UNDERSTANDING METACOGNITION AND CRITICAL COMPONENTS OF THINKING AND LEARNING IN PUBLIC EDUCATION CONTEXTS: AN EXPLORATORY STUDY

A dissertation submitted to the Faculty of Claremont Graduate University and San Diego State University in partial fulfillment of the requirements for the degree of Doctor of Philosophy and Education

by

Shawna Rodnunsky

B.Ed., University of Alberta, 1990

M.A., San Diego State University, 1999

Claremont Graduate University and San Diego State University

December 2012
APPROVAL OF THE REVIEW COMMITTEE

This dissertation has been duly read, reviewed, and critiqued by the Committee listed below, which hereby approves the manuscript of Shawna Rodnunsky as fulfilling the scope and quality requirements for meriting the degree of Philosophy of Doctorate.

__________________________
Dr. Philip Dreyer, co-Chair
Claremont Graduate University

__________________________
Dr. Alberto Ochoa, co-Chair
San Diego State University

__________________________
Dr. Karen Cadiero-Kaplan, Committee Member
San Diego State University

__________________________
Dr. Carl Cohn, Committee Member
Claremont Graduate University
ABSTRACT OF DISSERTATION

UNDERSTANDING METACOGNITION AND CRITICAL COMPONENTS
OF THINKING AND LEARNING IN PUBLIC EDUCATION CONTEXTS

Shawna Rodnunsky
Claremont Graduate University/San Diego State University
2012

Educational delivery in Canada and the United States is in question and it has generated a critical review of the mechanisms involved. Current emphasis is primarily on standardized testing results and receiving less consideration is the understanding of metacognition. Something as fundamental as knowing how you think is not a familiar conversation. This inspired the inquiry of this study. Specifically it explored if metacognition was only a tool that was developed after individuals left public schooling and entered adulthood.

This inquiry presents a perspective on the degree of metacognitive awareness of 104 adults educated in Canada and the United States and how their public schooling experience contributed to this understanding. Three questions guided this study: 1) What do adults identify as their learning epistemology? 2) What situations and conditions have supported adult metacognition? 3) What opportunities for metacognitive development are adults able to identify from their schooling experiences? Qualitative and quantitative approaches including survey data, open-ended questions, and selected interviews of eight participants were used in the analysis of this study.
The overall findings suggest that over 84% of adult participants identified themselves as being aware of how they learn yet only a third (34.6%) of the participants were able to identify personalized strategies when describing their learning. Grade school settings and resources were not identified as playing a significant role in facilitating metacognitive development for participants. The survey revealed that over half (51%) of the participants were able to develop their metacognitive awareness during post-secondary education or on the job. Of the remainder, a smaller percentage of participants (13.5%) indicated that their metacognitive development was facilitated during their grade school experience or from the support of a grade school teacher (10.6%). Less than a third (31.7%) identified that metacognitive awareness occurred during their K-12 grade school years.

The implications of the study point to the absence of metacognitive understanding and the direct teaching of these skills in public education. Further research is needed to provide more clarity in how metacognitive instruction will benefit learners in academic pursuits and beyond.

**Key words:** metacognition, critical reflection, self-regulation, thinking, epistemology, school reform
DEDICATION

This work is dedicated to the students I have worked with in the past and to those that I will encounter in the future. It is with them in mind that I endeavored to learn more through another formal education opportunity to better serve them and our communities.
ACKNOWLEDGEMENTS

I am most grateful to the mentorship I have received prior to engaging in doctoral studies and during this educational process. These mentors included my colleagues at both universities: fellow students, faculty and staff. In addition, I valued my friends and family who provided a foundation of support.

I would like to acknowledge the faculty who served on my committee. I do believe it is rare to be afforded the candid conversations I was able to engage in with these mentors. I deeply appreciated these opportunities and their importance in creating an authentic learning experience.

To my friends and family who directly and indirectly supported my process, I cannot adequately express how much this was valued. This kept me true to my purpose, especially in the many times I felt that this was contrary to what was desired in the environments and situations I found myself in.
TABLE OF CONTENTS

ACKNOWLEDGEMENTS ............................................................................................................. vii

LIST OF TABLES .......................................................................................................................... xii

LIST OF FIGURES .......................................................................................................................... xiii

ABSTRACT OF DISSERTATION ................................................................................................. 2

CHAPTER ONE ................................................................................................................................. 1
    Personal Narratives and Interest in Metacognition ................................................................. 1
    Class Curriculums in Contrast to Individual Education Plans .............................................. 2
    Testing the Waters with a New Approach .............................................................................. 3
    Improving Education Through a Shift in Paradigm .............................................................. 6
    Acting as an Agent of Change on the Macro Level ............................................................... 8
    Statement of the Problem ....................................................................................................... 8
    Purpose of the Study .............................................................................................................. 9
    Research Questions ............................................................................................................... 9
    Research Approach .............................................................................................................. 10
    Significance of the Study ....................................................................................................... 12
    Assumptions of the Study ..................................................................................................... 13
    Definition of Terms ............................................................................................................. 14
    Organization of Study .......................................................................................................... 15

CHAPTER TWO .......................................................................................................................... 16
    Modern Educational Trends .................................................................................................. 16
    Key Trends in Educational Management and Delivery ....................................................... 17
    The Current Educational Landscape ................................................................................... 20
    Results-Driven Reform and Accountability ........................................................................... 21
    Simplification and Efficiency in a Complex System ............................................................. 25
    Research Focus ..................................................................................................................... 27
Reflections on the Significance of the Study .............................................. 137
Recommendations for Future Research ................................................... 138
Conclusion ............................................................................................. 140
LIST OF TABLES

Table 3.1: Research Questions, Constructs, Data Sources and Collection Approaches .................................. 82

Table 3-2: Participant Categories ............................................................................................................. 85

Table 4-1: Frequencies for Survey Participant Demographic Information ................................................. 97

Table 4-2: Correlation between Demographic Characteristics and Metacognitive Factors ...................... 99

Table 4-3: Correlation between Gender and Metacognition Resources ..................................................... 100

Table 4-4: Correlation between Levels of Education and Self Assessed Metacognitive Ability .............. 101

Table 4-5: Correlation between Level of Education and Metacognition Resources ................................. 102

Table 4-6: Metacognitive Awareness of Learning Related to a Specific Memory Task .............................. 107

Table 4-7: Metacognitive Awareness of Learning in General ...................................................................... 107

Table 4-8: Comparison between Participant Description of Metacognition in Specific and Generalized Learning ........................................................................................................... 108

Table 4-9: Correlation between Self-Assessment and Coded Learning Descriptions ............................. 109

Table 4-10: Where Metacognitive Development was Fostered ..................................................................... 110

Table 4-11: Human Resources Who Facilitated Metacognition Development ........................................ 111

Table 4-12: Time Frame of Metacognitive Awareness ............................................................................... 112

Table 4-13: Best Strategy ......................................................................................................................... 113

Table 4-14: Interview Participant Demographics ..................................................................................... 115
LIST OF FIGURES

Figure 1-1. Research Framework ........................................................................................................... 12

Figure 2-1. The current landscape ........................................................................................................ 20

Figure 2-2. The Metacognitive Process .................................................................................................. 44

Figure 3-1. Research Framework ......................................................................................................... 71

Figure 3-2. Research Inquiry and Methods .......................................................................................... 81

Figure 3-3. Interview Thematic Analysis Process ............................................................................... 90

Figure 4-1. Frequencies for Survey Participant Age ............................................................................ 94

Figure 4-2. Frequencies for Survey Participant Level of Education .................................................... 95

Figure 4-3. Frequencies for Survey Participant Household Income .................................................... 96

Figure 4-4. Self Assessed Metacognitive Ability Based on Level of Education ................................. 101

Figure 4-5. Frequencies for Self Assessment of Metacognitive Ability ................................................. 104

Figure 5-1. Possibilities for Future Research and Exploration .............................................................. 139
CHAPTER ONE

*Education is what remains when we have forgotten all that we have been taught.*

*George Savile*

As an educator, I find myself in discourse every so often when people learn of my profession. Invariably they feel compelled to share their educational experiences with me as a representative of that professional career. Often they disclose their negative public school experiences and sometimes share how significant positive events that have shaped their lives. Thus, it is evident that many individuals have an emotional attachment to these important memories. However, When prompted to share how they have gained as learners from their formal education and what foundation they built for their life-long learning journey, these answers are less clear. When I engage and ask specifically “how they learn” (the process of metacognition); there is more confusion. Something as fundamental as knowing how you think, process information and engage is not a familiar conversation. This led to my interest in the relationship between individual personal narratives as they relate to metacognition.

**Personal Narratives and Interest in Metacognition**

For close to fifteen years, I have been involved in public education within public schools in the capacity of teacher and school administrator. I was fortunate to receive my initial training in elementary and special education and launched my career in special education placements. This led to teaching in both special education and mainstream classrooms at the elementary and junior high levels and eventually I served in the role of school administrator.
Class Curriculums in Contrast to Individual Education Plans

My initial exposure to public education began with teaching students having diverse learning needs and this provided me with a wide range of exposure to many different populations. One of the advantages teaching in special education settings and having received my training for teaching these populations was the attention given to the development of individual learning plans over generalized learning goals. In mainstream educational settings, course objectives receive the emphasis with the attempt of guiding all students towards these common goals. Generally, educational delivery traditionally was and continues to be prepared for mass presentation, with some additional support provided as an afterthought for any diverse needs within the group (Robinson, 2011).

