Pre-service teachers' perspectives: Discussion boards to foster critical thinking and knowledge growth

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Abstract

In today's society it is expected that individuals completing teacher education programs harness the skill of critical thinking before entering into the classroom practice. This qualitative case study focuses on three (3) pre-service teachers' experience in a teacher education course that was redesigned to foster and develop critical thinking skills and knowledge growth by the introduction of online discussion forums. This study was guided by the following question "How has the implementation of online discussion boards in the redesign of the two sections of a mandatory course of the Bachelor of Education program at a Canadian university supported the development of pre-service teachers critical thinking and contributed to their knowledge growth related to course content"? Data was collected from three (3) participants enrolled in the course, using semi-structured interviews and the data from the online discussion threads. Results show participants do not have a unified understanding of critical thinking and that online discussion boards can impact participant's critical thinking development and knowledge growth provided they are given a strong foundation in the content area and have adequate time to reflect on the information presented. As well, findings revealed that participants used online discussion boards as a type of social media interface. By examining the participant's perceptions and postings of online discussion boards, this study provides insights into how critical thinking can be developed in pre-service teachers through an online medium. Additionally, this study considers and how these skills might be translated into classroom practice.

Acknowledgements

The path to complete a Masters program has been a journey like no other, and I am so grateful that I have been blessed with the opportunities to follow my passion and achieve my goals. This accomplishment would not have been possible without the help, guidance, and contributions of many people. I would first like to acknowledge my supervisor, Dr. Stephanie Chitpin. The guidance, advice, and dedication towards this project has been invaluable, and without your support and faith in my abilities, this academic venture would not have been possible. As well, I would like to thank the members of my committee, Dr. Raymond Leblanc and Dr. Peter Milley, who have been extremely patient and supportive during difficult times, and who were always available to offer support and advice. I would also like to thank the participants of this study who took the time to share their experiences with me. Finally, I would like to thank my family and friends who have stood by me throughout this program. Without your moral support, this dream would not have become a reality.

Dedication

I would like to dedicate this work to every teacher, student, team member, leader, mentor, colleague, family member, and musician that God has brought into my life and has given me the opportunity to work and interact with. Each of you has challenged me to grow and develop into the individual I am today. Thank you.

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List of Acronyms and Abbreviations

EQAO = Education Quality and Accountability Office

IPDA = International Professional Development Association

OKGF = Objective Knowledge Growth Framework

P21 = Partnership for 21st Century Learning

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Chapter 1

Introduction

In today's western society, we are constantly bombarded with information from a variety of sources. A multiplicity of outlets are emerging to encourage the sharing of information in particular on social media. With new ways to access an assortment of information through social media platforms such as Facebook, Instragram, and Snapchat, we are left to sift through the information that is presented to us to structure our personal thoughts and opinions, to make decisions, and to grow and develop our understanding of the world around us, and to become more collaborative within it. With the amount of information that is presented to us on a daily basis, we must have personal ways set in place that allows us to process this information in order to make well-informed choices and decisions and to ask those questions that will provide opportunities for clarity and the further development of our current set of beliefs and understanding of situations. The 21st century is unlike any other in terms of the rapid development of technology and the idea that we are living in a knowledge age, and that the skills that would have sufficed in the 20th century are less relevant (Kivunja, 2014b).

With this information, that previously existing skills are less relevant, western society may be able to move forward with a new understanding of skills and techniques that will allow future generations to be more successful in the world. These concepts can be described as the "new learning paradigm" (Kivunja, 2014a, p.85) and are especially poignant to educators as they are the ones charged with ensuring that the youth in their classrooms are provided every opportunity to develop the skills necessary to be successful beyond the classroom setting.

The notion of 21st century learning skills has been evolving and developing since 2002, as the result of an effort begun in the United States of America to bring technology to all areas of education. To accomplish this, a joint private-public organization named the Partnership for 21st Century Skills (P21) was created to aid elementary and secondary schools to form a united vision for education that would help prepare youth for post secondary education, the work force and life (National Education Association [NEA], 2016). However, it is important to note that this partnership can be considered a function of the neo-liberal agenda that (in regards to western societies) wants to ensure a competitive and vibrant economy at the expense of other economies around the world. This alliance within this partnership can be viewed in a negative light, but at

the same time, there is significance to how this relates to the overall purpose of education. According to Goodlad (1984), the purpose of education includes socialization, citizenship and the pursuit of knowledge for its own sake, as well as employment. Through the work of P21, a framework was introduced in which domains were established that encompass skills in which students should be proficient in order to be successful beyond K-12 (Figure 1). One of the domains identified is Learning and Innovation Skills, also know as the 4 Cs, which encompasses critical thinking, communication, collaboration, and creativity. Another domain is that of Information, Media, and Technology Skills. It is these two domains that are particularly intriguing to me, as a recently certified educator in the province of Ontario, Canada, in the areas of mathematics and science.

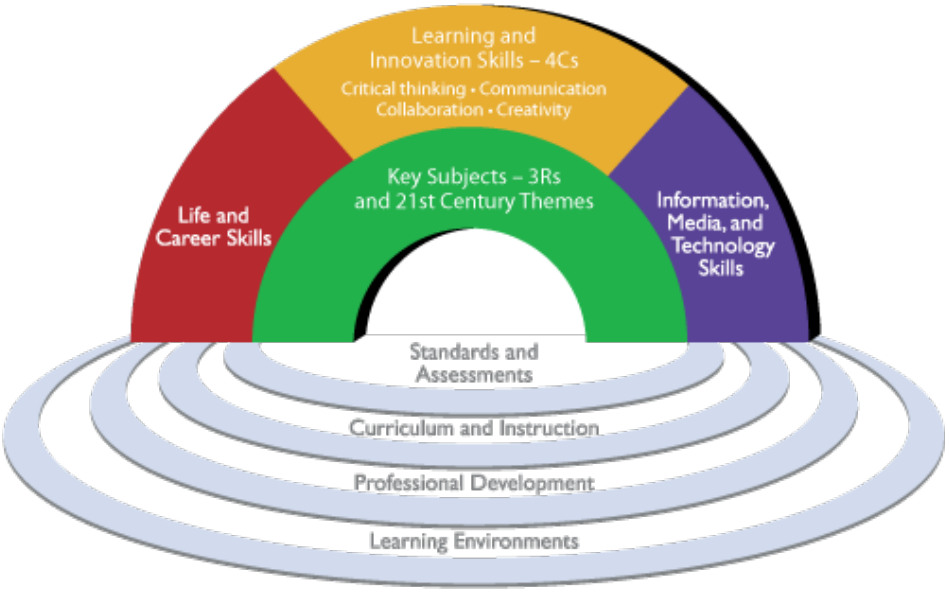


Figure 1: P21 Framework for 21st Century Learning (P21, 2016)

Over the course of this text, I will offer an overview of how my passion for the area of critical thinking has developed, my personal experience with critical thinking and technology in the Bachelor of Education program and connections to the Ministry of Education in the province of Ontario. In addition, I will identify various initiatives that are being carried out in school boards in Ontario to support 21st century learning as well as how the research project at the root of this thesis came to be.

Developing Interest in Critical Thinking and Blended Learning

For the intent of this paper, critical thinking will be defined as "active, persistent, and careful consideration on any belief or supposed form of knowledge in the light of the grounds that support it and the further conclusions to which it trends" (Dewey, 1933, p. 9). The concept of working through complex situations, making difficult decisions, and developing a strong knowledge base in a variety of areas has been an interest of mine for several years. It began to develop in my career in administration in Student Affairs and Campus Life in western Canada. During my career in this field, I had the opportunity to work with several young emerging professionals who were challenged in their thinking, as they were introduced to new concepts that disputed their belief sets. At times, these individuals were making critical decisions on the wellbeing of students who were living on campus during their years of post secondary education. Working through the aftermath of a few serious situations that were not handled well, I began doing some of my own personal and professional development on how I could become a better mentor to encourage critical thought in difficult situations to help these new professionals gain confidence in their abilities.

After taking some time to reflect on the various situations that were not dealt with in the most fitting manner, there was one common feature; instead of thinking through the situation to come to a conclusion as to the most appropriate way to move forward, the young professionals automatically turned to someone in a higher position to tell them what should be done, and how they should work through the problem in order to get the desired results. After noticing this trend, I began to question why these young professionals, who had achieved a post secondary degree and who were considered to be bright and upcoming individuals within the field, were not able to ask questions or think about the possible results that could be obtained from each scenario put in front of them. Through many conversations and professional development work with them, it was mentioned a few times that, ultimately, they did not want to make a mistake, and wanted to be told what to do so that they could rely on the authority of others. Through further reflection, it is also possible that these young professionals may not have wanted to take full responsibility for the final decision. It was these comments and ideas that embedded themselves in my mind and left an indelible impression.

After several years working within Student Affairs and Campus Life, I decided to follow my passion for education and returned to Ontario to complete my Bachelor of Education degree

in order to continue my personal and professional growth of understanding student development and work within the classroom setting. During my time in the Bachelor of Education program, the concept of blended learning, which is "the integration of traditional learning with web based on-line approaches" (Oliver & Trigwell, 2005, p. 17), became evident across a majority of the courses required to finish the program. In a variety of different online interactions with my peers, a common trend among the courses was to encourage interaction beyond the classroom, in that it required students in the class to post and discuss or reflect on topics through online discussion boards created by the professor. I found this process interesting, as it allowed me to reflect on the topic of discussion for the week. It also challenged me to work hard to ensure that I was creating a post that would be beneficial not only to myself but to the others in the class who would be reading it. It was this experience that began a thought process regarding how, one day, I might be able to bring this concept into my own classroom.

