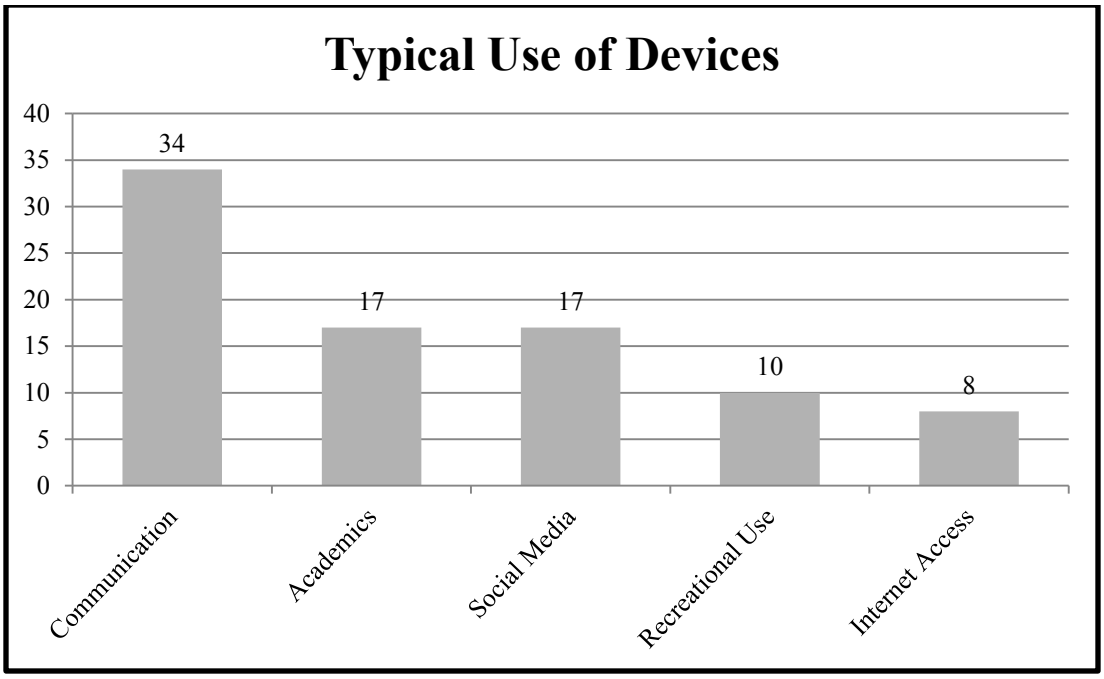


*Figure 6.* Participants reported typical uses for their mobile learning technology reported in Question 13 of the MLTC survey.

Question 15 of the MLTC asked participants to describe the kinds of information they gathered using their mobile learning technology and if they altered or adapted that information. The types of information gathered were classified into three categories by the researcher. The categories were identified as personal, academic, and pedagogical. Figure 7 shows the number of responses within the three categories of information gathered by participants. Personal use included using the technology to access weather, news, health, and fitness information. Academic uses included accessing information regarding research, professional literature, for course assignments, and using the university course management system for grades and course calendars. Pedagogical uses included accessing websites for lesson plans, instructional strategies, classroom management strategies, and planning field experience trips or guest speakers.

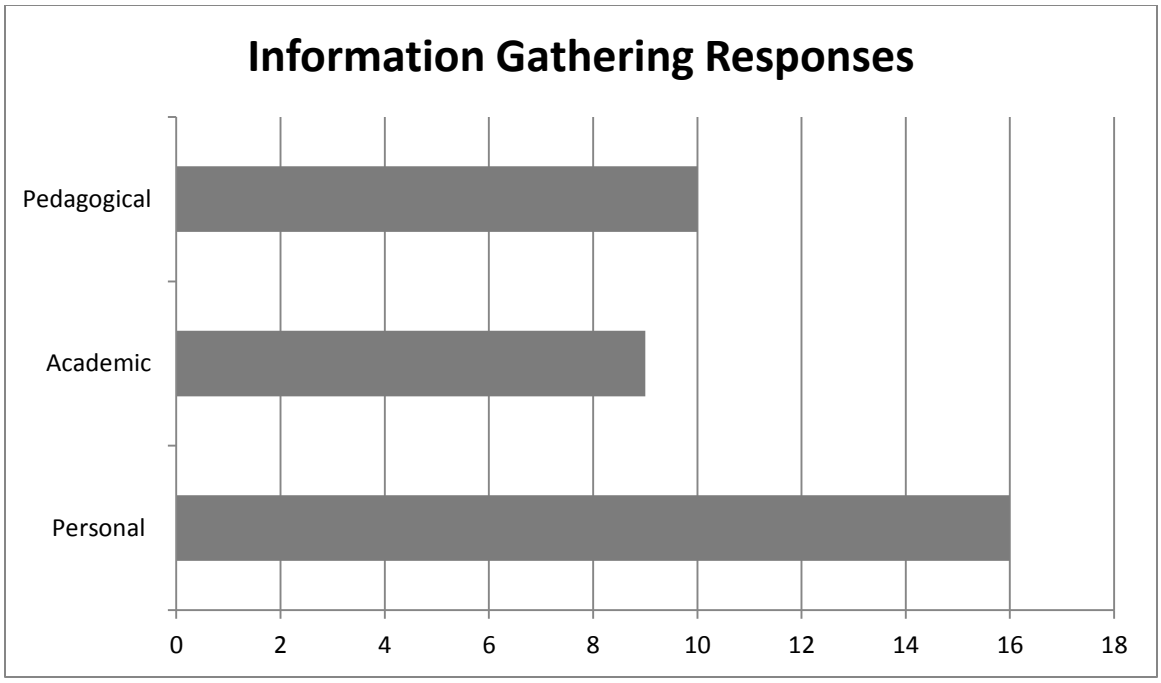


*Figure 7.* Number of responses to Question 15 of the MLTC survey classified into categories by the researcher.

Twenty of the 29 participants responded to the part of the question that asked if they altered or adapted the information they gathered in any way. Four of the participants indicated that they used the information just as it was, and 16 participants indicated that they did alter or adapt original information to suit their needs.

Of those altering information, some of the responses included:

- I creatively adapt it to suit my needs most of the time. I use the general concept but change it for me.
- I alter everything I find. I use it mainly to get lesson ideas, and then blend multiple ideas.
- I usually use the information as it is.
- I use resources on the Internet such as lesson ideas and printable materials.

- I creatively adapt the information to suit my needs, activities, crafts, and lessons.

The last question of the survey that addressed research question one asked participants to indicate if there was a device they could "not live without." Twenty-two of the 29 participants indicated their phone was the most important device they owned. Four participants chose their laptop, one participant chose the iPad®, and two participants indicated that none of the devices were essential to their needs.

**Results From the Focus Group Interview**

The process for analyzing the focus group interview transcript is provided under the heading for research question three. Three questions of the interview protocol addressed answering research question one. Participants were asked to describe how they used their mobile learning technology and what kinds of information they gathered. They were also asked if they could describe any adaptations they made to information. The participants' responses supported the data revealed in the MLTC survey. A category of mobile learning technology as a primary communication tool emerged during the interview. An additional category of use for academic purposes related to instructional practices during field experience also developed. Constant accessibility and all-in-one convenience was cited as a major reason that participants chose mobile learning devices as their primary technology tool for both personal and professional use.

Participants also described that they held expectations of being able to use their mobile learning technology for gathering personal information and pedagogical information during field experience. Lesson planning ideas and increasing content

knowledge emerged as the most often sought types of information. All of the focus group participants indicated that they modified or adapted the information in some way.

Focus group interview participants' responses aligned with the MLTC survey responses to the question regarding the significance of access to their technology, especially mobile phones. One participant said, "I think we depend on it too much sometimes, but it's convenient, and it's always there, and I don't know how to live without it."

**Summary of Results for Research Question One: In What Ways do Preservice Teachers use Mobile Learning Technology?**

An analysis of the data pertaining to Research Question One indicated that the preservice teachers in this study are active users of mobile learning technology. The data revealed that personal use of the technology is more prevalent than academic or pedagogical uses. Participants' responses indicated that smartphones and laptops were the primary devices typically used. Tablet-type devices were identified as the next most commonly used devices.

All 29 participants indicated that they owned a mobile phone. Two participants described their device as a cell phone and 27 participants described their device as a smartphone. Communication appeared to be the primary purpose for the use of mobile learning technology. Smartphones were identified as the most frequently used devices by this group of participants. Laptops were the next most frequently used devices. Accessibility was indicated as the main reason participants chose mobile phones as the most often used device. Participants' responses revealed that after personal use, their mobile learning technology for academic and social media applications was used equally.

The types of information gathered using mobile learning technology were classified into the three categories of personal, academic, and pedagogical. Participants' responses revealed that the primary type of information gathered was for personal use. Information for pedagogical applications had the next highest number of responses and information gathered for academic use showed the least number of responses. Twenty participants' responded to a question regarding whether or not they used the information they gathered in its' original form or if they altered or adapted it in any way. The majority of the participants indicated that they did alter or adapt the information they gathered for their own needs or purposes.

## Research Question Two

*What perceptions do preservice teachers have of the ways their personal creativity is displayed in their instructional practices?*

Data collected to address this research question were collected in the MLTC survey, written assignments, and the focus group interview. This section begins with analysis of the data generated by the MLTC survey questions that addressed research question two. Figure 8 illustrates the steps the researcher took in analyzing the data from the MLTC survey questions 17 and 18.

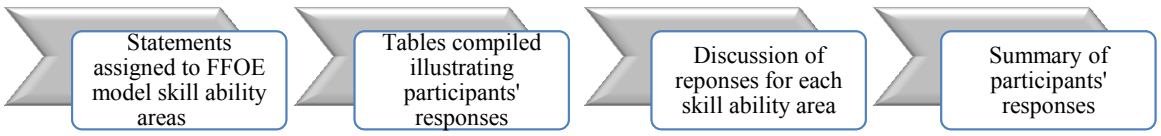


*Figure 8.* Diagram illustrating researcher process of data analysis of MLTC survey questions 17 and 18.

**Results From the MLTC Survey**

Questions 17 and 18 of the MLTC were directed at participants' perceptions of their personal creativity characteristics. Question 17 was a Likert scale and included 11 statements in which participants indicated their agreement of the statement within a range of *completely true* to *completely false* (See Appendix C). The statements of question 17 were developed based on the abilities, characteristics, and indicators used to develop the creativity descriptors shown in Table 7. As shown in Table 7, the researcher previously aligned three other resources (used to develop creativity descriptors) to the four skill areas of the modified FFOE model (Fluency, Flexibility, Originality and Elaboration).

The analysis of this question began with the researcher determining each statement's placement aligned to the skill area abilities of the modified FFOE Model. Based on the content of each statement, a comparison to the abilities and characteristics within the skill areas was made, and the statements were classified into multiple skill areas if appropriate. Table 11 shows the distribution of the statements into the skill area abilities.

Table 11

*Matrix of Question 17 Statements Distributed Across Modified FFOE Skill Area Abilities*

| Statement | Fluency | Flexibility | Originality | Elaboration |
|---|---|---|---|---|
| 1 | X | | | |
| 2 | | X | | X |
| 3 | | | | X |
| 4 | X | | X | |
| 5 | X | X | | |
| 6 | X | | X | X |
| 7 | X | | | X |
| 8 | X | X | X | X |
| 9 | X | X | X | X |
| 10 | | | | X |
| 11 | X | | | X |

**Fluency Skill Area Ability Responses**

Table 12 summarizes the participants' responses to the statements categorized into the Fluency Skill Area Ability. Fluency includes abilities associated with approaching problems from multiple perspectives, recognition of important problems to address, seeing relationships between problems and possible solutions, and evaluating the process and products of solutions. Also included in this skill area are environmental influences, cultural influences and values, and factors of motivation and self-esteem.

Table 12

*Summary of Participant Responses to Statements in Fluency Skill Area Ability*

| Statement | Completely True | Somewhat True | Somewhat True or False | Somewhat False | Completely False |
|---|---|---|---|---|---|
| 1. When faced with a problem, I try to look at it from different angles in order to come up with the best solution. | 14 | 15 | 0 | 0 | 0 |
| 4. When others get stuck, I am able to think of new solutions to problems. | 5 | 20 | 4 | 0 | 0 |
| 5. I don't think it's necessary to come up with new solutions to a problem if the one I've used in the past was successful. | 4 | 6 | 9 | 4 | 6 |
| 6. I like learning new things. | 25 | 4 | 0 | 0 | 0 |
| 7. When faced with a difficult problem I tend to get discouraged easily. | 3 | 8 | 9 | 8 | 1 |
| 8. I enjoy trying or using new things. | 14 | 13 | 1 | 0 | 0 |
| 9. I'm the type of person who thinks "outside the box." | 4 | 17 | 6 | 1 | 1 |
| 11. I don't mind if my life has aspects that are open-ended with no end in sight. I tolerate things being ambiguous or messy. | 3 | 7 | 10 | 6 | 3 |

Statements 1, 4, and 6 elicited responses from all 29 participants in the *completely true* to *somewhat true or false* range. Statement 8 had 28 responses in the same categories. Participants' responses to these statements indicated that they perceived themselves to be motivated to learn new concepts and enjoy new activities. Respondents also indicated that they viewed themselves as open to exploring multiple perspectives of their own problems as well as problems faced by others. However, two respondents indicated a *somewhat false* and *completely false* response to statement 9 which asked if they considered themselves a person who thinks "outside the box." These two responses do not align to the participants' responses in statements 1 and 4 in which the entire sample indicated agreement in the range of *completely true* through *somewhat true or false* in regards to looking at problems from different perspectives and helping others to find solutions to problems.

Nineteen participants responded to statement 5 in the *completely true* through *somewhat true or false* range in regards to being unwilling to search out a new solution to a problem if they have the option to use a tried and true solution. This seems contradictory to the responses to statement one regarding looking at a problem from different angles to come up with the best solution (all 29 participants indicated that statement one was *completely true* or *somewhat true*). Additionally, 20 respondents indicated in statement 7 that they were easily discouraged when facing a difficult problem. These responses seem to support the participants' responses to statement 5, yet are also contradictory to the responses of statement one.

Statement 11 drew responses that were nearly equivalent in addressing participants' perspectives about ambiguity within aspects of their lives. Using the

*somewhat true or false* measure from both ends of the agreement range, 20 participants indicated that they did not mind open-ended aspects of issues and 19 participants indicated that they were not as comfortable with ambiguous parts of their lives. At the extreme ends of the range, three participants indicated that the statement was *completely true* or *completely false.*

**Flexibility Skill Area Ability Responses**

Flexibility includes knowledge of a particular field and an awareness of knowing when to use past knowledge without hindering new developments. It also includes abilities to mentally combine dissimilar concepts into new ideas and reformulation of prior knowledge and strategies into new and original ideas. Metaphorical thinking and abilities to use analogies are included in Flexibility. Table 13 summarizes the participants' responses to the statements categorized into the Flexibility skill area ability.