My experience working with students who demonstrated a discrepancy in performance in one area alone and thus labeled as learning disabled was of particular value to my growth as a practitioner. Working with these students gave insight into the value of metacognition. For these students, a common intervention was to make strategies explicit as a way of improving their areas of weakness. Having experienced positive results with this type of learner, I began to consciously and unconsciously apply the act of making strategies explicit with other groups of students functioning at varying levels and in different contexts. Without realizing it, I recognized the value of engaging in metacognition before I was able to formally label it. These early experiences influenced my conclusion that a focus on fundamental learning skills that can be generalized to other settings or a “cognitive process orientation” was critical for student success (Eisner and Vallance, 1974).

I came to believe that metacognition had the potential to be a tool of empowerment for all students. Rather than the teacher alone being responsible for providing students with the
appropriate strategies, I found that students would benefit from sharing in the responsibility for identifying their own best strategies. This involved methods not only to interpret and understand new concepts but also how they organized their learning "in their own brain" and stored it for future retrieval. By recognizing their own process for learning, students were not only able to create greater effectiveness in their present learning situations but also would hopefully build a foundation for future success. In addition, the physiological mechanisms of learning, also referred to as brain-based learning, further validated and supported the process of metacognition (Marzano, Brandt, Hughes, Jones, Presseisen, Rankin, and Suhor 1988). This research related to how the brain works and the physiological aspects of learning impacted educational circles in the late 1980's and had implications for educational delivery. Understanding the functioning of brain better presented impetus to view learners in a new way and to develop an explicit understanding of their process of learning. New findings also changed our perspective of the brain in that there were tangible pathways that were changeable and could be consciously shaped by the learner.

Testing the Waters with a New Approach

An opportunity to work with upper elementary students and explore the potential of metacognition became available later in my career. By this time, I had exposed myself to a great variety of teaching settings and pedagogical approaches. Teaching being a craft, I felt grounded in the fundamentals and had established a reputation that enabled parents, caregivers, colleagues, administrators and the students to have confidence in my professional abilities. These conditions provided a strong foundation to allow for the risk-taking needed to teach in a new way that incorporated metacognition and to create the factors in the learning setting to support it.
Initially, much of my efforts involved the deconstruction of old notions of how the classroom should be structured and redefining what actions and practices would be supported and rewarded. Students were unconsciously conditioned to a particular pattern of engagement (Darder, 2005; Freire, 1970; Freire and Shore, 1987). A good student was one who was prepared and even primed in advanced for instruction, listened intently to instruction provided by the teacher, asked only relevant questions, completed follow up activities, refrained from off-topic conversations with their peers, minimized engagement in general with their fellow students, and completed any assigned homework. While these attributes can be productive, a limited focus on them may provide less opportunities for students to be vulnerable as part of the process of taking risks and exploring. What I proposed was that many of these traditional behaviors or task orientations would not be exclusively valued and at times would not receive the stringent level of monitoring that so often took place in the classroom.

Realistically, the limitations of resources such as time and financial support, had to be considered. Priorities had to be established regarding not only the focus of my tasks but also how classroom time was spent. While valuable processes were added to the classroom dynamic, some familiar practices were no longer supported. This was a challenging part of the transition to make space for the direct teaching of metacognition, especially in gaining acceptance from parents. For example, I no longer tediously marked homework assignments in their entirety and included it in student grading. The purpose of homework is predominately for students to have the opportunity to practice a previously learned skill or to demonstrated their understanding through an assignment that requires time outside the classroom to complete. Reviewing this work is to establish that the student has successfully solidified their learning. This can be accomplished in a number of ways such as through a cursory review of the work, by having
students review their own work and so forth. However, monitoring the completion of homework often becomes a behavioral or disciplinary issue more than an educationally driven one (Kohn, 2006). Simply put, emphasis on "doing your homework" is based on the behavioral skill of students needing to "be responsible" rather than the value it has in the learning process. Therefore, I used more time effective ways of accessing student understanding and also monitored completion so parents could facilitate the practice at home needed to support mastery of concepts. Homework was often reviewed as a group with the intention of students identifying if there were any areas of concern that they or their group experienced. Following this, they would receive further teaching to remedy the gap in learning. This allowed for additional time to present material in more than one way and for class interaction which frequently involved sharing different methods generated by other students. Emphasis was placed on students identifying what strategies and methods worked best for them based on their strengths and weaknesses.

Dialogue became increasingly more candid about how individual learning was progressing and any learning blocks which preventing them from being successful. At the beginning of this process, students were fearful or embarrassed to share if they were having difficulties. An intermediate step was to start by having a group leader identify if anyone in their group needed a concept reviewed. This progressed to students being open about their own difficulties and topic areas they needed reviewed. Students were able to take academic risk that also increase their motivation to learn (Beghetto, 2009). For this shift to happen, a multitude of reinforcements were realigned. Students were no longer directly and indirectly rewarded for raising their hands to guess at the right answer when a teacher presented a concept for the first time. In its place, students were held responsible for gaining understanding of ideas and
concepts by whatever means was most effective for them. They were empowered to keep track of their progress by identifying areas of concern on pre-test results and while working in class and then finding ways that "best suited their brain" to assimilate and retain the concept. As a teacher, my role was to act as a guide to help students identify their best way of learning until they were able to articulate this and then interpret material in a variety of contexts. Peer support was common and effective in this process enabling students to interact and reinforce their learning to a greater degree than in a traditional contexts where the teacher is the sole provider of learning assistance (Darling-Hammond, 2008). In the end, students were able to identify what they needed to learn best, to use strategies that were most effective for them, to request the teacher to present the concept in a particular way if necessary, and review any concepts that were not at a mastery level for them. Testing was vigorous and students became increasingly comfortable being tested especially when they understood they had a variety of tools and assistance at their disposal. Students had an increased level of success as the year progress despite concepts increasing in level and complexity.

**Improving Education Through a Shift in Paradigm**

The awareness of this empowering and efficient approach to improve student learning compelled a desire to apply it to a greater extent in my own teaching and to identify possibilities for application on a larger scale. On several occasions in my teaching and administrative career, I have been confronted by how much resistance there is to educational change and new practices despite evidence that these changes warrant attention and a chance to be applied. This has been a dynamic that I still fail to fully understand. I have come to appreciate that part of this may be due to the varying expectations for education of different stakeholder groups. Unfortunately, the
different motivations and perspectives of these groups can result in diverted priorities, and at times these can even be in conflict. Education in a democratic society should be reflective of the society which would involve addressing critical issues and an awareness of power structures that may limit growth for the community as a whole. While education is often touted as being the "great equalizer" (Dewey, 2004) in which every person has an opportunity to start from the same place and be successful, this simply is not the case. Paulo Freire (2004) posed that education has been and continues to be used as a way of oppressing or domesticating people rather than serving as an opportunity for praxis and self empowerment. Inequities are prevalent in our educational systems based on socio economic status, race and gender. With "banking" or planned program content from the top down, the educational system is still more aligned with the factories of industrial revolution that inspired mass education. While this approach to education may be viewed as being efficient, it also serves to support current societal norms and structures. Change may threaten the status quo and thus will face resistance (Freire, 2004, p. 92). Another barrier to change worth considering is the fear of the unfamiliar or the reverse, the desire to maintain the familiar. Much has changed in our society, yet our schools relatively have remained much the same since 1870 (Bowles and Gintis, 1976).

When considering the incorporation of metacognition or any instructional method, success is partially determined by the depth and breadth of implementation. This is further impacted by the ebb and flow of the existing forces of influences affecting educational delivery. The application of a particular process in the classroom environment requires a systematic approach that must consider the many related roles and relationships that are involved. In a community of learners, students, teachers, parents, and many other stakeholders are required to be involved for successful implementation to occur.
Acting as an Agent of Change on the Macro Level

Researched-based practices have become a catch phrase in educational circles and this is indicative of a greater level of merit given to ideas that have resulted from formalized research. While my considerable experience and informal research into the use of metacognition has shown that teaching metacognition to students is valuable, there was a need to formalize these observations and conduct further research to support my observations.

This research is an extension of the on-going informal research that I have previously explored through discussions with adults and practical applications with children in the school environment. It also builds on some of the initial research linking metacognitive awareness with academic success (Costa, 2008; Desoete, Roeyers and Buysse, 2001; Georghiades, 2000, 2004; Graesser, 2009; Hacker, Dunlosky and Joseph, 2009; Kolić-Vehovec and Bajšanski, 2001; Otani and Widner, 2005; Payne and Manning, 1992; Pintrich, 2002). This study marks the start of the formal research process aimed at clarifying the current status of metacognitive ability in our North American population and what support has been made available to children and adults to develop this skill.