Once in the classroom setting with teachable subjects in mathematics and science, I began to notice trends similar to those of the young professionals in Student Affairs and Campus Life in terms of how students would approach new information presented to them and how they handled problems that they had not seen before. Instead of thinking through the problem and developing a plan of how to approach the situation, they would, instead, turn to a neighbour or the teacher to ask how to complete the question. As well, working as an occasional teacher, I had the opportunity to work with several students who were taking part in online and blended learning courses. Having the opportunity to talk to these students about these classes, many of them shared with me that they like online learning because it was a lot easier then being in the classroom, as they did not find the work particularly challenging. This intrigued me and through personal development and seeking out information on the topic of online learning and blended learning that I discovered 21st Century Learning skills and how critical thinking and technology are important aspects of the framework of 21st Century Learning.

However, this endeavor brought to the forefront a new question, and this question was why had critical thinking and technology concepts not been presented to me as a pre-service teacher in my Bachelor of Education program and whether or not there are connections within the Ministry of Education in the province of Ontario that new teachers should be aware of.

Reflections on the Bachelor of Education Program and Ministry Connections

Even though the P21 movement was started in the United States of America, it is important to note that the skills introduced in the P21 framework are apparent in Canada, specifically in the province of Ontario. Reflecting on my time in the Bachelor of Education program, the concepts presented in P21 were very rarely discussed and, if they were brought up, it was done so in a manner that was overarching or mentioned briefly. The document *Growing Success,* released by the Ontario Ministry of Education, the *Ontario curriculum document*s, *Achieving Excellence,* and *21st Century Learning Competencies* are a few of the documents that support and discuss the importance of 21st Century Learning skills both directly and indirectly.

Once one becomes familiar with the concepts presented in 21st Century Learning, connections to the Ontario Ministry of Education become evident. By simply entering some of the key terms found on the ministry website, a variety of documents are generated that allow one to explore 21st Century Learning skills, even using the same terminology. Yet, during my time as a pre-service teacher, these concepts were never mentioned in this fashion. The only mention of these learning skills and their importance was indicated through one course, which was offered as en elective, "Technology in the Classroom." Concepts such as problem solving, innovation, critical thinking, and communication were mentioned during various courses and are outlined in documents of the ministry, but no reference was made as to their importance for the 21st century learner. An example of the 4 Cs (critical thinking, communication, creativity, and collaboration) are also found within the achievement charts within *Growing Success* where two of the main areas of assessment are thinking and communication. Thinking is defined as "the use of critical and creative thinking skill and/or processes" (Ontario Ministry of Education, 2010, p.17) and communication is defined as "the conveying of meaning through various forms" (Ontario Ministry of Education, 2010, p.17).

By taking a more in depth look at documents from Ministry of Education, the ministry has released information on how they are working to ensure students are achieving excellence, and have outlined a renewed vision for education in Ontario (Ontario Ministry of Education, 2016a) and have produced a document as a foundational discussion document on 21st century competencies (Ministry of Education, 2016c). In the renewed vision document, called *Achieving Excellence,* the ministry provides information on how students "can gain important higher-order skills – like critical thinking, communication, collaboration and entrepreneurship" (Ontario

Ministry of Education, 2016a). As well, the ministry also indicates that students "will benefit from a wide array of opportunities both inside and outside of school that are compelling and contribute to their success, including the opportunity to benefit from the effective and appropriate use of technology in the classroom" (Ontario Ministry of Education, 2016a). Finally, the Council of Ontario Directors state, "student engagement and curiosity could be addressed through stronger development of 21st century learning skills and well-being" (Ontario Ministry of education, 2016a). To reinforce the renewed vision of education excellence, many research projects were financed by the ministry on the concepts of 21st Century learning outcomes and final reports were released in 2013 (Ontario Ministry of Education, 2013). These research projects focused on all of the domains outlined in P21. Several projects have been carried out under each domain across both elementary and secondary schools, and looked at both students and teacher development.

Learning Initiatives that Support 21st Century Learning

Each school board in the province of Ontario pursues diversified goals, objectives, and strategic plans that can be explored by referring to their individual websites. Even though each of these boards serve a different region of the province, have a different and diverse student/parent population, and can potentially encompass an extremely large surface area, each district attempts to ensure that students, upon graduation, are equipped with the skills necessary to be successful. Another common thread that can be found in regards to the use of technology in the schools – both in the classroom and beyond is that of online learning. The concept of e-learning has become prominent in several boards, as they have begun to offer alternative ways for students to learn and achieve their educational goals.

As the Ministry of Education states, "schools must take advantage of the technologies that are connecting us to information and people around the world and around the corner" (Ontario Ministry of Education, 2016a), and this is evident in many school boards across the province. The concept of online learning (or e-learning) has become standard in many educational settings. School boards, such as the Ottawa Carleton District School Board, provide a variety of reasons why online learning can benefit the student, describe differences between online learning and traditional classrooms, and promote a variety of the 21st Century Learning skills. With ideas such as discussing topics in an online discussion area, taking the time to digest information, and review lessons as often as necessary (Ottawa Carleton District School Board

[OCDSB], 2016b), school boards are endorsing the connections among communication, critical thinking, and technology. School boards are also promoting 21st Century Learning by offering speaker series for parents on topics such as ways to promote critical and creative thinking in their children, how to support the 21st century learner, and promoting advocacy skills through the use of technology (OCDSB, 2016a).

Currently, in the province of Ontario, focus is being placed on literacy and numeracy skills, as evidenced by the development of the Literacy and Numeracy Secretariat in 2004. The goal of the secretariat is to aid in the area of student achievement when it comes to reading, writing, and mathematical skills (Ontario Ministry of Education, 2016b). The secretariat has promoted the idea of critical literacy and critical thinking into the classroom so that students think deeply and examine what they read and view in a wide array of situations (Roberge, 2013). The concept of critical literacy goes beyond simply interpreting and understanding texts; it focuses on the in-depth study of the message and the different viewpoints presented in order to allow the students to question what they are reading (Roberge, 2013). McLaughlin and DeVoogd (2004) state that critical literacy is a way of thinking that will challenge the understanding of information that can be extended into real life situations. Critical literacy is promoted across all areas of the curriculum, and is supported specifically in the area of numeracy by encouraging the merging of critical literacy and higher order thinking by creating story-like problems where students are required to pull information from the text in order to answer problems from multiple perspectives (Roberge, 2013). The concept of critical literacy goes hand in hand with that of critical thinking, as literacy ensures that students are able to read and understand the text that is given to them, while the term critical takes that information and questions the material presented in order to allow students to shape their own thoughts and ideas.

With this information, one might question why more is not being done to ensure that classroom or online teachers in Ontario are knowledgeable about 21st Century Learning skills and have the training and professional development necessary to provide, teach, and assess these skills in their students.

Development of the Research Project

After the completion of my Bachelor of Education program, I was invited by a professor in the Faculty of Education at the University of Ottawa to provide more detailed feedback and suggestions on how to make a mandatory course for pre-service teachers more effective by

providing additional course content and establishing greater opportunities for pre-service teachers to engage with the course material. This invitation came after course evaluations for two (2) specific sections of the course received negative feedback. After several discussions and the review of a variety of learning strategies that could be used, it was determined that online discussion boards would be implemented in the upcoming semester of the course, under the direction of the same professor. The goal of implementing the discussion boards was drawn from research indicating that online discussion boards are a strategy that can help develop critical thinking for pre-service teachers (Jones & Ryan, 2014; Kalelioglu & Gülbahar, 2014; Perkins & Murphy, 2006; Szabo & Schwartz, 2011).

As the course unfolded in the fall semester of 2014, I had the opportunity to travel to the United Kingdom and make a presentation on the process of the redevelopment of the two (2) sections of the course at the annual International Professional Development Association (IPDA) conference. Through conversations with members of the IPDA, from across Europe and from around the world, I became more familiar with 21st century learning skills and the P21 framework. As well, I began to explore the principles of critical thinking drawing from my experience in Student Affairs and Campus Life and my new experiences in the classroom as an occasional teacher. The theoretical framework implemented in this research, the Objective Knowledge Growth Framework (OKGF), was introduced to me during one of the courses that I took for the course work portion of the master's program. I found this framework to be extremely interesting and applicable to a wide array of situations in the field of education and beyond. From these experiences, I began to problematize the understanding of pre-service teachers as it related to critical thinking, their experience with technology in a classroom setting, and how it can be used both within and outside of the classroom to promote knowledge growth and understanding. The ideas generated and the questions explored were refined numerous times, and from there, the research project for this thesis was developed.

This article, written for the requirements of this thesis, follows the formatting guidelines of the academic journal, *Teacher Education & Practice*. The article must be double spaced, approximately 20 pages in length, written in the standard style/size of Times New Roman size 12 font, and have margins of 1 inch. In the pages that follow, the formatting guidelines have been followed and headings standard to the journal have been used. In the article, you will learn about the research carried out and the results obtained in the area of critical thinking and knowledge

growth for pre-service teachers who use online discussion boards as a platform to encourage these skills in and beyond of the classroom settings.