Table 13

*Summary of Participant Responses to Statements in Flexibility Skill Area Ability*

| Statement | Completely True | Somewhat True | Somewhat True or False | Somewhat False | Completely False |
|---|---|---|---|---|---|
| 1. When faced with a problem, I try to look at it from different angles in order to come up with the best solution. | 14 | 15 | 0 | 0 | 0 |
| 2. I have faith in my capabilities and skills. | 9 | 17 | 3 | 0 | 0 |
| 5. I don't think it's necessary to come up with new solutions to a problem if the one I've used in the past was successful. | 4 | 6 | 9 | 4 | 6 |
| 8. I enjoy trying/using new things. | 14 | 13 | 1 | 0 | 0 |
| 9. I'm the type of person who thinks "outside the box." | 4 | 17 | 6 | 1 | 1 |

The responses to statement two indicate that participants' perceptions of their abilities are of a positive nature. These responses align with the Flexibility skill area characteristic of having knowledge of the field in which the creator is operating as well as demonstrating an ability to repackage or combine that knowledge in a new way. The responses to statement one also aligns with these characteristics. The participants' responses to statements 1, 4, 8, and 9 indicated a confidence in their knowledge of content areas and pedagogical skills that promotes a willingness to look at problems from multiple perspectives for an improved solution. However, responses to statement 5 again

indicate somewhat of a contradiction to the responses provided in the other statements within this skill area. Using the *somewhat true* or *false* category as the neutral indicator, 10 participants indicated a willingness to search out new solutions to problems even if they know they have a successful solution at hand, and 10 participants indicated an unwillingness to look for a new solution if they had one that already worked.

**Originality Skill Area Ability Responses**

The Originality skill area includes producing original, novel, unconventional, or unusual products that are valuable to the creator. Originality is also indicative of self-initiated decisions about how and which skills to use in the process. Also included is a self-awareness of creativeness and acceptance of non-conformity. Table 14 summarizes the participants' responses to the statements categorized into the Originality skill area ability.

Table 14

*Summary of Participant Responses to Statements in Originality Skill Area Ability*

| Statement | Completely True | Somewhat True | Somewhat True or false | Somewhat False | Completely False |
|---|---|---|---|---|---|
| 4. When others get stuck, I am able to think of new solutions to problems. | 5 | 20 | 4 | 0 | 0 |
| 6. I like learning new things. | 25 | 4 | 0 | 0 | 0 |
| 8. I enjoy trying/using new things. | 14 | 13 | 1 | 0 | 0 |
| 9. I'm the type of person who thinks "outside the box." | 4 | 17 | 6 | 1 | 1 |

Responses to statements 6 and 8 indicate a positive disposition by all 29 respondents to characteristics within the Originality skill area. The participants indicated an enjoyment of engaging in new or challenging activities as well as activities that are learning opportunities. Statements 4 and 9 elicited responses that align to abilities of Originality that include being able to decide which skills to apply when imagining or creating something new or developing a unique solution to a problem. With the exception of two participants, the respondents overwhelming indicated that they perceived themselves to be self-motivated to produce ideas or solutions that were novel and useful to themselves and others.

**Elaboration Skill Area Ability Responses**

Table 15 summarizes the participants' responses to the statements categorized into the Elaboration Skill Area Ability. The Elaboration skill area encompasses multiple characteristics and abilities. Personality characteristics include willingness to take risks, defy conventional wisdom, and be persistent, self-motivated, and tolerant of ambiguity. Elaboration also includes demonstration of a capacity for curiosity, humor, and playfulness, openness to ideas, adaptability, and intrinsic motivation. Demonstration of abilities to add details to a concept and carry out ideas to completion is also included.

Table 15

*Summary of Participant Responses to Statements in Elaboration Skill Area Ability*

| Statement | Completely True | Somewhat True | Somewhat True or false | Somewhat False | Completely False |
|---|---|---|---|---|---|
| 2. I have complete faith in my capabilities/skills. | 9 | 17 | 3 | 0 | 0 |
| 3. Change in general makes me uneasy. | 4 | 8 | 7 | 9 | 1 |
| 6. I like learning new things. | 25 | 4 | 0 | 0 | 0 |
| 7. When faced with a difficult problem I tend to get discouraged easily. | 3 | 8 | 9 | 8 | 1 |
| 8. I enjoy trying/using new things. | 14 | 13 | 1 | 0 | 0 |
| 9. I'm the type of person who thinks "outside the box." | 4 | 17 | 6 | 1 | 1 |
| 10. Making "on the spot" decisions makes me uncomfortable. | 6 | 7 | 8 | 6 | 2 |
| 11. I don't mind if my life has aspects that are open-ended with no end in sight. I tolerate things being ambiguous or messy. | 3 | 7 | 10 | 6 | 3 |

Statements 2, 6, and 8 were designated as *completely true, somewhat true,* and *somewhat true* or *false* by all of the participants. In regards to the characteristics associated with Elaboration, these responses indicate that participants perceive themselves to be adaptable and open to new ideas and confident in their abilities to learn.

These responses also indicate that participants are self-motivated and willing to take risks to try new activities. Statement 9 responses also indicate a willingness to take risks and defy conventional wisdom. Statement 7 responses show a fairly even split between participants perceptions regarding their persistence and intrinsic motivation. Using the *somewhat true or false* category as neutral, 11 respondents indicated that they were easily discouraged when facing a difficult problem and 9 respondents indicated that they were not easily discouraged. Statement 11 responses show a similar split with 10 respondents indicating their ability to tolerate ambiguity and open-ended aspects of life. This would align to 9 respondents in statement 7 who indicated that they were not easily discouraged by problems. Conversely, 9 responses of participants who indicated they did not tolerate open-ended aspects of life or ambiguity align to the responses of 11 participants who indicated in statement 7 that they were easily discouraged by difficult problems. Participants responding to the *completely true, somewhat true, and somewhat true or false* range in statement 11 would appear to demonstrate perseverance and willingness to be the person who adds details to a project and takes it to completion.

Statement 10 responses indicated 21 participants reluctance to make "on the spot" decisions. These responses aligned to the Elaboration characteristic of people who enjoy taking an original idea and adding details to it to make it more appealing or to increase the value of the idea from outside viewpoints. Additionally, a direct indicator of creativity in the Elaboration skill area includes an ability to assess work in progress and make clarifications. On the other side of that statement in the *somewhat false* and *completely false* range there are 8 respondents who indicated that they would not be concerned by making "on the spot" decisions. This demonstrates a willingness to take

risks, acceptance of possible failures as a normal part of the process, and a no fear about being different or non-conforming. Statement 3 was placed under the Elaboration Skill Area Ability in regards to participants' perceptions of how change is accepted in their lives. These responses are indicative of creativity characteristics of risk taking, tolerating ambiguity, adaptability, and accepting non-conformity. Also considered for statement 3 are factors of cultural influence and group interaction influences. Twelve participants indicated a *completely true* or *somewhat true* response to change making them uneasy. Seven participants chose the *somewhat true or false* range. Ten participants indicated that change did not make them uneasy. Statements 3 and 10 addressed factors of decision making. Participants' responses in the *completely true* and *somewhat true* range were similar with 12 for statement 3 and 13 for statement 10. Similarly, in *the somewhat false* and *completely false* range, 10 participants indicated they were not uneasy about change in statement 3 and 8 participants indicated that they were very comfortable making snap decisions in statement 10.

The final question of the MLTC survey asked participants to provide a definition of creativity. Some of the responses included are compared to the researcher's definitions of creativity in Table 16.

Table 16

*Alignment of Participants' Definitions of Creativity to Researcher Definitions*

| Participants' Definitions of Creativity | Alignment to Researcher Definitions of Creativity |
|---|---|
| Creativity is being able to come up with something on your own. | Originality: an ability to imagine or invent something new and valuable to the creator |
| Being unique and individual. | Flexibility: an ability to combine two or more dissimilar concepts or repackage prior knowledge in new ways<br>Originality: an ability to imagine or invent something new and valuable to the creator |
| Using something in a unique way. | Flexibility: an ability to combine two or more dissimilar concepts or repackage prior knowledge in new ways<br>Elaboration: an ability to add details to a concept and carry out an idea to completion |
| Being able to take something that is a problem that doesn't have a definite answer and find new solutions that are out of the ordinary way to solve the problem. | Fluency: an ability to offering many options for solutions and ideas from different perspectives<br>Flexibility: an ability to combine two or more dissimilar concepts or repackage prior knowledge in new ways |
| Creativity is when you take anything and make it meet your needs. | Originality: an ability to imagine or invent something new and valuable to the creator<br>Elaboration: an ability to add details to a concept and carry out an idea to completion |

Four participants used the phrase "thinking outside the box" and three participants referred to adaptability in their definition.

**Results From Methods Course Written Assignment Submissions**

Data from voluntarily submitted written assignments completed during methods block were also used to answer research question two. Participants were asked to submit a written assignment chosen from a suggested list and answer the following two questions:

1. What parts of this assignment demonstrate that I used my mobile technology in a creative way?

2. What makes me feel that the way I approached and completed this assignment is creative based on the definitions/descriptions for this study?

Four participants voluntarily submitted written assignments for this data collection method. Two of the submissions were lesson plans, one was a technology tools presentation assignment, and one was a communication tools development assignment. Qualitative content analysis was used to analyze the written submissions. Initial categories for classifying data were established based on the theoretical framework of the study. Further themes and common ideas were drawn from the characteristics and indicators of creativity within the resources used to develop the creativity descriptors found in Table 7. Figure 9 illustrates the steps the researcher took in analyzing the data from the methods course written assignment submissions.


*Figure 9.* Diagram illustrating researcher process of data analysis of written methods course assignment submissions.

**Alyssa's presentation.** Alyssa (pseudonym) submitted a written summary of a technology tools presentation that she delivered in her methods block science course. She chose to present information about her e-Reader, the Kindle Fire®, for this assignment. She detailed the use of the device, the cost, availability, and suggested uses. Alyssa chose to focus on two particular applications for the device. The first application was for downloading books to the device, and the second application was a voice recorder. Alyssa demonstrated how to acquire these apps and install them on the device during her presentation to the class. She then enlisted volunteers from the group to

participate in a demonstration of how the applications could be used with young struggling readers to build confidence in oral reading fluency as well as providing a formative assessment tool for the teacher.

Alyssa answered the researcher's questions by saying that she submitted this assignment to show that she "...used the Kindle Fire® for a purpose that is typically not intended for the device during the interactive section of my presentation." She addressed the second question by saying, "I believe I was very creative for this assignment in that I used my Kindle® as a tool to instruct other preservice teachers how to go beyond just using it to read books for pleasure or even to use when reading to kids." She also stated, "I think that showing the other students how to use the technology to help children to practice their oral reading and be able to go back and listen to themselves read was a creative use of the Kindle®." She added, "Everyone was engaged in the activity and had fun using the voice recorder app."

Table 17 summarizes the themes, common ideas, characteristics, and indicators found during analysis of this written assignment submission and the participant's answers to the researcher's questions about the submission. The summarized commonalities are aligned to the categories within the study theoretical framework and resources used to develop creativity descriptors for data analysis.

Table 17

*Summary of Technology Tools Presentation Themes, Ideas, Characteristics, and Indicators*

| Themes, Common Ideas, Characteristics, Indicators | Theoretical Framework Resource or Creativity Descriptor Resource |
|---|---|
| Seeing many options. | FFOE Model: Fluency |
| Seeing problems in a new way.<br>Recognizing a problem to solve. | Sternberg Interrelated Resource: Intellectual Ability: Synthetic<br>Vandeleur: Direct Indicator |
| Repackaging a strategy in a new way.<br>Seeing the value of the product. | FFOE Model: Flexibility<br>Vandeleur: Direct Indicator |
| Using an object in an unusual manner. | FFOE Model: Originality<br>Vandeleur: Originality Direct Indicator |
| Willingness to take a risk.<br>Openness to new ideas. Curiosity. Adaptable. Self-initiated. Persistent. | Sternberg Interrelated Resource: Personality<br>Treffinger Creativity Categories: Openness and courage to explore new ideas<br>Treffinger Creativity Categories: Listening to one's inner voice |

**Andrea's communication tool.** As part of the Goldcup University methods block, preservice teachers must directly engage with parents of the children in their field experience. Establishing a relationship with parents through some form of daily communication is a program requirement and preservice teachers must document evidence of communication both to and from parents or caregivers.

Andrea (pseudonym) submitted a written report of her communication tool development assignment. After the first few days of field experience, Andrea documented that parents were very busy and did not have to time to chat when they were dropping off or picking up children from the child care center in which she was working. Even though a written note went home with the children, many times she would find it in their backpack the next day unread by the parents. She was not getting responses back to her daily communication note. Realizing this was not conducive to successfully completing the communication tool assignment, she decided to reach out to parents

through the technology that the majority of them used, that being their smartphones or cellphones. Andrea described her process:

> I went back through my class notes because I remembered one of our professors telling us about a free polling program, and she demonstrated it in class. The results were instant, and you could ask simple yes or no questions, or develop open ended questions that could be responded to through a text message. I thought I could develop a way to use this polling program to communicate with parents. I used my smartphone to look up the polling website and download the application. The program also provided reports that could be saved and printed out at a later time with the parents' responses, so I would have documentation of the two-way communication I needed for the assignment. I used my laptop to write a note describing how to use the polling program and directions for accessing the website for trouble shooting information. The way the program works, I didn't have to have their phone numbers, I just had to give them a slip of paper every day that had a couple of questions on it and they could use their cellphone, smartphone, tablet, or home computer to send an answer. I thought that with the limited amount of time the parents seemed to have, that it would be easier for them to send me a quick text through the polling program than sit down and write a response to me. Most parents knew how to use the program from voting on television shows etc... They seemed to embrace the idea and I got many more responses which I could then use as documentation for my assignment as well as established a better relationship with the parents of my students.

Andrea responded to the researcher's first question indicating that using her smartphone to establish the polling program as a communication tool for her students' parents was a demonstration of creativity. In response to question number two she added:

> Based on my personal definition of creativity as taking resources you already have and finding a new way to use them that results in an improved process or product, I believe that my idea for using the polling program via mobile learning devices was innovative, useful, and made the task more enjoyable for all the parties involved.

Table 18 summarizes the themes, common ideas, characteristics, and indicators found during analysis of this written assignment submission and the participant's answers to the researcher's questions about the submission.