Statement of the Problem

This absence of metacognitive understanding and skill was at the heart of this study. As a result of the importance given to standardized testing results, attention given to process skills has received less than adequate attention to promote student success over the long run. In addition, the direct teaching of metacognitive skills has failed to receive prioritization in
educational delivery practices based on the inaccurate belief that metacognition develops intrinsically (Dynarski, 2010; Kuhn, 2009; Noddings, 2003, Vukman, 2005).

**Purpose of the Study**

The purpose of this exploratory study was to contribute to the understanding of how the skills of metacognition, specifically the awareness of one’s own thinking and the explicit selection of cues to understand and attach meaning to new concepts, have developed or been limited in traditional schooling contexts. Uncovering if metacognition develops without direct teaching on the subject will circuitously was examined. Adults who completed their education in K-12 public schools in Canada and the United States were targeted.

Using both quantitative and qualitative approaches utilizing open-ended questions, closed ended questions, and candid discussions, the aim of the study was to: (1) encourage adults to reflect on their learning experiences from present to past; (2) document their understanding of how they came to identify their thinking and barriers to metacognition, and (3) explore the metacognitive ability of the adults who have completed their education in K-12 public schools within Canada and the United States.

**Research Questions**

The design of this study was two-dimensional. First it was designed to engage adults in understanding how they presently think and learn. Secondly, to gain an understanding of how metacognition was encouraged or limited in public school contexts in adults past learning experiences. The following research questions guided the exploration:
1. What do adults identify as their learning epistemology? What is their ideal learning context and how do they organize their internal thinking processes?

2. What situations and conditions have supported adult metacognition? Where did adults learn about how they think? What human resources were involved? When did these first experiences occur?

3. What opportunities for metacognitive development were adults able to identify from their schooling experiences?

**Research Approach**

The research paradigm (Figure 1-1) used combined the social constructivist and pragmatic perspectives. From a social constructivist perspective, the goal was to examine metacognition and its place in grade school education through the eyes of the participant. Through their recollections, metacognitive awareness and development was described as it unfolded in actual settings. A pragmatic view appreciates the complexity found in education and recognizes that situations are often unique and in constant motion. Events and behaviors evolve over time and are richly affected by context.

In addition to my personal informal explorations and key information derived from the research literature on the topic, this study engaged adults through surveys and follow-up interviews to better understand the patterns and common themes related to metacognition. The study involved 104 adults who received at least 6 years of their schooling in the United States or Canada. They were to consider their current learning behavior and then reflect back on what conditions influenced how they came to understand their thinking. Over 150 participants were recruited to complete a survey on their level of metacognitive awareness and what conditions
facilitated or hampered this development. From this sample, a subgroup of 8 participants (2 female/2 male participants from the United States and 2 female/2 male participants from Canada) participated in individual interviews which provided additional depth on the topic.

Based in grounded theory (Guba and Lincoln, 1985), much of the research process evolved during data collection. An exploratory pilot study was conducted to gain clarity as to the best approach to use. A theoretical model was determined after the exploratory pilot study data was analyzed.

For data collection, mixed methods incorporated surveys, interviews, coding techniques and statistical analysis as approaches to document the authentic schooling experiences of adult participants. To encourage participation and to access a more widespread geographical group, a social networking tool (Facebook) was utilized to recruit participants in the on-line survey and for those who were willing to further participate in an interview. For the interview phase, the type of engagement for interviews was presented as a choice to participants consisting of telephone communications, video chat or an in person dialogue. The overall process of the research design is described in Chapter three of this study.
Figure 1-2. Research Framework

Significance of the Study

This study contributes and provides one perspective on how effectively public school in Canada and the United States provides explicit instruction in metacognition and the degree adults are able to demonstrate metacognitive awareness and ability. The intent was to build on current literature in articulating the key components of metacognition, and identifying what experiences were beneficial in developing epistemological awareness. Addressing an absence of
metacognitive development and awareness of one's cognitive processes is also an outcome of the research.

This study provides a starting point for coming to understand how our public school systems have aided or failed in providing the direct teaching of metacognitive skills. Involving participants that are recent high school graduates and those that have long past that point, will provide a landscape of any educational changes that may have occurred over time in the direct teaching of metacognition. Providing the skills needed to be life–long learners has its beginning in public education and success in part will be demonstrated by the adults that are a product of this system. If there is an absence of metacognitive understanding, we have failed in part to capitalize on the human potential within our communities. With the loses experiences as a result of ineffective educational systems and the use of superficial interventions that only exacerbate the waste of resources, it becomes more critical for us to reconsider the benefits of process based interventions.

Assumptions of the Study

Some assumptions were made at the onset of the exploratory study on metacognition. One assumption was that participants’ reasoning influences their judgments, their learning experiences, and ultimately their perceptions of how they learn. A second assumption was that the adult participants could and would verbalize their reasoning about their own learning decision making and knowledge of the thinking and learning process. The anticipation was that they would be able to articulate their process and provide evidence and further clarification to support their understanding. The critical aspect of this discovery was not to simply have
individuals identify a process they use, but also be able to articulate WHY they use this process and how it helps them.

**Definition of Terms**

The following salient terms and definitions were operationalized for the purpose of the research questions.

*Metacognition*. For the purpose of this study and future applications, metacognition will be referred to as self-knowledge concerning our own cognitive processes. It involves an awareness of our strengths and weaknesses, being able to identify blocks to learning, and the ability to modify learning strategies and skills based on their effectiveness and the situation. An important distinction is that metacognition involves more than just the cognitive strategy. Metacognition involves additional levels involving not only the learner’s ability to identify the most efficient strategy for their learning style, the contextual language and cultural connections, but also the conscious choice of how they will assimilate the information to have meaning and retention.

*Metacognitive Awareness*. An awareness or knowledge of the thinking and learning process.

*Meta instruction*. Providing the learner with direct teaching on metacognition. This teaching involves developing an awareness of cognitive processes and strategies along with attention given to the learner’s ability to apply these to achieve learning tasks.

*Metalearning*. Being aware of and taking control of one’s own learning.

*Learning Signature*: The unique learning style, strategies and ideal learning context best suited to an specific individual.
Pedagogy. The science or profession of teaching.

Socio-constructivism. Social constructivists recognize that subjectivity is part of the research process rather than through a modernist approach that seeks to establish bodies of systematic and objective knowledge that may not necessarily provide more accuracy. In the social constructivist perspective, there is importance given to identifying the subjective meaning derived from individuals’ experiences (Creswell, 2009).

Organization of Study

Chapter 1 of this study introduced the problem statement and described the research questions addressed in the study as well as design components. Chapter 2 presents a review of the literature and relevant research associated with metacognition in public school contexts. Chapter 3 presents the methodology and procedures used for data collection and analysis. Included in this chapter is a description of how the research design was implemented, the research inquiry and corresponding research tools, characteristics of participants included in the study, the data collection approach, and analysis of the data. Chapter 4 contains an analysis of the data and presentation of the survey ($N=104$) and interview ($N=8$) results. Chapter 5 offers a summary of research findings for the three questions guiding the study, discussion of the implications for practice, and recommendations for future research.
CHAPTER TWO
Research Literature

The awareness of metacognition as an empowering and efficient approach to improve student learning compelled a desire to apply it to a greater extent in my own teaching and to identify possibilities for application on a larger scale. When considering the incorporation of metacognition or any method, success is partially determined by the depth and breadth of implementation. This is further impacted by the ebb and flow of the existing forces of influences affecting educational delivery. The application of a particular process in the classroom environment requires a systematic approach that must consider the many related roles and relationships that are involved. In a community of learners, students, teachers, parents, and many other stakeholders are required to be involved for successful implementation to occur.

A review of the literature will provide clarity on the current influences and trends influencing public schooling, the concept and nature of metacognition, its relevance to the public school setting, how to best incorporate the tool of metacognition systematically within this context, and research implementation pitfalls and problems. My professional orientation and perspective as a practitioner, having served both as a public school teacher and administrator in Canada, guides the critical issues identified. The review of the literature concludes with an overview of metacognition and the adult learner.

Modern Educational Trends

Educators exist in a climate of criticism in which the effectiveness of educational delivery in Canada and the United States is in question. The desire for restructuring has
generated a critical review of the mechanisms involved in education. Since the most recent influx of accountability on educational delivery, there has been a concurrent emphasis on testing and assessments to determine and encourage student success in schools (Cochran-Smith, 2005; Horn, 2003; Janesick, 2003; Marshak, 2003; Ravitch, 2010). Many would attribute the beginning of this new cycle of our modern times as occurring in the early eighties when “A Nation at Risk” (National Commissions on Excellence in Education, 1983) was published. Reactions to the perceived failure of education has shifted and mutated into many different trends, all driven by the increasingly intense focus on achieving high student test scores (Ravitch, 2010; Sandler and Apple, 2010).