Chapter 2

The Article

Introduction

Students entering the classroom in the 21st Century are faced with different learning goals and expectations than those who came before them, as the social cultural and economic concerns that underpin our current educational outcomes have undergone extensive modifications (National Education Association [NEA], 2016). With a continual focus on skills that will allow students to be successful and conscientious citizens in today's digital age within our knowledge based society, students require a different set of learning skills which encompass media/technology skills, critical thinking, and communication alongside that of numeracy and literacy (Partnership for 21st Century Learning [P21], 2016). It is these skills that will promote well-being and success in the fast paced, and changing world around them (NEA, 2016). In order to ensure that students achieve the necessary skills beyond schooling, they should have had teachers who are competent and well versed in 21st Century learning skills. It is these educators who mediate the experiences and skills necessary for success not only in the classroom, but in the future (Ontario Ministry of Education, 2016a).

Due to the present digital age, the application of technology, both inside and outside the classroom, continues to develop within the educational setting. There is no denying that educational institutions from primary to post-secondary will continue to develop ways to enhance the learners' experience both inside and outside of the classroom with the integration of various web-based tools and platforms to train students as critical thinkers (Kivunja, 2014a). With the continual expansion of online and blended learning initiatives, it is important that pre-service teachers be introduced to concepts, such as critical thinking, and provided opportunities

to develop their skills in critical thinking and technology implementation in the classroom. However, it is also important to gain an understanding of how pre-service teachers perceive and understand critical thinking as well as gain insight into their experiences with technological tools so that misperceptions can be dissipated and new educational techniques can be implemented.

This qualitative case study aims at answering the question as to how the redesign of a blended learning course to include online discussion boards within a Bachelor of Education course at a Canadian university by challenging the critical thinking skills and critical understanding of pre-service teachers contributing to their knowledge growth in the course content. By utilizing the Objective Knowledge Growth Framework (OKGF) as a lens for this study, a strategy that fosters enhanced critical thinking in pre-service teachers was analyzed.

Overview of Critical Thinking

Considering the vast array of interest in the topic of critical thinking, there are well defined ideas regarding critical thinking, however, there is not a set or agreed upon definition. This is evident in the variety of different philosophers and authors who have focused research in this area including Brookfield (1987a), Dewey (1910, 1933), Garrison (1991, 1992), Giroux (1978), Facione (2011), Le Cornu (2009), McPeck (1981), Reynolds (2012) and Siegel (1988). Dewey (1933), uses the term of reflective thinking in a way that is parallel to how others would describe critical thinking and defines reflective thinking as "…active, persistent, and careful consideration on any belief or supposed form of knowledge in the light of the grounds that support it and the further conclusions to which it trends" (p. 9). This is the primary definition of critical thinking used in this research study. Critical thinking is an active thinking process in which one raises questions and considers the grounds for their own positioning before simply accepting concepts (or claims, judgments, opinions) as facts (Dewey, 1933). This thinking

process can be aided and developed through the use of digital tools and resources, such as online discussion boards, which provide students with the opportunity to participate in dialogues as well as "discover, create, use new knowledge" (Fullan & Langworthy, 2014, p. 35), and provide the time to reflect and develop their positioning and understanding of the topic at hand (Wickersham & Dooley, 2006; Fullan & Langworthy, 2014).

The term "critical thinking" is very commonly used within educational settings and has been a hot topic for quite some time (Cheong & Cheung, 2008; Chitpin, 2010; Mason, 2008). It has been stated that, "critical thinking is a necessary condition for education" (McPeck, 1981, p.34). Furthermore, critical thinking is also viewed as being an essential part of the development of professional educators, as one would want those who are teaching to have highly established critical thinking skills in order to enhance these skills in their students (Elder & Paul, 1994). In addition, critical thinking has become a skill that students should have in order to be successful in the 21st Century society as "critical thinking and problem solving used to be the domain of gifted students, now it's a critical domain for every student" (NEA, 2016, p. 8) and acquiring these skills could open doors to a variety of opportunities (Cheong & Cheung, 2008) and more importantly, aid students in identifying and challenging systems of injustice (Roberge, 2013).

Critical thinking in educational practice reflects the idea that the use of cognitive processes in knowledge growth and development along with problem solving practices should be implemented instead of having students simply memorize information (Garrison, 1992). Students should be taught how to think instead of what to think (Lochhead & Clement, 1979). In fact, McPeck (1981) suggests that, "perhaps the most notable characteristic of critical thought is it involves a certain skepticism, argument or suspension of assent, towards a given statement, established norm or mode of doing things" (p. 6). Taking into consideration the ideas of McPeck

(1981) the term critical takes on a meaning of questioning in a proactive thought process as it reflects the search for a deeper understanding or solution to a difficult situation. When it comes to the area of education, Garrison suggests that critical thinking can be considered along a spectrum of weak to strong, "in the weak sense critical thinking is a set of discrete micro-logical skills concerned with technical reason, while in the strong sense critical thinking is a set of macro-logical skills concerned with insight and the development of emancipatory reason" (Garrison, 1991, p. 290). It is the strong sense of this spectrum that it is at the forefront (Garrison, 1991). Another point is made by Giroux who states, "students need to learn how to be able to move outside of their own frame of reference so that they can question the legitimacy of a given fact, concept, or issue" (Giroux, 1978, p. 299).

One term that appears several times in the literature in regards to critical thinking is criticism. It has been noted that criticism plays an important role to critical thinking due to the reasoning process (Peters, 1972). This can be linked to Sir Karl Popper's (1966) philosophy of 'critical rationalism' in that by working with each other, the truth may come to the surface (Popper, 1966). Popper (1966) states that criticism "…is the only way that we have of detecting our mistakes, and of learning from them in a systematic way" (p. 376). In this sense, criticism includes critically applying the theories or assumptions of others, as well as our own, because criticism consists of deductive logical reasoning to remove inconsistencies from the theories that we have established and to modify, enhance, or change our theories when they do not fit what are intended for them to accomplish, or when inconsistencies arise (Popper, 1989). It is these ideas presented by Popper that appear to be lacking in the definition put forward by Dewey, and it is for these reasons that the idea of critical rationalism was selected as the lens for this study. A model developed by Chitpin called the Objective Knowledge Growth Framework (OKGF), and

is based on Popper's critical rationalism. The OKGF emphasizes that knowledge growth occurs when individuals systematically eliminate errors in their tentative solutions when faced with problems of practice (Chitpin, 2014; Chitpin, 2015).

Critical Thinking, Knowledge Growth, and Online Discussion Boards

The concept of critical thinking has previously been explored in a variety of contexts when it comes to pre-service teacher training that includes the use of online discussion boards (Jones & Ryan, 2014; Kalelioglu & Gülbahar, 2014; Perkins & Murphy, 2006; Szabo & Schwartz, 2011) where a majority of the research has been placed on quantitative data from pre and post testing of critical thinking skills and not on the qualitative aspect of how pre-service teachers have engaged with the content. Online learning is becoming one of the fastest growing areas of education due to the popularity of technology, online courses and hybrid (blended) learning opportunities. Properly conceived, designed and facilitated, online education can enhance the learning experience for students (Jones & Ryan, 2014; Szabo & Schwartz, 2011) by providing learners with autonomy over their interaction with the material and encouraging self-reflection (Means, Toyama, Murphy, Bakia, & Jones, 2010). Instructors in both online and hybrid courses are turning to online discussion boards as a way of encouraging interaction of students beyond face-to-face instructional time and to aid in the development of critical thinking (Williams & Lahman, 2011). As students are pushed in their understanding of course content by critically analyzing the information provided, they are also encouraged to create or grow the knowledge that is required in order take further action (C21 Canada, 2012).

Knowledge growth in this study is referred to as knowledge building through the process of asking questions, leading discussions and testing the proposed solutions or theories to uncover error(s) contained in the solutions (Chitpin, 2003). The Objective Knowledge Growth

Framework (OKGF) has been shown to encourage individuals and groups to reflect on and question their theories or assumptions when applying various theories, before reaching a suitable conclusion (Chitpin, 2014; Chitpin, 2015).

Context of the Study

This study focuses on one hybrid course at a Canadian university that is specific to pre-service teachers, where online discussion boards were introduced in the fall semester of 2014 so as to encourage a higher level of engagement in the course material and, hence, critical thinking development as evidenced by previous quantitative studies (Jones & Ryan, 2014; Kalelioglu & Gülbahar, 2014; Perkins & Murphy, 2006; Szabo & Schwartz, 2011).

For a few years, it was noted that the student evaluations of the course and feedback provided by the students pointed to the need to motivate and engage students in the course material, as the feedback provided by the students pointed to the repetitiveness of course content. Due to the students' perceptions of the repetitiveness of the content, students did not see a need to attend face-to-face instructional time, as they felt that they were not challenged in their understanding of the course content. Armed with this information the course was redesigned to encourage critical thinking development, so as to build pre-service teachers knowledge through the implementation of online discussion boards.