Table 18

*Summary of Communication Tool Development Themes, Ideas, Characteristics, and Indicators*

| Themes, Common Ideas, Characteristics, Indicators | Theoretical Framework Resource or Creativity Descriptor Resource |
|---|---|
| Seeing from multiple perspectives. | FFOE Model: Fluency |
| Recognizing an idea worth pursuing.<br>Motivation. Recognizing cultural influence. | Sternberg Resource: Intellectual Ability: Analytic<br>Vandeleur: Indirect Indicator |
| Repackaging a strategy in a new way.<br>Using knowledge of the field in a way that does not hinder new ideas. | FFOE Model: Flexibility<br>Sternberg Interrelated Resource: Knowledge |
| Ability to apply unconventional methods.<br>Deciding how to apply skills.<br>Using an object in an unusual manner. | FFOE Model: Originality<br>Sternberg Interrelated Resource: Thinking Styles<br>Vandeleur: Originality Direct Indicator |
| Abilities to take an idea and make it work.<br>Self-initiated. Persistent.<br>Risk taking and defy the status quo.<br>Openness to new ideas. Curious. Adaptable.<br>Sensitive to problems. | FFOE Model: Elaboration<br>Treffinger: Listening to one's inner voice<br>Sternberg Interrelated Resource: Personality<br>Treffinger: Openness and courage to explore new ideas |

**Alexis's lesson plan.** Two participants submitted lesson plans as evidence of their creativity for this data collection method. Alexis (pseudonym) submitted a reading lesson plan. The part of this plan that Alexis described as creative was the use of her iPad® and several apps that she had researched and tried in developing assessments for various lesson plans. In contrast to using checklists or written anecdotal records she found applications that could be used to video document children engaging in the lesson activities and an application that was a virtual classroom in which she could record each learner's individual reading progress. She answered the researcher's first question by saying:

> I believe that parts of my lesson plan demonstrate creativity. In particular, the development and design of my assessment plan for this lesson shows my ability to find a unique and more effective way to approach what I and most of my fellow preservice teachers deem one of our most difficult tasks.

Alexis continued answering question two by stating:

> I researched until I found applications for my iPad® that I could use as tools to make various reading concept assessments of my students faster and more in tune with the information I needed to collect to plan further instruction. I think that the assessment plan I developed for this lesson was very different, and "off the beaten path" from what most of my fellow preservice teachers were doing. From that standpoint, I feel that this shows creativity in the way I approach instructional practice. This lesson got great reviews from my field experience supervisor, my cooperating teacher, and my methods course instructor, which confirmed for me that it was okay to try something new!

A requirement of the PreK-K methods block field experience is to plan a visit from an expert or to plan a field trip as part of implementing the project approach curriculum. The expert or the field trip is to be scheduled early in the project for children to have a basis upon which to draw assumptions and conclusions regarding the project topic. Implementing the project approach curriculum demands that children are involved in choosing the project topic which sometimes results in a challenge for preservice teachers in regards to locating an expert or planning a field trip.

Table 19 summarizes the themes, common ideas, characteristics, and indicators found during analysis of this written assignment submission and the participant's answers to the researcher's questions about the submission.

Table 19

*Summary of Reading Lesson Plan Themes, Ideas, Characteristics, and Indicators*

| Themes, Common Ideas, Characteristics, Indicators | Theoretical Framework Resource or Creativity Descriptor Resource |
|---|---|
| See a problem in a new way.<br><br>Recognizing an idea worth pursuing.<br><br>Understanding complexity of problems.<br>Recognizing a problem and evaluating the value of a created solution. | Sternberg Interrelated Resource: Intellectual Ability: Synthetic<br>Sternberg Interrelated Resource: Intellectual Ability: Analytic<br>Treffinger Categories: Digging deeper into ideas<br>Vandeleur: Direct Indicator |
| Repackaging a strategy in a new way.<br>Combining two existing dissimilar concepts<br>Using knowledge of the field in a way that does not hinder new ideas.<br>Reformulating a problem | FFOE Model: Flexibility<br><br>Sternberg Interrelated Resource: Knowledge<br><br>Vandeleur: Direct Indicator |
| Ability to apply unconventional methods to create a product desirable to the creator.<br>Deciding which skills to use and how to apply skills. | FFOE Model: Originality<br><br>Sternberg Interrelated Resource: Thinking Styles |
| Self-initiated. Persistent.<br>Willingness to take a risk; defy the status quo<br>Openness to new ideas. Adaptable.<br>Sensitive to problems. Energetic<br>Willing to experiment with ideas at risk of failure. | Treffinger Categories: Listening to one's inner voice<br>Sternberg Interrelated Resource: Personality<br>Treffinger Categories: Openness and courage to explore new ideas<br>Vandeleur: Direct Indicator |

**Anissa's lesson plan**. Anissa (pseudonym) submitted a science lesson plan from her PreK-K methods block field experience as her evidence of creativity in her instructional practices. Anissa was placed in a PreKindergarten classroom with 10 four and five-year olds. Through a process, the children choose a project topic of birds. Anissa had access to iPads® that she used for the children to research birds, look at videos of birds, and take pictures of birds. The time frame for this field experience was in the late fall. Anissa had arranged for a local wildlife officer to visit the children and talk to them about birds. On the day of the visit, her expert could not attend, and indicated that he would be very busy for the next couple of weeks. Instead of canceling the visit, Anissa indicated on the lesson plan that she arranged for the officer to Skype with the children in her room. The children were already familiar with using the iPads® and the "virtual visit" was a success. In addition to this, Anissa did manage to plan a field trip to a local pond where she had observed nesting geese. When she submitted this assignment, Anissa answered the researcher's question regarding her decision to choose this lesson as a demonstration of creativity by stating:

> I chose this lesson because the written lesson plan had to reflect the changes I had to make at the last minute when my expert canceled his visit. The lesson plan describes how I had to use my mobile technology creatively to meet the requirements of the field experience as well as provide my students with a hands-on experience to start their project.

Anissa continued to answer the second question:

> The descriptions and definitions we were provided of creativity led me to decide that the way I used the iPads® for the children to research and look at birds as

well as meet with the expert was creative. I feel that I found a way to still provide the same quality of lesson for the day using my mobile technology that I wouldn't have been able to do if I didn't have access to it. It probably isn't the first time a teacher has done the same thing that I did, but it was a first time for me and I thought it was highly imaginative. I managed to find a solution to a very stressful problem!

Table 20 summarizes the themes, common ideas, characteristics, and indicators found during analysis of this written assignment submission and the participant's answers to the researcher's questions about the submission.

Table 20

*Summary of Science Lesson Plan Themes, Ideas, Characteristics, and Indicators*

| Themes, Common Ideas, Characteristics, Indicators | Theoretical Framework Resource or Creativity Descriptor Resource |
|---|---|
| Looks for many options to problem solution.<br>Desires to resolve ambiguity, open-ended problems.<br>Recognizes a problem and determines how to proceed.<br>Motivated to solve problems. | FFOE Model: Fluency<br>Treffinger Creativity Categories: Digging deeper into ideas<br>Vandeleur: Direct Indicator<br><br>Vandeleur: Indirect Indicator |
| Shows flexibility.<br>Reformulates the problem. | Treffinger Creativity Categories: Generating ideas<br>Vandeleur: Direct Indicator |
| Using knowledge of the field in a way that does not hinder new ideas. | Sternberg Interrelated Resource: Knowledge |
| Ability to apply unconventional methods.<br>Deciding how to apply skills and recognizing what is important to focus on. | FFOE Model: Originality<br>Sternberg Interrelated Resource: Thinking Styles |
| Abilities to take an idea and make it work.<br>Self-initiated. Persistent.<br><br>Willingness to take a risk and defy the status quo. Tolerant of ambiguity.<br>Openness to new ideas. Adaptable. Has a capacity for imagination. | FFOE Model: Elaboration<br>Treffinger Creativity Categories: Listening to one's inner voice<br>Sternberg Interrelated Resource: Personality<br><br>Treffinger Creativity Categories: Openness and courage to explore new ideas |

**Summary of Results for Research Question Two: What Perceptions do Preservice Teachers Have of the Ways Their Personal Creativity is Displayed in Their Instructional Practices?**

**MLTC survey.** Qualitative content analysis was applied to the data generated by the MLTC survey questions regarding participants' perceptions of personal creativity. The Likert scale statements within question 17 of the survey were categorized into the four skill ability areas of the modified FFOE model and the corresponding resources used to develop creativity descriptors. The statements were grouped together by the modified FFOE model skill area abilities and the responses for each statement were tallied. The results of the data indicate that this group of preservice teachers perceive themselves as motivated to learn new concepts, willing to try new things, and that they enjoy engaging in fresh activities. The responses were also indicative of a willingness to view problems from multiple perspectives. Participants indicated that they were confident in their skills and abilities. The results also reveal that they perceive themselves to be self-motivated to produce ideas that were unusual and useful for their own use and for others use.

Responses to some statements indicated that participants believed they were willing to take reasonable risks, were open to new ideas, and were adaptable. However, this seems to be a contradiction to responses to other statements regarding decision making and persistence. Some participants indicated that they were easily discouraged when faced with a difficult problem, and were uneasy about making snap decisions or facing changes. Nineteen of the participants indicated that they would not make an effort to find a better solution to a pressing problem if they had one that was already proven to be effective.

Responses to statements regarding participants' tolerance of aspects of life that were open-ended or ambiguous were nearly equivalent. Three responses were recorded at the completely true or completely false ends of the range. The last question of the survey asked participants provided a personal definition of creativity.

**Written assignment submissions.** The analysis of the participants' responses to question one that accompanied the submission of a written assignment revealed that each participant identified a primary reason for their choice of assignment. Each response stated the type of device used in the assignment and a short description of the purpose of the assignment. Three of the four participants' answers showed a common theme of choosing the assignment to submit based upon using their mobile learning technology for a purpose other than the typically intended use. One participant's answer indicated choosing the assignment based on demonstration of "on the spot" adaptations made to a previously planned lesson through the use of mobile learning technology. Question two asked participants to support their choice of assignment based on its' creativity. All four participants indicated that their submission demonstrated creativity because they designed or developed an element of instructional practice using mobile learning technology as an alternative to typically used strategies or methods. They also described a belief that the enhanced engagement in the activities or products they created and confirmation by peers and instructors of success in the innovation was evidence of creativity.

Qualitative content analysis of the written submissions revealed participants' demonstration of skill area abilities, characteristics, and indicators of creativity as established in the theoretical framework for this study. Analysis of participants' written

assignment submissions also revealed a willingness to view problems from multiple perspectives before deciding upon a direction to take and which skills to use in creating a novel solution to a pressing problem. The data revealed that participants demonstrated abilities to understand the complexities of difficult problems including the cultural values that influence identification of significance of problems. Analysis of written assignments also demonstrated participants' capacity for sensible risk-taking by applying imagination in adapting prior instructional practices to create an improved process or product.

**Focus group interview.** The process for analyzing the focus group interview transcript is provided under the heading for research question three. Two questions of the focus group interview protocol addressed answering research question two. The results of the focus group interview analysis suggest that participants believe that they demonstrate creativity more often in their pedagogical use of mobile learning technology as opposed to typical personal use. This supports the results of the analysis of the written methods course assignment submissions. Indications are that participants perceive the use of their mobile learning technology to search for innovative teaching ideas, and to increase content knowledge as paramount to creatively adapting the information they gather. The data also revealed that only a few participants perceive themselves to be motivated to generate original products that were uncommon yet useful for their own instructional purposes. The results of the focus group interview, the MLTC survey, and the written course assignments do not point to the creation of original ideas as evident within the participants' instructional practices. Participants' responses alluded to creative adaptations of existing ideas and plans happening more frequently than original creations.

**Research Question Three**

*What perceptions do preservice teachers have regarding the influence mobile learning technology has on the ways creativity is displayed in their instructional practices?*

Data from the focus group interview, the MLTC survey, and written methods courses assignment submissions were used to answer research question three. Participants were asked to volunteer for the focus group interview when they completed the MLTC survey. Eleven respondents indicated that they would be willing to participate. Six of the participants were present at the focus group interview. Two of the focus group interview participants were non-traditional students in the sense that they fell outside the typical age range for university students or had previous higher education or work experience. These two participants fell inside the age range for digital native status. The interview was video-recorded and transcribed for analysis.

Figure 10 illustrates the steps the researcher took in analyzing the data from the focus group interview transcripts.

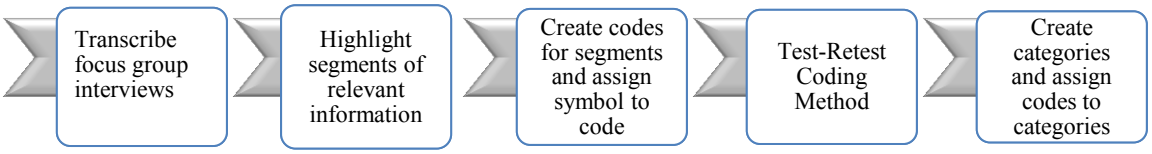


*Figure 10.* Diagram illustrating researcher process of data analysis of focus group interview transcripts.

**Results From the Focus Group Interview**

An open-coding process was used to analyze the focus group interview data. After transcribing the recorded interviews, the researcher reviewed the transcript to identify commonalities within the data. Upon a second reading of the transcript, relevant

segments of information were highlighted, and the researcher initiated an open-coding technique by creating a code for each highlighted segment. A code (i.e. a label that provides meaning) was assigned to segments of text within the transcript. The segments were then grouped together by codes forming categories which were then assigned a symbol. Each category was assigned a name that embodied the essence of the information contained in the codes. The data was coded a second time to ensure reliability of the coding process (Multon, 2010). The codes were reviewed for duplication or closely overlapping descriptions. After a complete coding of the dataset, the researcher reviewed the codes and based on the content of the segment, some of the initial codes were recoded. Some segments received multiple codes to facilitate their placement in more than one category.

Categories and themes that emerged from the data analysis of the MLTC survey and written methods course assignment submissions were used as foundations for category development for the focus group interview data. Categories associated with the theoretical framework for the study were also considered. Emergent categories were also identified and developed. All categories were assigned a symbol. The coded data were classified into the categories.

Table 21 illustrates the categories and corresponding coding symbols that were developed during the analysis of the focus group interview data.

Table 21

*Coding System for Focus Group Interview*

| Category | Coding Symbol |
|---|---|
| Identification of MLT usage | IDu |
| Identification of MLT purposes | IDp |
| Identification of information gathering purposes | IDI |
| Perception of academic creativity | AC |
| Perception of personal creativity | PC |
| Perception of pedagogical creativity | PDc |
| Creativity as modification to existing resource | MER |
| Creativity as creation of original resource | COR |
| Perception of originality | PO |
| Demonstration of synthetic intellectual ability | SIA |
| Demonstration of practical intellectual ability | PIA |
| Demonstration of analytic intellectual ability | AIA |
| Perception of confidence in knowledge and skills of field | KSF |
| Perception of preferred use of skills | PS |
| Perception of decision making characteristics | DMC |
| Perception of motivation characteristics | MC |
| Perception of persistence characteristics | PRC |
| Perception of risk-taking characteristics | RTC |
| Perception of openness to explore possibilities | OEP |
| Significance of access to MLT | ACC |

| | |
|---|---|
| Significance of peer approval of creation | PAc |
| Significance of instructor/supervisor approval of creation | IAc |
| Significance of learner engagement in created resource | LEc |
| Significance of environment upon creativity | EC |
| Perception of MLT influence on creativity | MIC |

Upon completion of the coding of pertinent information in the focus group interview data and the identification of categories, the following themes emerged as the categories were reviewed:

Theme One: Preservice teachers' preferences for using mobile learning technology and the identification of purposes for using it.

