

Teachers' Views of their Technology-Focused Preservice Education Program

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Abstract

This study explores the effectiveness of a technology-focused preservice education program by interviewing practicing teachers who have graduated from the program. The views of the teachers are examined with reference to Darling-Hammond's (2006) theoretical framework for teacher education, and Mishra and Koehler's (2006) TPCK model. The findings indicate that the teachers who participated in this study value the aspects of their preservice program that they can use in their teaching practice. There is also evidence that a preservice program which is infused with technology enables preservice teachers to adopt new pedagogies using technology into their own teaching practice. The intent of this study is to identify areas where the preservice program may be strengthened and to promote further research into technology integration in preservice education.

Keywords: preservice education, technology, teacher, education, TPCK

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Teachers' Views of their
Technology-Focused Preservice Education Program

Part One: Introduction

The central role in education played by teachers has been acknowledged by most; moreover, it is also understood that teacher effectiveness is linked to student learning. According to Gambhir, Broad, Evans and Gaskell (2008), “recent research literature suggests that what teachers know and are able to do is one of the most important factors influencing student learning”(p. 3). It might be difficult to come to an agreement on the definition of an *effective teacher* and it would be equally difficult to come to a consensus on how to make teachers become effective. Teacher preservice programs provide the initial formal preparation received by teachers prior to entering the classroom, so these programs have the potential to make a significant difference in the effectiveness of teacher and arguably the quality of student learning. In Canada, education is a provincial responsibility; therefore the critically important task of teacher preparation education falls to individual provinces. The focus of this study is to explore the value of a preservice education program from the perspective of its graduates who are practicing teachers. By interviewing graduates of the program, this study is intended to provide insights into the strengths and weakness of the directions of one technology-focused preservice education program in Ontario.

The introductory section of this report establishes the purpose of this study. To place the current preservice programs in context, the introduction begins with a brief history of teacher education in Ontario and a description of current programs. The second section outlines the challenges facing teacher education programs and the impact

that technology is having on teaching. The final section of the introduction provides an overview and rationale for this study.

Teacher Education in Ontario

Today teacher education, in Ontario, is the responsibility of Faculties of Education associated with universities but it has not always been that way. The first schools for teacher education, or “normal schools” as they were called, were established over 100 years ago. It was Ontario’s education superintendent-in-chief, Egerton Ryerson, who established the Ottawa Normal School in 1875 which later became the Ottawa Teachers’ College (University of Ottawa, Faculty of Education website). According to Wikipedia, *normal schools* were created to train high school graduates to become teachers by establishing teaching standards or *norms*, hence its name.

In a summary of the history of teacher education, Korthagen and Kessels (1999) explain that teacher education became known as “teacher training” as teacher educators transferred their knowledge of teaching and teaching theory to prospective teachers (p. 5). There was virtually no connection of theory to practice except through the use of assignments which were completed during field placement. They argue that this form of teacher education did not influence the practice of the graduating teachers because of a “transfer problem” (Korthagen & Kessels, 1999, p. 5). One of the reasons that this method did not change teacher practice was its failure to address the prior knowledge and preconceptions held by preservice teachers. Within this study, the term preservice teacher is used to refer to the students who attend a teacher education program. Successful teacher education programs are those that not only connect theory to practice

but also take into account the prior learning of preservice teachers (Korthagen & Kessels, 1999).

Currently, in Ontario, there are nineteen universities providing preservice education programs and although the programs vary some in structure, they all meet the standards established by the Ontario College of Teachers in order to be accredited. Preservice education programs generally run in one of two modes: consecutive or concurrent. The majority of teachers receive their B. Ed. through a one-year consecutive program which they enter after completing a 3-year or 4-year university degree. A smaller number of students enter a concurrent program directly from high school and take their educational program at the same time as their undergraduate degree. The participants in this study are all teachers who graduated, in different years, from the same one-year consecutive education program.

Challenges Facing Teacher Educators

Creating and delivering a program which successfully prepares preservice teachers for a career in teaching has always been a difficult task and it is not getting any easier. Preservice education programs should be preparing teachers who can deliver high quality education to all students as well as preparing those students for the demands of the 21st century. In this section, three of the challenges facing preservice education will be outlined: integrating technology into teaching; understanding and meeting the needs of adult learners; and the difficulty of generalizing findings from the research on preservice education.

Perhaps the most significant changes that have occurred in this century are as a result of the accelerated use of technology in society and these changes cannot be ignored

in the education system. Scholars are researching the most effective ways to use technology in classrooms within their other global priorities of increasing student engagement and improving student learning. As a result of this research, preservice education programs have added *technology integration* to an already long list of outcomes for preservice teachers.

The emergence of digital technology is changing societal expectations for education and for preservice education. Teacher educators must not only be able to model the effective use of technology, but also must know how to educate future teachers about how to integrate technology into their own teaching. Preservice teachers enter faculties of education having varying degrees of knowledge and expertise with digital technology; in addition, it can be assumed that they do not all place the same value on using technology in the classroom. There is much debate about whether students of today are the generation of *digital natives* described by Prensky (2001). He saw the young people born between 1980 and 1994 as being totally immersed in technology and “fluent in the digital language of computers, video games and the internet” (Prensky, 2001, p. 8). Bennett, Maton and Kervin (2008) describe “digital natives” differently stating that,

While technology is embedded in their lives, young people’s use and skills are not uniform. There is no evidence of widespread and universal disaffection, or of a distinctly different learning style the like of which has never been seen before (p. 783).

Teacher educators contend with the challenges of integrating technology into their teaching while facing preservice teachers who possess a range of varied technology skills and experiences as well as differing beliefs about the value of technology in education.

Teacher educators must also take into account the age of their students and how the adult learner differs from school-age learners. Cercone (2008) summarized the characteristics of adult learners in this way:

Many adult learners have responsibilities (e.g., families and jobs) and situations (e.g. transportation, childcare, domestic violence and the need to earn an income) that can interfere with the learning process. Most adults enter educational programs voluntarily and manage their classes around work and family responsibilities. Additionally, most adult learners are highly motivated and task-oriented (p. 139).

As well as considering these characteristics of adults, educators must consider how their varied and rich life experiences will impact their learning. According to Merriam, Caffarella and Baumgartner (2006), these experiences can be used by the adult learner to make sense of new situations and can be an incentive to learn new things. They also caution that the past experiences of adults can make it difficult for them to learn new concepts. Some learners may have to “unlearn negative attitudes towards learning, old ways of doing things, prejudicial views and so on” (Merriam, Caffarella & Baumgartner, 2006, p. 424). Research suggests that adult education programs will have greater success if they understand and make accommodations for the characteristics of the adult learner (Bai & Ertmer, 2008; Korthagen & Kessels, 1999; Merriam et al., 2006).

One would think that the research could provide teacher educators with valuable insights into the design and delivery of preservice education programs; however, despite the volumes of literature on teaching, and an increasing amount on adult learners, according to Grossman and McDonald (2008), there is a lack of research in the area of teacher education. When comparing research on teaching versus research on teacher education they state: “While research on teaching has reached adulthood, research in teacher education is still in its adolescence, in search of its distinctive identity” (p. 185).

They contend that research in teacher education will only move forward by connecting “the complexity of teaching as a practice and the preparation of teachers” (p. 185).

Others feel that it is the nature of teacher education, not the lack of research that presents the greatest challenges. Falkenberg and Smit (2010), argue that it is the complex nature of teaching that not only makes research into teacher education difficult but also means that the research is not as highly valued as other forms of research. They argue that, “Teacher education research does not generate reproducible findings – thus, the findings are not generalizable – because the findings are always tentative and contextual. . .”

(Falkenberg & Smit, 2010, p. 4).

Perhaps due to this inability to generalize findings from research on teacher education, there is no common agreement on what is expected of teacher education programs or how to measure their effectiveness (Boyd, Grossman, Lakford, Loeb & Wyckoff, 2005). As Cochran-Smith (2001) writes, “[T]he question that is currently driving reform and policy in teacher education is what I refer to as ‘the outcomes question’” (p.2). She poses the question, “[H]ow should we conceptualize and define the outcomes of teacher education for teacher learning, professional practice, and student learning?” (p. 2). If outcomes for teacher education could be developed and agreed upon, the next problem would be how to measure those outcomes. In the United States, the outcomes of teacher education are often linked to teacher test scores and student achievement data; there are, however, some researchers who find value in using a variety of methods (Cochran-Smith, 2001). To evaluate the program outcomes for a preservice education program at Stanford, Darling-Hammond (2006) found that a variety of assessment tools including “perceptual data on what candidates feel they have learned in

the program (through surveys and interviews)" yielded valuable data about their program (p. 120). She also found the graduates' perceptions of the value of their program changed as the graduates spent more time in the classroom. Therefore, studying graduates' perceptions of their preservice programs for an extended period of time after they graduate is an important avenue of research.

Significance of the study

Our understanding of teaching has moved beyond a model which views teaching as merely the delivery of information. Despite the fact that all teachers in Ontario must attend a preservice education program to become qualified teachers, there is a lack of literature on effective teacher education. The importance of this area of research has been highlighted by researchers such as Cochran-Smith and Zeichner (2005) who call for more scientific research on preservice education particularly related to teacher education practices. Others have stressed that evaluating the effectiveness of teacher education must include the views of the preservice teachers and the graduates to build authenticity (Darling-Hammond, 2006; Russell, 2007). Russell (2007) asserts; "[N]o teacher education program can achieve coherence and collaboration without listening, early and often, to preservice candidates' perspectives on their courses and their practicum experiences" (p. 121). He also recommends that further research on preservice education reform should include tracking graduates into their first two years of teaching to find out what was the most helpful and what they think we need to change. Despite the call for research in this area, there is a gap in the literature examining preservice education from the point of view of practicing teachers (Russell, 2007).

The focus of the present study is to explore the value of a preservice education program from the perspective of its graduates who are practicing teachers. The area of focus will be digital technology; specifically, the teachers' degree of preparedness to integrate technology within their classroom and their current use of technology. This study was intended to provide insights into the strengths and weaknesses of one preservice program as well as identify areas for further study from the perspective of the program's graduates.

All the teachers involved in this study graduated from the same consecutive one-year BEd. program at a faculty of education in Ontario. The preservice program at this university was established in 2003 and, although it initially began as an I/S program, three years later it expanded to include a P/J program. Digital technology is an integral part of both the I/S and P/J programs; all preservice teachers are issued laptops which they use daily in all classes. Students have access to wireless internet throughout the faculty of education building as well as LAN connections in all classrooms. Smartboard technology is available in all classrooms and science classes use a number of different technology probes. There are also video cameras, digital cameras and LCD projectors available for loan to students. To further encourage the use of digital technology, preservice teachers take a course in the first term which is designed to introduce "the tools and resources that are available to teachers to enhance the learning environment" (Academic Calendar, p. 232). In addition to the single course, preservice teachers receive course materials and submit assignments through the on-line learning management system WebCT. Furthermore, faculty integrate technology into their courses by modelling the use of digital technology specific to their subjects. More recently,

preservice teachers have been encouraged to use a variety of forms of digital technology when completing assignments.

Using the qualitative research method of interviews with practicing teachers, this study focuses on their views of four aspects of their preservice education: the most significant features of the program; how well prepared the graduates were for teaching; their use of digital technology in their classrooms; and finally their recommendations for the preservice education program. The questions about digital technology are of special significance because of the current appeal for a restructuring of teacher education to ensure that graduates can not only use technology but also integrate technology into their lessons (Albion & Ertmer, 2002; Angeli, 2005; Chen, 2010). In the 21st century, teachers must be prepared to use digital technology themselves and more importantly to infuse technology into their classes in ways that support and improve student learning.

Few would argue against the importance of a good education system or the significant role that future teachers play in creating such a system. Also, there would be little debate that some teachers are more effective in the classroom than others. There is, however, no such general agreement on how to measure the impact that teacher education programs have on teacher practice. This research is intended to provide some information about measuring the effectiveness of the integration of technology within a preservice education program by interviewing practicing teachers who have graduated from that program.

In summary, teacher education in Ontario has moved from teacher training which relied on the transfer of specific patterns of teaching lessons to programs which have become increasingly complex. The challenge facing preservice education programs is

created by the need to build learners who will be learning for themselves in the 21st century. One of the ways to meet this challenge is by designing preservice programs that prepare teachers to integrate technology into their teaching in ways that engage students and increase their learning. There is a lack of research in this area and this study is intended to address in some small way, this gap in the research.

Part Two: Literature Review

This literature review addresses four key topics related to preservice education followed by the description of a theoretical framework used to guide the results of this study. The first section contains a review of some of the key literature on adult learners with a focus on how they, as learners, differ from school-age learners. The second part summarizes the important role played by preservice education programs in preparing teachers for teaching in the 21st century. The third section which focuses on digital technology in education has three subsections: key definitions related to technology; methods used to incorporate technology into preservice education programs; and finally, the barriers faced by teachers who attempt technology integration. In the fourth section of the literature review, models for teaching and preservice education are explored in an attempt to illustrate and outline a comprehensive model, one which covers most of the aspects of preservice education. In the final section, I propose a new theoretical framework for this study by combining two of the models from the literature.

Understanding Adult Learners

Understanding the characteristics of adults and how their learning is affected by their life experiences and beliefs has been recognized as a key component of adult education programs and is used to guide the analysis and results of this study (Ertmer, 2005; Merriam, 2001; Mezirow, 1997). According to Mezirow (1997), adults “have acquired a coherent body of experience - associations, concepts, values, feelings, conditioned responses - frames of reference that define their life world” (Mezirow, 1997, p.5). For adults to develop new learning, Mezirow argues, “educators must help learners become aware and critical of their own and others’ assumptions” (Mezirow, 1997, p.10).

I reviewed three theories of adult learning which are described in the first section along with a discussion of how each adds to our understanding of adult education. The final portion of this section deals with a summary of the important differences between adult and traditional (K to 12) learners and how these differences potentially impact a preservice education program.

Merriam and colleagues (2006) provide a summary of some of the key theories on adult education. They explain that although the literature in this area is now quite extensive it really had its beginning with the work of Malcolm Knowles. In 1968, Knowles first used the term *andragogy*, which he defined as “the art and science of helping adults learn,” in contrast to pedagogy which is helping children learn (Knowles, 1968, p. 84). Knowles bases his description of the adult learner on his assumptions that adult learners are different from K to 12 learners. When he first proposed this idea, he listed four characteristics of adult learners and in later works he added two: the fifth and sixth assumptions. He states that,

as individuals mature:

- (1) their self-concept moves from one of being a dependent personality toward begin a self-directed human-being;
- (2) they accumulate a growing reservoir of experience that becomes an increasingly rich resource for learning;
- (3) their readiness to learn becomes oriented increasingly to the developmental tasks of their social role;
- (4) their time perspective changes from one of postponed application of knowledge to immediacy of application, and accordingly, their orientation toward learning shifts from one of subject-centeredness to one of performance-centered (Knowles, 1980, as cited in Merriam et al., 2006, p. 85).

[and in later works, Knowles added a fifth and sixth assumption];

- (5) The most potent motivations are internal rather than external
- (6) Adults need to know why they need to learn something (Knowles, 1984, cited in Merriam et al., 2006, p. 84).

Merriam and associates (2006) also outline some of the points of contention with Knowles' theory. They argue that “*andragogy* actually tells us more about the characteristics of adult learners than about the nature of learning itself” (p. 79). In his autobiographical work, *The Making of an Adult Educator* (1989), Knowles explains that his theory of andragogy was not so much a theory of learning for adults but rather a conceptual framework that may be the basis for a theory. Knowles’ six assumptions could also be considered to represent a continuum of learning ranging from teacher-directed to student-centered (Merriam et al., 2006, p. 86).

Two other theories of adult learning are described by Merriam and colleagues (2006): Illeris’ (2003 *Three Dimensions of Learning* and Jarvis’s (2006) *Learning Process Model*. Illeris focuses on the three dimensions of learning process: cognition, emotion and society. He states that learning is a holistic process during which the three processes: cognitive, emotional and social occur together. His model is explained through the example of an adult learning to read. This learning activity involves “cognitive and emotional dimensions” [and] “will be influenced by social interaction with instructor and other students” (Merriam et al., 2006, p. 99). A further influence would be the societal expectation that being literate is necessary to function in today’s world. According to Merriam and associates (2006), the strength of Illeris’ model lies in his addition of the emotional and societal dimensions to the learning process.

The foundation of Jarvis’ Learning Process Model is that “all learning begins with the five human senses of sound, sight, smell, taste and touch” (Merriam et al., 2006, p. 100). Each learner faces a new situation with a different history and biography which determines the way the individual will react with the new experience which results in a

change in the person (p. 101). Jarvis' definition of human learning summarizes his model,

I now regard human learning as the combination of process whereby the whole person – body (genetic, physical and biology) and mind (knowledge, skills, attitudes, values and emotion, belief and senses) – experiences a social situation the perceived content of which is then transformed cognitively, emotionally or practically (or through any combination) and integrated person's individual biography resulting in a changed (or more experienced) person (Jarvis, 2006, as cited in Merriam et al., 2006, pp. 102-103).

Each of these theories or models adds to our understanding of adult learners.

Knowles' work and introduction of the term *andagogy* represents the first formal recognition of the significant differences between adult and child learners. Although his theory could more accurately be called a list of assumptions of adult learners, he was successful in focussing researchers on the distinctions between learning in adults and learning in children. Illeris' model of learning is based on continuous interaction among the three dimensions of cognitive, emotional and societal. Adding societal influences to the cognitive and emotional aspects of learning is what distinguishes his model from others.