At the end of the fall 2014 semester it was noted anecdotally that students enrolled in these two sections of the course appeared to have participated more during face-to-face instruction and in the online discussion forums compared to previous sections of the same course that were led by the same instructor. The participation of students includes engaging in conversations that challenge their understanding on the topic area. However, it is unknown how the students perceived the learning experience and if the introduction of online discussion boards

through the redesign process actually increased the understanding of critical thinking, critical thinking skills, and knowledge growth of students. It is this query that brings forward the questions that will lead this study.

Research Question

The main research question is: How has the implementation of online discussion boards in the redesign of the two sections of a mandatory course of the Bachelor of Education program at a Canadian university supported the development of pre-service teachers critical thinking and contributed to their knowledge growth related to course content.

The guiding questions are:

1) What is pre-service teachers' understanding of critical thinking?
2) How, if at all, have online discussion boards assisted in developing pre-service teachers' critical thinking skills?
    a. Provided that the answer to guiding question 2 is positive, how has development of critical thinking on discussion boards led to knowledge growth in course content?

Theoretical Perspective: The Objective Knowledge Growth Framework

The Objective Knowledge Growth Framework (OKGF) is used due to the nature of the study looking at pre-service teachers' understanding of critical thinking and knowledge growth and how the OKGF has been linked to professional learning and development. The OKGF is a reflective tool and is cyclical in nature. It asks individuals to first identify a problem that they wish to solve and, through the method outlined, come to a solution. The initial problem to be investigated has to be identified and posed in the form of a question (Chitpin, 2015), then a tentative solution is proposed to address the problem. By taking a critical look at the aspects of

the proposed theory, participants are able to acknowledge weak points in the suggested solution(s), which will then allow a new problem to be identified, through the process of error elimination (Chitpin, 2015). Participants can complete as many OKGF cycles as required in order to obtain a solution that would best solve the problem (Chitpin, 2014). Figure 1 represents the process of the OKGF (Chitpin, 2014, 2015).

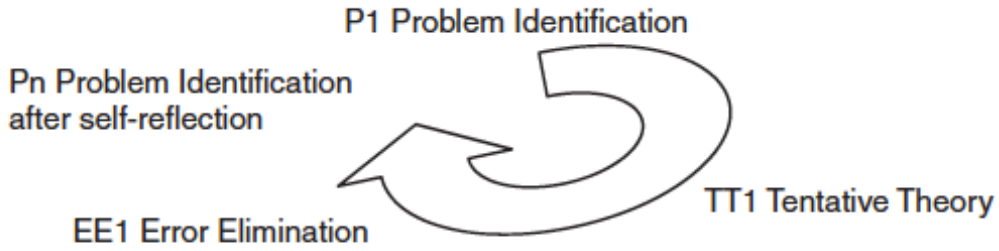


Figure 1: The objective Knowledge Growth Framework (Chitpin, 2014, 2015)

As a reflective tool, the OKGF can be used to track problem-solving practices and strategies, when individuals are faced with varying challenges and opportunities (Chitpin, 2014). When individuals apply the OKGF in school related contexts, they are encouraged to reflect on their established system of beliefs, as well as their decision-making strategies, so that the final conclusion that is stated is established in strong empirical content (Chitpin, 2014). The participant of the OKGF must have the desire to critically analyze a set of beliefs that they think, or continue to believe to be accurate (Chitpin, 2014, 2015) as this analysis is one of the central aspects of the process. By putting the OKGF into practice, users are able to discover weak points in the belief systems that have been established and to question various assumptions (Chitpin, 2014, 2015).

The OKGF is robust in that it supports professional learning and development in various contexts and, yet, it is very simple in its nature (Evers & Chitpin, 2003; Chitpin, 2015; Chitpin & Simon, 2009, 2012; Simon et al., 2010). The OKGF is also sensitive to experience, various

contexts, and demands (Chitpin, 2015) and this explains how those who have a broad range of professional experience, or have dealt with similar circumstances in the past are able to work through this process in an effective manner. Furthermore, as evidenced by previous studies, the reflective process of the OKGF enables pre-service teachers and principals to showcase their knowledge growth and "processional" development (Chitpin et al, 2008; Chitpin & Knowles, 2009).

When solving problems, the OKGF allows individuals to openly examine (1) how they attempt to solve problems; (2) how they establish tentative theories and then reflect upon their accuracy; (3) how other individuals influence their problem solving process; (4) and why they choose to eliminate certain theories in favor of others (Chitpin, 2015).

Participants

The participants of this study were drawn from a pool of approximately 70 pre-service teachers who were enrolled in the redesigned sections of a mandatory pre-service teacher course in the fall semester of 2014 at a Canadian university. All pre-service teachers in the two redesigned sections were invited, via email, to participate in this study. Participation was voluntary and no monetary compensation was awarded. Of the over 70 potential participants contacted, 3 pre-service teachers agreed to participate in the study. This study was conducted almost 12 months after the completion of the course. Due to the lapse in time, this could be a reason that only three (3) individuals came forward to participate. All three of these individuals were male and each had different life experiences before entering their Bachelor of Education program. The three participants had different teachable subjects and agreed to be interviewed and have their online discussion posts analyzed. Three participants was deemed to be an appropriate sample for this study, as the focus was placed on an in-depth analysis and the quantity of data

complied for each participant would be adequate to yield sufficient depth (Creswell, 2013; Merriam, 1998). The data include transcription of an hour long interview of each participant, analysis of five (5) different online postings, and feedback given by participants were part of the data collected. As well, the participant's previous experience, age, teachable subjects, and level of education provided a diverse and holistic view of the pre-service teachers who were enrolled in the redesigned sections of the pre-service teacher course.

Data Collection

In order to determine pre-service teachers' understanding of critical thinking and establish their knowledge growth, data were collected using a semi-structured interview, conducted by the researcher. In order to ensure that there was consistency in the interview process, the researcher conducted all of the interviews.

The interview was comprised of five questions that were open-ended and allowed participants to reflect on their experience using the online discussion boards. The questions were focused on: 1) their personal understanding of critical thinking, 2) their experience using the discussion boards that were presented to them throughout the duration of the course, 3) their views as to whether the discussion boards helped or hindered their understanding of the course material, 4) their experience with class assignments after engaging in online discussions, and 5) their views as to whether the online discussion medium enhanced their critical thinking development. The questions were designed to examine pre-service teachers understanding of critical thinking and their experiences with the online discussion boards and were broad in nature, so as to allow for the participants to fully reflect on their experience and not lead them to answer the questions in a specific manner.

The online discussions completed by the students were analyzed through the lens of the OKGF. The analysis of the discussion threads focused on the quality of the discussion topics and how the participant engaged in the discussion to determine evidence of critical thinking skills reflecting the stages outlined by the OKGF, that of 1) problem identification; 2) posing of a tentative theory; 3) the process of error elimination; and 4) the identification of a new problem or the modification of the solution (Chitpin, 2014, 2015)..

Data Analysis

The data for this study were analyzed inductively and deductively. The data from the transcripts were coded inductively in order to eliminate a form of bias (Creswell, 2013), as the researcher played a role in the redesign of the course to include online discussion boards. Codes and themes were established in the margins of the transcribed documents in various colours to aid in the visual representation of various themes that emerged. The themes that were established were placed together in different files, each representing one specific theme/idea (Creswell, 2013). The goal of grouping the themes in this manner was to establish deeper connections within like phenomena and to create a clearer understanding of the theme. Visual displays such as graphs were used to aid in the creation and understanding of the established connections.

The posts from the online discussion boards from this study were analyzed in a different manner. Each of the pre-service teachers' online postings was gathered using a separate document for each individual. A coding method was implemented again for this portion, but was done so in a deductive manner in order to comply with the stages of the OKGF, as outlined by Chitpin (2014). Each of the stages was coded in a different colour and was placed into a grid to establish a visual aid. The visual representation of the critical thinking skills demonstrated by the participants was used to make connections with the OKGF.

During each stage of data analysis, checks for consistency were employed by coding the data several times at different intervals in the analysis process (Creswell, 2013). As well, the central and guiding research questions were consulted on a regular basis in order to ensure that the focus of the study remained consistent.

This study was conducted as a qualitative case study and the boundaries of this case were established to be specific in nature due to the timeframe of the study, the distinct sections of the pre-service teacher course that was analyzed, and the Canadian university at which it took place (Creswell, 2013; Merriam, 1998). The idea was entertained to treat each participant as an individual case study, but the decision was made to do an integrated case study due to the hopes of establishing a holistic account of like phenomena (Creswell, 2013; Merriam, 1998).

Findings

Through the data collection process, five major themes were established and explored. The first four themes were found through an inductive process, and are emergent in nature as they were not pre-conceived. The final theme was found through a deductive process as the OKGF was used as a lens to identify incidents of the framework in use. The four emergent themes were: (1) critical thinking understanding, (2) creating a strong foundation, (3) establishing connections between their peers, and (4) the importance of time. The deductive theme is how pre-service teachers parallel aspects of the OKGF in their thinking process. These themes are outlined in Figure two.