Theme Two: Preservice teachers' perceptions of their creativity within various aspects of their lives.

Theme Three: Preservice teachers' perceptions regarding the ways creativity is displayed in their instructional practices.

Theme Four: Preservice teachers' perspectives of the significance of using mobile learning technology in various aspects of their lives.

Theme Five: Preservice teachers' perspectives about the significance of the investment in creative endeavors.

These themes are consistent with the themes that developed during the analysis of the written methods course assignment submissions and the results of the MLTC survey. The following sections will reflect on these key themes that formed during the analysis of the interview transcript.

**Theme one: Preferences and purposes.** The data generated by the study instruments concerning this theme were consistent. The results of the focus group interview questions that addressed participants' mobile learning technology usage habits were congruent with the results of the MLTC survey and have previously been discussed. The following excerpts from the focus group interview further illustrate the consensus of the participants (all names used are pseudonyms):

Researcher: How are you using your mobile learning technology?

Anna: I use my phone for everything.

Abbie: I use my Kindle® to upload books to read for myself and with kids.

Alex: My phone is my main form of communication.

April: I use it [my phone] to organize communication in all the groups I am involved in. It's much more convenient than using sign-up sheets.

Allen: I use it mainly for communication and for looking up stuff to help with lesson planning and school assignments. I definitely use it for increasing my content knowledge for teaching.

Amy: I use my phone and laptop most. My phone is always with me and I use the camera a lot. I also use it for social media. I use my laptop mainly for school work.

**Theme two: Perceptions of creativity.** In the focus group interview, preservice teachers were asked about their perceptions of their creativity. The MLTC survey also addressed aspects of personal creativity, but, the questions were aligned to established research-based skills, abilities, attributes, and characteristics of creativity that participants used to describe themselves. The written methods course assignment submissions also

asked participants to explain aspects of their submission that made them feel creative. The focus group interview question directly asked participants to describe how creative they are, and in what respects. The data revealed that all of the participants agreed that they perceived themselves to be creative in approaching a project or problem from several perspectives, but, that they believed they were more creative in adapting or modifying an existing resource than there were in creating an original resource on their own (all names used are pseudonyms).

Researcher: How creative are you?

Allen: I'm a great plan B person. I can think of so many ideas that we could do for lessons once I look at what someone else has done.

Abbie: Just because you are good at being creative in one area…like I am good at finding solutions to new problems or solutions to someone else's problems but artistically creative…not so much.

Alex: Artistically I'm a great stick figure drawer. When it comes to a project or like I said before when it comes to adapting a lesson or pulling tech into it then I am more creative in that aspect versus completely making up something from scratch.

Anna: I can find stuff that will help me like websites and if I have a problem I know where to go to find help but to come up with original stuff on my own…no.

April: I'm the same way; I know how to go find things and lesson plans and stuff but to create stuff right off the top of my head, I don't do that.

Amy: I think it depends on the subject of my lesson…I'm pretty good at coming up with ideas.

Even though all the participants agreed that they believed that had better creative abilities to adapt and modify existing resources, Amy described one instance that she believed demonstrated her ability to create an original instructional tool:

> I think I am good at coming up with ideas. I thought this was so clever when I came up with it. I developed a lesson using a cake pan with four small containers inside it that represented a cow's stomach for my preschoolers. They could put grass in the containers and move them around showing the digestive process. My field experience supervisor loved the idea and shared it with other students. They came and asked me to use my idea. I thought that was a great compliment!

One question on the MLTC survey asked participants if they looked for a way to improve a product or process that they were developing if they already had a solution or resource that worked effectively. The results indicated that this was not true for the majority of the preservice teachers. They indicated that they would not go out of their way to work on something unless it showed signs that it needed fixed or improved. The results of the focus group interview data regarding this type of creative behavior appear to be consistent with the survey data. However, participants did indicate that they were confident enough in their pedagogical knowledge to recognize when a problem existed that needed attention. The data revealed that preservice teachers' believe themselves to be motivated to solve problems and are persistent in doing so as evidenced in this conversation (all names used are pseudonyms):

Researcher: What do you do when you are faced with a problem? If a lesson bombs, do you look for a different way to teach it? Do you make changes then and there or do you modify it later? Would you say you are determined in making it work?

Anna: I'm a very determined person. I don't ever give up and when I see something needs changed, I try to find something better that will work.

Allen: I don't get discouraged easily. I look for ways to figure out how to make something better, especially if it is a lesson I have planned and it bombs. I try not to let it bother me. I just think about how I can fix it and make it work the next time.

Amy: Yes, I think we are creative every day because whether we realize it or not we face problems every day that have to be solved and we do it without thinking because we have to do it, it's part of life. If we are driving somewhere and have to take an alternate route, you just do it.

In the MLTC survey, participants were asked to indicate their propensity to become discouraged when faced with difficult problems. The survey data revealed that participants were nearly equally split on their responses about whether the statement was personally true or false. The preservice teachers who participated in the focus group interview appear to have been in the group who indicated they do not get discouraged easily.

**Theme three: Perceptions of ways creativity is displayed in instructional practice.** The data results of the focus group interview led to the development of this

theme which reiterated the results of the data analysis in the MLTC survey and written methods courses assignment submissions. As previously discussed, participants perceived their creativity to be (a) displayed in their instructional practices through innovative use of mobile learning technology, (b) displayed through finding, recognizing, and implementing an improved strategy for an existing issue and (c) demonstrated by the development of original products or processes. The focus group interview data were more revealing in regards to participants' perceptions of their creativity through the inflection and enthusiasm they demonstrated while describing instructional experiences that were enhanced or improved by the use of their mobile learning technology. This was also true of their descriptions of negative ways their instructional experiences were affected by the inability to have access to mobile learning technology. The qualitative data from the focus group interviews provided an increased understanding of these preservice teachers' personality characteristics and dispositions that were revealed during the conversation.

**Theme four: Perceptions of significance of mobile learning technology use.** Questions surrounding this theme received multiple responses. Participants were very willing to discuss the importance of their mobile technology from a personal, professional, and pedagogical viewpoint. The following question started the conversation, and participants' responses concerning instructional practice are detailed (all names used are pseudonyms):

Researcher: Tell me about a time that you were not able to use your technology or did not have access to it for some reason.

Amy: I had a challenge with that in my last placement, um, our math lessons would get split into smaller groups and all the k teachers (3 different groups) and two other teachers would also do math so there were 5 groups and the kids were in the small groups so I had a group of 8 kids and we would go to the music room so I didn't have any of the tech. The only thing was a teacher computer so a lot of my lessons had to be planned differently because a lot of the lessons are tied to technology and I didn't have any in this room. I had to look up lessons that didn't use technology and would still keep the kids engaged, because there is no tech I could use. I did things like pocket charts for number identification, and like we had different things like a number scavenger hunt, and interactive bulletin boards so it was different having to prep for those lessons not having my technology to use with instruction.

Anna: I would freeze up. Like my computer wasn't connecting to the Wi-Fi that was there and the other group was using their laptop to do their skit and I had to go onto another plan by rambling on things. But I am so used to having access to the Internet and my technology that... You know when you have it like I did when I couldn't connect my laptop and like at other times you can pull out your phone and still connect to the Internet using the 3G but I couldn't do that at that point. So I was stuck doing other things but for that second you are like oh no because you are so dependent on it so we substituted other things.

Another participant added a personal viewpoint to this question:

Alex: I was so dependent on it last semester. I would leave it in the car or somewhere because they were so strict about the cellphone usage. It surprised me that I would spend ten minutes in the car just checking everything and seeing who called or texted me and I thought this is really sad (everyone agreed and laughed) because I am so excited to see who called me or who texted me and cause it's like you have withdrawal from it. Or even at the end of my billing cycle I have used like 75% of my data package so I have to cut back or yeah, that's really hard, even that's hard for me because I am constantly messaging people about class, and stuff on campus and about all sorts of things and checking my email and it is hard because I have to go to my laptop so I have Wi-Fi and it's just more tied down than my phone.

The participants' responses to the questions regarding successful use and challenges of using mobile learning technology revealed an agreement amongst the group in a dependence upon access to their devices and connection to the Internet. However, some of the participants described a personal need to get away from the constant connection occasionally. Lengthy discussion continued regarding issues surrounding professional educators' engagement in social media, and the possible ramifications of this activity.

The data revealed that these preservice teachers were in agreement about the importance of providing access to technology for learners, regardless of the risks associated with possible inappropriate use, and their concerns about a lack of technical expertise in case of technology failure. Participants also revealed concerns about keeping

updated on the resources available, and the technical training needed for effective use of the myriad of new devices that seemingly are introduced daily. Participants described their concerns (all names used are pseudonyms):

> April: I think as a teacher it is scary because we can't monitor what they are doing on their technology, especially their phones but we are going to be held accountable if something bad happens and we've let them have them out. I think they shouldn't be allowed in the classroom, but then that means we can't have ours either because we are modeling that behavior.
>
> Amy: I think it's kind of scary because the kids are going to technologically get past us and how will we keep up with their needs as teachers then?
>
> Anna: Even with all the apps when we are planning to use them in the classroom we have to put a limit on ourselves as teachers. Are we really going to be able to use the technology in our lessons? So we have to realize what is important for us to learn and be able to do with children as far as technology. We have to decide this is going to be great to use and follow through with it not just, wow, this looks good. We have to decide what a waste of our time is and what isn't.

Allen summed up this thread of the conversation by saying:

> I think technology is great but we have to be careful not to let it be abused or used abusively by a teacher as a substitute for real teaching. We can't hide technology from kids, it's everywhere. It has to be connected to teaching though not all technology. The kids who seemed to be the most excited to have extra time on

the technology were kids from lower income families who don't have access to it at home and only get to use it for school purposes at school. The extra time for "playing" on it is really a treat for them. Eventually they need to know how to use it so it's good for them. It's like anything else; it has to be used in the right ways.

**Theme five: Perceptions of significance of investing in creative endeavors.** The emergence of this theme during the analysis of the focus group interview transcripts surfaced as participants described successes and advantages when using mobile learning technology at personal and professional levels. Amy's description of the success of her lesson about cow stomachs and the positive feedback she received from her field supervisor as well as her peers who asked permission to copy her lesson, exemplifies the significance of investing in creative activities. This theme is also evident in the results of the analysis of the written course assignment submissions. Participants who submitted assignments indicated positive feedback from course instructors, field supervisors, peers, and learners in their responses to the researcher's questions. The data results allude to positive feedback as significant for continued motivation to further invest time and abilities in creative work.

**Summary of the Results for Research Question Three: What Perceptions do Preservice Teachers Have Regarding the Influence Mobile Learning Technology has on the Ways Creativity is Displayed in Their Instructional Practices?**

**Focus group interview.** Seeking answers to research question three reaches deeply into the purpose of this study. The focus group interview data analysis revealed five main themes pertaining to participants' perceptions about the influence that using

mobile learning technology has on the ways they display creativity in their instructional practices. The themes that emerged also revealed participants' ideas and thoughts concerning the ways they use mobile learning technology and the significance of its use in aspects of their personal and professional lives. The themes that surfaced during data analysis echoed themes and categories within the analysis of the MLTC survey, and the written methods courses assignment submissions. The focus group interview data results support the suggestions of the data results of the other two instruments in that, participants perceive themselves as users of mobile learning technology that enhances their creativity, and that it is displayed in their instructional practices in various ways.

**MLTC survey.** As discussed earlier, the results of the MLTC survey revealed that participants' primary use of mobile learning technology is for communication purposes. Mobile phones are the device they choose most often to use because of accessibility issues and convenience. Participants' perceptions of the importance of mobile learning technology are surmised from the results of question 16 showing that 27 of 29 respondents indicated that they could not "live without" some form of mobile technology. The MLTC survey data also revealed that participants' purposes for using mobile learning technology included engaging in academic work and social media. Participants' descriptions of their purposes for information gathering suggested that enhancing content knowledge for lesson planning, and research for instructional ideas were important. The data suggests that participants' use of mobile learning technology is highly influential on their creative adaptations to lesson plan ideas and other instructional practices.

**Written assignment submissions.** The results of the analysis of the written methods course assignment submissions revealed three themes of information that addressed answering research question three. The results show that participants' perceptions about the influence of using mobile learning technology includes beliefs that their demonstration of innovative uses of mobile learning technology tools in their instructional practices is indicative of creativity.

This belief is based upon their perception of creativity as the development of a process or product that is personally new and useful. This perception includes adaptations to an existing idea, or the creation of an entirely original product or process.

## Summary of Findings

In this chapter, the researcher described the qualitative research method and instruments used to address the research questions guiding this study:

1. In what ways do preservice teachers use mobile learning technology?
2. What perceptions do preservice teachers have of the ways their personal creativity is displayed in their instructional practices?
3. What perceptions do preservice teachers have regarding the influence mobile learning technology has on the ways creativity is displayed in their instructional practices?

Also described in this chapter are the procedures applied to analyze the data collected from the MLTC survey, the written methods courses assignment submissions, and the focus group interview. The results of the analysis of the MLTC survey data, written methods courses assignment submissions, and the focus group interview are described and illustrated. Analyses of the qualitative data suggest that preservice teachers are

active and prolific users of mobile learning technology for communication, academic, and personal purposes. The data indicate that preservice teachers perceive themselves to be more creative in adapting and modifying existing resources for instructional practice than they are at creating original products or processes. The results of the focus group data also suggest that preservice teachers are highly dependent upon access to mobile learning technology and they believe that their instructional practices are creatively enhanced when they use it to plan and prepare for instruction.

# CHAPTER 5

# SUMMARY, FINDINGS, INTERPRETATIONS, AND CONCLUSION

## Overview of the Study

Current preservice teachers are members of a generation for whom using and adapting to new advances in technology is an everyday occurrence. Their expertise in the use of the features, software, applications, and functions of the technology encourages a shift in teacher education thinking that focuses on the pedagogical and student learning centered contexts of mobile learning technology rather than a device operations focus (Kumar & Vigil, 2011; Niess, 2011). Continually emerging mobile learning technology has the capacity to offer teacher education programs an opportunity to align educational approaches with the current technological practices of students (Eyadat & Eyadat, 2010). Additionally, an ever increasing variety of mobile learning technology provides powerful opportunities for creative expression and imagination in pedagogical practices (Tillander, 2011). The purpose of this study was to examine preservice teachers' perceptions of the ways creativity is displayed within their instructional practices when mobile learning technology is utilized. The following research questions guided this study:

1. In what ways do preservice teachers use mobile learning technology?
2. What perceptions do preservice teachers have of the ways their personal creativity is displayed in their instructional practices?
3. What perceptions do preservice teachers have regarding the influence mobile learning technology has on the ways creativity is displayed in their instructional practices?