Of the three models, Merriam and associates believe that Jarvis' is the most comprehensive and is the one that best relates to adult learners. In their view, "his model situates learning in a social context; learning is an interactive phenomenon, not an isolated internal process" (Merriam et al., 2006, p.103). They maintain that recognizing the link between adult learning to that adult's previous experiences and a social context provides a framework for teaching adults (Merriam et al., 2006). However, they caution, "there has been little research testing the power of the models to explain or predict adult learning behaviour" (Merriam et al., 2006, p. 104).

Merriam and colleagues (2006) summarize how adult learning differs from learning in children, noting that, “the accumulation of experience, the nature of that experience, the developmental issues adults address, how the notions of development and experience relate to learning, and how aging affects our memory and the more general neurological basis for learning – all of these differentiate adult learners from children” (p.426). The introduction of experience as a factor in adult learning is a key aspect of adult learning theory.

When discussing experience, Kidd (1973) concludes that adults not only have more experiences but have different kinds of experiences than children and this is one of the reasons that adults learn in different ways than children. The life experiences of the adult learner, argue Merriam and colleagues (2006), function in several ways;

- an adult's experiences can be a resource for others during a learning activity;
- attempting to make sense of one's experiences can act as a learning incentive;
- adults use experiences to transform meanings and values, and,
- finally these experiences can be obstacles to learning and prejudicial views or old ways of doing something may have to be unlearned (Merriam et al., 2006, p. 424).

Adults are adding the role of learner to their other full-time responsibilities. Using the examples of two adult learners, one the parent of a teenager and the other someone nearing retirement, they argue that the “developmental concerns, and presumably the nature of ensuing learning experiences converge to make learning in adulthood qualitatively different from learning in childhood” (Merriam et al., 2006, p.434). They explain that not only do these experiences set adults apart from children but a group of adults will have less in common than a group of children.

In summary, the research on adult education presents at least three different models of adult learning. Knowles (1980) first used the word *andragogy* when he listed characteristics of adult learners. Illeris' (2003) theory of learning stressed the importance of societal and emotional components of learning. However, it is Jarvis' model that situates learning within a social context and proposes that learning involves a change encompassing the whole learner.

The last section of this literature review includes a summary of the differences between a traditional (K – 12) learner and the adult learner. One of the most significant of these differences is the extensive and varied life experiences of the adult coupled with the increased responsibilities that come with age. There is also evidence that adult learners may have more difficulty with acquisition of information due to the impact of age on memory and the impediments caused by prior misconceptions or prejudices. There is a substantial body of work that states that adult learners are not the same as younger learners, and the differences must be considered in a teacher education program because preservice teachers are adult learners.

Importance of Preservice Education Programs

This section outlines the challenges facing teachers today and the role preservice education programs play in preparing teachers for their multifaceted role in the classroom. Two impacts of preservice education programs are discussed: the effect of these programs on teacher practice, and the effects of preservice education programs on teacher retention in the role. In the final section, the research in the area of preservice education is examined.

Many researchers have acknowledged the complex nature of teaching and the difficulties teachers face due to that complexity (Ball & Forzani, 2009; Darling-Hammond, 2006; Grossman & McDonald, 2008; Korthagen, Loughran & Russell, 2006). Darling-Hammond (2006) maintains that the realities of 21st century classrooms require teachers to know and be able to master a spectacular array of competencies to meet the expectations of the job. Not only do they have to understand how children learn but they must “construct and manage classroom activities efficiently, communicate well, use technology, and reflect on their practice to learn from and improve continually” (Darling-Hammond, 2006, p.300). She compares a teacher to an orchestra conductor in terms of the preparation and skill required by a teacher to enable students to acquire new skills and understandings over a period of time. Much like a conductor, the knowledge, plans and “backstage moves” of the teacher, are invisible (p. 301).

Hammerness, Darling-Hammond and Bransford (2005) reviewed recent theory and research on preservice education with the goal of developing a better understanding of the role played by these programs in “how teachers learn and develop” (p. 359). They found that although no teacher preparation program can enable preservice teachers to develop all the knowledge and skills required for a career of optimal teaching, these programs can play an important role in the development of teachers and establishing a framework for lifelong learning. They also found that preservice education programs can make a difference, stating that, “recent research suggests that new teachers can demonstrate more accomplished practice than previously thought when they experience stronger, more purposeful preparation” (p. 381).

There is also evidence that preservice programs not only impact the quality of teaching but similarly improve teacher retention. In a recent article, Darling-Hammond (2010) maintains “teachers’ preparation matters in two ways: It can both enhance initial effectiveness and increase the likelihood of staying on the job long enough to become more experienced and effective, as teachers’ effectiveness improves significantly after the 3rd year of experience” (p.37). She connects the statistics on teacher retention in United States to the importance of teacher education stating that, “[A]lthough about 30% of new public school teachers leave the profession over their first five years of teaching, attrition rates are much lower for teachers with greater initial preparation” (p.37). Darling-Hammond cites statistics from the NCTAF Schools and Staffing Survey (2003) which found “that new teachers who lacked student teaching and teacher education coursework left teaching in their 1st year at rates double of those who had had student teaching and coursework” (p. 37). The statistics for teacher retention in Ontario are not as alarming; nevertheless, according to a report conducted by OTF on behalf of the Ministry of Education, approximately 10 percent of beginning teachers leave the profession within the first five years (Clark & Antonelli, 2009).

Despite the amount of literature on teaching, there is a lack of research on many aspects of preservice education (Grossman & McDonald, 2008; Kosnik, Beck & Cleovoulou, 2009). In the United States there is considerable evidence that preservice education programs can increase teacher retention; however, there is a lack of research on which aspects of the program are the most significant or the long term impact of teacher education on teacher practice (Kosnik et al., 2009). Through interviews and classroom

visits, Kosnik and colleagues (2009), observed the challenges faced by new teachers and found that interviewing the graduates provided valuable insight into the strengths and areas for improvement for their preservice programs. Gathering data from teachers on the long term impact of teacher preservice programs can also provide valuable feedback for teacher education. More research on teacher preparation programs and their impact over time is required as, according to Grossman and McDonald (2008), few large-scale studies, across subject areas, exist. Similarly, there is a lack of research on how technology integration in teacher preparation programs and impacts the graduates' use of technology in their teaching (Hew & Brush, 2007; Kay, 2006a; Teo, 2008).

Technology and Preservice Education

This section of the literature review examines the literature on the impact of technology on teacher education. One of the more difficult challenges facing teacher educators is preparing teachers to use digital technology in meaningful ways within the classroom. Wiske (2005) pointing out that this is not an easy task states, "promoting meaningful learning with new technologies is daunting because, for most teachers, it requires a significant reconsideration of several dimensions of practice" (p.32). Not only do teachers need to learn to use new technology, but they must change the way they deliver the curriculum in order for technology to have a significant impact on student learning (pp. 32-33). Using technology within the classroom in ways that simply makes it quicker or easier to teach does not necessarily result in more meaningful learning for the students (Ertmer & Ottenbreit-Leftwich, 2010; Wiske, 2005). Integrating technology can make it possible for the teacher to "adopt new and arguably better approaches to instruction and/or change the content or context of learning, instruction and assessment" (Lawless & Pellegrino, 2007, p. 581). It is this latter use of technology that requires the

most significant changes in teaching and is the one which teachers find the most challenging.

As the integration of technology into teacher education raises a number of issues, this literature review focuses on three aspects of the issue: developing a definition of technology integration; identifying methods used to integrate technology into teacher education; and, identifying barriers preventing teachers from using technology in their classrooms.

Defining digital technology and technology integration.

Arriving at a working definition for the terms *technology* and/or *digital technology* is not a simple matter. Galbraith's (1967) definition of technology, "the systematic application of scientific or other organized knowledge to practical tasks" is still in use today (as cited in Januszewski & Molendo, 2008, p. 12). This means the term, *technology*, encompasses a vast array of meanings many of which include physical products such as "hardware and software, video recordings, personal digital assistants, and other handheld communications devices, satellites, satellite receives, and the like" (Branch & Deissler, p. 196). For the purpose of this study, the term *technology* will be used to mean *educational technology* as defined by the Committee of the Association for Educational Communications and Technology (AECTA). "Educational technology is the study and ethical practice of facilitating learning and improving performance by creating, using and managing appropriate technological processes and resources" (Januszewski & Molenda, 2008, p. 1). Within the context of this study technology will mean the effective use of computers, and the Internet as well as computer hardware and software, networks,

and a number of different devices that convert information (text, images, sounds, and motion) into general digital formats (ISTE, 1999; Januszewski & Molenda, 2008).

Coming to an agreement on the definition of the term *integrating technology* is not as simple as agreeing on the individual words, *integration* and *technology*. A search of the literature reveals a number of different definitions for the term *integrating technology* as well as a great deal of variation in those definitions (Brooks-Young, 2002; Hew & Brush, 2007; Lawless & Pellegrino, 2007). According to the Merriam-Webster Collegiate Dictionary, the word *integrate* means "to form, coordinate, or blend into a functioning or unified whole". A relatively simple definition is presented by Hew and Brush (2007); they define *technology integration* "as the use of computing devices such as desktop computers, laptops, handheld computers, software, or Internet in K-12 schools for instructional purposes" (p. 225). The definition put forth by Brooks-Young (2002); however, requires a much greater commitment to technology within the classroom. In her book *Making Technology Standards Work for you – A Guide for School Administrators*, ISTE, 2002, *technology integration* is defined as:

technology used to enable students to work with and understand a concept that might be too difficult, time consuming, or expensive to attempt otherwise. It is an environment where simple competence is not enough, but where all educators are encouraged to look for innovative uses of technology that enable students to approach problem solving using a range of thinking skills and learning styles and where teachers ultimately change their approach to instruction through the use of technology (p. 46).

Lawless and Pellegrino (2007) use the definition of *integrating technology* from the *Technology in Schools Taskforce* (2003) report produced by the U.S. Department of Education, stating:

Technology integration is the incorporation of technology resources and technology-based practices into the daily routines, work, and management

of schools. Technology resources are computers and specialized software, network-based communication systems, and other equipment and infrastructure. Practices include collaborative work and communication, Internet-based research, remote access to instrumentation, network-based transmission and retrieval of data, and other methods. This definition is not in itself sufficient to describe successful integration: it is important that integration be routine, seamless, and both efficient and effective in supporting school goals and purposes (p. 577).

Within this definition, Lawless and Pellegrino (2007) encompass the whole school, not just individual teachers within the classroom, so their concept of successfully integrating technology extends into all aspects of school in such a way that technology is integral to the goals and purpose of the school.

This study focuses on classroom teachers, so the term *integrating technology* will be restricted to the use of technology within the classroom as described by Pierson (2001). She proposes that a teacher who effectively integrates technology draws not only on extensive content knowledge and pedagogical knowledge, but is able to combine these with technological knowledge. Effective technology integration would be defined as the intersection of all three as demonstrated in the following diagram which is taken from Pierson (2001). Her definition of *technology integration* is, “teachers utilizing content and technological and pedagogical expertise effectively for the benefit of student learning” (p. 427). Figure 1 represents Pierson’s (2001) definition of *technology integration*.

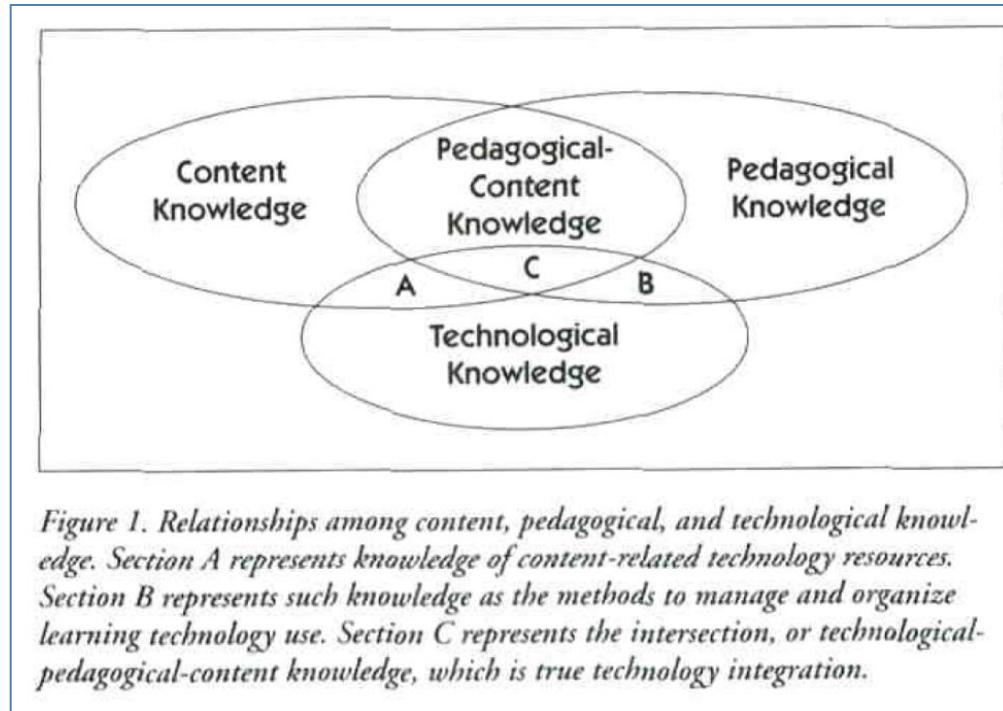


Figure 1: Technology Integration as defined by Pierson. 2001 (p.427)

In this subsection of the literature review, key definitions that are used in this study were developed. Within this study the use of the term *technology* is restricted to *digital technology*. Pierson's (2001) definition of *integrating technology* will be used within this study as it works well with the models of preservice education that are discussed at a later point in the literature review and is used also to develop a theoretical framework for this study.

Strategies used to integrate technology into preservice education programs.

This subsection of the literature review focuses on the literature describing the importance of integrating technology into preservice teacher education programs and identifies the varied methods used within these programs.

The importance of technology to classroom teachers is expressed by Ertmer and Ottenbreit-Leftwich (2010), who write that, "effective teaching requires effective technology use" (p. 256). *Effective technology* means technology that is used in ways that enable teachers to improve instruction and create meaningful learning for students. In recognition of the important role technology should play in education, there have been a variety of different strategies used to introduce new technologies to preservice teachers. A literature review conducted by Kay (2006a) examined 68 peer reviewed journal articles on integrating technology into teacher education programs. In a later article, Kay (2006b) grouped the ten different approaches he identified into four key strategies commonly employed in teaching/learning to use new technology:

1. collaboration among preservice teachers, mentor teachers and faculty, focusing on education faculty, focusing on mentor teachers (collaboration),
2. delivering a single technology course, offering mini-workshops, using multimedia (formal instruction),
3. delivering a single technology course, improving access to software, hardware and/or support (time for exploratory learning),
4. integrating technology in all courses, modeling how to use technology, practising technology in the field (completing authentic tasks) (Kay, 2006b, p. 367).

Kay determined that 44% of the approaches investigated involved integrating technology into all the courses and 29% involved a single technology course. He also found 31% of the programs focussed directly on improving the use of computers by the faculty. After a careful analysis of the findings of the 68 studies, Kay (2006a) did not come to any conclusions about which strategies worked best. He writes,

[B]ecause of the numerous methodological limitations noted above: small samples, poor population and program descriptions, an absence of formal analysis, limited reporting of reliability and validity estimates, neglecting to look at individual differences, and a narrow range of outcome measures, it is challenging to assess the effect of specific strategies used to introduce technology to pre-service teachers (p. 391).

However he was able to say that, “there is some preliminary evidence to suggest that multiple strategies work well with respect to use of computers by preservice teachers in the classroom”(p. 395).

Kay (2006a) claims that “creating a strong focus on technology for faculty may be a necessary first step, but other strategies might need to follow” (p.388). He acknowledges that this can be difficult as each faculty member must have the knowledge to be able to use technology and “to model and construct authentic teaching activities” (p. 394). Kay is not the only one who has identified the role of the faculty in this process. The two obstacles to infusing technology into teacher education programs most commonly identified in the literature are: the lack of the faculty’s technology skills and knowledge (Russell, Bebell, O’Dwyer & O’Connor, 2003; Thompson, Schmidt & Davis, 2003); and the pedagogical beliefs of the faculty (Ertmer, 2005).

Barriers to technology integration.

Researchers have found that the level of use of technology within the classroom is significantly less than teachers’ personal use of technology outside the classroom (Ertmer, 2005; Hughes, 2005; Teo, 2008). This section of the literature review examines the obstacles to technology integration. Using the classification system developed by Ertmer (1999), first and second order barriers are investigated with an emphasis on the second order barriers: teacher beliefs and lack of skills and knowledge. Teacher beliefs about technology cannot be considered separately from their knowledge as their beliefs have a bearing on their ability to learn new technologies and ultimately to integrate technology into their teaching. The connection between these barriers is discussed, first for classroom teachers and then for preservice teachers. Finally the role of the faculty of

a preservice program in preparing preservice teachers to integrate technology is considered.