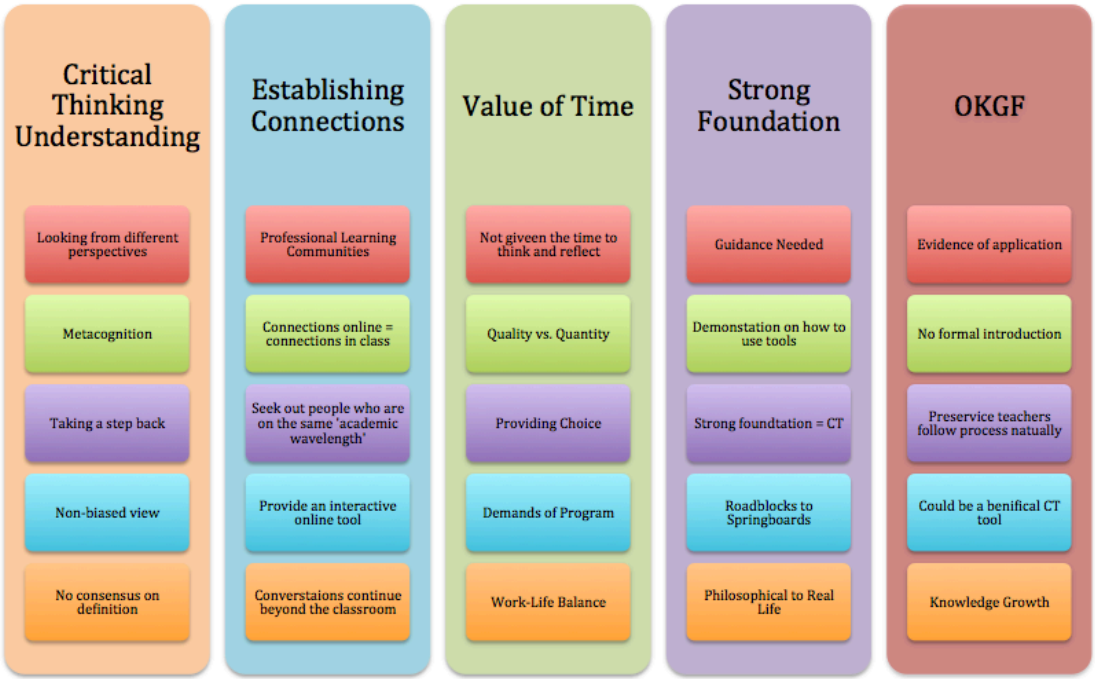


Figure 2: Overview of major themes established through data collection

Critical Thinking Understanding

Each of the participants was asked to define what critical thinking meant to them. The three participants that were queried put forward definitions that were all different in nature. There was no consensus among the students on what defines critical thinking. However, there were a few similar thoughts that did emerge. The first was that participants associated critical thinking with metacognition. One of the participants said "I guess I would say that it has to do, a lot with being conscious of…how you think, so I guess it has a lot to do with metacognition, I guess you could say." Another participant indicated, "I am struggling to distinguish between critical thinking and metacognition." One participant discussed the idea that critical thinking is about questioning beliefs and being able to open the mind to new concepts and a new way of thinking and to allow students to be truly open minded for the first time, "so they (students) used to think that they were open minded, but they weren't, and once your get them to question that,

they can be open minded for the first time." As well, two of the participants indicated that critical thinking skills are something that they are invited to take part in during their pre-service teacher program so that they will be able to impart those skills with their students, but they do not feel that they will be successful in that task. Additional concepts that are present in the participant's understanding of critical thinking are looking at concepts from different perspectives, taking a step back and evaluating the different options that are being presented, and establishing a non-biased view of the situation.

Strong Foundation

Something that was brought up in each and every discussion with the participants in the redesigned sections of the mandatory pre-service teacher course was that they were not being given the proper foundation in order to engage in critical thinking. Participants mentioned that they were being invited to take part in assignments and discussions, but they felt that they had not been offered the proper tools in order to go forward in the tasks confidently. They wished that they could have had more guidance with the material and the various teaching tools that were being presented to them. When it came to exploring the idea of critical thinking in their assignments, participants indicated that they were not thinking critically about what they were putting together for submission, but instead were trying to determine what the professor was looking for in order to achieve a strong mark. When the participants were questioned about the lack of information to think critically and creatively about what they were putting together for submission, it was noted by all three that, without a strong knowledge base to work from, they were left in a state of confusion. As one participant put it in regards to completing assignments, "I see it more as a roadblock. So yes it forced me to create my own (ideas), but in more of a roadblock way instead of a springboard. I feel that if I had a list, for example, of strategies, then I

could say, ‘oh cool! I want to do this,’ and then add something really cool to it because I already have a foundation.”

When it came to the online discussions, participants indicated that, at times, it felt like a philosophical discussion that did not relate to real life. The participants mentioned that they were left wondering how the topics of discussion posted would help them with transitioning into the classroom setting where they would be implementing teaching techniques and concepts for, potentially, the first time. For the pre-service teachers in this study, they were not able to establish connections between how a philosophical discussion would enable them to benefit their teaching in the classroom setting.

Establishing Connections

The online discussion boards appear to serve several purposes for the pre-service teachers who are required to engage in postings. The participants suggested that this is a space for them to connect with like-minded empathetic colleagues. The participants appear to be using the discussion boards more as a social media tool rather than as a space to post their thoughts and responses to the discussion topics. When the participants engaged in a conversation with someone during the in-class instruction time, they indicated that they are more likely to seek out that person in the online boards to continue the discussion. As well, the pre-service teachers also implied that, if they read a post from someone online that they thought was very engaging, they would seek that person out in class.

Participants indicated that, while they did like the online discussion boards, the online platform utilized in this study (Blackboard) may not be the best place to carry out these conversations. For one participant, the platform seemed to be limited in its capabilities and did not encourage students to come back and respond to postings. The way that the discussions were

organized required students to search and filter through a variety of different folders and organizational boxes. In this process, the participant mentioned that it became frustrating and they would abandon their quest of seeking out a posting that they had previously read which intrigued them. As the participant mentioned in regards to a better organizational system, "It would help develop social connections that we are using anyway; then, we would start linking up in other ways than being confined to a box in a course and a box in a folder, and it is something that you will lose access to if you do not go in and copy and past the stuff from the people that you do not want to lose contact with."

Value of Time

Another concept that was evident in each interview, as well as in the online discussion posts, was the amount of time that participants have to complete their assigned work. The previous one-year Bachelor of Education program at the Canadian university in this study was an intensive program, with students in the program taking part in six courses each semester for two semesters. Students indicated that the online discussions became something that they had to check off of as a to do list, rather than truly taking the time to engage in the content that was presented in the forum. Under such time constraints the pre-service teachers mentioned that, with the quick turn around of the online postings, they were not given the time to truly think and reflect about what was presented to them in class or in the readings and the postings became more about the quantity of their work and not the quality. One participant mentioned that, when they were not posting or doing other work, they felt that they should be doing something related to their program. This implies that they felt guilty, indicating that they may be struggling with a work-life balance in order to get everything done that is required of them.

The concept of choice was mentioned by two of the three participants in that it would allow them to truly engage with the content they would like to explore further, rather than posting on a concept that does not really speak to them and, to put it bluntly, wasting their time. As one student put it, "Sometimes you are in a situation where, I just have to go and do my post and I don't necessary have anything to say about that; whereas other times, it is like, 'Oh ya, I have something to say!' so I want do a post about it."

Use of the Objective Knowledge Growth Framework (OKGF)

The participants in this study were never formally introduced to the OKGF but, individually, each participant showed evidence of integration of various aspects of the framework in each of their online discussion board postings. Over the course of the semester, the participants were required to post in an online discussion thread five times, exploring different ideas in each post. It is interesting to note that in each of the postings done by the participants, at one point in their discussion thread, they posed a question that challenged their understanding of the topic. However, some of these questions were not very detailed and this could be related to their interest in the topic at hand, as indicated by the participants in regards to the value of their time.

An entire cycle of the OKGF was only noted in one post, where the participant worked through all three steps of the framework, but did not go beyond a single cycle. However, the participant did in fact pose a new question that would be considered the first step of a secondary cycle being explored. In most of the primary postings, participants identified a question and posed a tentative theory, but did not show evidence of error elimination or the identification of a new problem. An outline of a complete cycle of the OKGF and a partial cycle of the OKGF can be found in Table 1. Participants were also encouraged to read the postings of their peers, and to

respond and engage in a discussion online. When responding to online postings from their peers, in two events, two of the participants showed evidence of error elimination and posed a new question. Throughout the process of the online postings, it became evident that knowledge growth in the course content was occurring.