**Key Trends in Educational Management and Delivery**

The administration of schools has evolved in addressing political agendas and public scrutiny. John Hunt (2008) identified three key stages that have occurred in the United States over the last few decades. Starting in the 1980s, “The Excellence Movement” (Hunt, 2008, p. 581) increased the standards for both students and teachers. More attention was given to student assessments and teacher certification. Haertel and Herman (2005) similarly categorize that, …as the 1980s dawned, the United States already was replete with standardized tests and data on student achievement. Results from annual tests …were routinely published in local newspapers; minimum competency testing was in full swing across the country; the federally funded National Assessment of Educational Progress (NAEP, now known as “The Nation’s Report Card”) had been reporting periodically on the performance of 9-, 13-, and 17-year-old students in reading, mathematics, writing, science, and additional content areas since its inception… (p. 14).
Following this in the late 1980s, “The Restructuring Movement” (Hunt, 2008, p. 582) began. During this phase, restructuring was guided by educators and their professional associations. Greater local autonomy was given to schools and hierarchical structures were flattened. Principals were considered instructional leaders not simply managers. Accountability increased during this time and this led to the publicizing of school achievement results.

Influenced by “A Nation at Risk” (National Commissions on Excellence in Education, 1983) and further renewed by the “No Child Left Behind” Act, “The Standards Movement” (Hunt, 2008, p. 583) attention was shifted back on the achievement of individual students and groups. Haertel and Herman (2005) identify this as a time when content and performance standards represented a turning point in thinking about the role of assessment in reforming and improving schools. The attention on testing created greater emphasis on test preparation. The end result was a narrowing of the curriculum to the basic skills that were assessed, a neglect both of complex thinking skills and of subject areas that were not assessed, and a tendency for teachers to mimic the tests’ multiple-choice formats in their classroom curriculum (Cochran-Smith, 2005; Haertel and Calfee, 1983; Meisels, Atkins-Burnett, Xue, Nicholson, and Pellegrino, 2006; Bickel and Son, 2003; Linn, 2003; Sullivan, 2006; Koyoma, 2011). Pellegrino (2006) further cautions, “under the No Child Left Behind legislation, states have been driven to put in place assessment systems that seriously undermine high achievement standards and quality instructional practices“ (p. 6).

While “A Nation at Risk” (National Commissions on Excellence in Education, 1983) was based on education in the United States, ramifications from this document were also experienced in Canada. Many state, province and territory departments of education along with professional organizations reviewed and developed learning standards. School administrators were held
responsible for student performance and developing school improvement plans with their staff. In addition to this increased focus on learning standards, establishing goals for performance became popular. Grant money was also made available for planning and implementation (Jaafar and Anderson, 2007). Despite increased attention given to standardized testing, an exciting initiative during this time was performance based assessments.

In January 2002, the No Child Left Behind Act came into effect in the United States. The intention of the act was to improve student learning and particularly to assist groups of students who were not traditionally successful. Hunt (2008) described how the introduction of this inhibited growth within schools,

Over the years since the passage of NCLB, school improvement efforts have narrowed significantly. Now, both school improvement and staff development in school districts are increasingly confined to those areas tested under NCLB for the purposes of determining whether schools are making adequate yearly progress (AYP). A recent study of school districts that failed to make AYP for two or more consecutive years showed that both school improvement efforts and staff development initiatives were being primarily restricted to language arts and mathematics (p. 583).

In Canada, while federal legislation had less impact and there had been no prominent over-riding legislation that informed school jurisdictions, the accountability movement had been firmly rooted. Reforms have been guided by the strongly held belief that more accountable schools are better schools (Jaafar and Anderson, 2007). Amongst other things, the narrowing of curriculum focus to improve results on what is tested has also had an impact on teaching methodology.
The Current Educational Landscape

The educational milieu in Canada and the United States features standards based reforms that emphasize high accountability for students and teachers. To any seasoned educator in K-12 public schooling, the common issues and patterns described should be familiar. Critical influences directing educational delivery in schools are political scrutiny and legislation, public scrutiny and pressure from the various stakeholders groups such as parents and the business community, the emphasis on accountability and measurable results, the simplification of teaching methodology, and a research focused on improving learning outcomes at the cost of exploring learning process effective in a variety of contexts (Figure 2-1).

Figure 2-1. The current landscape.
Results-Driven Reform and Accountability

During nearly a decade and a half of my professional involvement in public schooling, the pressure for change has been a constant. Education has been in a perpetual state of reform influencing the roles and relationships of all the stakeholders involved. Increased accountability has led to an emphasis on data collection that features high stakes testing. Over this period of time, the responsibility for the failings of public education has been directed towards teachers, parents to the students themselves. “Most state and federal laws that have been enacted in the past few years, as well as policy discussions of accountability, have focused more narrowly on educators and students” (Linn, 2003, p. 2). Interestingly, often the people rather than the system have been targeted as being problematic (Blake, 2008; Goodwin, 2003; Koyoma, 2011). Despite the numerous interventions and good intentions, very little has seemed to resolve the crisis within our educational systems (Murray, 2008). Quantifiable results have been the driving momentum. These have been determined by the statistical sums of provincial and state standardized tests. In the current political climate, “the only conversations that are deemed meaningful are those that are linked directly to raising test scores” (Darder, 2005, p. 211). In many cases, the results of these tests have been misconstrued from a measure to provide generalized feedback about program effectiveness to becoming the sole recognized indicator of achievement. Test scores have served the purpose of ranking schools, emphasizing those that are effectual and those that are not (Baum, 2004; Popham, 1998; Ravitch, 2010).

The previous statements are not intended to discount the need for accountability. Goals and objectives are necessary and important in delivering education to youth. Yet despite education aims and values communicated by politicians, educators, parents and students that emphasize higher level thinking skills, achieving individual potential and demonstrating good
citizenship, there is incongruence in what is ultimately measured. In the end, what receives attention are popular assessment measures and this has an overriding value in our formal learning communities (Cochran-Smith, 2005; Janesick, 2003, Marshak, 2003, Nichols and Berliner, 2007; Sandler and Apple, 2010). This value is translated into the attention it receives from school boards, emphasis placed on analysis of test results in school meetings, relevance parents give it when determining school placement for their children, and publicity it receives in community newspapers. In some communities, school funding and staff job security is related to student test result scores (Meisels et al., 2003; Ravitch, 2010). Certainly there is an issue that test scores will be used to determine teacher merit (MacInnes, 2009; Pfeffer, 2007). A multimodal approach to learning that encourages relevant connections for students as it applies to their environment is not part of the current testing culture (Abedi, Herman, and Golan, 1994; Figlio and Loeb, 2011). These and other established and researched practices of proper learning and assessment are violated affecting all students, particularly those already experiencing disadvantage. Concrete action from teachers to address this issue is lacking. They are obligated as employees and “are increasingly caught up in a measurement-induced maelstrom focusing on raising student’s test scores on high-stakes tests” (Popham, 2001, p. 16). In fairness to educators, both teachers and administrators, the systemic inertia that exists around the use of one-time testing is powerful and the consequences for not creating an environment for students to perform well on these measures are considerable (Appleman and Thompson, 2002; Horn, 2003; Janesick, 2003; Marshak, 2003; Nichols and Berliner, 2007; Ravitch, 2010). Teacher’s credibility, and school effectiveness and prestige depend greatly on demonstrating satisfactory or excellent test scores. A great deal of value, represented by funding and recognition, is based on successful results from standardized testing.
There is a great contradiction in the use of norm-reference tests to access curricular knowledge as this is not the intention of these tests. Darder (2005) articulates this in the context of California where the Stanford 9 was used, previous to the No Child Left Behind initiative, that has been widely administered in public schools. These tests are designed to rank students against one another, rather than to measure students’ knowledge of the material. Many of the questions ‘are intentionally developed so that a relatively high percentage of students will be tricked by them.’ This is an important method of differentiating one student from another in the rankings. (p. 211)

Thus, it lacks common sense that test designed to distinguish students are used to determine academic proficiency for individual students and schools. Unfortunately, history repeats itself. Gould (1996) tells the story of IQ testing in his book, The Mismeasure of Man that resembles the current situation with standardized testing. It is all about assessment gone terribly wrong. For the most part, it is not about the measures themselves. Rather, it is about how the initial intention of a test becomes lost in the inertia of political agendas of the time.

In 1904, Alfred Binet was commissioned by the minister of public education to conduct a study with the purpose of identifying students who would require specialized education to be successful (Gould, 1996, p. 179). He developed a scale that became the foundation of intelligence testing still used today. It was not the intention for his test to be used as a labeling mechanism or for it to be used to fuel the agenda of biological determinism (Gould, 1996, p. 181). The origins of intelligence testing were focused on effectiveness of educational programming and providing assistance to students. Gould (1996) quotes Binet as proclaiming, “(Intelligence) is too complex to capture with a single number (p. 181).” Despite this, IQ testing
was used for exactly that and it became a measure used to label, quantify and categorize people. It became a convenient and immediate way of defining the exceptional, the ordinary and the inadequate. It was used to make generalizations about groups of people; specifically for the purpose of “innate cognitive stratification by social class” and then linking this “to a claim for inherited racial differences in IQ” (p. 369). Gould connects the use of testing with a method to “affirming social inequalities as dictates of biology” (p. 31). He is very clear on his stance that intelligence is influenced by both genetic and environmental factors (p. 34). The degree of emphasis placed on the genetic component is the cause for concern. Similar to issues of race, “the errors of biological determinism are so deep and insidious” (p. 26). This is the undercurrent behind the wrongful use of the IQ test.