There are a number of reasons teachers give for not integrating technology into their teaching. In an attempt to classify these obstacles, Ertmer (1999) introduced the concept of first- and second-order barriers. She defines first-order barriers as obstacles that are external to teachers; second-order barriers are intrinsic to teachers. Lack of technology would be a prime example of a first-order barrier; whereas, lack of knowledge about how to use technology would be an example of a second-order barrier. Many teachers cite lack of technology as being the main reason they cannot integrate technology into their classrooms; recent surveys, however, suggest that lack of computers may not be the biggest obstacle to technology integration. In a study conducted by Plante and Beattie (2004), during the 2003/04 school year, the median number of students per computer in elementary and secondary schools in Canada was estimated at five (p.10). They found that roughly 90% of the computers in a school are split between computer labs and classrooms with the remainder being found in libraries (p. 21). Their survey revealed that virtually all elementary and secondary schools in Canada are connected to the internet (p.16).

The Second Information and Technology in Education Study (2006), which looked at the use of technology in Ontario schools, indicated that computers may not be as available as reported by Plante and Beattie (2004). According to the SITES' (2006) survey, the technology needs most commonly cited were to increase the number of computers connected by the internet and to decrease the ratio of students to computers as 60% of the schools responding reported ratios of five to nine students per computer. It

would seem that lack of technology in schools may well be a barrier to technology integration but there is also considerable evidence that lack of the required knowledge and skill for technology integration is a bigger barrier. According to school principals, although most teachers possessed the required technical skills to use ICT for administrative purposes such as preparing report cards, taking attendance or recording grades, fewer had the necessary qualifications to effectively engage students in using ICT to enhance their learning (Plante & Beattie, 2004, p. 25).

A review of the literature identifies two second-order barriers: lack of technology knowledge and skills and personal attitudes and beliefs of teachers, as the biggest obstacles to teachers integrating technology into their teaching (Darling-Hammond, 2006; Ertmer, 2005; Hughes, 2005; Teo, 2008). Teachers most commonly identify lack of specific technology knowledge and skills as their reason for not integrating technology in their classroom; however, it is difficult to separate a teacher's attitudes and beliefs from a teacher's ability to learn and implement new concepts (Darling-Hammond, 2006; Ertmer, 2005; Hughes, 2005; Martin & Russell, 2009). In her work with teacher education, Darling-Hammond (2006) finds that preservice teachers' prior experience with school means they have deep seated beliefs about education which can impact their ability to learn (p. 35).

Ertmer (2005) came to a similar conclusion when studying the effect that beliefs have on practicing teachers' technology integration. She concludes that it is not likely the technology skills obtained by teachers will be used in the classroom "unless they fit with teachers' existing pedagogical beliefs" (p. 37). She asserts, "It is imperative that educators increase their understanding of and ability to address teacher beliefs, as part of

their efforts to increase teachers' technology skills and uses" (p. 37). The research indicates that teachers' prior beliefs about technology and its role in education can be a barrier to the integration of technology into their teaching. Teachers usually indicate that it is their lack of knowledge of technology which prevents them from using it within their classrooms; however, it may be that their deep-seated beliefs make it difficult for them to even learn new technology (Darling-Hammond, 2006; Ertmer, 2005).

When technology is introduced by targeting specific content and pedagogy, it builds on a teacher's subject knowledge and previous experience; such approaches appear to lead to greater implementation in the classroom (Hughes, 2005). When Hughes (2005) studied practicing teachers, she noted the link between their technology-supported-pedagogy knowledge and skills base, and their ability to integrate technology into their teaching. The ability of a teacher to integrate technology into his or her classroom depends not only on his or her ability to successfully use technology but "in the teacher's interpretation of the technology's value for instruction and learning in the classroom. This interpretation is mediated by past experience and accumulated knowledge" (p. 287). She created three categories to describe how technology-supported-pedagogy functions within a classroom: (a) replacement, (b) amplification, or (c) transformation (Hughes, 2005). In the first category, *replacement*, technology is merely a "different means to the same instructional end" (p. 281). Hughes uses the term *amplification* to describe the use of technology to complete tasks more efficiently without any real change in the task. When technology is used in a way that changes a teacher's instructional practices resulting in a change in "students' learning routines, including content, cognitive processes and problem solving", Hughes applies the term *transformational* (Hughes,

2005, p. 281). She notes "technology has the potential to innovate, as in transformative uses, but also can maintain the status quo as in *replacement* or *amplification* uses" (p. 281).

Research on technology integration and preservice teachers supports Hughes' (2005) findings of the importance of addressing pedagogy, content, and beliefs for successful technology integration (Angeli, 2005; Lei, 2009; Swain, 2006). In a study of over 200 preservice teachers, Angeli (2005) reported on the difficulty of getting student teachers to integrate technology into their science teaching. She found that student teachers will only effectively develop the necessary competencies to teach with technology when technology is infused throughout the curriculum in a way that addresses both content and pedagogy. She concludes that this will only happen if the faculty is technology competent and, due to the time and effort required, the faculty must possess a high level of commitment to integrating technology into their teaching.

In a study of preservice education, Lei (2009) found that the personal use of technology by preservice teachers did not necessarily translate into use of technology within the classroom. One obstacle facing digital native preservice teachers is their lack of experiences and expertise in using classroom technologies such as interactive whiteboards, idea processors, content-related technology, and assistive technologies. Perhaps more surprisingly, Lei found the preservice teachers had some reservations about using technology in classrooms. As a result of his research, Lei concluded teacher education programs play an important role in enabling the digital-native students to become "digital-native" teachers who can use technology in meaningful ways in classrooms" (p. 91). Teacher graduates must leave their preservice program with the

right knowledge, skills and attitudes to be able to integrate technology within their teaching (Lei, 2009)

The faculty at a preservice program play a key role in preparing teachers to integrate technology in the classroom (Kay, 2006b; Lei, 2009; Swain, 2006, Yeun & Ma, 2002). Faculty must be knowledgeable about technology and how to infuse it throughout the curriculum in a way that addresses both content and pedagogy. Swain (2006) added another aspect to the role by questioning the importance of the faculty's beliefs and attitudes about technology integration in determining the degree to which preservice teachers will integrate technology in their teaching. In her study of preservice teachers who completed a technology course, she found their ability to use technology and talk about effective integration of technology did not necessarily translate into practise. In many cases preservice teachers felt that integrating technology into their teaching was not worth the effort. According to Swain, during the technology course, faculty did not regularly model the varied technology they were encouraging the preservice teachers to adopt. Swain's study left her questioning how the beliefs and attitudes of faculty about technology integration impact the adoption and implementation of new technologies by preservice teachers.

This section has presented a summary of the literature on integrating technology into teacher education programs. There are a number of different approaches used to integrate technology into teacher education programs, and it seems that multiple strategies are more effective than any single approach. Furthermore, successfully supporting preservice teachers with the integration of technology into their classrooms requires more than teaching the new technology. Teacher educators must also address

the preservice teachers' beliefs about the role of technology in education. It is important for teacher educators to believe in the value of technology integration in teaching since their personal attitudes and beliefs about technology can be transmitted to the preservice teachers.

Models for Preservice Teacher Education

In this section of the literature review, four models for teacher education are examined. Each model is explained and critiqued in light of the expectations for teacher education programs. Preservice programs, according to Ertmer and Ottenbreit-Leftwich (2010), have the challenge of preparing preservice teachers to "adopt a new definition of learning" which focuses on "engagement, participation, and knowledge" rather than the traditional definitions of learning which were focused primarily on achievement (p. 263). They maintain that technology has added another dimension to the knowledge and pedagogy and perhaps even redefined *effective teaching*; moreover, technology has to be a focus in teacher education today. After each model is described in this section, an analysis of the important aspects of each is provided in an attempt to find a comprehensive model for preservice education.

The first model of teacher education to be discussed was developed to reform teaching in general and was not initially proposed as a model for teacher education. Shulman's (1986) model, which was first published over twenty-five years ago, remains a foundation for other models of teaching and teacher education. Shulman developed his pedagogical content knowledge model (PCK model) as a response to finding that teachers seldom integrated knowledge of content with pedagogy. His model "represents the blending of content and knowledge into an understanding of how particular topics,

problems or issues are adapted to the diverse abilities and interests of learners, and presented for instruction" (1986, p.8). In Shulman's opinion, PCK contains the elements that enable a teacher to guide a student to understand content in a way that is meaningful to that student. Shulman maintains that pedagogical content knowledge can be explained in this way:

that special amalgam of content and pedagogy that is uniquely the providence of teachers, their own special form of professional understanding ... Pedagogical content knowledge ... identifies the distinctive bodies of knowledge for teaching. It represents the blending of content and pedagogy into an understanding of how particular topics, problems, or issues are organized, represented, and adapted to diverse interests and abilities of learners, and presented for instruction.
Pedagogical content knowledge is the category most likely to distinguish the understanding of the content specialist from that of the pedagogue (Shulman, 1987, p. 8).

Schulman's (1986) PCK Model has been the focus of much literature within the field of education. According to Grimmett & MacKinnon (1992), PCK is a central component of teachers' practical knowledge or craft knowledge. van Driel, Verloop, and de Vos (2002) describe PCK as the transformation of different types of knowledge including; "subject matter knowledge, pedagogical knowledge (classroom management, educational aims), and knowledge about context (school, students)" (p.574). Since Shulman's work was published, his PCK Model has been incorporated into many aspects of educational research especially science education (Hewson & Hewson, 1988; Cochran, King, & DeRuiter, 1993; Hume & Berry, 2010). It has also been used within research on teacher education in general (Cochran et al., 1993; Grossman, Smagorinsky & Valencia, 1999; Ma, 1999). Shulman's Pedagogical Content Knowledge Model is important to this study because of its contribution to teacher education; teacher knowledge has come to

focus on the interplay between pedagogy and content rather than treating them as separate entities.

Shulman's model does not come without its critiques; some scholars claim that the PCK Model omits key components and others have created their own version (Cochran et al., 1993; van Driel et al, 2002; Mishra & Koehler, 2006). One such altered model was suggested by Cochran et al. (1993), who proposed a modification of Shulman's Model "based on a constructivist's view of learning and its application to teaching and teacher preparation" (p.265). They called it PCKg replacing Shulman's word *knowledge* with the term *knowing*. Within a constructivist's perspective, Cochran and colleagues' (1993) model emphasizes that "teachers must develop their pedagogical knowledge and subject matter knowledge in the context of two other components of teacher knowledge: teachers' understanding of students and of the environmental context of learning" (p. 265).

Cochran and associates (1993) maintain that teachers must have a clear and deep understanding not only of their students' abilities but also of their students' prior knowledge. The authors argue that "teachers' understandings of the social, political, cultural and physical environmental contexts shape the teaching and learning process" (p. 267); however, it is the student who constructs his or her own learning. In a preservice education program, the learner is the preservice teacher, and according to Cochran et al (1993), teacher educators must design their instruction in ways that allows the student to develop his or her own understanding. Moreover, the authors contend that the preservice teachers must "use their knowledge of each component together to teach their own students within their classrooms. Cochran and associate's (1993) PCKg model, as seen

in the figure below, adds the components, *knowledge of environmental contexts* and *knowledge of students* to Shulman's knowledge of pedagogy and subject matter.

According to Cochran et al (1993), the arrows are radiating from the circles to "represent the changes in a preservice teachers' understanding in each of the four components" (p. 267). The authors write "the overlapping circles represent the simultaneous integration of the four PCKg components which theoretically become so integrated and so interrelated that they can no longer be considered separately" (p. 267).

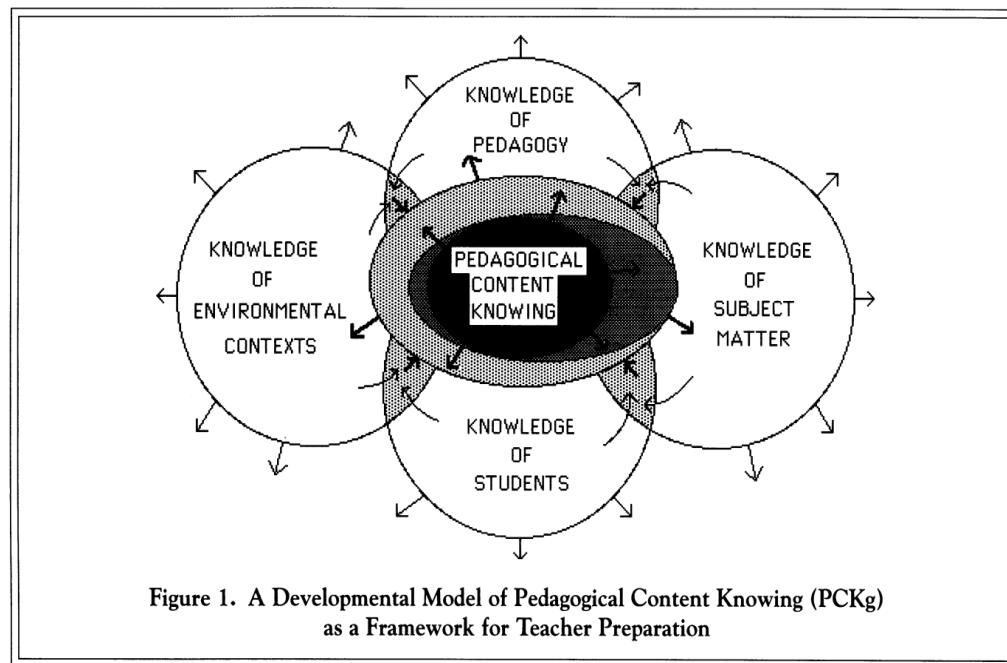


Figure 2: A Developmental Model of Pedagogical Content Knowing (PCKg) as a Framework for Teacher Preparation (Cochran, DeRuiter, & King, 1993, p. 267)

It is not clear that the PCKg model adds significantly to Shulman's model. Although Shulman did not use the term *environmental context*, he did stress the importance of considering the diverse interest and abilities of the learners when making decisions about how to blend pedagogy and content. Shulman did not build his model on

a constructivist's view of learning; there is however, nothing in his model to prevent educators from viewing it from a constructivist viewpoint.

The third model for teacher education to be considered for this study was first presented by Darling-Hammond (2006). She developed a framework for teacher education as a result of her findings from a study of seven exemplary teacher education programs in the United States. Darling-Hammond (2006) identified certain common features in those education programs: a common, clear vision; well-defined standards of practice and performance; a strong core curriculum; extended clinical practice; use of case studies; strong relationships and shared beliefs among school and university-based faculty; and "explicit strategies to help students confront their own deep-seated beliefs and assumptions about learning" (p. 305). She states,

teachers learn to teach in a community that enables them to develop a vision for their practice; a set of understandings about teaching, learning, and children; dispositions about how to use this knowledge; practices that allow them to act on their intentions and beliefs; and tools that support their efforts (Darling-Hammond & Bransford, 2005, p. 385).

Darling-Hammond (2006) developed a model for teacher education by integrating her findings with the framework for teacher education proposed by the National Academy of Education Committee on Teacher Education. Her framework is organized "on three intersecting areas of knowledge found in many statements of standards for teaching" (p. 303). The three key areas of knowledge used in her framework are: knowledge of learners and how they learn; knowledge of curriculum content; and knowledge of pedagogical skills for teaching. She framed these three key concepts with the moral and technical expectations for teacher along with "the belief that, in United

States, education must serve the purposes of a democracy" (p. 304). Darling-Hammond's framework for teacher education appears, on this page, in Figure 3.

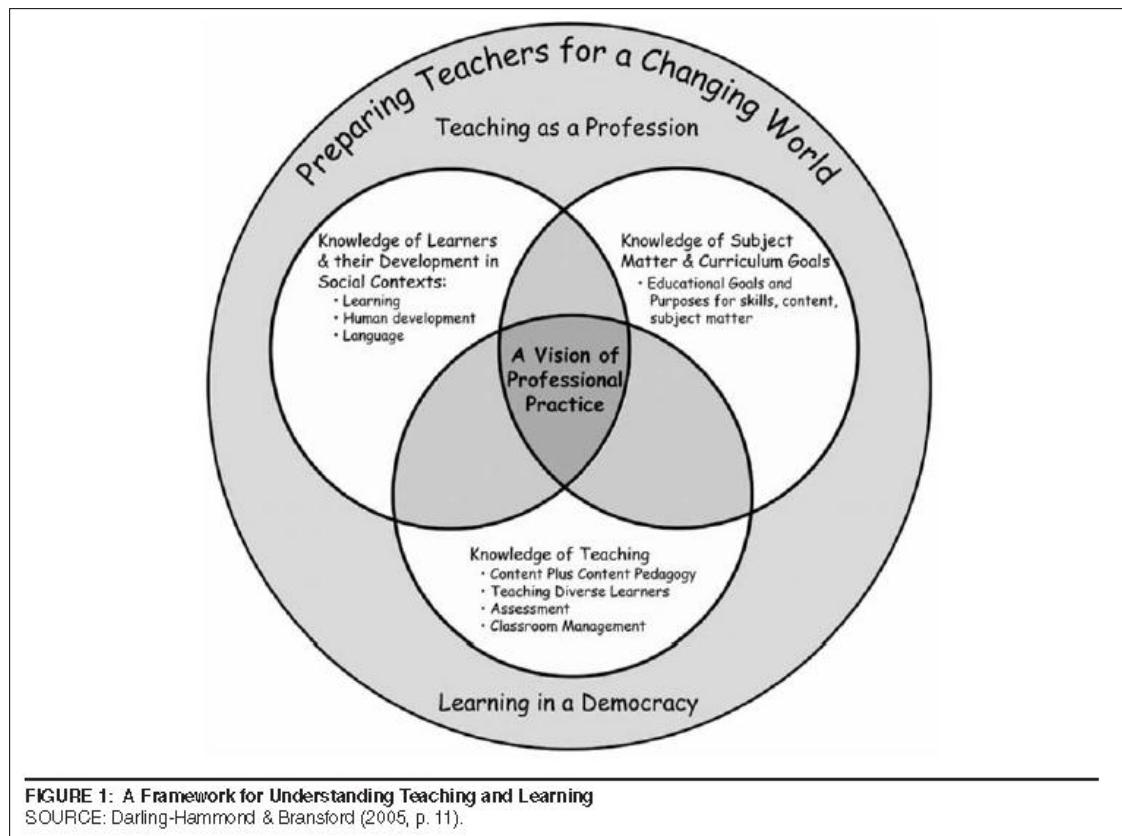


Figure 3: Darling-Hammond's (2006) Framework for Understanding Teaching and Learning (p. 304).