OKGF Partial Cycle	**OKGF Complete Cycle**
P1: Do we need to add to the explicit curriculum? TT1: Perhaps a balance needs to be established on the emphasis we place on the content in it. EE1: No identification of error established within the post.	P1: Should we read their (losers, in the context of history) perspectives at the public school level? TT1: Clean up the language associated with the losing view and present it in a textbook to allow students the opportunity to gain understanding of the negative sides of history without engaging in explicit language. EE1: By not reading the original text and gaining understanding of the true 'horror', we will not understand new enemies until it is too late. P2: How do we avoid the repetition of democracies falling into tyranny if we don't study the enemies' original perspective?
*Posting asked participants to reflect on the concepts of the null and explicit curriculum	

Table 1: Examples of partial and complete cycle of the OKGF in participant online discussion board postings

Implications and Limitations

As indicated by Kivunja (2014b), effective teaching of critical thinking involves the deliberate attempt to help individuals acquire information and knowledge, to identify different alternatives and evaluate them, to take a position that they are able to support with valid arguments, and to advance analysis in a logical manner. As well, Pohl (1997) states that, in order for students to engage in critical thinking in the 21st Century work place, they need to learn relevant skills explicitly. When looking at participants understanding and definitions of what critical thinking is, it is not surprising that they do not have a unified and concrete understanding. Within the literature (Brookfield, 1987a; Dewey, 1910, 1933; Facione, 2011; Garrison, 1991,

1992; Le Cornu, 2009; McPeck, 1981; Reynolds, 2012; Siegel, 1988) a variety of different definitions and understandings of critical thinking are presented and, so one would not expect pre-service teachers to have a solid understanding of the concept. It is interesting to note that many of the ideas put forward by the participants in this study in some way do connect with the various definitions outlined by the philosophers and authors mentioned in the literature. One concept put forward by two of the participants was that of metacognition when it comes to critical thinking. In essence, effective instruction relating to critical thinking engages students in metacognition that, in turn, helps them to consciously ask questions about observations or ideas (Kivunja, 2014b). However, participants interviewed in this study never mentioned that they were engaging in discussions in any of their courses regarding what critical thinking is and how it can be explored in classroom settings. The participants also indicated that they did not feel that they would be successful implementing critical thinking strategies in their own classrooms. With this information, we may gain insight into why participants in this study have a challenging time incorporating critical thinking techniques into their own work, as well as in their teaching practice.

With participants mentioning that they were not introduced to foundational concepts to aid the construction of their knowledge base, they appeared to be left trying to put together the pieces of a puzzle with no diagram to follow. If a scaffold relative to the required concepts is not properly built, students may not be able to make the leap from philosophical to real life contexts, such as in their own professional practices. It appears that participants equate a strong foundation in the area of content understanding with being able to engage in critical thinking. This was evidenced through interview responses where all participants individually noted that they did not feel they had a strong understanding of the content leading into various assessment strategies.

This lead them to focus more on what would get them a strong grade instead of thinking about what was being asked of them to do. Strategies such as studying in the zones of proximal development (Vygotsky, 1978) and providing the opportunity for pre-service teachers to work through situations under the guidance of the professor or more experienced peers, instead of assuming that the pre-service teachers have the knowledge base necessary to operationalize critical thinking in a new subject area could be a resolution to this observation. By being provided the basics and shown how to use them appropriately, students can start to evaluate and question the various techniques in order to create their own ideas and to make decisions based on the knowledge that they have acquired, and hence, lead to their development and knowledge growth in critical thinking.

All of the participants involved in this study indicated that they did enjoy the discussion board postings, as it allowed them to connect and communicate with their peers beyond the classroom setting. However, at times they felt that the online discussion postings were a burden placed on them, overwhelmed the demands of the Bachelor of Education program as the timeframe for posting within the discussion thread was restrictive. It was reiterated by all participants that they should have choices regarding when and what they would like to post. They feel this would allow them to connect to a subject area they are interested and passionate about. It was also noted by the participants that they are seeking out others who they deem to be on the same 'academic wavelength' as they are. From the discussions in the face-to-face instructional time, they went out of their way to connect with these individuals in the online discussion threads, and vice versa. The participants appear to be selective in terms of whom they want to engage with and, from that, they are beginning to establish their own Professional Learning Communities and, in a way, are treating the discussion boards as a type of social media

interface. This could also pose a potential issue in terms of the concept of 'groupthink,' as outlined by Janis (1972), which suggests that a desire to have a strong concurrence of viewpoints between members of a group of individuals suppresses critical inquiry. It is important to be aware of this potential trend in order to ensure that groups are encouraged to interact with others beyond their pre-set connections and are challenged in the way they gather and interpret information as this may aid in diminishing groupthink tendencies (Janis &Mann, 1977).

One of the most interesting results of this study is that of the relevance of the OKGF in the online postings of the participating pre-service teachers. As previously mentioned, participants were never formally introduced to the OKGF, yet they tended to follow a logic framework, that appeared to parallel the OKGF, to a certain extent, in their online postings. With participants implementing the first two stages of the cycle in terms of posing a question that has challenged their thinking and posing a tentative theory, and in one instance establishing the process of error elimination and presenting a new problem, they are exhibiting traits consistent with the critical thinking definition outlined in this study by Dewey (1933), with the additional lens of critical rationalism by being able to identify errors, indicating that the OKGF can be tied to critical thinking development. As well, within the online postings, there was evidence of knowledge growth in the subject area. This evidence should be noted and explored in greater depth in future studies in this area of the OKGF as it presents a potential direct teaching tool for pre-service teachers to understand and engage in critical thinking more readily in their teacher education journey. If formally presented with this framework as a critical thinking method, it could potentially be incorporated into their classrooms and professional practice. Then their students would then be provided an application to help develop their critical thinking skills in order for them to be successful in the 21st Century society. The official introduction of the OKGF to pre-

service teachers could explicitly teach relevant skills, as outlined by Pohl (1997). Further research in this area could allow more in-depth analysis of how various forms of 21st Century communication technology (discussion boards, social media outlets, interactive learning boards, and hybrid learning platforms) can encourage critical thinking skills, critical understanding, and knowledge growth of pre-service teachers.

There are, however, several limitations evident in this research. The primary limitation regards the transferability of results gathered in other courses that are similar in nature. As the boundaries of this case study were quite strict, the conclusions that have been established may only be relevant to the pre-service teachers directly involved in the course. It is hoped that the data gathered in this study will be applicable to others implementing online discussion boards in various courses and that critical thinking strategies and knowledge growth may be linked with encouraging students to utilize the OKGF, not only as a decision making strategy, but as a tool that can help promote critical thinking abilities.

Another limitation to this research project is the amount of time which elapsed between when the inception of the redesigned course and when the research was conducted (Creswell, 2013). With regard to this elapsed time, participants may not have had the best recollection of the thoughts and experiences of their time enrolled in the course. It is believed, however, that the participant pool was established and the interview questions presented allowed for depth of thought, reflection, and conversation regarding the pre-service teachers' experience with the online discussion boards in the redesigned course.

As the selection process for this study was done on a volunteer basis, there were a limited number of individuals who came forward as willing participants. There is also the possibility that the pre-service teachers who decided to participate in this study had strong opinions about their

experience within the course and the use of online discussion boards. It was evidenced that varying opinions were represented which did provide an opportunity to collect data from a continuum of points along the entire spectrum of possibilities.

Conclusion

Trilling and Fadel (2009) explore the concept that, in order to be an effective teacher and provide students with the skills that will enable them to be successful citizens in the 21st Century, it is fundamental to not just teach them the traditional subjects such as reading, writing, and arithmetic, but to provide students the opportunity to learn the skills most in demand in the 21st Century. This study reveals that pre-service teachers may not have sufficient understanding and practice of critical thinking when they are enter the professional field, and there is the possibility that they are not being provided with the necessary foundational tools to be able to implement critical thinking opportunities in their classrooms. Other results from this study restate the importance of providing pre-service teachers with the options of time, choice, and the opportunity to make connections with their peers within the teacher education program. With the implementation of online discussion boards in a redesigned mandatory pre-service teacher course, pre-service teachers were given a 21st Century technology medium to practice critical thinking skills in discussion topics that went beyond the face-to-face instructional time. It was through these discussion boards that knowledge growth in the subject area was evidenced as the participants were asking questions, leading discussions, and engaging in hypothesis testing to eliminate errors in their proposed ideas. It was also through analyzing the content of the discussion boards that it was discovered that participants were engaging with elements of the OKGF, even though they were never formally introduced to this model of introspective thinking and decision-making. This leads to the conclusion that the OKGF, when properly presented and

discussed with pre-service teachers, may lead to a more direct connection with critical thinking strategies that can be incorporated into teaching methods in order to demonstrate this process with their students to encourage critical thinking skill development. It is this information that should lead future research studies in the area of linking the OKGF to that of the 21st Century skills of critical thinking and to technology.

Chapter 3

Final Thoughts

Over the duration of this research project, I have been provided the opportunity to work through many challenging questions, observations, and scenarios which have allowed me to take a deeper and critical look at how pre-service teacher education courses are designed and implemented in a university setting. I have also been able to listen to the experience of pre-service teachers, not only with regard to a newly redesigned course, but also, their experience in the Bachelor of Education program as a whole. It was through the conversations in the interview that drove my curiosity to consider the questions posed in the research study. This process also allowed me to reflect on my role as a teacher within the education system and how I can work to better my teaching practice in the classroom setting.

The topics of critical thinking and knowledge growth are truly ones that are stimulating when it comes into the area of 21st Century Learning skills. With so much emphasis being placed on these skills in official documentation, such as *Growing Success* (Ontario Ministry of Education, 2010), the various Ontario Curriculum Documents, and with a promise for excellence from the Ontario Ministry of Education (2016a) regarding how Ontario will ensure that students are provided with an education that will allow them to become more competitive on the global stage, it is an area that should be researched in greater depth. Through personal reflection on my teaching practice, and listening to others who are also beginning their journey into the classroom, it has allowed me to question if the documentation that is being published by the ministry is being followed and implemented, or if it much more talk than action when it comes to critical thinking.