Answering these questions provided the researcher with a greater understanding of this group of preservice teachers' current uses for mobile learning technology, and the views they hold of their own personal and pedagogical creative abilities. The results of this study provided insight into current preservice teachers' perceptions about the influence using mobile learning technology has on their creativity within their instructional practices.

Examining behaviors of preservice teachers who link their creativity using mobile learning technology to successful instructional practices is paramount to ensuring that future classrooms are led by teachers who have a clear understanding of professional practices concerning mobile learning technology and can implement them from their first day of teaching (Chesley & Jordan, 2012). Gaining a greater understanding of this component of preservice teacher development will further teacher educators' capacity to design curricula embedded with opportunities that support preservice teacher creativity including the use of mobile learning technology (Kumar & Vigil, 2011; Schmidt-Crawford, Thompson, & Lindstrom, 2012).

The results of this study will inform discussions regarding the call for significant changes within teacher education programs to meet the technological training demands of current students who will become the future education workforce. For preservice teachers, this study provided opportunities for exploration and development of an awareness of their personal creativity that could potentially result in development of higher levels of creativity, increased teacher effectiveness, and professional dispositions to support the achievement of their future learners. The purpose of Chapter 5 is to

summarize this research study, discuss the findings and interpretations of the data, and provide considerations for further research.

**Summary of the Theoretical Framework**

The Investment Theory of Creativity (Sternberg, 2012) formed the theoretical base for this study. The interrelated resources of the Investment Theory of Creativity are relevant to this study in regards to preservice teacher training and application of skills during practice teaching experiences. Using the interrelated resources of this theory provided the researcher with a basis to examine the participants' perceptions of creativity and align them with creative processes and products within their instructional practices.

Through an interpretive qualitative methodology, the researcher examined preservice teachers' uses of mobile learning technology, perceptions of their personal creativity, and perceptions about the influence of mobile learning technology upon their creativity within their instructional practices in relation to the theoretical framework.

**Summary of the Research Methodology**

An interpretive qualitative methodology was employed for this study. This method was selected for the opportunities that could be incorporated into the instrument design that would promote participants' willingness to reveal their experiences and elaborate on personal perceptions in a detailed manner. A purposeful sampling strategy was employed to provide the researcher with an adequate number of study participants who have the commonalities of:

a.) having completed assignments with a focus on instructional practices and

b.) having participated in at least one field experience where they were required to implement instructional practices integrating the use of mobile learning technology.

A total of 29 preservice teachers enrolled in a methods block of courses within a public university teacher education program participated. All of the participants fell inside the age range for digital native status and two of the focus group interview participants were non-traditional students. Three data collection instruments were used for this study:

- The researcher created Mobile Learning Technology and Creativity survey.
- Submission of a written methods course assignment.
- A focus group interview.

During the process of taking the survey, participants were given the opportunity to volunteer to participate in the two additional data collection methods. The survey was completed by all 29 of the participants. Ten participants volunteered to participate in the written methods course assignment submission. Four participants actually submitted written methods courses assignments for the researcher to review. Eleven preservice teachers from this cohort volunteered to participate in the focus group interview during the process of taking the survey. Six of the 11 volunteers actually participated in the focus group interview.

Even though the study sample was small, using three forms of data collection provided the researcher with opportunities to explore the participants' responses in depth and cross-validate those responses through triangulation of the data generated by the instruments.

## Discussion of Findings and Interpretations

The data generated by participants' in this study were situated within the current generation of preservice teachers' known as the Net generation or digital natives (Oblinger & Oblinger, 2005; Prensky, 2001). Questions 1-5 of the MLTC survey were directed at gathering demographic data from the participants. The data revealed that 27 of the participants fell inside the age range defined as Net generation or digital native and two of the participants were outside the range. Ninety percent of the sample was female and 10% was male. All the participants in the sample had completed at least one block of methods courses with a corresponding field experience component. Seventeen participants had completed two blocks of methods courses and field experience time. Twenty-one of the participants indicated that they had access to their mobile learning technology during their field experience opportunities, and were permitted to use it for planning and instructional purposes.

### Discussion of Research Questions

**Research question one: In what ways do preservice teachers use mobile learning technology?** This question was answered by the data gathered in questions 6-16 of the MLTC survey regarding participants' ownership and habits of using mobile learning technology and focus group interview responses. The results from these questions are detailed in Chapter 4. The findings were consistent with some previous research reviewed for this study regarding the ownership of mobile learning technology devices by the current generation of college students (Chen & deNoyelles, 2013; Dahlstrom, 2012; PBS, 2010).

***Findings and interpretations of the MLTC survey for research question one.***

The data revealed that laptops and smartphones were the most frequently used mobile learning technology followed by e-Readers and tablet-type devices. The question regarding participants' first experiences with technology did not elicit the type of response that the researcher expected. The expected response was that participants would choose television, home game systems, or music players, but the overwhelming response was school computers. The researcher attributed this response to participants' frame of mind being focused on school-related technology during the administration of the survey. Seventeen participants indicated that a smartphone was their most recently acquired mobile learning technology device. The analysis of the data showed that smartphones were the most frequently used device followed closely by laptops. Open-ended responses to question 12 were grouped into five categories, and the results show that participants indicated they used their phones most often because it was always accessible, always in their possession, and their main method for communication. This was further corroborated in the survey responses for the next question which asked for three typical uses of their technology. After categorizing the responses, the results showed that communication was the primary use of mobile learning technology by this group of preservice teachers. Surprisingly, academic use and social media use tied for the second most typical use of the technology. Responses to the last question of the survey regarding mobile learning technology use revealed that 22 of 29 participants said that they could "not live without" their phone.

Participants were asked to describe the kinds of information they gathered through mobile learning technology, and what they did with it in terms of using it "as is"

or if they altered it in any way. Once the responses were categorized by the researcher, the data indicated that information for personal use was gathered most often. This included email, weather, news, sports, health, and fitness information. Pedagogical information such as lesson plans, strategies, lesson ideas, and content knowledge was the next most often gathered information. The next category with the most responses was mobile learning technology use for academic information. This included accessing the course management system, homework, grades, and research. Sixteen participants addressed the second part of the question indicating that they did alter or adapt the information they gathered in some way.

In summary, the findings of the MLTC survey questions and the focus group interview regarding mobile learning technology use showed:

- Smartphones and laptops are the mobile learning technology of choice.
- Smartphones are used most often.
- The main purpose for using mobile learning technology is communication.
- The information gathered by using mobile learning technology is primarily for personal use, pedagogical use, and academic use.
- Preservice teachers make changes to the information they gather using mobile learning technology.

Based upon the data analysis and the definitions of creativity established for this study, the participants' responses to the survey questions 1-16 indicated a dominant creativity characteristic of Elaboration in their preferred abilities to seek out information for modification and adaptations to use for personal and professional purposes. As discussed in Chapter 1, abilities to concurrently manage copious amounts of electronic

information, work, and continue professional development is of high importance to employers. This has long been an expectation of education professionals. Currently the expectations of employers are that this will be facilitated through the use of mobile learning technology. The findings of the data in regards to research question one indicate that preservice teachers use of and proficiency with mobile learning technology will support their future professional endeavors.

**Research question two: What perceptions do preservice teachers have of the ways their personal creativity is displayed in their instructional practices?** The purpose of this study was not to make judgments about participants' levels of creativity (i.e. very creative, less creative), the quality of their instructional practices, or effectiveness of their teaching. Rather, the purpose of this study was to gain insight into participants' perceptions of how creativity is displayed in the products or processes of their instructional practices. The theoretical framework interrelated resources and the descriptors developed for data analysis provided a broad range of skills and abilities to examine how creativity functions in preservice teachers' lives. The theoretical framework also offered a guide to examine factors that influenced, and are influenced by, participants' creativity. The factor specific to this study was the use of mobile learning technology. Research question two was answered through analysis of questions 17 and 18 of the MLTC survey and analysis of the participants' written methods courses submissions, and the focus group interview data.

***Findings and interpretations of the MLTC survey for research question two.*** Answering this question began by examining the participants' perceptions of their own creativity through a personal definition of creativity provided in question 18. Words

describing products such as unique, different, and new were used frequently in participants' definitions. Being adaptable and the phrase "thinking outside the box" were also part of their definitions.

Eleven statements pertaining to characteristics, abilities, and indicators of creativity established for this study were included in a Likert scale question. Participants had a choice of responses to describe themselves ranging from completely true to completely false. To begin analyzing participants' responses to these statements, it was important to understand the participants' perceptions of their current level of pedagogical abilities, because, within the theoretical framework of this study, Sternberg (2012) postulated that creativity is not possible without knowledge of the field in which an individual is operating. The responses showed that all the participants indicated confidence in their skills and abilities to draw on content knowledge and implement pedagogical practices. The findings suggested that based on their confidence in the knowledge of content and instructional practices, at this point in time, this particular group of preservice teachers' responses indicated a high capacity to be creative within their professional field. This finding could not be corroborated through the other data results in regards to products or processes that were original in creation, but was substantiated in creative adaptation or modification of existing resources.

The findings from the responses to these statements imply that all 29 of the participants believe they have creative abilities and characteristics that allow them to be open and willing to try new activities and enjoy learning opportunities. The findings indicate that participants perceive themselves to be flexible and adaptable, and that they demonstrate a personality feature of sensible risk-taking in response to opportunities or

actions initiated by someone else. All of these are characteristics associated with creative behavior based on the body of creativity research reviewed for this study.

The findings regarding participants' perceptions of the actions they initiate that fall along the continuum of creativity point to 27 of the participants responding that they were the type of person to think "outside the box." This phrase was used frequently in definitions of creativity that participants were asked to provide. Only two of the participants indicated that this was a completely false personal characteristic. The findings show that all 29 participants believe that they evaluate new or existing problems from many perspectives to come up with the best solution. They believed this to be true when they personally face problems and when asked to assist others in finding a solution to a problem. These results would support their perceptions of being "outside the box" thinkers, and were categorized as demonstration of the intellectual abilities characteristics within the theoretical framework of this study (Sternberg, 2012). These aspects of participants' perceptions also aligned in multiple places to skill areas in the modified FFOE model (Guilford, 1984) the creativity categories (Treffinger, Young, Selby & Shepardson, 2002), and the direct and indirect indicators of creativity (Vandeleur, Ankiewicz, deSwardt, & Gross, 2001) found in table 7.

Although most of the participants' perceived themselves as "outside the box" thinkers and indicated that they approached problems from multiple perspectives to find improved solutions, the findings from statement 5 somewhat contradict these perceptions. Nineteen of the participants responded that they would *not* be motivated to look for a new solution to a problem if they had employed a successful solution in the past. These findings suggest that fewer than half of the participants demonstrated a desire to self-

initiate generating imaginative ideas or employ a critical thinking skill of evaluating the value of their products unless the product or process failed. This indicates that participants do not appear to be motivated to use their creative abilities to be proactive in searching for new or improved solutions to problems. Indications of the data are that motivation to engage creative abilities seems to be limited to reaction to uncomfortable situations or potential failure. Perhaps this absence of motivation is related to the responses of twenty participants who indicated that they were easily discouraged by difficult problems. Even so, as previously discussed, all 29 participants indicated that they did try to find different angles to look at problems and suggest multiple solutions. The findings of the statements in this question of the MLTC survey do not reveal if participants are persistent in finding solutions to their problems or in making creative improvements to solutions. Responses to one of the statements suggest that most of the participants are tolerant of open-ended aspects of their lives, and that they readily tolerate ambiguity. This would imply that unless there is a pressing problem or issue, most of the participants would not persist in pursuing a new or improved solution. This supports the earlier discussion regarding participants' reluctance to alter a solution that already has worked for them. Although high tolerance of ambiguity and unresolved problems are both considered hallmark characteristics of creative individuals, they do not appear to facilitate or promote increased motivation to be creative in this group of preservice teachers.

A perspective of thinking "outside the box" would infer that most of the participants viewed themselves as willing to take some risks, be non-conforming, and to defy conventional wisdom. However, based on the findings of two statements eliciting

responses about participants' levels of ease when faced with change in general and decision making, this does not appear to happen regularly, rather, it happens occasionally. Thirteen participants responded that they were uncomfortable making "on the spot" decisions, while eight participants indicated a *somewhat true or false* answer to this statement. The use of the word uncomfortable in the statement does not preclude participants making these types of decisions, so a conclusion that they have not or would not ever take a risk cannot be made. The eight participants who indicated that they had no qualms about making snap decisions could be assumed to have less concerns about taking risks or being identified as different. A similar response was found in the statement about change in general. The statement asked participants if change made them uneasy. Twelve indicated that it was true for them, seven indicated a *somewhat true or false* answer, and ten answered that they were not uneasy about change at all. The findings do not imply that either group of participants has an inclination to be more or less creative than the other.

In summary, the findings of the MLTC survey questions regarding preservice teachers' perceptions of personal creativity showed:

- Participants are confident of their skills and abilities.
- Participants enjoy new activities and learning opportunities.
- Participants perceive themselves to be "outside the box" thinkers.
- Participants are not motivated to find an improved solution to a problem if they already have a solution that has previously been successful.
- Some participants are easily discouraged by difficult problems.

- Motivation to engage creative abilities may be more reactive than proactive.
- Some participants are tolerant of the ambiguous and open-ended aspects of life.
- Participants do not appear to be persistent in searching for improved or new solutions unless the problem is imminent or pressing.
- Most participants appear to be willing to take sensible risks and defy conventional wisdom when someone else is responsible for the activity.

As an educator, a reluctance to be proactive in accepting the challenges of keeping up with technological and professional changes has far reaching implications in regards to measures of teacher accountability and student engagement. Even though the participants' responses indicated a confidence in their knowledge base and professional practices, their responses regarding little desire to actively seek opportunities to creatively enhance that knowledge or improve an instructional practice may have several possible explanations. One of the most likely explanations is a limited amount of unstructured teaching experience at this stage of a teacher education program, where creation of original lessons and strategies is limited due to course requirements. Another possibility is that of a disconnection between coursework and motivation to consider the practical application of coursework due to the timing of data collection within the semester. A third possibility is a lack of motivation based on previously successful academic experiences that did not require proactive creative thinking. Examining this group of preservice teachers' responses to these statements after more extensive teaching experience would hopefully generate very different results.

***Findings and interpretations of the written submissions for research question two.*** The answer to research question two also included the results of the analysis of written assignments voluntarily provided by participants. Whereas question 17 of the survey addressed participants' perceptions of their personal creativity, the written assignment submissions were selected by participants as evidence of how their creative abilities are displayed in a product or process of instructional practice. Two of the written submissions were submitted by participants who also participated in the focus group interview, one of which was provided by one of the non-traditional students in the focus group.