Darling-Hammond's model was established with reference to the American school system and the standards of practice as developed by National Academy of Education Committee on Teacher Education; it is, however, applicable to teacher education in Ontario. An analysis of the Standards of Practice for the Teacher Profession in Ontario reveals a lot of commonality with the standards used in Darling-Hammond's model. The chart below demonstrates how The Standards of Practice of the Teaching Profession in Ontario fit into the Framework for Understanding Teaching and Learning developed by Darling-Hammond (2006).

Ontario College of Teachers Standards of Practice for the Teaching Profession (2006)	Where the Ontario Standard fits in Darling-Hammond's (2006) Framework for Understanding Teaching and Learning
Professional Knowledge	Knowledge of Subject Matter and Curriculum Goals Knowledge of Teaching
Professional Practice	Teaching as a Profession Knowledge of Teaching
Commitments to Students and Student Learning	Knowledge of Learners Teaching as a Profession
Ongoing Professional Development	(although not part of the framework could be part of Teaching as a Profession)
Leadership in Learning Communities	Learning in a democracy

Table 1: Comparison of the Ontario College of Teachers' *Standards of Practice* to Darling-Hammond's (2006) *Framework for Teacher Education*.

An analysis of the three models and how each can be applied to teacher education reveals some strengths and weakness. Shulman's concept of pedagogical content knowledge as a focal point for teaching is central to all the models. Although the terminology is somewhat different, all models contain the three aspects of knowledge: knowledge of learner, knowledge of subject and knowledge of teaching (pedagogy). It seems this is fundamental for any model of teacher education. One important aspect of the models by Cochran et al. (1993) and Darling-Hammond (2006), which is missing in Shulman's PCK model, is the addition of a component to describe the community within which teacher knowledge is framed. Cochran and associates (1993) use the phrase "knowledge of environmental context" whereas Darling-Hammond (2006) includes a surrounding circle in her model which represents the larger community (Cochran & Zeichner, 2005, p. 267).

Darling-Hammond's model recognizes another key aspect of teaching and teacher education with the recognition of *teaching as a profession*. After studying all three models, Darling-Hammond's model does seem to provide the most comprehensive framework for teacher education; there is, however, one important component absent from all three models. A framework for teacher education that corresponds with our current expectations for teaching must include technology. This component is added into the theoretical framework for this study in the section that follows.

Theoretical Frameworks

The focus of this section of the literature review is Mishra and Koehler's (2006) TPCK Model. The elements of their model are explained along with the significance of the intersections of the three components. A theoretical framework for this study is developed by combining the TPCK model with Darling-Hammond's (2006) model.

Mishra and Koehler (2006) used Shulman's (1986) PCK model to develop a theoretical framework for teaching which includes the important element of technology. They state that such a model could "transform the conceptualization and practice of teacher education, teacher training and teacher professional development" (p. 1021). By adding technology to the PCK model developed by Shulman, Mishra and Koehler feel their model gives educators and researchers a new tool with which to analyze, understand, and improve learning. They argue that in the 21st century, providing powerful analogies, illustrations, examples, and demonstrations to support learning requires knowledge of how to integrate technologies most effectively, explaining as follows:

Ranging from drawings on a blackboard or interactive multimedia simulations to etchings on a clay tablet or web-based hypertexts to the

pump metaphor of the heart or the computer metaphor of the brain, technologies have constrained and afforded a range of representations, analogies, examples, explanations, and demonstrations that can help make subject matter more accessible to the learner" (Mishra & Koehler, 2006, p. 1023).

Mishra and Koehler argue that prior to Schulman's work, educators viewed knowledge of pedagogy and knowledge of content as separate entities. They reason that, much in the same manner, knowledge of technology has been treated independently from knowledge of pedagogy and knowledge of content. Mishra and Koehler (2006) emphasize the integration of technology in their pedagogical content knowledge model. They contend, "Teachers will have to do more than simply learn to use currently available tools; they also will have to learn new techniques and skills as current technologies become obsolete" (Mishra & Koehler, 2006, p. 1023).

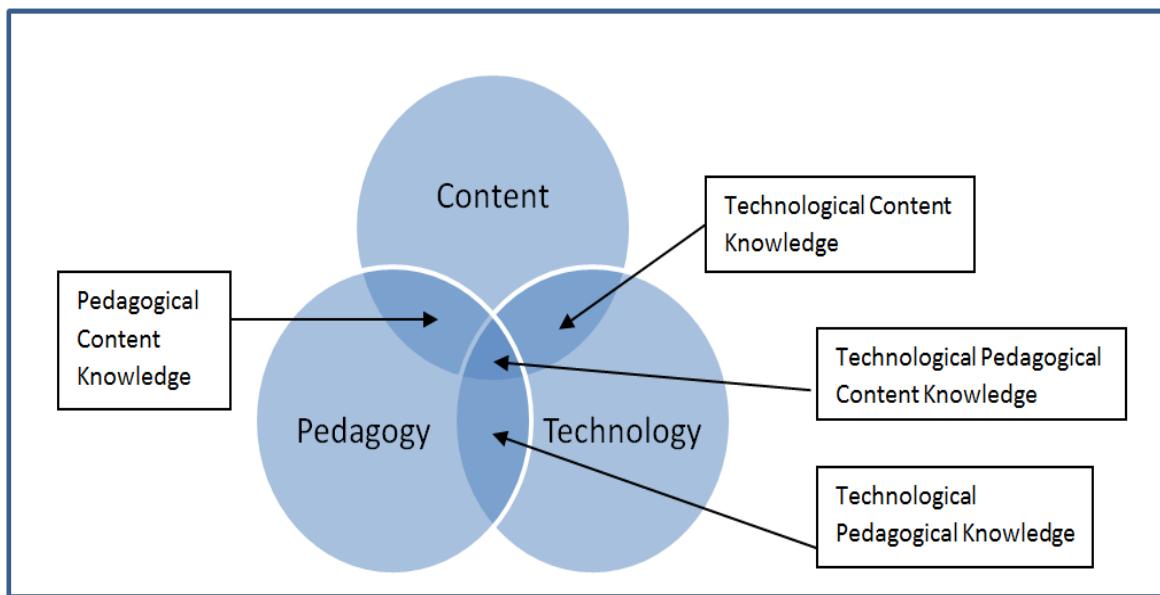


Figure 4: Mishra and Koehler's (2006) TPCK Model (Pedagogical Technological Content Knowledge). The Three Circles, Content, Pedagogy, and Technology, Overlap to Lead to Four More Kinds of Interrelated Knowledge (p. 1025).

Understanding the complexity of their model requires an examination of the meaning of the three components and more importantly the overlapping areas which are labelled in Figure 4. Mishra and Koehler (2006) believe that not only do we have to look at each of the individual components but more importantly recognize the relationships between the components. They look at each of the pairing of the elements as well as the triads that are formed in their model. In this model, a change in any one of the three components requires a change in the other two because the components are dependent on one another. **Table 2** outlines the overlapping areas within the TPCK model and provides an explanation and rationale for each.

Intersecting Categories	Explanation	Rationale
Content Knowledge (CK)	“Knowledge about the actual subject matter that is to be taught or learned” (p. 1026)	Teachers must have a thorough knowledge of their particular field to be able to successfully teach that subject to their students.
Pedagogical knowledge (PK)	Knowledge required “about the processes and practices or methods of teaching and learning” for teaching in general (p. 1026). Knowledge about how “students construct knowledge, acquire skills”, and “develop positive dispositions toward learning”(p.1026)	Teachers need an understanding of social and developmental theories of learning and how those theories apply to their students for successful classroom management and lesson planning.
Pedagogical Content Knowledge (PCK)	Knowledge of the specific pedagogy that applies to a particular subject area. PCK is what “makes concepts difficult or easy to learn” (p. 1027).	Having “knowledge of what makes concepts difficult or easy to learn, knowledge, of students’ prior knowledge and theories of epistemology” enables the teacher to choose appropriate teaching strategies appropriate for different learners (p. 1027).
Technology Knowledge (TK)	Knowledge of technologies and the skills to use those technologies. Because of the changing nature of technology, it is also important that teachers have “the ability to learn and adapt to new technologies” (p. 1028)	Knowledge of technologies is ever changing but increasingly is an integral part of education.

Intersecting Categories	Explanation	Rationale
Technological pedagogical knowledge (TPK)	Knowledge of how technology can be used with a pedagogical goal or how teaching might change with the use of particular technologies.	Understanding the range of technologies that exist and how a particular technology might work with a pedagogical strategy.
Technological pedagogical content knowledge (TPCK)	Knowledge of how to use “pedagogical techniques that use technology in constructive ways to teach content”. TPCK involves the ability select an appropriate pedagogy and work with a particular technology to approach a particular topic in a manner that impacts student learning.	Quality teaching is a result of interweaving knowledge of technologies with strong subject knowledge and pedagogical techniques. “Productive technology integration in teaching needs to consider all three issues not in isolation, but rather within the complex relationships in the system defined by the three key elements” (p. 1029). This intersection of the three components is defined as technology integration

Table 2: An explanation of the TPCK Model (adapted from Mishra & Koehler, 2006)

The TPCK model can be valuable for studying and analyzing teachers' use of technology within the classroom. Using technology in ways that impact student learning requires more than technology knowledge (TK) (Mishra & Koehler, 2006). When teachers incorporate new technologies into their pedagogy to change student learning within the classroom, it would be considered “transformative” (Hughes, 2005, p. 281). The addition of technology in the TPCK model makes it much more applicable for examining teaching and teacher education in the 21st century.

The TPCK model is an improvement over Shulman's model as a framework for teacher education as a successful program must include knowledge of technology as well as knowledge of pedagogy and subject content; it still does not, however, encompass all that is required for good teacher education. Teachers must be more than technicians who

rely solely on a body of knowledge to facilitate student learning. This view of teaching fails to recognize the social context of the profession which relies on the teacher's previous experience and beliefs as well as the unique nature of each classroom (Cochran, et al., 1993; Barnett & Hodson, 2001). The complexity of teaching means that good teachers use their knowledge to provide students with "situationally appropriate learning experiences for their students" (Barnett & Hodson, 2001, p. 433). A model for teacher education must recognize the social context of teaching, that ability of a teacher to assess the particular students within a classroom and choose appropriate actions for each circumstance.

Darling-Hammond's (2006) model acknowledges the importance of the community of learners and professionalism in teacher education. Setting the TPCK model in a circle containing those additional elements creates a framework which includes the key aspects of a teacher education program. Teacher knowledge must not be considered in isolation or separate from teachers' sources for that knowledge. Teachers acquire their teaching knowledge from a number of different sources including; classroom practice, personal reflection and from the "*wider educational landscape*" (Barnett and Hodson, 2001, p. 437). Barnett and Hodson (2001) write that teachers not only learn from other teachers but also from non-teachers such as "school administrators, government regulators, and parents" as well as the organizations that establish the professional practice for teachers and are responsible for collective agreements (Barnett & Hodson, 2001, p.437). The knowledge gained from these outside organizations is important for new teachers; a teacher education program has a responsibility to ensure

preservice teachers are exposed to both the professional side of teaching as well as the social community of teaching.

Figure 5 is a visual representation of a proposed theoretical framework for preservice education which incorporates both Mishra and Koehler's (2006) TPCK model and some aspects of Darling-Hammond's (2005) model. This framework for teacher education acknowledges the importance of factors outside of the pedagogy, content, and technology knowledge that are the bones of a teacher education program. A preservice education program is a community of adult learners who work and learn together by sharing their knowledge and experiences. Of equal importance is the recognition that teaching is a profession and as such has certain professional expectations and standards. A preservice education program acknowledges the importance of these factors and includes them in its program.

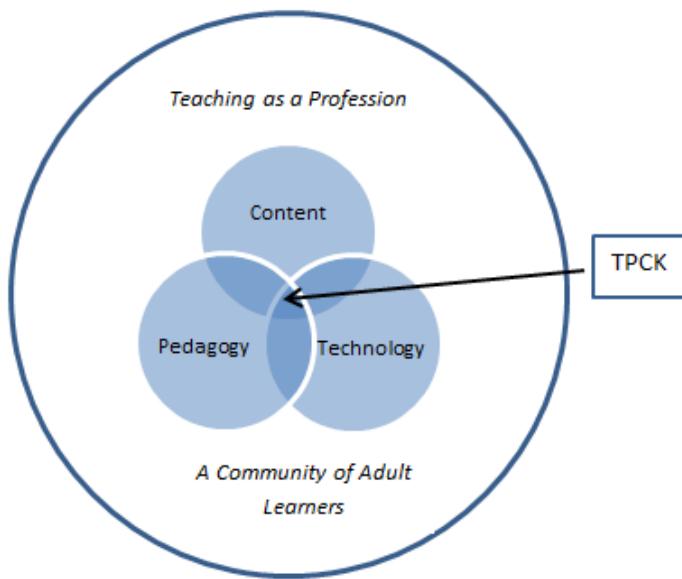


Figure 5: Smith's (2012) Theoretical Framework for Teacher Education. Based on Mishra and Koehler's (2006) TPCK Model with the addition of aspects from Darling-Hammond's (2006) model.

Summary of Literature and Implications for the Study

Reviewing a wide variety of scholarly readings in the areas of adult education, technology integration and teacher education has provided a research focus for this study. Teacher education programs looking to be effective and current must take into account the prior learning experiences and other characteristics of the adult learner while enabling preservice teachers to develop the knowledge and skills that will make them effective teachers in 21st century classrooms. Knowledge of subject content alone is not sufficient for good teaching. Teachers must have the knowledge of how to use specific pedagogies with a subject to make the concepts easy for the diverse learners within their classrooms. Today's teachers must also recognize the impact that technology has on society and be prepared to utilize digital technology in their classrooms in ways that have a positive impact on student learning.

The prior educational experiences that all preservice teachers bring to their preservice program, can hinder their ability to adopt new teaching pedagogies and to embrace the use of digital technology within the classroom. Teacher education programs must not only acknowledge the prior knowledge of preservice teachers but more importantly, work to change attitudes and beliefs so that graduates do not just teach the way they were taught. These changes are most successfully brought about by establishing a community of learners within the faculty. Teacher education programs have the responsibility of preparing teachers for the classrooms of the 21st century and those classrooms must integrate technology in ways that effect student learning.

Rationale for This Study

As previously mentioned, there is a lack of research in the area of teacher education and there is even less research which looks at the impact of teacher education once the teachers are working in the classroom (Russell, McPherson & Martin, 2001; Darling-Hammond, 2006). The program under study is a relatively new program, having only been established eight years ago. As well as being a new program, all preservice teachers have a personal laptop and one of the goals of the program is to integrate technology into all aspects of the program. Several researchers have written about the difficulty of getting teachers to use technology in the classroom and others have called for teacher education programs to assume a role in improving the use of technology by teachers (Ertmer, 2005; Hughes, 2005; Wiske, 2005). Interviewing teachers about the impact of their teacher education program on their teaching and specifically asking how the program had an impact on their use of technology could provide directions for further research.

These components have led to the following conceptual framework for studying how practicing teachers value their teacher education.

Purpose of this study

This research focuses on how teachers' are influenced and changed by a preservice education program with a technology focus and how that experience extends into their subsequent teaching practice. The general research questions guiding this project are:

1. How do graduates of a technology-focussed preservice program value the various aspects of their program?
2. How are these values reflected in their teaching practise?

3. How is technology reflected in their pedagogy?

Conceptual Framework

Based on the literature reviewed, my theoretical framework and the research questions, I developed a conceptual framework for the study of the teacher education program. The conceptual framework is primarily based on the work of four researchers: Cochran-Smith (2001), Darling-Hammond (2006), Mishra & Koehler (2006), and Shulman (1986). A visual representation of the conceptual framework is presented in Figure 9. The conceptual framework is based on the premise that understanding the learning that preservice teachers experience while in their teacher education program requires acknowledgement of both the formal and the informal aspects of the program. The formal aspects of a teacher education program include the knowledge gained by the preservice teachers from their courses and field placements. In the visual representation of the conceptual framework, these formal aspects of the program are represented by four hexagons located in the centre of the diagram. Three of the categories of analysis for the formal aspects for the formal aspect of the program are based on Mishra and Koehler's (2006) TPCK model: content knowledge, pedagogy knowledge and technology knowledge. The fourth formal aspect of the program represents the learning that occurs as preservice teachers apply their knowledge during their practicum experiences.