An example of this was the recent report published by the Education Quality and Accountability Office (EQAO) on the Grade 6 mathematics testing for the 2015-2016 year. Since 2011, there has been a steady decline in the percentage of grade 6 students in the province of Ontario passing the assessment and for the 2015-2016 year, only 50 percent of students met the standard (Education Quality and Accountability Office, 2016). As a mathematics teacher, much of what is required of students in this subject area are critical thinking skills. It is the process of being able to ask questions, think of possible ideas regarding how to solve the problem, providing a tentative solution as to how to solve the problem, and identifying errors in their

proposed solution that produces the cyclical pattern until the best solution is reached. When the students are able to identify the potential error in their proposed solution that promotes critical thought and establishes a new idea of how to carry on with the problem they are attempting to solve. When results like this are published, it brings me to question how educators in front of the classroom are implementing critical thinking skills with their students, and if the teachers have the appropriate knowledge of critical thinking skills in order to practice these stills with students.

From carrying out this research study and conducting literature reviews and looking more deeply into the education system in Ontario, I believe that there is still a large gap to close when it comes to the areas of 21st Century skills and various teaching methods to promote the application of these skills in the classroom setting by students and teachers. From my personal experience, more emphasis needs to be placed on these skills in Bachelor of Education programs. With Ontario now requiring pre-service teaching students to complete a 2-year (4 semester) program, instead of the previous intensive 8-month (2 semester) program, this could allow for the introduction of these topics and in-depth conversations about how to practice these skills into the classroom setting. This entire process has also taught me that there is no easy answer as to how we can utilize and implement technology in the educational setting to encourage critical thinking development, critical thinking understanding, and knowledge growth. However, there is the opportunity to be more explicit in explaining the concepts of critical thinking to pre-service teachers by providing them with tools that will allow them to be more critical and creative thinkers in, not only their work, but in their everyday lives and the roles that they play in their families, communities, and in the larger society.

The findings that were generated in this study I found to be very interesting and applicable to the educational field. The potential for more research to be carried out in the area of the OKGF being directly connected to critical thinking skills is exciting. The OKGF is easy to follow and, as evidenced by the research, pre-service teachers are following a logic framework that parallels the OKFG to a certain extent. To be able to provide pre-service teachers (and through them, theoretically, their students) with a framework that they are able to explore and create direct connections to a 21st Century Learning skill, which can be implemented in the classroom setting has great appeal. The potential of this framework is its ability to be an explicit, easy to follow model for critical thinking skill development that could create more confidence around critical thinking for teachers, when trying to establish new and creative ways to

encourage critical thinking with their students. As well, as the use of technology continues to develop at such a rapid pace, there are great opportunities to encourage and incorporate ideas presented in the OKGF in a variety of communication technology settings.

As I move forward in my teaching career, it is this research that has truly allowed me to connect in with the students in my classroom and which has enticed me to utilize and implement critical thinking on a daily basis in my teaching methods. As I continue to grow and develop in my role in the classroom, it is this research that pushes me to take an in-depth look at my teaching methods and to work to create authentic opportunities for the students who come into the classroom each day to become successful not only in the classroom, but beyond.

References

Brookfield, S.D. (1987a). *Developing critical thinkers.* San Francisco: Jossey-Bass.

C21 Canada (Canadians for 21st Century Learning and Innovation). (2012). S*hifting minds: A 21st century vision of public education for Canada*. Retrieved from: www.c21canada.org/wp-content/uploads/2012/11/Shifting-Minds- Revised.pdf.

Cheong, C.M., & Cheung, W.S. (2008). Online discussion and critical thinking skills: A case study in a Singapore secondary school. *Australasian Journal of Educational Technology. 24*(5), 556-573.

Chitpin, S. (2003). The role of portfolios in teachers' professional growth and development: A knowledge building analysis. Unpublished Doctoral Dissertation, University of Toronto, Toronto, Canada.

Chitpin, S. (2010). A critical approach for building teacher knowledge. *International Journal of Education, 2*(1), 1-14.

Chitpin, S. (2013). Should Popper's view of rationality be used for promoting teacher knowledge? *Educational Philosophy and Theory*. *45*(8), 833-844.

Chitpin, S. (2014). Principals and the professional learning community: Learning to mobilize knowledge. *International Journal of Educational Management, 28*(2), 215-229.

Chitpin, S. (2015). Capturing principals' decision-making processes in an online professional learning community. In S. Chitpin & C. W. Evers (Eds.) *Decision making in educational leadership. Principles, Policies, and Practices* (pp.67-89). New York, NY: Routledge.

Chitpin, S., Simon, M., & Galipeau, J. (2008). Pre-service teachers' use of the Objective Knowledge Growth Framework for reflection during practicum. *Teacher and Teacher Education, 24*(8), 2049-2058.

Chitpin, S., & Knowles, J.G. (2009) A principal's view of the use of the OKGF as a reflection tool. In Caltone, M.P. (Ed.), *Handbook of lifelong learning developments* (pp.1-15). New York, NY: Nova Science Publishers Inc.

Chitpin S., & Simon, M. (2009). Even if no one looked at it, it was important for my own development: Pre-service teachers perceptions of professional portfolios. *The Australian Journal of Education. 53*(3), 197-227.

Chitpin, S. & Simon, M. (2012). Capturing problem-solving processes using critical rationalism. *Teacher Education and Practice, 25*(2), 302-319.

Creswell, J.W. (2013). *Qualitative Inquiry and Research Design 3rd Edition.* California: Sage Publications.

Dewey, J. (1910). *How we think,* Lexington, M.A.: Health and Co.

Dewey, J. (1933). *How we think: A restatement of the relation or reflective thinking to the educative process.* Boston, MA: Health & Company.

Education Quality and Accountability Office. (2016). Highlights of the provincial results. Retrieved from http://www.eqao.com/en/assessments/results/communication-docs/provincial-report-highlights-elementary-2016.pdf on 20 August 2016.

Elder, L., & Paul. R. (1994). Critical thinking; Why we must transform our thinking. *Journal of Developmental Education, 18*(1), 34-35.

Evers, C., & Chitpin, S. (2003). From uncertainty to knowledge growth through individual reflection. Australian College of Educators, *Teachers as Leaders in a Knowledge Society* (The College Year Book, 2003), pp. 33–44.

Facione, P.A. (2011). *Measured reasons and critical thinking.* Lillbrae, CA.: The California Academic Press.

Fullan, M., & Langworthy, M. (2014). *A rich seam: How new pedagogies find deep learning.* London: Pearson.

Garrison, D.R. (1991). Critical thinking and adult education: a conceptual model for developing critical thinking in adult learners. *International Journal of Lifelong Learning. 10*(4), 287-303.

Garrison, D.R. (1992). Critical thinking and self-directed learning in adult education: An analysis of responsibility and control issues. *Adult Education Quarterly, 42*(3), 136-148.

Giroux, H.A. (1978). Writing and critical thinking is social studies. *Curriculum Inquiry, 8*(4), 291-310.

Goodlad, J.I. (1984). *A place called school: Prospects for the future.* New York, NY: McGraw-Hill Book Company.

Janis, I.L. (1972). *Victims of groupthink.* Boston: Houghton Mifflin.

Janis, I.L. & Mann, L. (1977). *Decision making.* New York, NY: The Free Press.

Jones, M. & Ryan, J. (2014). Learning in the practicum: engaging pre-service teachers in reflective practice in the online space. *Asia-Pacific Journal of Teacher Education. 42*(2) 132-146.

Kalelioglu, F. & Gülbahar, Y. (2014). The effect of instructional techniques on critical thinking and critical thinking dispositions in online discussion. *Educational Technology & Society, 17*(1), 248-258.

Kivunja, C. (2014a). Do you want your students to be job-ready with 21st Century skills? Change pedagogies: A paradigm shift from Vygotskyian social constructivism to critical thinking, problem solving and Siemens' digital connectivism. *International Journal of Higher Education, 3*(3), 81-91

Kivunja, C. (2014b). Innovative pedagogies in higher education to become effective teachers of 21st century learning skills: Unpacking the learning and innovations skills domain of the new learning paradigm. *International Journal of Higher Education, 3*(4), 37-48.

Le Cornu, A. (2009). Meaning, internalization and externalization: Towards fuller understanding of the process of reflection and its role in the construction of the self. *Adult Education Quarterly, 59*(4), 279-297.

Literacy and Numeracy Secretariat (Ontario Ministry of Education). (2009). Critical literacy. *Capacity building series*. Toronto, ON: Queen's Printer.

Lochhead, J., & Clement, J. (1979). *Cognitive process instruction: Research on teaching thinking skills.* Philadelphia, PA: Franklin Institute Press.

Mason, M. (2008). Critical thinking and learning. In M.Mason, *Critical thinking and learning.* (pp.1-11). Hoboken, NJ: Blackwell Publishing.

McLaughlin, M. & DeVoogd, G.L. (2004). *Critical literacy: Enhancing students' comprehension of text*. New York, NY: Scholastic.

McPeck, J.E. (1981). *Critical thinking and education.* Oxford, UK: Martin Robertson.

Means, B., Toyama, Y., Murphy, R., Bakia, M., & Jones, K. (2010) *Evaluation of evidence-based practices in online learning: A meta-analysis and review of online learning studies.* Washington, DC: US Department of Planning, Evaluation, and Policy Development.

Merriam, S. (1998) *Qualitative research and case study applications in education.* San Francisco, CA: Jossey-Bass Publishers.