Participants were asked to provide a description of what aspects of the assignment demonstrated creativity, and what made them feel it was creative. The submissions consisted of one reading lesson plan, one science lesson plan, one technology tools presentation, and one communication tools development assignment.

One theme that emerged from the analysis of these submissions is that participants' believe creativity was displayed through innovative use of tools in their instructional practices. One participant admitted that the application of the mobile learning technology she used may not have been the first time a teacher had thought of using it in the way that she did, but it was original in her experiences, and very useful to her. This perception is a critical factor in judging originality, and is supported by Shively's (2013) contention that originality must be evaluated relative to the creator's prior experiences. This participant justified her belief that her process was creative because it was new to her. All four submissions contained references to using the mobile learning technology in ways that the participants would not have normally used it. This

is supported by the analysis of the data in the MLTC survey regarding participants' typical usage patterns of personal use and communication purposes rather than for pedagogical purposes. The findings surrounding this theme are also in line with skill abilities of flexibility and originality in the modified FFOE model. Both of these areas suggest that abilities to use prior knowledge in a new way and put it to use unconventionally are indicative of creative behavior. Components of the submissions that align to this theme also included participants' characteristics of personal awareness of skills and abilities. This awareness and the process of deciding how to use those skills are elements of thinking styles in the interrelated resources of the theoretical framework for this study. Additionally, using the technology outside the typical intended use demonstrates a personality characteristic of being willing to engage in some level of risk-taking, which is an indicator of creativity within all the resources used in the data analysis for this study. The findings suggest that these participants' perceptions that creativity is displayed by the unusual use of their mobile learning technology are supported by the research within this study surrounding characteristics and indicators of creativity.

A second theme in the written assignment submissions emerged as participants' beliefs that creativity was displayed through finding, recognizing, and implementing an improved strategy for an existing issue. In the assignments that were submitted, those issues included teacher and parent communication, assessment strategies, and alternatives to planned lesson activities. Analysis of the written assignments showed that when participants recognized they were engaged in situations that were not showing signs of success they demonstrated abilities and characteristics of flexibility, fluency, knowledge of their field, and cultural sensitivity. One participant said, " In particular, the

development and design of my assessment plan for this lesson shows my ability to find a unique and more effective way to approach what I and most of my fellow preservice teachers deem one of our most difficult tasks." Another participant added that her definition of creativity included "...taking resources you already have and finding a new way to use them that results in an improved process or product."

The findings that resulted in the emergence of this theme are supported by Guilford (1984) and Sternberg's (2012) description of creative individuals as having abilities that enable them to view problems from many perspectives to develop a myriad of options for solutions. The findings also suggest that participants demonstrated an ability to recognize which ideas were worth pursuing, understood the complexity and relationships between the problem and possible solutions, decided how to proceed, and reflected on the effectiveness of the product. The findings imply that combined with pedagogical knowledge of assessment, child development, parent communication, and use of mobile learning technology, the participants' submissions displayed several indicators of creative behavior (Sternberg, 2012; Treffinger, Young, Selby, & Shepardson, 2002; Vandeleur, Ankiewicz, deSwardt, & Gross 2001).

The third theme that emerged from analysis of the written assignments was that participants' perceive creativity was demonstrated by the development of original products or processes. In each submission, participants demonstrated an unconventional use of technology, an original technique, or a new or adapted teaching strategy. One of the six interrelated resources of the Investment Theory of Creativity is knowledge of the field in which creativity is being evaluated. Sternberg (2012) contended that without enough knowledge, creativity cannot be present regardless of the presence of the rest of

the interrelated resources. The participants' knowledge of the field was displayed in their written assignment submissions through the confidence they showed in taking a risk to develop original or alternative ideas to attain a goal of enhancing their quality of instruction and their learners' achievement. Additionally, in seeking to develop an improved idea, participants showed a characteristic of being motivated to initiate investigation into a new idea or solution, and the demonstration of persistence in bringing the idea to fruition. These are key indicators of creative behavior across all the resources used in analysis of the data.

Participants also indicated that success of an innovation or strategy, confirmation of usefulness by peers or supervisors, and engagement of learners contributed to their willingness to potentially be personally viewed as different or non-conforming. Sternberg (2012) said that individuals' creativity can be hindered or buoyed by their environment, and included it as one of the six interrelated resources of his theory. This supports the findings from this study that allude to supportive environmental factors and rewards for creativity as crucial aspects of continued creative behavior.

In summary, the findings of the written methods course assignment submissions regarding participants' perceptions of creativity within instructional practice indicated a predominant tendency towards creativity characteristics of Fluency and Flexibility through:

- Participants perceive their implementation of an idea or product to be creative if it is new within their experiences.
- Participants took cultural sensitivity into consideration.

- Participants' perceptions of creative abilities included recognizing when to develop or adapt an established instructional practice for an existing issue.
- Participants are persistent in pursuing and completing good ideas.
- Participants' believe that environmental support and rewards for creative behavior are significant.

Because only four participants submitted assignments for this data collection method, the results are not generalizable to the rest of this group or preservice teachers outside the study group. Two of the participants were also focus group participants. It became apparent to the researcher through analyzing the data from the written assignments and the focus group interview, and comparing it to the results of the MLTC survey, that these participants were not representative of the entire group. They demonstrated a higher interest in regards to discussing their perceptions of creativity and participating in activities that offered opportunities for creative work. The fact that the participants' volunteered to submit written assignments and followed through on their commitment contrasted with the results of the MLTC survey that suggested many participants were only motivated to engage in creative activities that were necessary, rather than just for personal development.

***Findings and interpretations of the focus group interview for research question two.*** The findings of the focus group interview data that addressed this research question are consistent with the findings of the other data collection instrument results. Five themes surfaced during the data analysis:

Theme One: Preservice teachers' preferences for using mobile learning technology and the identification of purposes for using it.

Theme Two: Preservice teachers' perceptions of their creativity within various aspects of their lives.

Theme Three: Preservice teachers' perceptions regarding the ways creativity is displayed in their instructional practices.

Theme Four: Preservice teachers' perspectives of the significance of using mobile learning technology in various aspects of their lives.

Theme Five: Preservice teachers' perspectives about the significance of the investment in creative endeavors.

Two of the five themes that emerged from the data analysis align to answering research question two. Participants' perceptions of their personal creativity and the ways creativity is manifested in their instructional practices were the focus for discussion during the interview. The findings imply that preservice teachers perceptions of the ways creativity is displayed in their instructional practices is evidenced by their innovative use of technology tools, and their abilities to recognize when a problem exists, and then creatively modify and adapt existing resources for an improvement or solution. These behaviors are consistent with characteristics of the intellectual abilities and thinking styles of the interrelated resources of Sternberg's (2012) Investment Theory of Creativity. Participants exhibited thinking abilities described by Sternberg (2012) as practical (persuasive), analytical (recognizing worth), and synthetic (open to multiple perspectives). The findings also indicate that participants' perceptions of ways they display creativity have commonalities with the skill area abilities of the modified FFOE model (Guildford, 1984). These findings also consider Shively's (2013) proposal that an individual determines what constitutes creativity based on their past experiences and

within the field in which the creator is operating. Findings of the focus group interview data analysis also indicated that these preservice teachers perceive themselves to be more creative at adapting or modifying existing resources than they are at creating them. The findings reveal that they have preferred ways of thinking and are confident in choosing the skill or ability needed to successfully bring a problem or innovation to completion.

**Research question three: What perceptions do preservice teachers have regarding the influence mobile learning technology has on the ways creativity is displayed in their instructional practices?** The findings from the data regarding the answers to this question extend deeply into addressing the purpose of this study. The first two research questions provided insight into preservice teachers' typical uses and purposes of mobile learning technology, and perceptions of their creativity at a personal and pedagogical level. Research question three delves into participants' perceptions of how (or if) using mobile learning technology influences their creativity on the products or processes within their instructional practices.

***Findings and interpretations of the MLTC survey for research question three.*** As previously discussed, the findings of the MLTC survey revealed that participants' primary use of mobile learning technology is for communication purposes. Additionally, the findings concluded that participants' main purposes for using mobile learning technology included engaging in academic work, which included course assignments and engagement in field experiences, and social media. The findings indicate that participants primarily gathered personal information, but, when gathering information for academic purposes (at this particular point in the program) they placed a high importance on information for enhancing content knowledge for lesson planning, and research for

instructional ideas and strategies. However, the findings suggest that because participants adapted or altered the information they gathered in some way; their use of mobile learning technology does influence their creative adaptations to instructional practices.

***Findings and interpretations of the written methods course submissions for research question three.*** The analysis of the data within these assignments has previously been described. In regards to the findings that addressed research question three, the themes that emerged from the data assisted in answering the question. In specifically seeking to determine the influence of mobile learning technology on creative instructional practice, the findings imply that preservice teachers perceive evidence of creativity as the use of mobile learning technology devices in ways that are unintended (for that device) or innovative. Participants also perceived creativity to be displayed in their instructional practices by their abilities to (a) recognize when something needed changed, (b) use their technology to find resources, and (c) adapt those resources to develop an improved product or process as a solution to the change that was needed. The findings also infer that this research question is answered by participants' perceptions that using mobile learning technology in the creation of an original product or process for instructional practice (for themselves or others) demonstrates creativity.

***Findings and interpretations of the focus group interview for research question three.*** The analysis of the responses to the focus group interview questions that addressed research question three led to the emergence of a theme regarding preservice teachers' perceptions of the significance of access to, and use of, mobile learning technology. Additionally, another theme took shape concerning participants' perceptions

of the significance of investment in creative endeavors. Discussion concerning topics that resulted in the formation of this theme elicited lively conversation, and revealed a more personal side of the participants. The findings from the data regarding answers to this research question conclude that preservice teachers are very dependent upon their mobile technology, especially mobile phones. The data suggests that they perceive access to the Internet and mobile technology to be extremely important to themselves as teachers, and to their future learners. They also indicated that they have concerns about keeping up with developing technology and how to manage the copious amount of potentially useful information available. The conversation did not reveal additional descriptions of original creations for assignments or field experience requirements that have not already been discussed. The majority of the discussion focused on the ways they used their technology rather than the creativity aspects associated with using it. In reviewing the audio and video recordings of the focus group interview, the researcher was led to observe participants' verbal and non-verbal cues to infer that the two non-traditional students seemed more likely to be willing to take risks in planning instruction for field experience using their mobile learning technology than the traditional students. These two participants' responses and contributions to the conversation indicated that they were not as concerned about grades and meeting field experience requirements as they were about developing their personal teaching styles and practicing instructional delivery.

Even so, when the conversation did turn to taking creative risks, the findings showed that these preservice teachers were buoyed by positive feedback to their creativity when they risked using a new or improved product or process. The group who

participated in the focus group interview all indicated that they were not easily discouraged, and were determined in their actions personally, academically, and professionally. The findings reveal participants' demonstration of characteristics found in Sternberg's (2012) interrelated resources of environment and personality. Characteristics in the creativity category of *Listening to One's Inner Voice* (Treffinger, Young, Selby, & Shepardson, 2002) were also present in the findings. The findings from the current study can support the claim that these preservice teachers are persistent, motivated, and risk-takers who continue to make investments of time and effort into creative instructional practices that are improved through the creative use of mobile learning technology.

## Implications for Teacher Education

Recommendations for increased opportunities of engaging preservice teachers' creative abilities through course activities, assignments, and less structured field experience requirements have the potential to enhance the development and quality of instructional practices, which in turn may increase both preservice teachers' and their students' success. Mobile learning technology devices are a vital component of educational practices, and a major tool for current preservice teachers. The findings of this study suggest that designers of teacher education curriculum should include opportunities for preservice teachers to use their mobile learning technology creatively to support a transfer of competency from personal use to professional use. Challenges will arise in designing course activities and assessments that promote creative use of mobile learning technology without judging levels of individual creativity. Even more complex challenges arise in determining a collective definition for creativity and incorporating individual perspectives regarding the process of how to teach creativity to people who do

not view themselves as creative. Designing courses and assignments around the use of mobile learning technology does not guarantee an increase in student creativity and raises more questions about whether or not those courses and assignments will promote a feeling of being more creative. The participants in this study viewed their use of resources found on the Internet as creative, and perhaps that does push them to a higher level of creativity than they would demonstrate without the resource. However, a bigger question lies in determining if this behavior constitutes development of creativity and how it would fit into the curriculum.

An additional implication identified in this study was one of creative mobile learning technology practices of non-traditional students and compared to those of typical traditional students. Teacher educators may have to determine adaptations to meet the higher proficiencies of some tech-savvy students. A suggestion would be to enlist those higher proficiency students in peer modeling of creative practices using their mobile learning technology.

Modeling effective practices has been a long-standing strategy of the teaching and learning process (Walberg, 2009). Teacher educators are the primary model for preservice teachers regarding effective instructional practices. Even though some teacher educators may already be incorporating using mobile learning technology into their coursework and are expecting students to recognize, internalize, and apply its' use, the creativity factor coupled with these expectations is not supported for this group of participants by the results of this study. This is especially true in light of the findings that indicated participants' lack of motivation to pursue a better solution to a problem if they already had one that was working. Professional development for teacher educators in

regards to training for using the mobile learning technology and research-based strategies for creative use of the technology will support preservice teachers' development of creative practices through more effective modeling before and during field experiences. Although the current generation of preservice teachers is representative of the Net generation and demonstrates abilities to rapidly absorb advances in technology through daily use, the data indicated that they still require explicit modeling of and guided instruction for effective and creative use of mobile learning technology incorporated into coursework by instructors. This gives teacher educators opportunities to offer ideas and strategies to preservice teachers that assist in developing a professional disposition promoting a proactive approach to designing instruction. This would appear to be more effective than waiting until the role changes into one of a field experience supervisor who critiques what has been taught, but typically who does not have time to offer specific suggestions for improvement. Specific, explicit instruction and experiential mobile learning technology opportunities coupled with the support and guidance of the teacher educator will encourage preservice teachers' willingness to take risks in engaging in creative instructional practices.

## Conclusions

The analysis of the data generated by the MLTC survey and focus group interviews indicated that preservice teachers who participated in this study perceived themselves to be more confident and creative at modifying and adapting existing resources to improve a problem or process than they were at creating something from scratch. The responses of the two non-traditional students who participated in the focus group interview showed more promise in regards to attempting original creation of

instructional resources than the traditional students. The responses to survey questions showed that participants used the technology to gather both personal and professional information. The focus group interview participants expanded on this by describing the processes they used for finding instructional strategies and increasing content knowledge, and how they modified or adapted those resources for use. This same theme of modification and adaptations was evident in the responses to the researcher's questions by participants who submitted written assignments. They indicated that they believed their submissions to be creative from the aspect of having used their technology as a tool for an educational or pedagogical purpose other than its' intended use. The data from all three instruments also pointed to participants' motivation to seek out new resources as stemming from a reaction to a situation rather than a proactive stance to improve instructional practices simply for the sake of improvement. These findings addressed one facet of the purpose of this study in seeking to understand participants' perceptions of their personal creativity and how they displayed it through instructional practices.