In recognition of the other aspects of a teacher education program that also contribute to the knowledge gained by a preservice teacher, I have used four rectangles to represent informal aspects of the program. Two of these aspects relate to the learning that comes from interactions and relationships that preservice teachers have not only with

other preservice teachers but also with faculty and their associate teachers. Learning about the teaching profession and what it means to be a teacher is another of the informal aspects of the program. The final category for analysis is represented by the rectangle labeled teacher reflection. This category represents the learning that occurs as preservice teachers reflect on their experiences and the knowledge they have gained from all aspects of the program to generate new understandings.

In creating the conceptual framework, I wanted to acknowledge that preservice teachers enter the program with different backgrounds, which can impact their learning. At the left of the diagram are three ovals, labelled: beliefs, subject knowledge, and prior experiences. Each of these will be slightly different for each candidate and can influence how they perceive experiences and their ability to adopt new practices. Along with the subject knowledge they gained through previous education, and prior experiences, they enter with specific belief systems formed from their life experiences. Although these factors are not categories of analysis for this study, they do influence other categories which are used to analyze the data.

The right side of the conceptual framework represents the time after graduation when teachers are into their teaching careers. All those interviewed for this study are presently teaching and they were asked to reflect back on their experience in their teacher education program. The data from their interviews was categorized based on seven categories of analysis, represented above the circle labelled, *Reflecting Back on the Program*. **Figure 6** represents the Conceptual Framework for Graduates' Reflections on a Preservice Education Program.

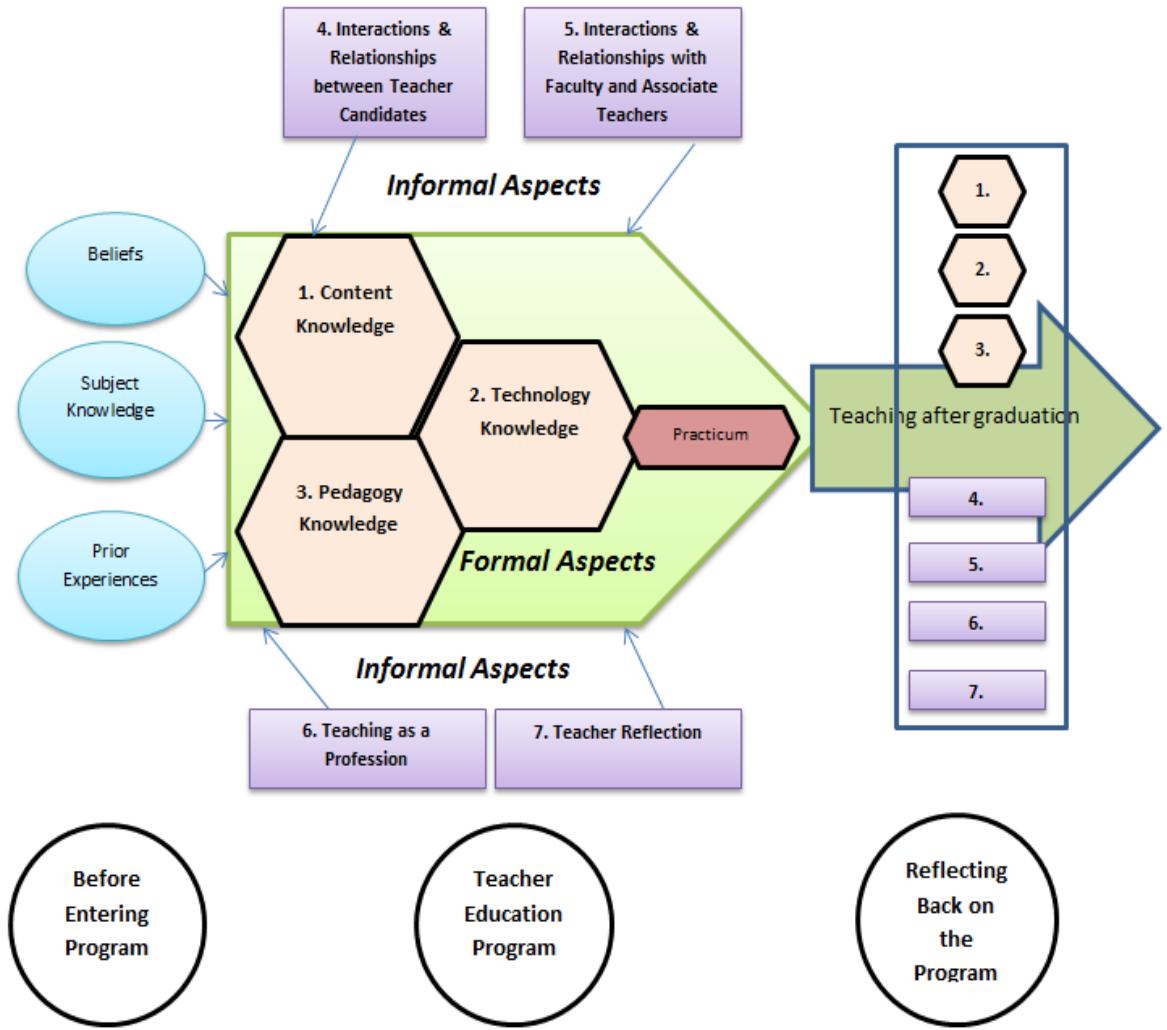


Figure 6: Conceptual Framework for Graduates' Reflections on a Preservice Education Program.

Part Three: Methodology and Limitations

In seeking information concerning the effectiveness of a teacher education program, this study was designed to reveal the voices of practicing teachers concerning their perceptions of the value of their experiences during their year in their teacher education program. This research study employed a qualitative approach. Glesne (2006) describes qualitative researchers as ones who “seek to understand and interpret how the various participants in a social setting construct the world around them” (p. 4). Merriam (1998) states that the key concern in qualitative research is: “understanding the phenomenon of interest from the perspective of the participants, rather than the researcher’s” (p. 6). Merriam describes four other characteristics of qualitative research: the researcher is the primary instrument for data collection and analysis; it usually involves fieldwork; primarily employs an inductive research strategy; and is deeply descriptive.

A qualitative method was chosen for this study in an attempt to develop an understanding of what graduates value from their teacher education program. As demonstrated by the conceptual framework, such a program is multi-faceted and complex; therefore, a qualitative study which is descriptive should yield a better understanding of the perceptions and beliefs of the graduates. Support for the use of qualitative studies comes from a study conducted by Bai and Ertmer (2008) on the pedagogical beliefs and attitudes towards technology in relation to the beliefs and attitudes of their teachers. They recommended that qualitative studies be designed to explore such relationships, because the multiple-choice test used in their study limited their ability to describe these relationships (p. 110). Since teachers’ views of their

preservice education and their recommendations for the future are indeed complex issues with multiple variables, it was deemed that this study is best suited to qualitative research.

Interview Questions

The interview questions were designed based on the research questions, literature and from the researcher's professional practice. According to Glesne (2006), questions about experience or behaviour tend to be the easiest for respondents so the first question was designed to establish a rapport and put the interviewee at ease. Glesne (2006) also advises that questions about the past or present tend to be richer in description than asking participants to predict the future. The questions were designed to be open-ended, but in instances where the question did not generate a full answer, probes were used to encourage a more detailed response.

- (Q 1) Describe the education related jobs that you have held since graduation.
Describe your current role in the workforce.
- (Q 2) What do you recall as the most significant learning aspects of your BEd year at [the University]?
- (Q 3) How well did your experiences within the program match your expectations of the program and your needs within your current role in the workforce?
- (Q 4) Could you please comment on the skills and knowledge you use in your current role and how well the experiences afforded by the BEd program assisted you in preparation for your present role?
- (Q 5) How are you currently using digital technologies in your classroom? Please describe with as much detail as possible.
- (Q 6) Comment on how the experiences afforded by the BEd. program enabled you to deal with digital technologies relative to the level of use of digital technologies in your current role?
- (Q 7) If you had a chance to give feedback on the BEd. program at [the University], what would you like to say?

Research Design

The participants for the study were selected by convenience from a list of graduates who had participated in an on-line survey conducted by the faculty of education. At the end of the survey, participants were asked if they would agree to a further, more lengthy, one-on-one interview at a mutually agreeable time. Of the 200 who completed the on-line survey, 20 expressed a willingness to participate; however, it was only possible to arrange interviews with eight.

Each participant was contacted individually so that a mutually acceptable time for the interview could be established and the parameters for the study could be discussed. Participants were sent a consent form which advised them that the study had been reviewed and approved by the university's Research Ethics Board. The consent form also indicated the interview would be about 45 minutes in length and that their privacy and confidentiality would be protected. Identity codes were used for participants and no names of schools or school boards were revealed or used in any report or publication. Participants were also told that they could withdraw from the study at any time up to two months after the interview had been conducted. They were also informed that once the interviews were conducted, they would be sent a verbatim copy of the interview so they could edit their responses. A copy of the consent form was received from all the participants prior to the interviews. A copy of the consent form is included in Appendix A.

The candidates were interviewed in person, on the phone or using Skype. Prior to the interviews, each participant was sent a copy of the interview questions to give him or her some time to think about the questions. The interviews, which varied in length from

twenty-five minutes to fifty minutes, were digitally recorded and then transcribed with their prior permission. The participants received a copy of the text by email within fifteen days of the interview and were given the opportunity to modify their responses. Despite being given the opportunity to edit or add additional comments, none made any alterations to the original transcript. The verbatim data provided direct quotations that were used to present the perspectives of the participants with the exception that identification of educational institutions or faculty was removed.

Research Participants.

The eight teachers who participated in the study had graduated from the faculty of education within the past six years with four graduating from the P/J program and four from the I/S program. The participants are seven females and one male with a range of teaching experience from one to five years and all teach in different schools located in four different school boards. A summary of the participants, their BEd program, and their teaching experience is included in **Table 3**.

Code Name	Graduation Date	BEd. Program	Teaching Experience	Other notes
Donna	June 2008	PJ	Asia: various grades (elementary)	
Elaine	June 2008	PJ	Ontario: LTO's - alternative education secondary	Second career
Mary	June 2009	PJ	Ontario: LTO's - elementary	
Patty	June 2005	IS	Ontario: Math and Computer Science (secondary)	
Anne	June 2008	IS	Ontario: Science (secondary)	
Susan	June 2005	IS	Ontario: Science (secondary)	
Lara	June 2008	PJ	Ontario: French (elementary)	Second career
Ken	June 2006	IS	Ontario: Science & Engineering	Second Career

Table 3: Summary of the Research Participants

Data Analysis

The transcribed interviews were analyzed using the “Constant Comparative Method” developed by Glaser and Strauss (1997) as the means of developing grounded theory. Merriam and associates (2006) state, “a grounded theory consists of categories, properties, and hypothesis that are the conceptual links between and among the categories and properties” (p. 159). Initially, the answers for each question were studied for recurring themes and temporary codes were assigned to each theme or category. As other similar comments were identified and placed together, they were compared with existing comments in the category to find “recurring regularities” (Merriam et al., 2006, p. 180) so that the final categories could be created and named. Once the final categories had been identified, the data was combed again to collect and regroup the quotes from other questions which fit in the category. The categories were then grouped not based on the individual questions but on the data from all the questions together and regrouped along with the supporting quotes to produce themes that formed the major findings for analysis. It is this ongoing comparison of ideas with each other that is the foundation of the constant comparative method. Finally the data were grouped into the seven categories of analysis outlined in the conceptual framework.

Limitations of the Study

There are recognized limitations within this study that could be addressed in future research. The sample size was small, involving only eight participants and the teachers who were interviewed were not randomly selected so the results from this study cannot be generalized. The survey component of this study also provided additional data that are yet to be analyzed.

It is important to acknowledge my background and experience in education as it has an impact on this study. I was a science teacher for 20 years who had a number of student teachers in my classrooms. As well as my extensive teaching experience, I spent four years as a District President of a teacher federation and was also an administrator in secondary schools for 13 years. Furthermore, I am currently an instructor in the teacher education program that is the subject of the study. My experiences in education could be considered a limitation or perhaps are best described as an unique lens through which I viewed and analyzed the data.

As Glesne (2006) points out, although it is easier to do “backyard research”, there are possible problems as well (p. 31). She argues that it is more difficult being objective as you enter the study with a specific role. In this study, I did teach two of eight graduates that I interviewed and that could have had an impact on their responses to my questions. It could be argued that although qualitative studies are required for deep insight into teachers’ perceptions of their teacher education, this study did not qualify as an in-depth study. The interviews were relatively short given the scope of the questions and the results are subject to the constraints and limitations of one-on-one interviews. Although I conducted a practice interview, this was my first experience with in-depth interviewing and the use of probing for more in depth responses. A more experienced interviewer may have been able to get more detailed and descriptive responses. Triangulation of the data, with findings from the online survey would have added value to this study. Despite the limitations, resulting insights from this study do provide faculty of education programs with some insights into their program from the perspective of their

graduates. The results may be useful in providing a direction for future research in teacher education.

Part Four: Findings

This section summarizes the findings from the eight interviews conducted with teachers on their perceptions of their preservice education program. The data from the interviews was transcribed verbatim and then coded according to themes suggested by the literature and the theoretical framework for this study. The theoretical framework was developed by combining Mishra & Koehler's (2006) TPCK model with components of the model for teacher education developed by Darling-Hammond (2006).

I present the data primarily in correspondence with the seven categories of analysis outlined in the conceptual framework presented previously in this report. In addition to those categories of analysis, I begin with a section which reveals some of the teachers' overall perceptions of the value of their teacher education program. The next sections focus on what the interviews reveal about each of the seven categories of analysis outlined in the conceptual framework. Finally, I include a section on the perceptions of the teachers on future directions for the education program.

Teachers' Views of Their Teacher Education Program

The teacher education program in this study began as an intermediate senior program in 2004, and in 2007 a P/J program was added, so all those interviewed had less than eight years teaching experience. The eight teachers who were interviewed represent graduates from both the I/S and the P/J programs. The four teachers, who graduated from the I/S program, obtained full-time teaching jobs in secondary schools, teaching in their subject area, immediately following graduation. That was not the case for the four teachers who graduated from the P/J program. Although all are employed in education, they are not all working in full-time contract positions or in a P/J English classroom.

Two worked as day-to day supply teachers before obtaining a number of long term occasional jobs. One of those teachers is currently working in an alternative program with high school students. A third P/J graduate was hired into a full-time French position at the elementary level. She is bilingual and, after graduation, became qualified to teach French by taking an additional qualification in French as a Second Language. The final graduate of the P/J program has taught in Asia and Africa since graduating.

Although teachers were not asked directly to comment on what they thought of the program, some responses involved references to the program as a whole and are reported separately from other comments which focused on specific aspects of the program. One teacher, who graduated from the I/S program, comments on how prepared she felt for teaching,

I feel that [the university] prepared me so well for the teaching world. I almost felt that I was an expert coming into teaching. I mean, of course, there were times when I had my low points because I was just so stressed, but I never had to question how do I plan a unit or how do make a lesson plan or how do I look for resources when I cannot think of anything of my own.

A second I/S graduate used very similar words when describing how well prepared she was for teaching. This teacher also still feels current even though it has been a number of years since s/he graduated. The graduate comments,

I cannot thank [the university] enough for giving me the experience that I had and the opportunities that came from it.... [The university] prepared me very well and I am so up-to-date on the practices that a teacher should have in the 21st century. So definitely, I feel that they have done a very good job in preparing me and I feel very prepared to this day. I felt well prepared in all of the areas and the areas that exceeded my expectations would be the technology area.

Two of the graduates from the P/J program commented on how their views of the program changed once they had been teaching for a while. One of the teacher's comments focuses on the *busyness* of the preservice program,

I think if you interviewed me two years ago, I would have had a different answer....I remember at the time when I graduated, feeling, "Can I do this on my own?". In my mind, I could not connect everything or know how I was going to walk into a classroom in September and remember all I learned. I felt overwhelmed when I was in the program and when I left, I just did not see how it was all going to work. I think the most significant thing I learned was how busy teaching really is. ... I saw a lot of other teachers struggle with it but when I started in September, I was not as overwhelmed because I was used to the go, go, go.

The second P/J graduate remarked on how her views of the program changed once she was actually teaching. She indicates that once she was in the classroom, she developed a better understanding of the reasons for the various aspects of the program. She describes her change of attitude this way,

When I was first out, I was just glad to be done. Some things would be negative about the program, but now that I had some time to think, and actually have experience in the field and in my own classroom, I look back and realize – hey, things were not so bad and they did it for a reason. But when you are doing it, you complain a lotbut for the most part [the university] had a pretty great program and I feel fairly prepared to go in and do what I am doing.

The next sections of the findings deal with the data using the categories of analysis from the conceptual framework. First the data concerning the formal aspects of the program is presented beginning with the three types of knowledge: content, pedagogy and technology; followed by the data which demonstrates the intersection of the different types of knowledge. The final four sections deal with the informal aspects of the program.