Intelligence testing has perhaps now found its way back to Binet’s original purpose, that being a way to identify appropriate educational placement, but it has been replaced with a new form, the standardized test, to quantify people and groups. It is apparent that these types of tests do not, as a lone measure, accurately convey what students know and understand. There is also no compelling research that demonstrates that increased testing of this nature improves student learning. The question arises as to why they remain so popular in Canada and the United States. Again, standardized test scores provide quick and clear information that is used to serve political needs. Results are and have been used to rank individuals and schools, to identify groups that are failing to meet standards and for the allocation of funds (Blake, 2008; Ravitch, 2010). A great deal of resources and capital are used in addressing the results of standardized tests that makes these very powerful tools to gain access and support.

With norm-referenced testing, it is projected that students will follow a pattern of results reflecting a bell curve. These tests are used to differentiate students, not determine if students
are achieving outcomes. However, the original purpose of this form of testing is ignored within political agendas and school strategic plans where results from these types of test are used. It is expected for students and schools to improve testing results, with the intent that all are capable of meeting or exceeding standards despite the fact the test being used was specifically created to prevent this from occurring (Darder, 2005). Despite the lack in logic, schools are instructed to set goals and they attempt to improve student scores each year. In addition, standardized tests currently in place do not measure all the curricular objectives within a year of study. Many argue that established practices of effective learning and assessment are violated in what can be called “a culture of testing” affecting all students, particularly those already experiencing disadvantage (Darder, 2005; Jaafar and Anderson, 2007; Moon, Brighton, Jarvis, and Hall, 2007; Popham, 2001; Ravitch, 2010; Sandler and Apple, 2010).

**Simplification and Efficiency in a Complex System**

An irreconcilable conflict exists between the recognition of the complexity surrounding the process of educational delivery and the inclination to create simplicity for the sake of efficiency. Rather than embrace and accept the diversity and multi-dimensional aspect of public education, much is done to streamline the process of educating our youth (Sandler and Apple, 2010). Teacher training programs may also be under pressure to consider approaches to educating children that are efficient and provide the best short-term impact in terms of test scores rather than incorporating approaches that focus on learner empowerment and strategies to become better learners in a variety of contexts (Moon, Brighton, and Callahan, 2002).

Along with greater accountability, the desire for increased efficiency in educational delivery also plays a prominent role. Eisner and Vallance (1974) would define the current
orientation as being a “technological approach” that emphasizes educational engineering and efficiency. Similar to a business type model, the use of strategic plans have multiplied at the school, district, and provincial or state levels. But, by their nature, schools are not like businesses and running them as such leads to over standardization of tests and goals (Cuban, 2004; Sandler and Apple, 2010). There has been an emphasis on specific results yet less attention has really been placed on the systems we use to organize our learning in our communities and the processes we employ to create greater learning effectiveness. Individuals and groups have been disempowered and there has been a lack of opportunity for there to be a real involvement in the structures of current learning experiences.

This manifests both in the effective use of financial resources and also in regards to the processes and organization of education. In the drive for greater student results, product has taken priority over process and yet education cannot be effective without both (Koyoma, 2011; Sandler and Apple, 2010). Critics of measurement-driven instruction, believe it creates a tendency to drive teaching and learning in the wrong direction, promoting outmoded behaviorist pedagogy that will be unlikely to prepare students for success (Blake, 2008; Haertel, 1999; Herman, 1997; Herman and Golan, 1993; Nichols and Berliner, 2007; Resnick and Resnick, 1992). Of particular importance is how high stakes testing has an impact on the skill of metacognition or student’s critical understanding of their own learning process. Rather than moving towards processes to support greater depth and understanding of concepts, the need for efficiency has created an urgency in which it is felt that there is simply not enough time to teach in this manner (Reay and William, 1999; Koyoma, 2011). A danger of the increasing pressure for efficiency is that it will take the form of direct teaching, decontextualized learning, and engaging students in lower level thinking skills. Pellegrino (2006) asserts that “… under
pressure to prepare students for high-stakes accountability tests, teachers often feel compelled to move back and forth between instruction and external assessment and teach directly to the items on the state test” (p. 3). Effectiveness perpetuates the desire for short-term results rather than creating an environment that also prepares for aptitudes and practices that provide long-term results (Moon, Brighton, Jarvis, and Hall, 2007; Popham, 2001).

**Research Focus**

The focus on standards has evolved in our current times where schools are encouraged to develop instructional strategies to improve academic performance. Opportunities for action research and the like help develop research that is relevant to the communities that are involved. Ganz (2003) suggests that in this way action research can be used to promote school renewal. Action Research gives teachers the skills needed to work on problems specific to their classrooms and their schools. By using an actual research procedure, researching teachers can resolve their own teaching challenges. They learn how to ask a focusing question, define terms, collect relevant data, use an analysis process that rules out bias, and includes methods that yield validity and reliability. The findings become immediately applicable to their individual situations (Reed, 2002).

Allowing local autonomy to consider and evaluate teaching methodology has the potential to effectively meet the needs of learners, however in reality, as the measures of success exclusively rest on standardized testing results, opportunity for growth is limited to using methodology that directly impacts test scores. In short, improving students’ ability to perform well on these types of tests alone does not lend itself to using methodologies to promote dynamic learning skill and ability (Center on Educational Policy, 2009). Blake (2008) conducted a study
that revealed teachers felt high-stakes testing impacted instruction and contradicted teachers' views of sound educational practice. Accountability in the form of high stakes testing creates disequilibrium in the balance between the orientations of process and product outcomes as measures of educational growth (Abedi, Herman and Golan, 1994; Figlio and Loeb, 2011).

To have an impact in improving education using process-based research, it would need to be valued by those involved in the driving force behind the focus on standards and rigorous testing. The majority of influence is emphasized at a macro level or at the higher levels within the structures of hierarchy within our educational systems. In Canada and the United States, while stakeholders exert some influence, ultimately legislation at the federal or provincial levels guide practice. The emphasis on high-stakes testing maintains this power structure and dictates the relationship between school-based education and stakeholders (Popham, 2001; Sandler and Apple, 2010). A reaction to this primary focus of accountability has been the use of research to defend current practices aimed at improving student results on these tests. Often, mainstream research values the perspective of rigour through quantifiable constructs and generalized outcomes. Unfortunately, as Herr and Anderson (2001) identify, the impetus on traditional notions of rigorous research can become so disconnected from reality that it no longer is useful when dispensed down to the classroom setting.

In the current era, educational reform is driven by an end justifies the means agenda. A product of this reform is greater emphasis on research to inform educational practice particularly in the area of analyzing data from summative assessment measures (Nichols and Berliner, 2007; Popham, 2001). In short, the perceived success of our educational system is primarily dictated by standardized test results. As a culture, we are seduced by numbers and the quantification and the simplicity of these results to determine the value of our actions and efforts (Popham, 2003;
Ravitch, 2010; Koyoma, 2011). Receiving less consideration is research that concentrates on the processes and skills necessary for students to become effective learners over the long term. This does not mean that curriculum content should not be valued, but rather, how learners understand, interpret and retain knowledge requires direct attention as well. How students engage in understanding their own thinking processes has received some attention from educational stakeholders in recent decades, and the skill of metacognition has been identified as an essential capacity for learner success (Caine et al., 2005; Georghiades, 2000, 2004; Kuhn, 2000; Weinsten, 1996). The idea that the application of new knowledge and skill is an entirely natural process has been dispelled. Explicit instruction in the process of how to learn is required for all students to be effective learners. Empirical evidence shows that using metacognition as a skill to improve learner outcomes holds promise (Georghiades, 2000, 2004; Kuhn, 2000; Kolencik and Hillwig, 2011).

**A Pragmatic School-based Perspective**

Ideally, from a teacher and administrator perspective, the quality of learning experienced by the students that inhabit our K-12 public schools is the center of all goals and actions. Teacher development and training should be developed and evaluated based on how it ultimately serves the contexts of engaging and educating our youth. To provide effective teacher training, it must be embedded in the classroom and cultural context the teacher will face (Eilam and Poyas, 2009; Pedder, James, and MacBeath, 2005). In building partnerships for this cause, an understanding of the culture, daily life of schools, the roles of all the stakeholders, and the multiple agendas that influence schools is critical. A reality of many public schools is that time is at a premium especially in managing the multiple tasks required for survival.
My direct experience in schools as a teacher and administrator have shaped my views on the critical aspects of optimal learning environments for students, on the roles of the various stakeholders, and on the professional development and training needed for teachers to be effective. As my proximity to the classroom is lost, there is a fear that this understanding will also be lost. A reoccurring issue is and has been the disconnection between schools and teacher education outside the K-12 experience (Benson, 2004; Sandler and Apple, 2010). Without the recognition of pragmatic and practical realities of educating in authentic contexts, meaningful interactions are hindered.