The researcher also sought to determine how preservice teachers used mobile learning technology and if they perceived it to be an influential factor in creativity within their instructional practices. The analysis of the data in all three instruments indicated that participants regularly and actively used mobile learning technology, and that they perceived it to directly impact the quality and level of their creativity. This was reiterated in the written assignment submissions as participants' indicated that using their technology for a purpose other than its' intended use was a demonstration of taking a risk and being creative. They indicated that using their mobile learning technology was very important to their successful completion of coursework and field experience

requirements. The survey data also suggested that this group of participants believed themselves to be risk-takers and enjoyed the challenges of learning new things and participating in new experiences. The survey questions and the written assignment submission data regarding participants' perceptions showed that they were confident of their skills and abilities based on their prior experiences, but, that having access to their mobile learning technology increased their confidence. The focus group interview participants also stressed that they felt more confident and better equipped to handle pedagogical problems during field experience when they had access to their technology and could use it to alter instruction and avoid having a lesson fall apart. They indicated they needed and used the technology as a back-up plan.

These findings regarding original creation versus creative adaptation or modification of resources may or may not be typical results for students at this stage of a teacher education program. This study's participants have had limited unstructured teaching experience upon which to practice creating original lesson plans or instructional strategies, thus possibly explaining their preference for adapting or modifying existing resources. An additional factor may be that participants were only halfway through an instructional technology course required for the program at the time of data collection. Practice teaching experiences in this particular program are four weeks in length and heavily laden with program requirements that may limit opportunities for creativity. At the conclusion of the program they will participate in a field experience that will extend for the full fifteen week semester where those opportunities to be creative in an original manner may be more forthcoming.

The analysis of the data revealed that participants did show evidence of a confluence of selective interrelated resources considered within the Investment Theory of Creativity (Sternberg, 2012), which was chosen as the theoretical framework of this study. Sternberg submitted that this confluence of resources is evidence of creativity. The researcher concurs with Sternberg to a certain point. Although the participants demonstrated characteristics and abilities aligned to the Investment Theory resources that are indicative of the presence of creativity, it must be reiterated that these are based on their personal perceptions of what they considered creative. Participants' definitions of creativity were also based only on personal prior experience. This aspect of personal experience when judging creativity is not stressed within the literature surrounding Sternberg's theory that was reviewed for this study.

Judging original creation of a product or process is highly subjective due to the nature of an individual's prior experience. The analogy was made by Shively (2013) that a five-year-old child who puts together a tower of blocks for the first time considers herself an architectural master, but the adult who has completed the same activity hundreds of times does not consider the feat as creative or original. In much the same way that we use the saying beauty is in the eye of the beholder, creativity is in the mind of the creator, but, is not always outwardly evident. As several researchers' studies in the literature review for this study pointed out, creativity must be evaluated within the field in which it is operating. A self-perception of creativity in regards to a professional education career would change as the educator became more experienced and confident in teaching strategies and abilities. This experience would result in an evolution of the type of dominant creativity each individual possesses, much like the process described in

the Big-C, little-c study conducted by Kaufman and Beghetto (2009). In response to this evolving level or type of creative characteristics, individuals' instructional practices may be impacted.

Thus, at this stage of participants' experience in planning and delivering instruction, if they engaged in an activity that they had not previously experienced such as finding resources and making modifications to those resources for improving an instructional practice, then the preservice teachers in this study perceived the modifications they made to resources as creative. Whether this can truly be considered creativity or is pseudo-creativity would have to be determined by the parties involved in the judgment of a product or process (and the purpose of), if such a judgment is necessary. The purpose of this study was to examine the preservice teachers' perceptions of their own creativity, not to make a judgment or determination of individual creativity.

The findings are important in regards to the needs of employers that were discussed in Chapter 1 of this study. The results showed that participants' had abilities to recognize the emergence of a problem, preferred adapting or modifying existing resources using mobile learning technology, and were persistent in developing a solution to a problem. These abilities align with employers' demands for a workforce that is capable of keeping abreast of technological changes and using them to enhance, increase, and promote the success of the product or process. However, a concern for employers lies in the study findings regarding participants' lack of motivation to be creatively proactive in seeking solutions to as yet unknown problems, or to develop an improved product or process without having experienced failure of the current one. This is

especially concerning in regards to education where a professional disposition to be intrinsically motivated and proactive are key to both personal and learners' success.

## Future Research Considerations

At the conclusion of this study there are many more questions that could be asked regarding preservice teachers use of mobile learning technology and its' connection to creative instructional practices. The rapid development of mobile learning technology brings challenges to educators and learners. Further research regarding effective teaching practices that incorporate mobile learning technology is important to teacher educators and teachers in seeking to meet learners at their level of technology use. Determining the perspectives of students at various levels within a teacher education program in regards to what they consider "new" technology would support a more current curriculum design and instructor modeling opportunities. Ensuring that teachers have a clear understanding of how to effectively incorporate mobile learning technology in 21st century classrooms (online and face-to-face) is essential to successful professional practice, and successful learners. Additional research concerning mobile learning technology use is also of utmost importance to teacher educators as they design curricula that support preservice teachers' technical training needs combined with pedagogical abilities development. In particular, research surrounding the use of smartphones as instructional design tools and student instructional tools is timely considering the results of this study in which participants' indications were that this is their primary mobile learning technology device. Included in this research could be a focus on the attitudes of teachers towards the 'taboo' of having mobile phones in the classroom and the potential advantages and disadvantages.

A broader research opportunity arises in the study of practicing and preservice teachers' use of mobile learning technology to compare and contrast purposes and habits within various certification levels and multiple disciplines.

Research concerning creativity continues to be of concern to social scientists and educators who seek to understand the complexities of human learning processes. A goal of education is to prepare learners to be successful. An important research opportunity lies in the connections between creative instructional practice that incorporates mobile learning technology and its' impact on student achievement. A study examining this aspect of using mobile learning technology would also provide a look into the practices of teachers who demonstrate creativity while ubiquitously integrating technology that engages learners and produces results that are significantly outside the norm.

Research concerning the impacts of creativity training for preservice and practicing teachers and its' transfer to supporting creativity in their students provides another avenue to explore. More specific creativity study opportunities lie in examining the dominant creative characteristics of preservice teachers across certifications and disciplines as well as general research into the types of creativity preservice teachers perceive themselves to have. This area of research could further be extended to include multiple universities in both the creativity and use of mobile learning technology areas.

Based on the results of the focus group interviews for this study, the creativity of non-traditional students in comparison to traditional students is an additional opportunity to add to the body of research surrounding creative use of mobile learning technology. Studies within each group of students could also include investigations into ways they

transfer mobile learning technology use between personal and professional purposes and to what extent that process is happening.

## Summary

The qualitative results of this study proposed that preservice teachers who are members of the current generation of students known as the Net generation, perceive themselves to be prolific, knowledgeable, and creative users of mobile learning technology for improving their instructional practices. The results of the study provided a selective overall picture of how preservice teachers in one western Pennsylvania university perceived their personal creativity and the influence of mobile learning technology upon their instructional practices.

A goal of this study was to contribute to the literature surrounding preservice teachers' creativity and to discover the influence that mobile learning technology had upon the ways they planned, prepared, and implemented instruction. The results of this study can contribute to understanding factors of mobile learning technology that positively or negatively affect individual preservice teacher creativity.

A better understanding of preservice teachers' perceptions about creativity combined with the use of mobile learning technology to promote improved instructional practices will inform teacher educators' curricular design discussions. These discussions are necessary to plan experiential learning opportunities that support providing future learners with teachers who have the professional dispositions and technology skills to face the challenges of today's classrooms.

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Appendix A
Letter to Participants

Indiana University of Pennsylvania

Dear Preservice Teacher:

I am a student in the Curriculum and Instruction doctoral program at Indiana University of Pennsylvania. I am conducting a research study to fulfill the requirements of my program. This letter serves as my formal invitation requesting your participation in this study. The following information is provided so that you may make an informed decision regarding your participation in this study.

The purpose of this study is to examine preservice teachers' perceptions of the ways creativity is displayed within their instructional practices when mobile learning technology is utilized.

As a current preservice teacher, your voice is important to increasing understanding of the issues surrounding creativity and mobile learning technology use. If you consider yourself a regular and proficient everyday user of mobile learning technology, I hope you will consider participating in this study.

If you choose to participate, please sign the provided informed consent document and return it to me. Your personal information and identity will not be revealed and will be kept in strictest confidence. A pseudonym will be assigned to you for data analysis purposes. Goldcup University will not be informed of your decision to participate or not participate in this study. Any communication such as phone or email will be treated in the same manner with regard to confidentiality.

The information gathered during the course of this study may be published in professional journals or used for professional presentations in the future and your identity will be kept confidential.

To be in compliance with federal regulations, your informed consent document and all research data will be retained for a minimum of three years. All materials will be locked in a cabinet in my home office in Kentucky.

Upon your consent, participation in this study will include engagement in up to three methods of data collection. You may choose to participate in a single method or in all.

- Method one will be an eighteen question Mobile Learning Technology and Creativity (MLTC) survey that will be administered during the science methods class period.
- Method two will be participation in a focus group interview that will take place on a day immediately following your ECH 418 science methods course in your science classroom. This interview will take approximately one to two hours. The focus group interview will be video recorded for later analysis. The date is _____. (Date to be determined upon IRB approval)
- Method three will be electronic submission of a self-selected assignment previously completed during a block class. In addition to submitting the assignment, you will be asked to provide a written response to two questions. Another option for this response is to provide a short video response to the two questions and electronically submit it with the assignment. Please submit this by _____. (Date to be determined upon IRB approval)

Appendix A cont.
Letter to Participants

Indiana University of Pennsylvania supports the practice of protection for human subjects engaged in research. There are no known risks associated with participation in this study. Your participation in this study is voluntary**.** You are free to decide not to participate in this study or withdraw at any time. You may contact me at the provided contact information with your request to withdraw. Withdrawal from the study may also be accomplished by not completing the survey, not submitting an assignment, or leaving the focus group interview at any time. Upon withdrawal from the study, all information concerning your participation will be destroyed.

Thank you for your time and consideration. It is greatly appreciated. Please do not hesitate to contact me if you have concerns or questions.

Sincerely,

Amanda K. Onion, M.Ed.
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**This project has been approved by the Indiana University of Pennsylvania Institutional Review Board for the Protection of Human Subjects**
**724.357.7730**

Appendix B
Informed Consent Form

# Indiana University of Pennsylvania

## VOLUNTARY CONSENT FORM

I have read and understand the information within this letter. I consent to volunteer to be a participant in this study. I understand that my responses are completely confidential and that I have the right to withdraw at any time by not participating in the survey, not submitting an assignment, or leaving the focus group interview location. I may also withdraw from the study through personal conversation, written communication, or email to Amanda Onion, the principal investigator or Dr. Valeri Helterbran, Faculty Sponsor at the provided contact information.

Name: _____
Address: _____
_____
Email: _____
Phone: _____

I consent to participate in:

- ☐ Mobile Learning Technology and Creativity (MLTC) Survey
- ☐ Focus Group Interview
- ☐ Electronic Submission of Methods Course Written Assignment

Signature of
Participant_____

I certify that I have explained to the participating individuals the nature and purpose, the potential benefits, and possible risks associated with participating in this research study, and have answered any questions that have been raised.

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**This project has been approved by the Indiana University of Pennsylvania Institutional Review Board for the Protection of Human Subjects**
**Phone: 724.357.773**

Appendix C
Mobile Learning Technology and Creativity (MLTC) Survey

(1). Indicate your age range:

- ☐ 18-22
- ☐ 23-27
- ☐ 27-30
- ☐ 31-40
- ☐ 41-50

(2). Indicate your gender:

- ☐ Male
- ☐ Female

(3). Describe your previous field experience grade level or age level assignment(s):

_____

(4). Approximately how many children did you interact with on a daily basis in your last field experience?

_____

(5). Were you permitted to access and use your mobile learning technology for professional purposes while interacting with the children during your last field experience?

- ☐ Yes
- ☐ No

(6). Which mobile learning technology device(s) do you currently use? (Mark all that apply)

- ☐ Tablet Device (iPad®, android, or similar)
- ☐ Laptop
- ☐ Smartphone
- ☐ Cell Phone
- ☐ iPod®
- ☐ eReader (Kindle®, Nook®, or similar)
- ☐ other_____

Appendix C cont.
Mobile Learning Technology and Creativity (MLTC) Survey

(7). Rank the mobile learning technology device(s) you use in order of frequency. (1 being the most used)

_____ Tablet Device (iPad®, android, or similar)
_____Laptop
_____Smartphone
_____Cell Phone
_____iPod®
_____eReader (Kindle®, Nook®, or similar)
_____other_____

(8). What was the first mobile technology device you owned?

_____

(9). What is your earliest memory of using a form of technology?

_____

(10). How old were you when you got a cell phone?

_____

(11). What was the last technology device you purchased or received?

_____

(12). Describe any reasons you use a particular mobile device more than another.

_____

(13). List three of your typical everyday uses of the mobile learning technology device you use most frequently.

_____

_____

_____

Appendix C cont.
Mobile Learning Technology and Creativity (MLTC) Survey

(14). How much time do you estimate you spend each day (24 hours) using mobile learning technology for the following purposes:

a. Personal _____

b. Recreational_____

c. Academic (coursework)_____

d. Pedagogical (teaching) _____

(15). Describe the kind of information you gather through mobile learning technology for personal or professional use. Do you use the information without altering it or do you creatively adapt the information to suit your needs?

_____

_____

(16). Which mobile technology device could you "not live without"?_____

(17). For each statement place an "X" in the column that best describes you.

| | Completely True | Somewhat True | Somewhat True or False | Somewhat False | Completely False |
|---|---|---|---|---|---|
| When faced with a problem, I try to look at it from different angles in order to come up with the best solution. | | | | | |
| I have complete faith in my capabilities/skills. | | | | | |
| Change in general makes me uneasy. | | | | | |
| When others get stuck, I am able to think of new solutions to problems. | | | | | |
| I don't think it's necessary to come up with new solutions to a problem if the one I've used in the past was successful. | | | | | |
| I like learning new things. | | | | | |
| When faced with a difficult problem I tend to get discouraged easily. | | | | | |
| I enjoy trying/using new things. | | | | | |
| I'm the type of person who thinks "outside the box." | | | | | |
| Making "on the spot" decisions makes me uncomfortable. | | | | | |
| I don't mind if my life has aspects that are open-ended with no end in sight. I tolerate things being ambiguous or messy. | | | | | |

(18). Provide your personal definition of creativity:

_____

_____

Appendix D
Focus Group Interview Protocol

**Interviewer:** Amanda K. Onion, Doctoral Candidate, Indiana University of Pennsylvania

**Date:**_____
**Time:**_____
**Location:**_____

**Interviewees:** Goldcup University Early Childhood Preservice Teachers' Focus Group

**Welcome Remarks:**
Thank you for agreeing to be part of this focus group. I appreciate your willingness to participate. If at any time you no longer wish to participate in this interview, you are free to leave the room and all your responses and record of participation will be removed from the data.