National Education Association (NEA). (2016). Preparing 21st century students for a global society: An educator's guide to the '4 Cs'. Retrieved from http://www.nea.org/assets/docs/A-Guide-to-Four-Cs.pdf on 29 July 2016.

Ottawa Carleton District School Board. (2016a). Speaker series: Past events. Retrieved from http://www.ocdsb.ca/par/pi/ocdsbss/Pages/default.aspx 16 August 2016.

Ottawa Carleton District School Board. (2016b). Student corner: Online learning. Retrieved from http://www.ocdsb.ca/stu/ol/Pages/default.aspx 16 August 2016.

Oliver, M., Trigwell, K. (2005). Can "blended learning" be redeemed?. *E-learning 2*(1), 17-26.

Ontario Ministry of Education. (2010). *Growing success: Assessment, evaluation, and reporting in Ontario schools.* http://www.edu.gov.on.ca.

Ontario Ministry of Education. (2013). *Extending the landscape and enlarging the vision: Pedagogy, technology, and innovative practices in a digital world*. Retrieved from http://www.edu.gov.on.ca/eng/research/Extend_LandscapeE.pdf 4 August 2016.

Ontario Ministry of Education. (2016a). *Achieving excellence: A renewed vision for education in Ontario.* Retrieved from http://www.edu.gov.on.ca/eng/about/great.html on 3 August 2016.

Ontario Ministry of Education. (2016b). *Literacy and numeracy strategy.* Retrieved from http://www.edu.gov.on.ca/eng/literacynumeracy on 20 August 2016.

Ontario Ministry of Education (2016c). *21st Century Competencies: foundation document for discussion*. Retrieved from http://www.edugains.ca/resources21CL/About21stCentury/21CL_21stCenturyCompetencies.pdf on 15 December 2016.

Partnership for 21st Century Learning (P21). (2016) *Framework for 21st century learning*. Retrieved from http://www.P21.org/framework on 2 August 2016.

Perkins, C., Murphy, E. (2006). Identifying and measuring individual engagement in critical thinking in online discussions: An exploratory case study. *Educational Technology & Society, 9*(1), 298-307.

Peters, R.S. (1972). On teaching to be critical. In F.R. Dearden, D.H. Hirst, & R.S. Peters (Eds.), *Education and the development of reason* (pp. 209-229). London, UK: Rutledge & Kegan Paul.

Pohl, M. (1997). *Teaching thinking skills in the primary years: A whole school approach.* Melbourne, AU: Hawker Brownlow Education.

Popper, K.R. (1966). *The open society and its enemies: The high tide of prophecy, 5th edition.* Volume 2, London, UK: Routledge.

Popper, K.R. (1989). *Conjectures and refutations: The growth of scientific knowledge,* 5th edition. London, UK: Routledge.

Roberge, G.D. (2013). Research into practice: Promoting critical literacy across the curriculum and fostering safer learning environments. Retrieved from http://www.edu.gov.on.ca/eng/literacynumeracy/inspire/research/WW_PromotingCriticalLiteracy.pdf 16 August 2016.

Siegel, H. (1988). *Education reason: Rationality, critical thinking, and education.* New York, NY: Routledge.

Simon, M., Chitpin, S., & R. Yahya (2010). Pre-service teachers' thinking about student assessment issues. *The International Journal of Education,* 2(2), 1-22.

Szabo, Z., & Schwartz, J. (2011). Learning methods for teacher education: The use of online discussions to improve critical thinking. *Technology, Pedagogy and Education, 20*(1), 79-94.

Trilling, B. & Fadel, C. (2009). *21st Century skills: Learning for life in our times.* San Francisco, CA: Jossey-Bass.

Vygotsky, L.S. (1978). *Mind in society: The development of higher psychological processes.* Cambridge, MA: Harvard University Press.

Wickersham, L.E., & Dooley, K.E. (2006). A content analysis of critical thinking skills as an indicator of quality of online discussion in virtual learning communities. *The Quarterly Review of Distance Education. 7*(2), 185-193.

Williams, L., & Lahman, M. (2011). Online discussion, student engagement, and critical thinking. *Journal of Political Science Education. 7,* 143-162.

Yücel, T.B., Ok, A. (2012). Incorporating critical thinking in the pedagogical content of a teacher education programme: Does it make a difference? *European Journal of Teacher Education, 35*(1), 39-56.

Appendix I

Interview Protocol

Time of Interview: _____
Date: _____
Place: _____
Interviewer: _____
Interviewee Code: _____

Project description: The purpose of this study will is to examine the understanding of critical thinking in pre-service teachers from their perspective who were assigned to one of the redesigned sections of the pre-service teacher education course 'Curriculum Design and Evaluation' at the University of Ottawa during the Fall 2014 semester. By interviewing students who were enrolled in one of the redesigned sections of the 'Curriculum Design and Evaluation' course, information will be able to be collected from the perspective of the students that will hopefully aid in the understanding of critical thinking development in pre-service teachers with the introduction of online discussion forums as part of the mandatory requirements of the course format.

Questions:

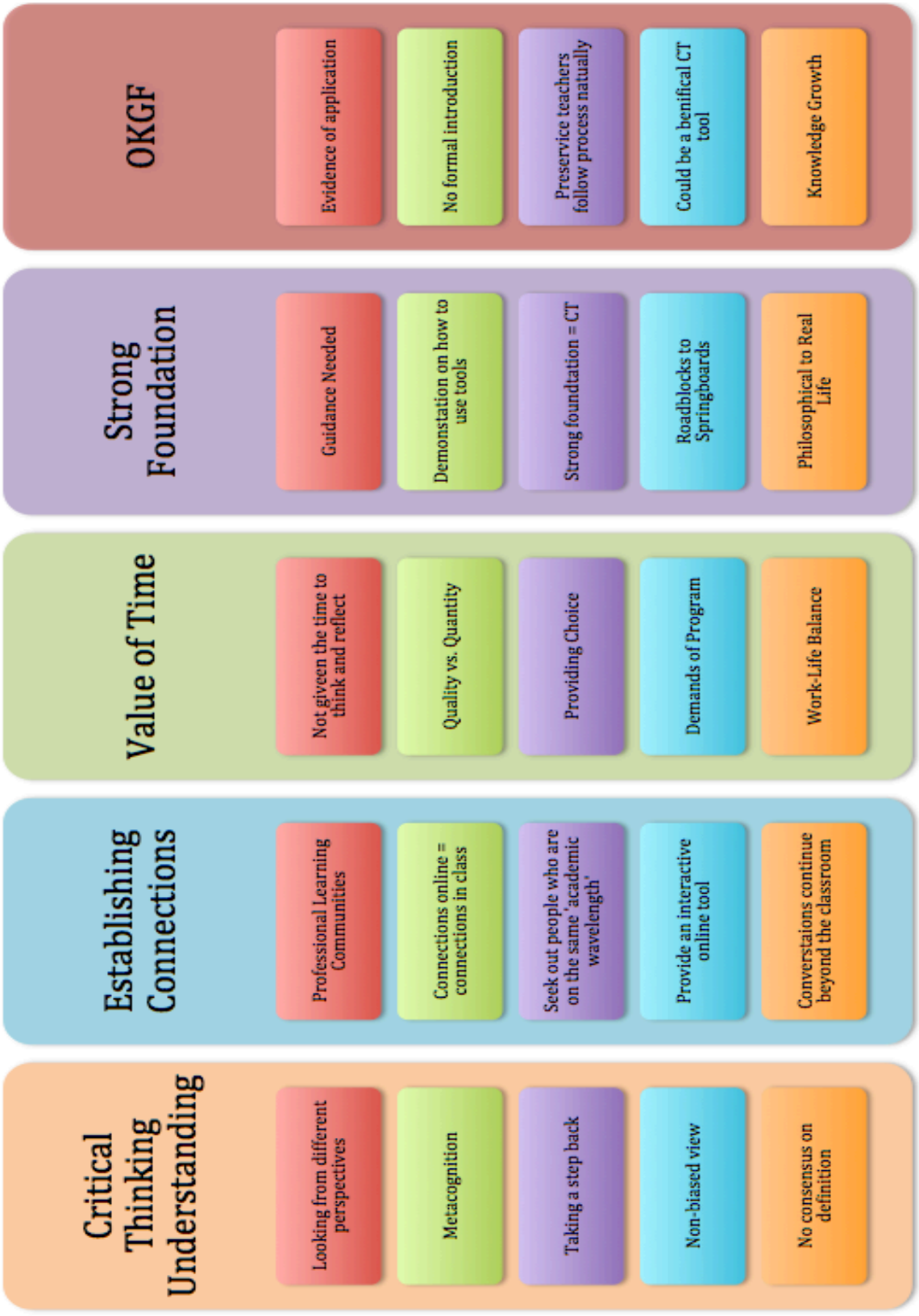
1. What is your understanding of the concept of critical thinking?

2. What was your experience with the online discussion forums that were presented to you and that you engaged with throughout course?

3. In what ways did the online discussions help/hinder your overall thought process on various topics?

4. Do you find that you were being challenged in your class assignments (lesson plan/unit plan) and to think critically in your approach in order to complete the work? If so, how? If not, why not?

5. If you had the opportunity to add anything to this course that you believe would have helped aid in your critical thinking development– what would have been?

Appendix II

Overview of Major Themes Established Through Data Collection