**Learning and Research is Contextual**

From the standpoint of an educator and researcher, the issue of integrating theory and practice has been contentious for a few reasons. Firstly, methods courses can be too theoretical and may not account for the realistic dynamics found within school settings. Lortie (1975) explains that courses such as these “proffer impractical expectations and a utopian conception of classroom reality” (p. 69). Learning and research as it related to public education cannot realistically be completed in a vacuum. Every individual and the interaction between all in the learning community influences ideas, perceptions of the facts, claims and research outcomes. “Vygotsky believed that theory and practice were inexorably connected and mutually dependent… (and that)... scientific or formal knowledge originates in everyday knowledge” (Samaras, 2002, p. 81). Nuthall (2008) recommends research methods that are most likely to bridge the teaching-research gap, arguing that it should provide continuous, detailed data on the experience of individual students, an analysis of the changes that take place in the students' knowledge, attitude, and skills, and an identification of interactive relationships between these.
Thus, learning and educational research is contextual. Secondly, problems with the marriage between practice with theory is a result of inappropriate use. In educational circles, the key phrase of “research says” has gained popularity yet many times there has been no further explanation as to what this research actually represents. Further to this, in a field represented by a great deal of uncontrollable variables, the extent in which educational research may be considered valid and reliable in varied contexts and scenarios may be limited. Davis and Sumara (2005) comment:

… many educational researchers (have) reached the conclusion that statistical tools are often inappropriate and inadequate for the study of such self-transforming phenomena as learners, classrooms, communities and cultures (p. 313)

The issue achieving pure scientific educational research is questionable (Erickson, 2005). While I value the conscientious use of empirical evidence and well-articulated theory, I have become cautious of its significance when applying these within local contexts. Unfortunately, there has been a long tradition of incorporating theories, methodologies and approaches that have been less than successful. At times, this has been due to a lack of strong empirical evidence to support implementation into a particular setting or that a study was misinterpreted. Practical barriers such as inadequate preparation time given to teachers to learn and apply new research into classroom practice have also been a common barrier to successful implementation of new theory (Borg, 2009). In the busy lives of learners and educators, failed approaches are costly. Seasoned educators may become critical of new approaches that may have not benefit and cause them to sacrifice time and effort that is needed in other essential areas.
Definition and Components of Metacognition

Metacognition was a term coined by Flavell based on the cognitive phenomena of learners’ recognition and understanding of their own epistemology (Georghiades, 2004). Martinez (2006) provides a more precise definition as “the monitoring and control of thought” (p. 696). Metacognition can be understood based on its components that represent an awareness of how one thinks and control over cognitive operations. Kuhn (2000) describes these aspects of awareness and control as “metacognitive knowing” which refers to declarative knowledge, and “metastrategic knowing” which correlates with procedural knowledge (p. 179). In a similar fashion, Pintrich (2002) recognizes cognitive awareness and the use of self-regulatory processes. The former includes knowledge of general strategies that can be applied to different tasks, knowledge of the conditions under which specific strategies might be used, the extent to which the strategies would be effective, and knowledge of personal ability in the actual use of strategies. Paris and Winograd (1990) provide two categories in their definition of metacognition: ‘self-appraisal’ and ‘self-management’ of cognition. The self-appraisal of thinking involves reflections about learners’ understanding, abilities and affective state during the learning process, while self-management indicates ‘metacognitions in action’ or the mental processes that assist in problem solving (Paris and Winograd, 1990, p. 8). Martinez (2006) identifies three essential features of metacognition as metamemory and metacomprehension, problem solving, and critical thinking. Metamemory and metacomprehension refer to an understanding of one’s own knowledge state. Metamemory is the awareness of what knowledge can be recalled and metacognition is the awareness of what knowledge is understood. Problem solving involves pursuing a goal involving “generating possibilities, weighing options, and confirmation” (Martinez, 2006, p.697). Nelson and Narens (1994) conceptualized metacognition
as operating at two levels: the objective level and the meta-level. The objective level carries out cognitive operations, whereas the meta-level controls activities that occur at the objective level. From a neurology and neuropsychology perspective, metacognition has been defined as the executive functions of the brain (Denckla, 1996). These executive functions can be separated into self assessment and self management (Flavell, Miller and Miller, 1993). Self assessment involves the ability to critically assess personal cognition. Self management involves the regulation of future cognition. The more critical skill is the accurate assessment of knowledge which is necessary to be successful in management (Rivers, 2001; Costa, 2008). Although some variance exists in what is defined as metacognition or its components, metacognition is basically considered the knowledge of how learning occurs. This includes an awareness of cognition and the processes involved in the monitoring, control, and regulation of cognition.

*Metacognition is a Developmental Skill*

The concepts of reflective abstraction and formal operations identified by Piaget involved the idea of thinking about cognition (Flavell, 1996). Vygostky connected the activity of private speech or externalized thought as being a fundamental skill of self-regulatory behaviour (Crowley, Shrager, and Siegler, 1997). An essential characteristic of metacognition is self-regulatory thinking. In this way, metacognition differs from cognition in that it involves critical reflection of the learning process. While cognition can involve passive observation or active thinking, metacognition must be an active process (Costa, 2008; Hacker, Dunlosky and Graesser, 2009).

Kuhn (2000) expanded upon the concept of metacognition within a developmental framework. Like other theories on cognitive development, Kuhn believed that metacognition
involved a hierarchy of skill. Metacognitive awareness in young children progresses towards complex metacognitive abilities that may not be mastered by adults. Flavell, Green and Flavell (2000) compared three groups of 20 participants consisting of 5 year olds, 8 year olds and adults regarding their ability to be introspective. Ability was determined by providing participants with an introspection task, observing behavior followed by interviews. Findings revealed that young children had some capacity for introspection but were much less aware than older children and adults. In another study conducted by Vukman (2005), developmental differences in metacognitive variables were explored by engaging adolescents, young adults, mature adults and older adults in one well-defined and six ill-defined problems while their externalized thoughts were taped. Specifically, metacognitive experiences, metacognitive knowledge about problems, metacognitive control involving planning and monitoring of the problem solving process, and awareness about the thinking process were investigated. Vukman (2005) concluded that better self-awareness of our own abilities and efficient reflection of thinking processes and problem solving are essential strengths that enable adults to regulate cognitive functioning necessary to address real life problems. He found significant differences amongst the groups. Younger adults performed the best on divergent problems while mature adults had the best performance on everyday problems. Awareness and reflection of thought had a positive correlation with age only with a minor decline in older adults.

Regardless of their theoretical perspective, researchers agree that with development students become more aware of their own thinking as well as more knowledgeable about cognition in general (Pintrich, 2002). Georghiades (2004), Costa (2008) and Hacker, Dunlosky and Graesser, (2009) confirm that conclusions reached by metacognitive research have found that knowing about knowing develops.
**Metacognition and Cognitive Development**

Metacognition is a term that represents a broad concept that is not domain specific. The rules of metacognition can be applied to a variety of contexts such as playing chess, reading text, or completing a math problem (Fernandez-Duque, Baird and Posner, 2000; and Hacker, Dunlosky and Graesser, 2009). Metacognition has been related to a number of general cognitive abilities and aptitudes such as intelligence, general aptitude, and memory (Georghiades, 2004). One perceived value of metacognition is that it has a direct impact on cognitive development. Kuhn (2000) indicates that metacognition helps to explain why cognitive development occurs or fails to occur. It has been suggested that metacognition may be a bridge between developmental stages (Crowley, Shrager and Siegler, 1997). This particular role of metacognition has been demonstrated in young children, when a certain level of cognition had been reached.

Metacognitive thinking emerged, allowing the children to develop cognitive skills to a higher level. Educational psychologists believe that learners must become strategic learners to be successful. This involves knowing how to convert new information into meaningful knowledge (Weinsten, 1996; Kolencik and Hiilwing, 2011). Metacognition is involved in a cyclic process of the selection of strategies, meta-analysis of analysis of the consequences of this choice, and revision. Metacognition both directs and is modified by performance (Kuhn, 2000). Caine et al. (2005) describe the metacognitive process as a “basic feedback loop” that begins with becoming aware of how one functions and then intentionally developing additional capacities. In this way, metacognition is an essential skill in improving learning and performance in any field (p. 215).
Metacognition and Academic Ability

Some research has been conducted to identify correlations between metacognitive level and student academic ability. Findings over the past three decades have shown a positive correlation between learners who understand their own way of learning and learning outcomes (Georghiades, 2004; Hacker, Dunlosky and Graesser, 2009).

Metacognition has been identified as a tool of improvement to assist students in the retention of concepts and the transfer of knowledge across contexts. Georghiades (2000) conducted research in the area of science instruction with primary school children and found that the use of metacognitive instruction was feasible under everyday circumstances. Both qualitative and quantitative measures provided evidence that metacognitive instruction had a positive impact on the durability of pupils’ conceptions of science and on their ability to transfer this knowledge into significantly different contextual requirements.

In a study performed by Kolić-Vehovec and Bajšanski (2001), metacognition was identified as a predictor for reading comprehension. The study involved 93 third grade students, 105 fifth grade students, and 83 eighth grade students. A questionnaire was used to assess metacognitive knowledge about reading and results were compared to measures of comprehension using close-task and sentence detection tasks. Moderately strong relations were determined for all developmental levels. Payne and Manning (1992) conducted research with 20 fourth grade students to determine if deliberate training in metacognition and related strategies will have an impact on reading. Results showed significant gains in reading comprehension, and these students showed evaluation, planning and regulation of their own reading.