**Collect Consent Forms:**
At this time, if you did not submit a consent form and wish to participate in this focus group interview you will need to sign a consent form. I have extras available.

**Introduction of Interviewer:**
Amanda K. Onion, Goldcup Alumna, Former Faculty Member, Doctoral Candidate at IUP, current faculty member at Sullivan University in Louisville, KY.

**Purpose of Focus Group Interview:**
The purpose of conducting this focus group is to gain an in-depth understanding of preservice teachers' perspectives about their uses of mobile learning technology, the influence that using mobile learning technology has on creativity in their instructional practices, the extent of the transference of everyday use of mobile learning technology to academic and professional practices, and thoughts regarding increasing student achievement through the use of mobile learning technology. The focus group interview format was chosen to provide opportunities for you to describe your experiences in detail in an environment that encourages interaction between participants who have similar yet unique experience with topics of discussion. This format also maximizes collection of information in a short period of time.

You are unique in the regard that you fall into both roles of student and teacher. In addition to examining your ideas about creatively using mobile learning technology within your instructional practices, this study will also explore the connections you are making between

personal and professional use of mobile learning technology in creative ways during field experience. Your participation in this study will extend teacher educators' understandings of mobile learning technology use by preservice teachers to inform discussions that will result in improved curriculum design to better prepare future educators.

**Ground Rules:**

**1. I want you to do the talking. Feel free to jump into the discussion at any time; however, do NOT feel obligated to participate in the discussion. I will not ask you directly to answer any question. Please observe proper conversational etiquette during the interview.**

**2. There is no right or wrong answer. Every person's experiences are valued, and I want to hear from you.**

**3. What is said in this room stays in this room. I want you to be comfortable to share your experiences and know that your privacy is of utmost importance. All the responses you share today will be kept in my possession and locked in a cabinet in my home office in Kentucky for three years. Your name will never be associated with any of the data in any written report for this study or future presentations, conferences, or publications.**

**4. This interview will be video recorded so that I can focus on listening to what you are saying and ask questions for clarification and elaboration. The video will be stored in a locked cabinet in my home office in Kentucky for the required three years.**

**What to expect:**
There are nine main questions for this interview. There are subquestions for each main question. I may deviate from the structured list of questions as our discussion progresses to make sure that I completely understand your perspectives and perceptions regarding the interview topics.
There are statements to be read that will guide you in some of the definitions and terminology associated with this study. You may ask for these to be repeated any time during the interview.

If you have decided not to participate in the focus group interview at this time, you are free to leave the room. Do I have a consent form to participate and be recorded from everyone in the room at this time?

The focus group interview will now begin. **HIT RECORD BUTTON!**

Appendix D cont.
Focus Group Interview Protocol

**Statement:**
For the purposes of discussion within this study a description of instructional practices includes but is not limited to the processes used for preparing lessons, selecting content, individualizing instruction, selecting instructional strategies, implementing instruction, monitoring understanding, choosing student grouping, social interaction, classroom management strategies, developing student and parent-family relationships, and processes used for assessing mastery of content and concepts.

When we talk about Mobile Learning Technology we are including but not limited to: smartphones, cell phones, iPads®, iPods®, netbooks, tablets, eReaders, PDA's, MP3 players, GPS units, assistive technology, and laptops. You may add other devices to this list.

When questions regarding creativity are discussed keep in mind that creativity has many different definitions. For this study we will describe creativity as the interactions that happen and result in an individual or group producing a product that is both novel and useful within instructional practices. Also, we can consider creativity to be the ability to imagine or invent something new, the ability to repackage or combine knowledge in a new way, combining two or more dissimilar concepts or subjects in the same mental space to form new categories, ideas, and behaviors, and the ability to produce original work that is high in quality and is useful.

**Interview Questions**

1. In what ways are you using/ have you used mobile learning technology?

    a. Describe how you use the information you gather through mobile learning technology. Do you use the information without altering it or do you creatively adapt the information to suit your needs? (e.g. content knowledge, instructional strategies, lesson plans, find something on Pinterest and use it, download a presentation and use it to teach a lesson, download an app and use it, use a website for teaching)

    b. Describe the ways you are using mobile learning technology that bridges the gap between everyday purposes and academic purposes (i.e. course work).

c. Describe the ways you are using mobile learning technology that bridges the gap between everyday purposes and teaching purposes (i.e. field experience requirements).

d. In what ways do you use it for professional purposes that differ significantly from personal uses? Using a percentage, can you compare how much you use it for each?

2. Do you believe you use your mobile learning technology more creatively for personal or professional purposes?

a. If you believe you use it more creatively for one purpose than the other can you describe what you do that you feel makes it more creative for that purpose?

3. Based on your previous practice teaching experiences, describe your expectations for using mobile learning technology within your instructional practices during future field experience.

a. What are those expectations based on? (e.g. previous experience with this school, previous experience with this cooperating teacher, professors, university supervisor, word of mouth, other students, nothing specific)

4. Think of a time during field experience when you have creatively used mobile learning technology effectively and describe how you interpreted what needed to be done and what technology you chose to use (this can include classroom management strategies and rewards).

a. Describe your actions.

b. What specific actions did you take that were successful and how do you know they were?

c. What factors do you think contributed to you creatively using mobile learning technology to solve the problem?

d. What did you initially consider and did you change your approach? Why?

e. What challenges did you face? Did you overcome them? How?

5. Think of a time when you were unable to use mobile learning technology to address a problem during field experience and describe what needed to be done.

a. Describe your actions.

b. Describe factors you attribute to impeding or hindering your use of mobile learning technology.

c. Describe any attempts you made to correct or overcome the problem.

d. Describe your reaction to the inability to use your mobile learning technology.

6. How would you describe the significance of having access to your mobile learning technology for instructional practices during field experience?

7. Do you believe that using mobile learning technology makes a significant difference in the creativity and quality of your instructional practices?

a. If so, why, and in what ways?
b. If not, why?

8. Describe your beliefs regarding potentially increasing your students' engagement and achievement by creatively using mobile learning technology within your instructional practices.

9. Based on your field experience, describe any changes to your expectations and plans for using mobile learning technology within your instructional practices as you begin your professional teaching career.

**Is there anything else you would like to add or comment on in terms of this study?**

**END RECORDING!**

**Wrap Up and Thank You:**

I would like to thank you for your time and input today. I appreciated hearing your thoughts and insights on the topics of preservice teacher creativity and the use of mobile learning technology.

Appendix E

Methods Course Written Assignment Submission

The purpose of this study is to gain an in-depth understanding of preservice teachers' perspectives about their creative use of mobile learning technology within all facets of instructional practices.

For the purposes of this study a description of instructional practices includes but is not limited to the processes used for preparing lessons, selecting content, individualizing instruction, selecting instructional strategies, implementing instruction, monitoring understanding, choosing student grouping, social interaction, classroom management strategies, developing student and parent-family relationships, and processes used for assessing mastery of content and concepts.

Mobile Learning Technology includes but is not limited to: smartphones, cell phones, iPads®, iPods®, netbooks, tablets, eReaders, PDA's, MP3 players, GPS units, assistive technology, and laptops. You may add other devices to this list.

**To participate in this data collection method, I am asking you to choose an assignment from the attached list that you feel best demonstrates your creativity.**

I know you are probably wondering...how will I determine what is creative? Creativity has many different definitions and models of creative characteristics. One of the hallmarks of defining creativity is that the product is useful and desirable ***to the creator***. I will not be evaluating your assignment for creativity; rather, I want to know what your perception of creativity is and how using mobile learning technology influences your creativity.

Answer these two questions when you send me your document. As on option you may use your mobile learning technology and send me a short video clip answering these two questions.

1. What parts of this assignment demonstrate that I used my mobile technology in a creative way?
2. What makes me feel that the way I approached and completed this assignment is creative based on the definitions/descriptions for this study?

**Send your document submissions and answers to the questions to my email: a.k.onion@iup.edu**

**(You can send me an iMessage to my iPad or upload a video to YouTube if you choose and send me the link!)**

Appendix E cont.
Methods Course Written Assignment Submission Options

ECH 301: Child Development and Guidance: Child Guidance Plan - 100 points

ECH 310: Family-Community Collaboration: Communication Instruments/Tools - 150 points

ECH 322: Curriculum Basis for Learning and Teaching: Curriculum Presentation- 100 points

ECH 323: Language, Literacy and the Young Child: Authoring a Children's Book – 100 points

ECH 325: Young Children as Theory Builders: Lesson Plans – 150 points

ECH 325: Young Children as Theory Builders: Technology Presentation – 50 points

ECH 414: Teaching and Learning Language and Literacy Grades 1-4 - Field Experience Task - Assessment Calendar – 10 points

ECH 414: Teaching and Learning Language and Literacy-Grades 1-4- Comprehension Task- 10 points

ECH 415: Teaching and Learning Mathematics Grades 1-4 Estimation Project – 50 points

ECH 415: Teaching and Learning Mathematics Grades 1-4 Common Core Project – 50 points

ECH 415: Teaching and Learning Mathematics Grades 1-4 Activity Journal – 50 points

ECH 415: Teaching and Learning Mathematics Grades 1-4 – Lesson Plan – 25 points

ECH 417: Technology For Early Childhood Educators- Digital Storytelling Assignment - 20 points

ECH 417: Technology For Early Childhood Educators- iPad assignment - 20 points

ECH 417: Technology For Early Childhood Educators- Level 1 and 2 SMARTBOARD Training- Create a SMARTBOARD Lesson: Developing Smart Notebook Materials - 50 points

Appendix F
Methods Courses and Corresponding Assignments

ECH 301: Child Development and Guidance: Child Guidance Plan - 100 points

Preservice teachers must develop a child guidance plan. It can be for the entire class or a specific child. They must also provide parents with information about child guidance. Develop the plan using technology and integrate technology into the parent communication aspect.

ECH 310: Family-Community Collaboration: Communication Instruments/Tools - 150 points

Preservice teachers must communicate with the families of the children with whom they are working and involve them in learning experiences with their children. They must also involve the community in the project work- such as through a community expert coming to class or going on a field trip. Integrate technology into the communication tools developed for this assignment. Utilize technology for planning expert visits or field trips.

ECH 322: Curriculum Basis for Learning and Teaching: Curriculum Presentation- 100 points

Preservice teachers will research an assigned curriculum and present a 15 minute professional presentation to peers. Presentation must include the use of technology, a small group activity, and professionally designed handout.

ECH 323: Language, Literacy and the Young Child: Authoring a Children's Book – 100 points

Preservice teachers create a Literacy Backpack that includes books and other materials related to the project topic. They send this home for the children and families to engage in literacy activities together. In this backpack is a book authored and illustrated by the preservice teacher. Integrate technology into the research and design of the book project.

ECH 325: Young Children as Theory Builders: Lesson Plans – 150 points and Technology Presentation – 50 points

Preservice teachers construct lesson plans using the ECH format. All lesson plans are to integrate at least two content areas. Three lesson plans including math, science, and social studies must be submitted. Use of technology for planning lessons, inclusion within lessons and recording assessment data related to lesson objectives is required.

Preservice teachers will research any technology device or software application and present this information in class. The presentation must include price, availability, levels of use, application to teaching, and potential users. The presentation must be presented using technology only.

Appendix F cont.
Methods Courses and Corresponding Assignments

ECH 415: Teaching and Learning Mathematics Grades 1-4 Estimation Project – 50 points

Preservice teachers will design and present an estimation project in the ECH 415 classroom. This project will require students to complete a problem solving process in order to estimate the answer to your project. This is NOT a jar of jellybeans or the weight of a pumpkin or the like. The project will be presented to your peers using current technologies.

ECH 415: Teaching and Learning Mathematics Grades 1-4 Common Core Project – 50 points

This assignment will require research of a specific Pennsylvania Common Core Mathematics Standard, development of an activity based on the standard, and presentation of the activity to your peers. The presentation must be electronic using current technologies.

ECH 415: Teaching and Learning Mathematics Grades 1-4 Activity Journal – 50 points
This assignment is ongoing, as nearly every class meeting will include a hands-on activity. The Activity Journal will be due the last week of class before the Block Experience. How you create the journal is up to you, but it must be digital. During ECH 417 or ED 417, a wide-variety of tools will be introduced that could work for this journal. The Activity Journal will be an electronic document or site that contains specific information about each of the activities we do in class. Each activity entered into the journal must contain the following:

1. The Activity Name
2. Approximate Grade/Age Level
3. Topics and NCTM Standards Covered
4. General Procedures
5. Comments and Reactions
6. Extensions and Connections

ECH 415: Teaching and Learning Mathematics Grades 1-4 – Lesson Plan – 25 points
Design, teach, and submit (in D2L) at least one lesson plan for mathematics that will be taught during the field experience this semester. If possible, the mathematics lesson plan should integrate and fit with the other subjects being taught on that particular day. The mathematical concepts taught or reinforced by the teaching of the lesson should apply mathematics to real life situations and help students understand how to use math to solve problems in their daily lives. Use the ECH 1-4 Block Lesson Plan Format.

Appendix F cont.
Methods Courses and Corresponding Assignments

ECH 414: Teaching and Learning Language and Literacy Grades 1-4 - Field Experience Task - Assessment Calendar – 10 points

Create and maintain a Literacy and Literacy-Related Assessment Calendar (any format that works for you for keeping track of assessments).
This project should document the literacy assessments, both formal and informal, as well-as the literacy-related assessments that have occurred in your field experience classroom.

ECH 414: Teaching and Learning Language and Literacy-Grades 1-4- Comprehension Task- 10 points

Look for comprehension strategy ideas found on web sites. Create a resource list of comprehension-supporting ideas and links (reflection). Use library databases to peruse journal articles that focus on comprehension and comprehension strategies. Create a list of particularly well-written, helpful, and informative articles. Include bibliographic information and craft descriptions of the main features and ideas found in the articles.

ECH 417: Technology For Early Childhood Educators- Digital Storytelling Assignment - 20 points

ECH 417: Technology For Early Childhood Educators- iPad assignment - 20 points

We will be exploring apps for use by elementary teachers. We will be using apps such as Glogster, Prezi, Dropbox, Slideshare, Voicethread, Go Animate, and others. You will have an
"App of the Week" assignment.

ECH 417: Technology For Early Childhood Educators- Level 1 and 2 SMARTBOARD Training- Create a SMARTBOARD Lesson: Developing Smart Notebook Materials - 50 points

You will participate in training sessions for SMARTBOARD. You will develop a lesson using the SMARTBOARD and develop Smart Notebook Materials.