Content Knowledge (CK)

This section outlines the findings from the eight interviews that reveal the teachers' perceptions on the value of *content knowledge* obtained from their teacher education program. Mishra and Koehler (2006) define *content knowledge* as "knowledge about the actual subject matter that is to be taught or learned" (p.1026) and teachers had a number of comments on the value of this aspect of their teacher education program. In the I/S program, subject content is dealt with in the three-credit courses which preservice teachers take each term in each of their two *teachable* subjects. The courses for the *teachable* subjects cover all contain some subject content according to the Academic Calendar for the university. For example, the course description for I/S Mathematics includes this statement: "Topics will include: mathematics content in courses taught in these divisions, relevant Ontario Ministry of Education guidelines, policies and resource documents, teaching philosophies, instructional and assessment techniques appropriate to mathematics" (University academic calendar, 2011, p. 230). The Academic Calendar course descriptions of all the *teachable* subjects in the I/S program contain a similar sentence. Therefore, although the amount of subject content varies, it is a component of four of the courses taken by I/S preservice teachers.

Two of the teachers from the I/S program commented on content knowledge, explaining why this part of the program was not very important to them as some other aspects of the program. One makes the comment, "I was more interested in how to use stuff in class". The other, who comments on subject content, explains why s/he did not find this particularly useful. The teacher contends,

When you go into teacher's college, you have been to University for four years and learned about your subject...I mean, I needed to have a

background in biology and chemistry to get into the Bachelor of Education program. ...[h]ow you are going to communicate that information to your students is what you are so interested in learning when you enter the bachelor of education program. . . . the subject courses were good but they were not as important to me as classroom management and assessment and evaluation. . . . there was some review to do but it was not the subject areas that was as important to me.

The program for the P/J program is organized differently from the I/S program but they also take a number of courses which have a subject focus. Over the year, all P/J preservice teachers take six credits in language arts, three credits in each of science/technology, mathematics and the Arts and 1.5 credits in social studies and physical education. The descriptions of these courses, in the Academic Calendar, all contain a similar component, "The curriculum content will include a review of related curriculum documents and supporting resources as well as a review of current subject-related theory, teaching strategies, and classroom practices" (Academic Calendar, 2011, p. 231). Much like the subject-focused courses for the I/S program, subject content is a part of each of these courses. Two graduates from the P/J program felt the subject content was not as useful as other aspects of the program. One of the teachers, interviewed, explains it this way,

An area that I did not find as valuable was the subject matter; the sciences, the math, the language. Not that the information was not good, but teaching kindergarten is so different from teaching grade eight or grade seven....that you need a whole year just to learn the curriculum for each of those grades in science or just in math.

The second PJ teacher comments on how relatively easy it was to obtain subject resources, "there are documents on the internet, there are other staff members that would give you worksheets and tell you how to use the textbooks and they come up with creative art ideas".

The data does not suggest that the teachers were dissatisfied with the quality of the subject material but rather they indicated that it was not as useful as other components of their preservice program. There is some suggestion, from the findings, that the subject courses provided the graduates with valuable resources for their teaching. Two of the I/S graduates found the subject courses gave them valuable resources which they were able to use in the classroom. One remarks, "I really liked that in our teachable courses, most of the assignments that we did were applicable and thing that we could take out into the field and use. So I ended up using a lot of those assignment ideas, lab ideas". Another makes a similar comment, "I felt that I was given the tools to be successful in the classroom and just a wealth of resources". Both of these teachers ended up teaching in their subject areas.

The findings indicate that some of the teachers did not find the content knowledge, which was the focus of their subject courses, to be particular useful preparation for teaching. Those who did find value in their subject courses indicated that it was the resources they obtained in those courses which made the courses useful. The data do not reveal any evidence that the subject courses helped them learn the content for a particular subject. Next, I present the findings on the graduates' perceptions of the value of pedagogical knowledge presented in the program.

Pedagogical Knowledge (PK)

Mishra and Koehler (2006) use the term *pedagogical knowledge* (PK) which they define as knowledge "about the processes and practices or methods of teaching and learning" (p. 1026). For the purpose of this study, *pedagogical knowledge* will include: using appropriate teaching strategies to deliver content; assessment and evaluation tools;

teaching and learning theories; and how to apply those theories for successful classroom management and lesson planning.

According to the interview data, the teachers placed considerable value on their experiences and exposure to different pedagogical approaches within their preservice program. One explained learning new pedagogy this way saying “The specific techniques, like ‘think, pair, share’ are specific to teaching and not specific to any other industry. They were brand new techniques to me, and they stick out in my memory because I use them all the time.” Another explained the difference between subject knowledge and being able to teach that subject, using her undergraduate program as an example. She recalls, “[S]ome of my professors in university . . . were extremely bright, but they were horrible teachers. They knew a whole lot about the subject they were teaching, but had no idea how to communicate it to somebody who did not know too much about it.”

Several of the graduates focused on the applicability of the varied teaching strategies they had learned during their preservice program. Comments from two different graduates were: “I use the strategies, I learned, in the classroom on a daily basis”, and, “the different teaching strategies were really helpful....I have used a lot of them.” Two other teachers spoke specifically about the optional TRIBES training which was offered to preservice teachers during their teacher education program. (The TRIBES TLC course is a 24-hour training session for teachers which provides participants with a variety of teaching strategies that can be used to develop a collaborative classroom environment). Both of the teachers who referenced the TRIBES strategies also commented on the usefulness of the TRIBES book as a resource; “the [TRIBES] book is

so valuable to me, I use it weekly, and I shared it with everybody". Another said, [TRIBES] one of the best things that I have ever done. Having that TRIBES book as a supply teacher is a really great thing to have."

A number of those interviewed referenced the way strategies were modeled by the faculty. Some were very impressed with way the faculty modeled teaching. One of the I/S graduates declares, "I think that teaching is both an art and a science and, yes, you would learn the science from reading stuff and reading articles, but to actually see your instructors and fellow peers perform, that was really cool." Another teacher comments on a specific faculty member saying, "[S]he was outstanding, just the ideas and the way that she demonstrated how a good teacher behaved in a classroom. She would use those skills, even teaching us as adults, and I certainly go a lot out of it."

The data suggests that the modeling of strategies enabled preservice teachers to view teaching in different ways. One teacher, recalling a particular incident which occurred in class, says, "One day the professor came into the classroom and [she was at the back of the class. Everyone was turning around, thinking why isn't she at the front?....[She] was just demonstrating that you don't have to always teach from the front of the classroom, that you can move around."

A strong theme revealed by the data, was the impact on the teachers of watching faculty model different teaching strategies. One of the graduates from the P/J program described how different teaching strategies were modeled first by faculty, prior to giving preservice teachers the opportunity to practice it themselves. In this case, the faculty member also made it very easy for them to compile their own list of teaching strategies. The teacher, describing her experience, says,

I think that for the most part, things were modeled very well and the teaching strategies were really helpful in modeling them and [then] doing them after. I have used a lot of [different teaching strategies] a jigsaw, the four corners [and] the graffiti. [The professor] made a spot on the web page, just for teaching strategies, so that I literally just went and copied and posted them in my file so that I can refer back to the different strategies, which I found super helpful.

Others graduates had similar comments and this teacher revealed the way the activities were discussed after the modeling, commenting,

[W]hat the teachers would do is model the activities with us and [then] they would have us brainstorm something that was pertinent to what we were learning, by using the techniques they were trying to show us how to use it in a classroom as well. It was good to see how those things were used and have the behavior modeled for you. It happened a lot.

The data also suggest that seeing the strategies modeled in their preservice program with adults did not always translate perfectly into a classroom of children. This preservice teacher describes how things are not the same in a classroom of children, commenting,

Even though you model ‘think, pair, share’ when you are dealing with adults, the adults cooperate. . .When you are dealing with kids, it is different. So yes, the techniques they modeled were great and I used them, but I had to sometimes think on my feet. There is something about learning and working with children that is different from learning and working with adults.

There were only a few comments about faculty successfully connecting their teaching practice to theory. One teacher, recalling how the faculty effectively integrated theory says,

She modeled how to teach, as she was teaching us the theories. When I was stuck teaching I would remember stuff from that class. I learned so much from that course, and I use pretty much everything. She used a lot of the TRIBES methods and that really helped me.

Another graduate talked about the importance of doing “practical things to use in the classroom.” She went on to explain her views on how studying theory should fit into the program. “I think there is a spot for the theory, but I would think you should use the theory to explain why we would should use this skill in the classroom as opposed to [saying], ‘just read this article and what do you think about it’”.

Not all graduates felt the material learned in the preservice program translated well into real classrooms. One graduate from the P/J program says, “[U]nderstanding assessment has been useful. I rarely get time to use the fancier techniques, especially in grade one. I mean, using rubrics in grade one is very difficult as the level of questioning is lots of knowledge, a little bit of synthesis, a little bit of analysis, we are not getting into the higher thinking.” Another teacher had a specific concern that what she had learned within the program had not prepared her for supply teaching. She says, “You are just thrown in there, you are a brand new teacher, I don’t have a bag of tricks – [the University] talked about having this bag of tricks, but where do I get it and what is in it?”

The findings indicate that modeling of teaching strategies by the faculty was prevalent throughout the program and that the preservice teachers were given opportunities to practice the strategies. Fewer of the graduates recognized that the faculty used modeling to tie theory to practice. The value of acquiring new teaching strategies from their preservice program was a strong theme revealed by the data.

There were fewer comments from the teachers on the value of their exposure to assessment and evaluation strategies during the program. One teacher, who did comment, indicates she learned the importance of assessing student learning more often than evaluating. She remarks, “I came out understanding the difference between assessment

and evaluation, and to assess more often and evaluate less often. Just different techniques and tools to use for assessing and evaluating students as opposed to the typical test unit; we were given lots of ideas to use." However, one of the graduates of the P/J program expresses uncertainties about her ability to use her assessment of students to create a mark for the report card. She states,

But one thing that I did not quite understand was how to take a mark and turn it into a grade on the report card. I know everyone does it different, but we could have talked about different ways of recording assessment, because that was a big challenge for me. I do not know what to do after I marked all of the rubrics. What do I do because I have knowledge, thinking and communication?

I have separated out the comments that deal specifically with strategies for classroom management. Somewhat unique to this teacher education program, is a course specifically designed to address the issues involved in managing a classroom. The course is part of both the P/J and I/S programs. The data reveal that a number of those interviewed, most notably the teachers who had graduated from the I/S program, found this course particularly valuable. There were also several teachers who commented on the importance of classroom management for successful teaching. One graduate expresses her/his views on the course, "The classroom management course was fantastic, and I just found that it was something that I became more comfortable with than a lot of new teachers from other schools because of the skills I was given." Another teacher believes the course gave him/her an advantage over teachers who did not have the same preparation. S/he states,

I think the course in classroom management was really valuable because I find a lot of other teacher candidates did not have the opportunity to take a course like that. If you cannot manage your class, you cannot expect to teach anything. So having the skill first hand and having that when I started

teaching was really beneficial because I can focus on being an effective teacher rather than controlling my classroom.

A third graduate spoke with a similar enthusiasm about what s/he learned in his classroom management course. When asked to discuss what s/he would consider to be the most significant learning aspects of the program, s/he responds,

"[O]ne [component] was classroom management, that was huge. I believe it was [name of faculty member] who was teaching classroom management, and that was a big thing for me because it was used right off the bat. It stuck with me because of the lessons we learned and that if we don't have our class under control then we can't really begin to teach them".

Only one of the graduates from the P/J program commented on the way classroom management had been dealt with in the program. Like the others, she highlighted the importance of being able to manage a class to teach effectively. She reasoned that the subject content was mandated by the Ministry and that was "the easiest part of teaching; the harder part was thinking of how to get the twenty kids to do the math activity, and we learned some really great interactive techniques that only worked if you have a cooperative classroom." It was evident, as she went on to describe her experiences more fully, that she did not find all of the classroom management techniques that she learned during her course work, transferred easily to the classroom. She feels that there was not enough time spent talking about how to apply the different strategies in "real world situations." She explains,

tapping your fingers on the desk is good, [these strategies] work in the older grades that have one of those great classrooms, where you can just give the eye and the kids will settle down. Like in grade one, it takes about 6 months to build a relationship with the kids before they figure out what *your eye* is. Then they figure out what fingers tapping on the desk means.

The findings indicate that the graduates found value in being exposed to a variety of teaching strategies and most identified the modeling of the strategies by faculty as

being very valuable. All the teachers, who graduated from the I/S program, identified the course on classroom management as being particularly important to the development of their teaching practice. The one graduate from the P/J program who commented on the classroom management strategies felt that the strategies were not always appropriate for the younger grades. In the next section, I present the findings on the integration of pedagogy and content.

Pedagogical Content Knowledge (PCK)

The term *pedagogical content knowledge* is used by Mishra and Koehler (2006) to mean knowledge of the specific pedagogy that applied to a particular subject area. They stipulate that this is what makes the concepts within a subject easy to learn. This would include taking into account different learners and theories of epistemology when choosing teaching strategies. All preservice teachers take courses which are based on specific subjects and according to the Academic Calendar for the university, ‘instructional and assessment techniques appropriate to [subject]’ are part of the course (University Academic Calendar, 2011, p. 230). Developing unit plans, which incorporate the content along with instructional and assessment strategies, would be an example of PCK. One of the P/J graduates commenting on how much she had learned from a long-range plan assignment, says,

The long-range planning, that was probably one of the best assignments that we did, and it really, really prepared me for when I was trying to plan for my LTO. I actually used the template that she had given and just kind of adapted it to what I had and then filled it in that way.

Another teacher had a very similar comment about the long range planning activity saying, “I really liked the skill of planning, the backwards design model, giving us the

template for planning of a long-range plan and a monthly plan, that is one of the best things I took away from [the University].”

Some teachers did mention specific subject-related strategies they had learned within their courses. Within the P/J mathematics course, learning to use manipulative and elastic boards were mentioned by one of the teachers. Others from the P/J program noted the value of learning: conducting group readings within the language arts program; and learning strategies for teaching visual arts within that subject class. One of the I/S graduates referenced the specific laboratory techniques they had used in science classes.

There is evidence from the data that their practice teaching provided valuable experience. One teacher describing her practice teaching says, “[D]efinitely, the field experiences were the most valuable because they give you the best insight into what teaching is really going to be like.” Another describes how s/he learned about dealing with diversity through practice teaching and this was good preparation for dealing with the diversity in his/her current classroom. The teacher notes,

I was prepared more because I think I learned more from my practicums, just being out in the field, because they gave me a diverse school, I was able to apply it more. As far as the pedagogy is concerned, yeah I think it did prepare you, but when you did see it and practice through a practicum, that helped me prepare for the actual place for where I was working.

The findings reveal that some of the graduates did not feel prepared to deal with diversity, specifically the number and range of identified students within their classrooms. One of those comments came from a graduate of the P/J program, who says,

I think there should be a lot more emphasis on the diversity in the classroom, meaning special education. The things that you are dealing with – you have at least three to five kids in a class, if not more, with some kind of IEP. I did not feel prepared enough or know enough about different things like there are so many different ranges of autism and I had a child

with Asperger's [syndrome] and, to be honest, I didn't really know anything about it.

A graduate of the I/S program makes similar comments about her lack of preparation to deal with the special education students within her/his classroom and specifically mentions students with autism. S/he says,

I wish there were a few more experiences when dealing with children with special needs and children with autism. I do see these in my classroom. I had at least one student with autism in my classroom each year. Having more tools for working with special education students who are integrated into a regular classroom, just some more tools for that kind of thing would be useful.

Another respondent from the P/J program made similar remarks about not having sufficient instruction on special education, noting "I remember there was some information on special education; it was not nearly enough. I sort of remembered learning some interesting things about fetal alcohol syndrome, but especially in the younger grades, I don't get kids with labels."

When teachers were asked what advice they had for the teacher education program for the future two mentioned the focus of keeping things practical and one specifically identified assessment and evaluation and classroom management as being particularly important.

The data do not reveal many comments that would demonstrate the integration of pedagogy with content. The exception to this would be when the graduates talked about the value of practice teaching during their field experience. When the graduates talked about different pedagogy within the program, it was not usually within the context of a specific subject. It is not clear if that is because the strategies were not modelled using subject specific content or if the respondents just focused their comments on the specific strategy as that is what they now use in their own classroom practice. Most of the

comments made by the graduates about their degree of preparedness for teaching diverse classrooms, centered on how they felt unprepared to deal with the identified students in their classes. One teacher did explain that s/he learned about dealing with a diverse classroom during his placement.

It should be noted that this section did not include any of the findings related to the use of technology within the preservice program, as that will be the focus of the next category of analysis. The following sections report on how the teachers valued their experiences with technology.

Technology Knowledge (TK)

In this technology-focussed preservice program, preservice teachers use a laptop in all classes and take a *Learning with ICT* course, in their first term. The ICT course focuses on “practical exercises in using technology” that can be used “to develop effective lessons” (Academic Calendar, p. 236). Within this course, the preservice teachers are introduced to different types of digital technology and given the opportunity to acquire and practice a range of technology skills. Furthermore, faculty are encouraged to integrate technology into their teaching and the design of their assignments. This section reports on what the findings reveal about the knowledge of technology the preservice teachers gained during their teacher education program. *Technology knowledge* is defined by Mishra and Koehler (2006) as “knowledge of technologies and the skills to use those technologies” (p. 1028). They acknowledge that because technology is changing so rapidly that this knowledge must also include the ability to learn new technologies.

A number of the teachers indicate that [the University] has earned a reputation for being a leader in technology. One remarks, "I think it [technology] was excellent, and the schools that I was a part of recognized that [the University] was a leader in that area." Two of the teachers said their principals had commented on how [the University] was well-known for its use of technology. A graduate of the I/S program, commented on how the university's reputation had been the main reason for her coming to [name of the university]. She revealed that she had researched numerous teacher education programs and had specifically chosen this program because of its focus on technology. She discloses, "I remember when I was researching a lot of the Bachelor of Education [programs]. [the University] was really the only one that focussed on application and technology in the classroom. I knew that would give me a huge leg up over others when I entered the work force."