A positive correlation was determined between metacognition and mathematical problem solving in elementary school children. Desoete, Roeyers and Buysse (2001) conducted research
with 165 grade 3 students of average intelligence. Assessments for mathematical and metacognitive ability were used to determine levels of functioning. In part, findings identified that, while not all components of metacognition were significantly correlated with ability, three metacognitive “supervariables” were identified as being involved (Desoete, Roeyers and Buysse, 2001, p. 445). Therefore, metacognitive assessment to determine differences amongst students would be possible. Only off-line metacognition, predication and evaluation, differentiated metacognitive ability between average, above average and students with math difficulties.

Across domains and subject areas, the use of metacognition empowers students to engage in the learning of new knowledge and skills (Costa, 2008; Hacker, Dunlosky and Graesser, 2009). There is a parallel between the attributes of self-directed learners and executive functions (Rivers, 2001). Research (Joseph, 2009; Otani and Widner, 2005; Pintrich, 2002) identifies metacognition as a predictor of academic ability. In addition, metacognitive training has the potential to improve academic functioning.

The Value of Metacognition in School Settings

Contrary to traditional thought that uses the analogy of the empty vessel to represent children’s learning, many educators, educational psychologists and researchers recognize that students take an active role in converting new information into meaningful knowledge (Weinstein, 1996). Current theories of metacognition (Kuhn and Dean, 2004; Lovett, 2008; Zulkiply, Kabit, Ghani, and Abas, 2008; Dunlosky and Graesser, 2009; Kolencik and Hillwig, 2011) suggest that effective control of learning by either metacognitive or self-regulatory processes has a positive effect on cognitive development. A central belief is that learners who
have higher levels of metacognitive ability also will have an increased sense of empowerment, along with improved achievement and academic success.

**Metacognition in the Information Age**

It can be argued that metacognition is central to what being educated means in the fast-paced and constantly changing information age. Pellegrino (2006) agrees:

The range of computational devices and their applications are expanding exponentially, fundamentally changing how people think about communication, connectivity, information systems, educational practices and the role of technology in society (p. 11).

Cogburn (1998) believes that in this era, “a new system of knowledge, education and learning will include many components that do not exist in the current educational model” (p. 29) and that one of these components needs to include “enhances the student’s ability to acquire and utilise knowledge” (p. 29). It is unrealistic to expect learners to acquire all existing knowledge nor is it necessary. Having internet access allows individuals to have a library at their fingertips (Doherty, Hansen, and Kaya, 1999; Costa, 2008; Santrock, 2008). Also, much of the knowledge that can be disseminated will become obsolete at a faster rate than in previous decades. In this environment, the focus is on learning processes rather than acquiring knowledge. Hargraves (2002) concurs by stating:

Teaching for the knowledge society involves cultivating special capacities, not just any kind of learning in young people. These include developing deep cognitive learning, creativity and ingenuity among pupils; drawing on research, working in networks and teams and pursuing continuous professional learning as teachers; and promoting problem-
solving, risk-taking, trust in fellow professionals (whether they are close to you, or always agree with you or not), ability to cope with change and commitment to continuous improvement as organizations (p. 3).

From this viewpoint, content knowledge is important but not at the expense of process knowledge. The value of metacognition becomes apparent as learners will most benefit from learning how to effectively acquire knowledge and process it as it is required (Kolencik and Hillwig, 2011). The role of the teacher also shifts within the classroom context. Fifteen years ago Cogburn (1998) began to describe,

There are a range of new technologies and new techniques engendered by the Information Revolution that allow for the production of new knowledge and the dissemination of data, information and knowledge. Some of these technologies include the Internet, World Wide Web, CD-ROM, and printed, audio, video and other electronic media forms. These new technologies allow for academic practitioners to move from being “sages on the stage” into the role of the “guide on the side” and assist students in gaining the skills and abilities required to acquire and utilize knowledge contained in various forms around the world (p. 25).

Thus, the information age impacts the classroom focus from content to a process orientation (Santrock, 2008). The emphasis on content specific knowledge is not sufficient in preparing students for the world they are in and the work force they will enter into.
**Learner Empowerment Through Metacognition**

A significant role of education is to help students become more knowledgeable of and responsible for their own cognition and thinking. Kuhn (2000) believes that enhancing both metacognitive awareness and control is an important developmental and educational goal. Students can enhance their learning by becoming aware of their own thinking, and teachers should promote this awareness by providing opportunities for students to develop metacognitive skills (Georghiades, 2004). Individuals can be taught to regulate their behavior which allows them to self monitor and execute control over their own performance (Bransford, Brown and Cocking, 2000; Efklides, 2011). Research indicates that this type of self-insight is predictive of subsequent learning (Martinez, 2006). Metacognition is also useful in relation to K-12 special student populations. Ogle (1997) acknowledges that a “thinking curriculum” that supports metacognition and includes planning, organization and evaluating progress is appropriate for students labelled “at-risk students”. With the increasing demand for accountability, implementation of effective instructional practices that improve student learning within all classrooms is critical.

**Barriers to the Use of Metacognition**

Several factors impede the development of metacognitive skill such as an over emphasis on direct-instruction methods of education delivery, the expectation that metacognition develops implicitly, and the emphasis on lower level thinking skills to achieve results on high stakes testing. School curriculums focus more on knowledge, skills and attitudes that are content specific rather than prioritizing metacognitive development and engaging the student in the process of understanding their own learning. The development of metacognitive skills is viewed
as a value added activity rather than an essential one when using a traditional pedagogy that emphasizes knowledge acquisition over self-directed learning (Smith, Edelsky, Draper, Rottenberg, and Cherland, 1990; Kohn, 2000; Pellegrino, 2006). Most metacognition is a process that is assumed and is not directly taught (Pellegrino, 2006; Kolencik and Hillwig, 2011). As Pintrich (2002) recommends:

In terms of instruction, there is a need to teach for metacognitive knowledge *explicitly*. Teachers may do this in some lessons, but in many cases the instruction is more *implicit*. Simply stated, many teachers assume that some students will be able to acquire metacognitive knowledge on their own, while others lack the ability to do so. Of course, some students do acquire metacognitive knowledge through experience and with age, but many more students fail to do so (p. 223).

Although students may develop these skills on their own, through learning activities that involve them with their peers, growth can be limited for many who would have otherwise profited from direct attention to developing metacognition. Finally, in striving to be competitive in the international arena, test performance has been a strong driving force in determining educational success. Political agendas use high stakes testing as the main form of accountability and assessment is used as a reform strategy (Haertel and Herman, 2005; Sandler and Apple, 2010). Results from these tests provide a type of clarity that is both alluring and simplistic. In this manner, test results not only inform stakeholders but also influence the educational priorities within learning contexts. Classroom teaching becomes geared towards methods that assist students on written tests rather than building complex thinking skills and reflection on the learning process (Blake, 2008; Cochran-Smith, 2005; Haertel and Calfee, 1983; Meisels, Atkins-
The trend is to use teaching methods that are perceived as being more efficient in delivering higher test scores.

**Considerations for Imbedding Metacognition into Public Schools**

Educational interventions may be impeded not due to their merit but based on the process of implementation. In complex organizations such as schools and learning institutions, a systemic approach will consider the many roles, responsibilities and relationships of all stakeholders involved. Successful school reform activities impact all levels of the education system. Therefore, incorporation of metacognition into K-12 public schools ultimately is complex in nature as it involves building relationships among the members within these various roles (Little, 2004, p. 59). A typical school-based professional development model considers the process, content and context or essentially the *how, what and where* characteristics necessary for the effective implementation of a learning intervention. Metacognition can facilitate this process by engaging stakeholders in the process of metacognition throughout the implementation process. This involves the use of critical review during the planning, engaging and implementing phases (Efklides, 2011).

Metacognition provides a context for teachers to engage in the process of reform that is shaped by the experiential realities of the classroom. Little (2004) asserts that research based engagement is the “core instructional technology necessary for school reform” (p. 64-65). Teachers can actively work with the ideas, make choices, work individually and collectively, and share and demonstrate their learning with others through increased self-responsibility.
Revisiting Reflection and Extending this Practice

Reflection is a common practice in both K-12 schools and professional training programs for teachers. “(It) is a crucial component that must be incorporated into every new and existing teacher preparation program” (Lowery, 2002, p. 189). Reflection shares many of the critical components found in the process of metacognition. While reflection is more generalized and can simply be the elaboration of the teaching experience, metacognition is more specific to the actual thinking process. Both identify the need for thoughts to be made explicit and the need for action to be part of the process for it to be meaningful for growth (Costa, 2008; Hacker, Dunlosky and Graesser, 2009). Cranton (1996) states that our interpretations are often “deeply ingrained” and “taken for granted” which makes them difficult to articulate. Further to this, it is valuable for educators to articulate their philosophy, values held by family or in their community, their assumptions about their practice, and their experiences (Cranton, 1996). The similarity of the two processes is advantageous when considering how to incorporate metacognition into the school setting and in teacher education. Metacognitive processing can build on the use of reflection that has already gained approval and favor in educational circles.