Many of the teachers remarked on the technology skills and training they received during their preservice program. One of the graduates, from the P/J program, remarks, "I know that the technology teacher, . . . he always had sheets for us prepared, step-by-step, which was really helpful." Another teacher had the following comments about technology,

I felt that the technology we received and training was great, and I really enjoyed doing a lot of it with [the University]. It really prepared me for the skills that I need for today, going into teaching, because the new thing is technology. I have used a lot of the programs we were taught at [the University] and I continue to expand on it because I know what the principals are looking for now.

During the interviews, the teachers commented on being exposed to a wide range of technologies throughout their program, including: Smartboards, science probes, and clickers; PowerPoint presentations, digital portfolios, photostories, learning objects and

websites. There were also some comments about the value of learning basic skills like: accessing resources on the internet, connecting the projector to the computer, and organizing data into files. One remarks about learning basic computer skills, "I learned how to organize everything into certain folders for subjects. I could not believe that some of the teachers [in my school] had no idea, and it was just a big mess in their documents."

Although somewhat limited, there is evidence of criticism about the way technology skills were taught in the program and a concern that not all preservice teachers had the same experience. One graduate expresses her concern,

In the year that I graduated, it seemed to depend who your professor was, if you learned the [technology] skills that would be useful in class and I remember spending a lot of that year talking to other students, getting their notes because I did not know anything about computers. I know that we had so many programs on our laptop, but I don't think I used more than 5% of them.

The findings indicate that the preservice teachers valued the many different opportunities they had to acquire knowledge about technology and technology skills within their ICT course and throughout their program.

Technology Pedagogical Content (TPK)

The findings provide limited evidence of technology being used by faculty within their courses to augment different pedagogies. According to Mishra and Koehler (2006), *technology pedagogical content* is using technology for a particular pedagogical goal.

Several teachers commented on how technology was integrated throughout their program and that they were able to observe technology being modeled in a number of courses.

The I/S graduates made a number of remarks about the integration and modeling of technology. One says, "[technology] was integrated through all our courses. It was excellent." Another remarks, "modeling of technology – they had PowerPoint

presentations, but they also had other technology they used as well. I remember it being in every course, it was pretty standard." A third teacher's comments about technology echo those of the previous two teachers, ". . .in every class that I was in. . .even if it was a psychology class or something else, and they weren't directly teaching you how to use the technology, but they were modeling it in such a way that I knew the proper way to do it."

In summary, the findings indicate that the preservice teachers had numerous opportunities, throughout the program to observe faculty modeling the use of technology with different pedagogical strategies.

Technological Pedagogical Content Knowledge (TPCK)

Mishra and Koehler (2006) use the term *technological pedagogical content knowledge (TPCK)* to describe the ability of a teacher to use an appropriate pedagogy along with a particular technology to approach subject content in a way that impacts student learning. TPCK involves the interweaving of the three key types of knowledge: subject content, pedagogy, and technology. The data reveal a number of examples of preservice teachers being given the opportunity to use technology in this integrated manner.

A graduate of the P/J program says, "I also liked the fact that we didn't just look at technology, we did class projects, so we made photo stories, we made flash movies." A graduate of the I/S program described how the preservice teachers used the technology in their physics presentations and how presenting provided motivation for others in the class. The graduate comments,

It was really good presenting in front of your peers. I guess I am competitive in this instance where you see what other people are doing and

you want to do the best that you can. That gave me a lot of comfort with [technology] because by the time I was actually teaching with technology, I had done it several times teaching in front of my peers. I think it is harder to teach in front of your peers than it is to teach in front of your students. Students are just 'wowed' by the technology, but your peers, they know what you should know, . . . so if you are not doing what you were taught, they would really pounce on you for that. Not that they do, but I feel that you have to be sharper when you are in front of your peers.

Another teacher remarked that although she was fairly comfortable with technology prior to entering the program, she learned how to use technology for student learning. She says, "[A]fter coming out of the program, I was just more aware of the different programs . . . and how I can use those things in the classroom."

There is some evidence from the data that preservice teachers benefit from using a specific technology themselves during their preservice program to prepare them to apply it within their own classrooms. A graduate of the P/J program comments, "[T]he language-arts program with using the literacy photo story that has really stuck out with me as I really enjoyed [using] the photo story and I have used it a couple of times in my long term occasional [assignment] and in this summer camp." Two of the graduates from the I/S program commented on how they learned to use probes in science and had created learning objects. One says, "We created learning objects which I have used quite a bit especially in 12 U biology." Another said, "I actually worked on one of the learning objects while I was at [the University] and it opened my eyes to the work of learning objects on the internet, and now I use them as often as I can with my students."

Several of the teachers were given opportunities during their field placements to practice using their technology and in some cases they were able to learn to use specific types of technology. One teacher describes her associate teachers saying, ". . . [T]hey were open to me trying technology with the kids and they . . . let me do one technology

project with the kids. . . Having done [the projects] in my practicum, when I went to use them in my classroom, it was really easy." Another described her experience using an interactive whiteboard during her field placement. She describes her experience, "I had one practicum teacher who was big into that stuff and had a SMART board, so during that placement, I got a chance to play around and try things, and that was good, because if I did not have that teacher I don't know if I was going to be so willing to try."

A number of those interviewed who said they believed that technology helped them get hired into their teaching job. One of the graduates from the P/J program who has held a number of long term assignments explains it this way,

The technology is huge, and for me, being a young teacher, it has really given me a boost. . . In almost every interview, I really stuck out because of have the technology background. . . In every interview, they are asking something based on technology and the media literacy component.

A graduate of the I/S program felt her/his ability to demonstrate technology was key to her/him being hired. The graduate says,

I think the focus on technology almost got me my job. The focus on technology is huge and that is what gives everyone from our program an edge over everyone else who is graduating out of BEd. programs. I will tell you how my interview went. I was asked one or two questions and then they asked me to show them a sample lesson that I had taught. I showed them the learning object that I had created and they were just stunned speechless and skipped to the last question.

Another graduate felt the digital portfolio, which included samples of his/her learning objects and a video of her/his teaching was significant to getting being hired. The graduate comments,

The digital portfolio was fantastic, just having that and saying to the principal . . . this is my resume but apart from that, this is my url and you can type it in and you can actually view a video of me teaching . . . [and] look at some of the assignments that I have done.

Another theme, revealed by the data, was how technology has provided the teachers with opportunities for leadership within their schools. Sometime it is informal leadership as described by this teacher, who says,

I am willing to try and do different things and help other teachers. [The principal] has mentioned to other people that I have the technology background so that other teacher can come to me, which they have. Other teachers have seen what I am doing, and they do kind of copy and come and ask me because they are interested in what the new stuff.

A second teacher describes how her/his teacher colleagues ask for help to effectively integrate technology into their lessons. The teacher also describes how she/he has led formal professional development sessions within his/her school. The teacher comments,

I am looked at as a leader of technology within my Department. A lot of people come to me wanting to learn how to use the Smartboard and how to use PowerPoint effectively and web videos and so forth. Actually on our first PD Day, I was asked to lead a technology session, so I taught a lot of teachers how to use a Smartboard because a lot of departments were getting them and no one in the department knew how to use them. I did that twice.

When the teachers were asked to describe how they use technology in their own classrooms, there was a real disparity in their answers. All indicated they used technology, although the amount of technology used by the teachers varied. Three of the teachers said they have created webpages for their classes which are used for posting class notes and homework assignments. One reported using blogs to assess her students' understanding of concepts and encourage peer-to-peer discussions. Several teachers have their students use on-line resources such as gizmos, and mathematics and literacy activities. Others talked about the importance of the internet for student research. Several said they used technology to assist with presentations, both PowerPoint and interactive whiteboards (Smartboards). Word processing, creating graphs and spreadsheets were all technology-based activities mentioned by the teachers. All of the

graduates from the P/J program said they have had their students use technology to create photo stories for literacy assignments. Each of the teachers was able to describe ways in which students use technology for assignments or to augment their learning. Although not as commonly named as computers, the teachers described using a range of technology including: digital cameras, video cameras, phones and robots.

There was one teacher who expressed her discontent over the cost and quality of the laptop they were required to buy for their teacher education program. She remarks,

[M]y laptop, I paid almost \$1800.00 for it and it does not work anymore; it only works if you plug it in and it is really slow. I expected a little more life out of it for the price that I paid. I have had it for about three years and everyone I talked to since I graduated has the same problem.

The same teacher indicated that there were many of programs on her laptop that she had not opportunity to use. At a later point in the interview, she did reveal how her exposure to technology during the program, taught her to take risks with technology. She says, "When I left, I did not feel as if I had enough knowledge in technology or how to use it in the classroom; I did learn to start taking risks with technology."

When asked about advice for future directions for this teacher education program, several advised the university to keep its technology-focus. One of the graduates of the I/S program had a lot to advise for the teacher education program and the role technology should play in its future. The teacher advises that although [the University] is already ahead of others with their use of technology, they should go one step further and "start defining the important skills that students need and make sure that all their teacher had it and . . .that all their teachers were able to pass that down. . . that would put them ahead of the game."

The data provide considerable evidence that the teachers, who participated in this study, found value in the technology aspects of their preservice program. The findings also suggest that technology was integrated throughout the teacher's preservice program and was modelled by most of the faculty in their courses. The teachers who were interviewed found value in being given opportunities to practice using technology within their classes and during field placements. There is also some evidence that expertise with technology may have helped some teachers get hired and has provided some with leadership opportunities within their schools. During the interviews, all the teachers describe using some technology in their classrooms although the extent to which technology is used and the purpose of that use varies. There were some examples of the teachers using technology, within their classrooms, for transformative purposes. The following sections focus on the informal categories of analysis from the conceptual framework.

Interactions and Relationships with Faculty

According to the interview data, some of the graduates found the relationships they established with the faculty at [the University] to be quite different from what they had experienced at other universities. One of the I/S graduates describes the difference in the relationships this way,

My ten months at [the University] was the best ten months I have had even in my whole university career and it is because of the small class size. Everybody knew my name, all the professors, I would sit beside them at lunch time. When I walked across the stage and got my diploma . . . [t]he person who shook my hand knew me . . . and I was smiling as opposed when I graduated from [name of another university], I was a nobody".

A second graduate had very similar comments about getting to know the faculty. The teacher comments,

[the University] was smaller . . . compared to schools where there are ten thousand students in the program and the professors don't even know them, that was a big thing for me. We got to know the professors and we were given every opportunity to use the tools we learned.

A third teacher who had similar comments indicated the personal interest shown by the faculty made a big difference to her. The teacher says, "I remember one thing that sticks out was the faculty at [the University] were much more social and hands on, making time for you". She went on to compare her BEd year to two other university programs she had attended, "While the professors [at the other universities] were nice and respectful, nothing bad to say about them, there was not that feeling of commitment and interest and personal involvement. That is one thing that I can say about [the University] that made a huge difference."

When asked what advice they would give to the preservice program at [the University], two teachers commented on the importance of staying small to enable connections between the students and the faculty. One advises, "[S]tay small, stay personal and have a connection between the students and yourself, the teacher."

The findings provide some evidence that graduates valued the personal relationships they were able to establish with the faculty. The data also suggest that these relationships made their experience during their teacher education program different from their previous experiences in university. In the next section, are the findings from the interviews about the value graduates placed on the relationships formed with their peers.

Interactions and Relationships with Peers

This section reports on how the teachers viewed the value of their relationships with their peers during their preservice program. Within this preservice program, students are grouped into sections of about thirty and remain with that group of students

for the year. The comments from the teachers indicate that the *sections* may have some of the characteristics of a learning community (Cox, 2005). Several teachers commented on the importance of being able to share ideas and resources with their peers and others reported learning from presenting to their classmates and watching their peers present. One remarks on how her views of the experience have changed with time,

I did not appreciate it at the time, but I appreciate it now, the gathering of ideas and sharing of ideas. . . I am so thankful because I remember things that my classmates did. I remember the fun ways they would teach us something, or really great science ideas and I realize that is more valuable, to have a bank of ideas in my mind and all my files too”.

Another teacher had similar comments about the value of being able to share experiences and ideas with her peers. She recalls, “Even when we came back from our placements, I liked sharing ideas with the other preservice teachers and just hearing their experiences and getting ideas.”

A teacher, who graduated from the I/S program found the resources that were produced by her/his peers to be very useful. “Having those assignments that my peers produced, although they may not have been perfect, at least I had something that I could use or tweak, and tailor it to my own classes. It was huge, I was so well prepared, I never felt like I was sinking.” For another teacher, the ability to practice teaching in her class and watch her peers was a valuable experience. She comments, “We did a lot of practice teaching between students, so for a lot of our presentations [we would] pretend to teach a lesson and our peers would role play a bad student or [a student] with a lot of questions. It gave you a lot of practical experience.” There was one teacher, who found the relationships could be stressful and competitive. She remarks, “We got along, everyone

was friendly but when it came to group work, it was . . . ohh! I am trying to think about how to eliminate the competition."

The findings suggest that some of the teachers valued the relationships they had with their peers. Being able to share ideas, resources and experiences as well as practice teaching were all mentioned as positive outcomes of their relationships. There was some evidence that the peer relationships could, at times, be stressful and competitive.

Teaching as a Profession

This section reports on the findings about being prepared for the professional obligations of a teaching career. Several teachers identified the value of learning about professional and legal responsibilities of teaching. One comments, "I came out of it understanding the professional aspects of it and the standards that sort of thing". For another teacher, the information on child abuse was particularly useful. She reveals,

I think it was [name of faculty], I remember her talking about the legal aspects of teaching and it has come up so many times. I've had to call Children's Aid about 3-4 times . . . When you think about kids, you think about teaching and you don't think about the legal aspect stuff. . . that was invaluable.

Another mentioned how the program emphasized that teachers have more responsibilities than just teaching. She remarks," I remember we said that teachers aren't only teachers, we are parents, we are social workers and all those different roles. That definitely came through in the program, teachers don't just teach, we do so much more and we don't even realize it."

Several of those interviewed commented on the workload for the program and how the expectations for the preservice teachers helped prepare them for being a teacher. One of the graduates of the P/J program says, "as first-year teachers, constantly having to

be on top of your work, and administration always on me to get stuff done, call parents, marking, being on top of all that stuff – that was the most important thing I learned from the program. . . I was used to replying to emails right away.” The same teacher also talks about how she got assistance with getting all her paperwork in order, “you went over all the paperwork like OCT. . . that kind of administrative detail that a teacher has to deal with. . . It was one less think you have to worry about.”

In summary, there is some indication from the data that teachers, who participated in this study, felt the program prepared them for the professional aspects of teaching and there were no comments by teachers that indicate they did not feel prepared for this aspect.

Reflection

The data reveal that none of the teachers who were interviewed actually used the word *reflection* to describe their experiences with any aspect of the program. There were, however, occasions when teachers spoke about having the opportunity to generate new understandings from their experiences within the program. These new understandings came from dialoguing with and observing faculty, their peers, and other teachers during their field placements. The classroom experiences which generated these *new understandings* have been discussed in the previous sections on pedagogy and technology. One teacher describes how s/he learned from his/her peers and adds a comment about the importance of the learning that occurred during placements. The teacher comments,

My placements were also significant because of all the different places we went. [T]hey were the best experiences because that was when we were out in the field with the teachers, which is where we are learning the most from them and the students.

Another teacher describes how, even now, she is able to improve and change through learning from her colleagues.

I find that when I am teaching now, one of the best things that I get now is from talking to other teachers, learning from other teachers, watching them, just getting the opportunity to see them in action and see what they are doing and comparing myself to them. Seeing what I can do to improve and change.

The findings reveal a number of examples of how the preservice teachers were able to develop new understanding of their teaching practice. Teachers who were interviewed identified interactions with faculty, their peers, and associate teachers during placements as being catalysts for developing new understandings about their teaching.

Summary of Findings

This section summarizes the finding from the eight interviews with teachers on their perceptions of the value of the various aspects of their technology-focused preservice program. The first parts of the findings are those related to the formal aspects of their teacher education program: subject knowledge, pedagogy and technology. The latter part presents the findings related to informal aspects: relationships with peers and faculty; professionalism; and reflection. The key findings for the teachers who participated in this study are reviewed below:

1. They value the resources and skills, obtained from their preservice education, which can be used directly in their own teaching. They did not see the value in learning theory except as it related to understanding teaching practice.
2. They value being exposed to faculty modeling pedagogy which can be directly applied to their own teaching practice. Teaching and classroom management strategies were the two types of pedagogy most commonly identified in the data, with some mention of assessment and evaluation. Some teachers comment that they did not feel well-prepared to deal with the range of children with special needs in their classrooms.
3. They value the technology-focus of their teacher education program which they feel was integrated throughout the program. Benefits of this exposure to

technology identified in the data were: learning technology which they could integrate into their teaching; helping them get hired for a teaching job; and providing them with opportunities for leadership within their schools.

4. They find value in having the opportunity to practice using different pedagogies and technology within their preservice program and during their field placements.
5. They value the relationships they established with faculty and their peers, and felt this was possible because of the small size of their teacher education program. At least one graduate felt there should be more done to maintain those relationships after graduation.
6. Although not as strong a theme, some of the teachers who participated in this research value how the program prepared them for the professional aspects of the teaching profession.
7. Although they value learning from their peers, faculty, and their practice teaching experiences, none of the teachers who were interviewed used the term *reflection* to describe any aspect of their learning during their preservice program.

Part Five: Discussion of the Findings and Recommendations

This section analyzes findings from the study relative to the literature review in order to answer the primary research question: *How do graduates of a technology-focused preservice education program value the various aspects of their program?* I explore this question according to my theoretical framework which was derived from Mishra and Koehler (2006) and Darling-Hammond (2006). Recommendations based on the findings will be made throughout this discussion section.

The data suggest that the teachers who participated in this study find the greatest value in those aspects of their preservice education program which they are able to apply directly to their teaching practice. Discussed in the following section are those aspects of their preservice program which were identified as being valued by the interviewed teachers. The findings will be related to the research presented in the literature review and to Smith's theoretical framework for preservice education.

Content Knowledge – Deemed of Limited Value

According to the data, the teachers who were interviewed, value the aspects of a preservice program that prepare them for teaching. This was revealed by the teachers through their responses to a number of different questions. Despite wanting to be prepared for teaching, those interviewed, did not place equal value on all aspects of their teacher education program. One of the requirements of effective teaching, revealed in the literature, is a thorough knowledge of the content to be taught (Cochran, DeRuiter, & King, 1993; Darling-Hammond, 2006; Shulman, 1986.). Yet, the teachers interviewed did not indicate that they valued the courses which dealt directly with subject content. I do not believe this is because they failed to recognize the importance of teachers knowing

the content, but rather that they felt the preservice education program was not the place to learn subject content. Some teachers indicated they already had a thorough knowledge of the content through their undergraduate degree and one graduate of the P/J program felt there was not enough time to cover all the curriculum from K to 6.

When discussing how adults learn, Merriam and associates (2006) stress how an adult's previous experience can impact their learning and can even act as an incentive for learning. It could be that, as one teacher expressed, experiences with knowledgeable university professors who were unable to teach has influenced preservice teachers' beliefs that teaching is much more than knowing the content. So, although they did not find the courses that taught subject content to be poor, the teachers in this study just did not place as much value in learning content as they did in learning how to teach the content.

For some of the graduates of the I/S programs, the resources obtained in their subject courses were considered to be valuable. Those who commented about how useful the resources had been seem to be the teachers who were able to use the resources directly or with slight modification in their teaching. Often the resources that were referenced by the teachers were activities or lessons that had been developed and demonstrated by their peers during classes. It is perhaps not surprising that graduates of the P/J program did not mention valuing resources obtained from the classes that focused on P/J content as none of them are currently teaching in primary/junior classrooms in Ontario.

Pedagogical Knowledge (PK) – Highly Valued by Teachers

The data suggest that the teachers in this study value the opportunities they had to learn a variety of new teaching and classroom management strategies. During the

interviews, teachers described observing faculty and their colleagues model different strategies as well as having the opportunity to practice the strategies within their preservice program and during field placements. Many of the teachers gave direct examples of how they had adopted new strategies into their own teaching practice and in some cases even shared strategies with other teachers in their schools. The teaching strategies learned during the TRIBES workshops were referenced by two teachers as not only being very useful for their teaching practice but also something they had shared with other teachers in their school. This is further evidence that the program transformed their teaching practice as they have adopted new teaching strategies and now teach differently than they would have been taught in their own K-12 schooling.

The findings reveal that the emphasis on classroom management within the preservice program was recognized as being of value to the teachers. More than one teacher commented on the importance of learning to manage a classroom contending that you cannot teach without a well-managed class. Several of the teachers recalled how faculty modeled various aspects of classroom management and how, as preservice teachers, they had opportunities to practice during their field experience. There was, however, one teacher from the P/J program who did not find the classroom management skills learned in the preservice program transferred well into a primary classroom. She felt that more time should have been spent talking about how to use the strategies with different age groups. It could be that modeling and practicing classroom management strategies within I/S classes is easier than in P/J classes. Preservice teachers can more easily role play being inattentive teenagers than inattentive primary students, which makes practicing classroom management in I/S classes more easily replicated. Another

explanation is that faculty perhaps needs to spend more time *unpacking* the specific pedagogies used to manage P/J classrooms.

The importance of preparing teachers for the challenges of managing their classroom is stressed by Darling-Hammond and Bransford (2005). They argue that classroom management is much more than determining consequences for inappropriate behavior and that it begins with developing a supportive learning community. It is worth noting that teachers found the TRIBES training to be particular useful as the workshops are designed to not only introduce participants to a variety of teaching strategies but also focus on how to establish a positive learning environment within a classroom.

The data suggests that observing faculty model pedagogy combined with opportunities to practice using the strategies, enabled the preservice teachers to adopt a new pedagogy. There is less evidence from the data that faculty were successful in explaining their use of pedagogy using relevant theory. Based on this small study, it might be worthwhile for the faculty to re-examine the theory/practice linkages in their preservice classes and consider how they can more effectively make the theory underlying their modeling more explicit in their classes.

Pedagogical Content Knowledge (PCK) - Valued

Within Mishra and Koehler's (2006) conceptual framework, pedagogical content knowledge represents the intersection of pedagogy with content knowledge. Mishra and Koehler (2006) argue that PCK is the type of knowledge that teachers require to enable them to choose appropriate teaching strategies while considering the subject content and the needs of the different learners within the classroom. Considering the needs of the *different learners* in a classroom would include examining variables that impact learning

for students, including factors such as: culture and language; learning styles; and students with special needs.

From the P/J program, a number of the graduates found value in the long range planning assignment. This task requires the creation of an integrated unit plan outlining teaching and assessment strategies for several subjects within a P/J grade. Graduates of the P/J program also identified several courses in which they had been acquired subject-specific pedagogy: language arts, visual arts and mathematics programs. There were a number of other subject courses which were not mentioned by any of the P/J graduates. This could be because they did not acquire any subject-specific pedagogy from those courses or perhaps because they were not currently teaching those subjects.

During the interviews with graduates from the I/S program, there was little mention of course-specific pedagogy, except for pedagogy which involved technology which will be addressed in a later subsection of the summary. There was some mention of laboratory techniques, but little else. These teachers were mathematics, computer science and/or science teachers so it might not be that surprising that laboratory techniques and use of technology were the dominant types of subject-specific pedagogy referenced.

The findings suggest that some of the graduates did not feel well prepared to deal with the students with special needs students within their classrooms. There was mention by teachers from both the I/S and P/J programs of being ill-equipped to deal with the number and range of identified students within their classroom.

Although the findings indicate preservice teachers were exposed to many different forms of pedagogy, there is not nearly as much evidence of exposure to pedagogy which

is subject specific. There is evidence from the data that the field experiences provide preservice teachers with valuable experience with teaching in a diverse classroom as well as practicing different subject-specific pedagogies. The data findings, from this small study, suggest that it might be valuable to examine how teaching students with special needs is integrated into the preservice program,

Technology knowledge (TK) – Infused into the Program

The findings indicate that the teachers found technology to be infused throughout their preservice program. There is also evidence that they learned to use forms of digital technology which they have since been able to incorporate into their own teaching. The teachers interviewed did talk about the skills they had learned during their technology course but many of their comments focused on how technology was applied throughout their program within all their courses.

The data suggest that being given the opportunity to observe, discuss and practice using technology led to teachers acquiring new technology skills and incorporating those skills into their teaching practice. The use of technology within the classroom has been linked to the exposure of preservice teachers to technology within their teacher preparation in the literature (Chen, 2010). In the next section, I will discuss how their technology knowledge led to transformative learning.

Technology Pedagogical Content Knowledge (TPCK) – Highly Valued

According to Mishra and Koehler (2006), “TPCK is the basis of good teaching” and requires “pedagogical techniques that use technology in constructive ways to teach content” (p. 1029). They argue that TPCK involves being aware of students’ prior knowledge and knowing how technology can make concepts easier to learn. The data

suggest this level of technology integration by preservice teachers requires more than just acquiring the skill to use different types of technology. Observing faculty model different technologies within their subject-specific courses, using technology to complete assignments, and being given the opportunity to practice using technology to teach subject-specific content, all contribute to the adoption of new technology pedagogies by preservice teachers.

The data reveal strong examples of how a well-designed subject-specific assignment, requiring the use of digital technology, can lead to teachers adopting a new technology-focused pedagogy. During the language arts course all P/J students are required to produce and present a photo story which documents their own experiences with literacy. All of the graduates from the P/J program describe how they now have their own students create photo stories within their literacy programs. Another example came from interviews with graduates from the I/S program who created websites and learning objects for assignments during their preservice program and now use them within their own teaching. These are both examples of teachers acquiring and using new pedagogy in their teaching practice in a way that demonstrates transformative learning (Hughes, 2005).

Although the data are limited, the findings suggest that designing assignments that provide preservice teachers with opportunities to practice subject-specific pedagogies using technology can help the preservice teacher acquire the skill and knowledge required to adopt new technologies into their pedagogy. Kay (2006a) in his literature review on technology use in preservice programs, reported that there was “some preliminary evidence to suggest that multiple strategies work well with respect to use of computers by

preservice teachers in the classroom" (p. 395). The findings from this small study seem to concur with his suggestion that multiple strategies within a preservice program can lead to technology integration by preservice teachers and transformed pedagogy.

Interactions and Relationships with Faculty and Peers - Valued

The findings indicate that for some of the graduates, the relationships formed between faculty and preservice teacher were significant. At least two of the teachers identified the small size of the faculty as being a reason why it was easier to form these relationships. There was also evidence from the data that preservice teachers found value in the relationships and interactions with their peers. Although the data did not reveal evidence as to why, specifically, they valued their relationships with faculty, several teachers did give reasons why they found relationships with their peers important. Sharing ideas, resources and experiences were the most common reasons given for their relationships with their peers being meaningful. It could be that the cohort structure of the program makes it easier for the preservice teachers to form significant relationships with their peers while in the program.

Teaching as a Profession – Few Comments

Although the data are limited, there is some evidence that teachers felt their preservice program prepared them for the professional role of teacher. One teacher talked about how helpful it had been to be introduced to the protocol for dealing with child abuse but most of those interviewed did not comment on any of the legal aspects of their preservice program. It is interesting, however, that two of the teachers commented on how the busyness of their preservice program helped prepare them for the hectic

schedule of a teacher. There was also an appreciation of the time spent within their preservice program to help them complete the paperwork required to become a teacher.

Reflection – Not Recognized

There are some indicators of teachers recognizing the value of developing new understandings through their experiences within their preservice program. Teachers were able to develop different understandings of their teaching practice through observation of others teaching, and discussions about teaching. There was no indication from any of the data that teachers recognized this change as resulting from *reflecting* on their own teaching practice.

Summary of Findings and Recommendations

This section discussed the key findings as they relate to aspects of the preservice program that were valued by the interviewed teachers. There was considerable evidence, that the teachers valued the opportunities they were given to observe and practice different teaching strategies with and without technology, in their preservice program. The findings also suggest that the preservice teachers were able to form meaningful relationships with faculty and their peers which, in some cases, enabled them to examine and improve their own teaching practice. There is less evidence from this limited study that their preservice program provided them with clear understandings of the interplay between theory and practice because none of the participants articulated this. Some evidence was presented that not all teachers were prepared to teach the range of students with special education needs within their classrooms. These last two areas, identified in this limited study, might be areas of the program for the faculty to re-examine to see if there are some additional ways to incorporate teaching students with special needs and

theory/practice connections into their classes. In light of the recent policy direction to increase the time frame for preservice programs in Ontario, this study may be helpful in identifying areas that the teachers in this study found to be the most helpful as well as where they perceived some program gaps.

Part Six: Conclusions

There are recognized limitations within this study. The sample size was small and all the participants graduated from the same preservice program; therefore, the results cannot be generalized. The interview questions were researcher-generated and would require further distribution to acquire additional reliability. The teachers' classroom use of technology and other pedagogy were self-reported which may or may not be more reliable than observations obtained by classroom visits. My extensive and varied experience in education and personal knowledge of the program have most certainly shaped my interpretation of the data and the conclusions that I have made from the findings. The study did reveal some interesting findings about the technology-focussed preservice program being studied. Based on the findings within this study, this section contains conclusions that are discussed and organized by Research Questions, followed by a consideration of the implications for further research.

Research Question 1. How do graduates of a technology-focussed preservice program value the various aspects of their program?

There was considerable evidence that the teachers, who participated in this study, found value in being exposed to faculty modelling teaching strategies including those strategies which involved the use of technology. The teachers valued the technology-focus of their preservice program. Several teachers who participated in this study believe the technology expertise they gained from the program helped them obtain their teaching job and has enabled them to become *technology-leaders* in their schools. The teachers also valued assignments which resulted in teaching resources which could be shared with their peers and used in their own classrooms.

The teachers who participated in this study valued the relationships they were able to form with faculty and with their peers and they felt that those relationships were made possible by the small size of their preservice program.

Research Question 2: How are these values reflected in their teaching practise?

Based on the self-reporting of the participants, the teachers, who participated in this study, acquired new pedagogies during their preservice program which they are now using in their teaching practice. There was also considerable evidence, that being exposed to technology during their preservice program supported them in acquiring technology-based pedagogy in their own classrooms. The teachers, who participated in this study, reported using a variety of different types of technology in their teaching practice and felt their exposure to technology during their preservice program enabled them to effectively incorporate technology into their classrooms. Furthermore, the teachers are able to use their knowledge of teaching and technology to form professional relationships within their school.

Research Question 3: How is technology reflected in their pedagogy?

Based on the self-reporting of the teachers who participated in this study, they use a range of technology within their classes. There are many examples of teachers using technology to augment their teaching practice, such as: use of videos, accessing information on the internet; producing websites, and presentation software. Although fewer, there are also examples of technology being used, by students to create new ways for students to demonstrate their learning. Examples of this type of student-use of technology include: on-line blogs used to support student discussion; literacy assignments

produced with photo story software; student-created videos; and using and producing student learning objects.

There is evidence from this study that easy access to technology along with exposure to modeling and the opportunity to practice using technology for subject-specific projects can result in teachers adopting new approaches to pedagogy that are enabled by technology.

Implications for Further Research

As this study focussed on the views of the graduates of the preservice program after they had been teaching, it provided an important perspective on their program. Practicing teachers can provide a valuable perspective about their teacher education programs once they have had some time in the classroom. Many studies of teacher education focus on the graduates at the end of the program or changes during the program. The conclusions revealed areas for future study revolving around two key themes: best practices for technology integration and the impact of formal learning communities on preservice education. Further research into the impact of the various components of technology integration within a preservice program would add to the understanding of the factors which lead to shifts in beliefs and adoption of new technology-focussed pedagogy by preservice teachers. Much research knowledge could be gained by longitudinal studies of teachers and their teaching practice following graduation from their preservice programs. Future studies could involve larger number of participants from the same cohort, and include classroom visits combined with interviews with both the teacher and the faculty.

There is some preliminary evidence, from this study, that the positive student-student and student-faculty relationships were a factor in the effectiveness of the technology-focussed preservice program. There is a need for additional research concerning the structure of preservice programs and the impact, on both students and faculty, of establishing cohorts which act as professional learning communities. There is a growing body of literature directed at the impact of professional learning communities on professional development for teachers but there is little focussed on how this research might inform practice within preservice programs. On-going professional development of the faculty of preservice programs is necessary for a technology-focussed program whose goal is preparing teachers to teach students in the 21st century. Research on the impact of the teacher-student and student-student relationships could provide data concerning how communities of practice incorporated into a preservice program might impact not only student learning but also the professional development of faculty.

Appendix A: Informed Consent Letter

To be put on UOIT Letterhead:

Thank-you for agreeing to participate in an interview. We need your written consent – this could be through an email to us.

If you consent to an interview, please indicate here: _____ yes _____ no

Signature of Participant: _____

Interviews are approximately 45 minutes in length and they can be online (e.g. over Adobe Connect) or face to face.

This study has been reviewed and approved by a UOITResearch Ethics Board. Participation in this study is completely voluntary. If you choose to participate, your privacy and confidentiality will be protected. All information you provide in the interview interviews will remain private and confidential, and only accessible by the researchers and a designated research assistant.

Identity codes will be assigned to you, and these codes will be used, instead of your names, on the questionnaire and documents pertaining to this project. Your name will never appear in any report or publication about this study.

If you decide to participate in the study and then decide to stop participating, you may do so at any time up to two months from your interview, without explanation, and with no consequences of any kind.

You may indicate withdrawal from the project by sending an e-mail to Shirley Smith.

There are no risks in participating in this project, but there are benefits! You will be giving researchers and others who read any papers or publications a unique opportunity to learn more about the B.Ed. program for future cohorts Teacher Candidates and their prospective students. The results of this study will be shared with the greater education community through publications and conference presentations. The information gathered in this study may also be used in other research projects for comparison purposes.

If you have further questions regarding any aspect of this study, please do not hesitate to contact Shirley Smith at shirley.smith@uoit.ca. Also, feel free to contact the UOIT compliance office at 905-721-8668 Ext 3693 or compliance@uoit.ca if you have any concerns regarding the rights of the participants (or your rights as a participant).

Thanks for your participation in our research work.

Sincerely,
Lorayne Robertson on behalf of the Research Team: Dr. Roland vanOostveen and Shirley Smith,
Graduate student

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