Incorporating Metacognition into Teacher Development Contexts

There is limited guidance and few models for systematic inquiry about how partnership relationships affect student learning, behavior, and attitudes (Benson, 2004). Considering the potential benefits of metacognition in educational contexts, it is worthwhile to explore how training pre-service teachers and current teachers in this practice for their own professional development will impact the transfer of this skill to their students.
Metacognition has many advantages for improving not only student learning in schools but also improving the education and development of teachers (Hacker, et al., 2009). Metacognition can be utilized in a cyclic process that engages learners in ongoing reflection, action and revision (Figure 2-2). Teachers engage in the process of metacognition that involves awareness and regulation of their own thinking as it relates to planning, interactive teaching, and organizing the learning environment (Manning and Payne, 1996; Martinez, 2006).

**Figure 2-2. The Metacognitive Process**

Adapted from Manning, B. H. & Payne, B. D. (1996)
As a tool for professional development, metacognition is valuable in addressing three widely documented problems in trying to teach (Darling-Hammond and Bransford, 2005). One concern is the need for new teachers must come to understand teaching in ways different from what they have learned from their experience as students to counteract what over thirty years ago Lortie (1975) calls “the apprenticeship of observation.” There is a tendency for new teachers to teach in ways that they remember from when they were students. The danger is that less effective strategies and approaches may be incorporated because they are assumed to be appropriate.

“Despite what are often the best efforts of teacher education programs to prepare teacher candidates for progressive education practices involving complex teaching, student performance that reveals complex learning and thinking is often missing” (Folsom, 2004, p. 206).

Linking educational teacher training and professional development with student performance in the classroom traditionally has proven to be a challenge. Metacognitive reflection can address these preconceptions about teaching and learning. “Assumptions that have been uncritically assimilated from past experiences or current contexts can be assessed for their validity” (Cranton, 1996, p. 86). A second issue in learning to become a teacher is what Kennedy (1999) refers to as “the problem of enactment” (Darling-Hammond and Bransford, 2005). Metacognition not only uses reflection to increase awareness, but it also engages learners in the process of action. Effective teaching must involve the application of effective practices. Finally, the problem of complexity” is an issue new teachers face (Darling-Hammond and Bransford, 2005). Metacognition or the ability to think about one’s own thinking is extremely
important for helping teachers become adaptive experts who can manage complexity (Hacker, et al., 2009). It is through narrative that “individual teachers make sense of teaching, they also enable other teachers to connect with the larger picture” (Jalongo and Isenberg, 1995, p. 83). In this process of awareness, analysis and action, teachers are able to navigate within the complicated environment of teaching. Metacognition becomes a value added activity because it facilitates learning as an educator while at the same time it exposed new teachers to a tool that can be used with their future students Kolencik and Hillwig, 2011).

The daily realities of working in the school context exposes new teachers to the dynamic environment they must be prepared to teach within. Teachers are expected to juggle many tasks, and function in an environment that is in perpetual change. Prospective teachers need help in learning to think systematically about these complexities. “When teachers retell significant teaching events, they see themselves from multiple perspectives” (Jalongo and Isenberg, 1995, p. 100). The use of metacognitive habits of mind will help guide teacher decisions and reflection on practice in support of continual improvement (Darling-Hammond and Bransford, 2005). Preservice teachers can be encouraged to consider critical incidents or identifying critical episodes. This is a reflective activity that provides a way for individuals to examine how they responded and made decisions (Samaras, 2002). Further exploration into key events reveals assumptions that underlie their actions and thoughts.

New teachers have the potential to use metacognition as a tool of empowerment similarly to their future students. Manning and Payne (1996) suggest that metacognition supports teachers taking responsibility of their own learning and teaching. Darling-Hammond and Bransford (2005) found that,
...people with high levels of metacognitive awareness have developed habits of mind that prompt them to continually self-assess their performances and modify their assumptions and actions as needed. People who are less metacognitive rely on external feedback from others to tell them what to do and how to change. (p. 376)

Thus, metacognition becomes a continual process used by educators to inspect and improve their practice within the contexts they work in. As individuals become more knowledgeable about teaching, they can further reflect and revise their current practices (Martinez, 2006; Costa, 2008).

From a systems approach, incorporating metacognition into teacher training is purposeful. Implementing a particular strategy is best accomplished by engaging everyone in the organization or, in this case, the learning community. For the proper incorporation of metacognition into the delivery of education in K-12 public schools, teachers play a critical role. They must be well versed in using metacognition so they are able to model the process. Congruent with the beliefs of Vygotsky, metacognition can and should be modeled by teachers and interaction amongst students should be cultivated to improve metacognitive capacity (Martinez, 2006).

Educators can engage in a variety of activities to explicate assumptions underlying their practice. They may keep a shared journal with a trusted friend or colleague and write about their practice and then exchange their journal. At this point their role would be to look for assumptions. Additional activities to assist with the identification of assumptions is to write a biography of oneself as an educator. Write a description of their personal philosophy or practice and justify it to a friend or colleague. Analyze video tapes of one’s practice and justify behavior to others. Discuss one’s philosophy of practice with learners; ask them to challenge and question
the premises of their thoughts. Write a philosophy of practice held by someone who has a perspective similar or in contrast to your own; analyze it for assumptions and compare these to your own. Further more, write a description of the philosophy of practice of a favorite educator from the past and analyze the assumptions underlying that philosophy (Cranton, 1996).

Metacognition is an enabling tool that has the capacity to be beneficial in addressing key dilemmas faced by new teachers (Costa, 2008; Hacker, et al., 2009).

Teachers are often faced with barriers to implementation that revolve around the complexity of the task of educating for the sake of student development in our public schools. “Reflection is inhibited in pre-service and in-service training due to isolation of the teacher or by structure of courses and schools” (Lowery, 2002, p. 192). In addition, an educator in Canada and United States is expected to have a comprehensive knowledge of curriculum, an increased understanding of how learning occurs based on current research, an awareness of the unique diversity of the student population including specialized learning needs, and the ability to work in settings that often are less than adequate in providing all the resources to accomplish the required task (Sandler and Apple, 2010). Educators serve additional roles such as mediator and counselor, nurse and caregiver, while still maintaining their role as an educator. This entails dealing with the pressure to produce excellent test results with students. Little time is left for thinking beyond the life in the classroom and the current strategic plan.

If educators are to develop their practice, a process including both personal and professional growth, then critical reflection on practice will be central to learning. This is not to say that instrumental and communicative learning about teaching are not a part of becoming an educator, but rather that development requires moving beyond the
acquisition of new knowledge and understanding into questioning our existing
assumptions, values, and perspectives. (Cranton, 1996, p. 76)

We have been conditioned to not question the real life accountability and relevance of
mandatory curriculums. If relevance has been deemed a priority in political circles, it has led to
an intensified focus on the basics and workforce applicability more than anything else. The main
predicament has been that this cycle of reform remains within current limited structures despite
enormous efforts and continual planning. It is like being stuck in a rip tide, whereby; the same
problems are being sifted up without a true sense of renewal. Breaking out of this momentum
and engaging in “out of the box” thinking about public education will require a move beyond
current structures. The revolution of education, as I have observed it, has witnessed intense
reform practices without question. Unfortunately, these processes have been constricted to
action all within long-established conventions, within the traditional mental models of
educational systems and within the confines of what is familiar.

My personal bias, based on my own investigation and experience with public education,
has been that true transformation will only occur when change occurs at all levels and with all
stakeholders simultaneously. Poplan (2001, 2003) has a grounded view of the realities of
educating our youth and our views overlap. In considering meaningful intervention,
implementation must consider all levels and stakeholders involved in the educational experience
to have a significant impact (Dynarski, 2010).
Research Implementation Pitfalls and Problems

In the context of reflecting between research and its application, this section elaborates on the need for researchers and practitioners to improve and articulate the benefits and application of research as in the case of metacognition. Repeatedly in the research literature are references that are made to the research to practice gap (Burkhardt and Schoenfeld, 2003; Cook et al., 2003; Dynarski, 2010; Fox, 2000; Hallinan, 1996; Hiebert, Gailmore, and Stigler, 2002; Hess, 2008; Jones, 2009; Maag and Katsiyannis, 2003; Millar, Drill, and Behrstock, 2010; Noddings, 2003, Ohi, 2008; Snell, 2003; St. Clair, 2004). The researchers identify several factors that impede the successful integration of research into the school context. Barriers include the different agendas of the researcher and practitioner, an overall mistrust of research in general, issues of relevancy, the ease in which research findings can be practically applied, and the ability of stakeholders to embrace and apply the changes suggested within studies.

The Limited Impact of Research

In current times, the call for research-based practices and interventions has increased. This initiative may be oriented to failure as traditionally research has had a reputation of being inadequate in impacting change and improvement in school contexts. There is a general experience of dissatisfaction with research from a practitioner and school perspective. Burkhardt and Schoenfeld (2003) state “educational research is not very influential, useful, or well funded” (p. 3). Based on my personal experiences in schools, I have been troubled by the limited role research has had. Noddings (2003) concurs by saying:
….after many years as a high school mathematics teacher, administrator, university professor, and philosopher of education, my inclination in answering this question (what can teachers learn from research?) is to say, “not much.” (p. 23)

In the end, the value of educational research is dismissed when seeking solutions to issues of student achievement. Noddings (2008) argues that research has lacked in usefulness and thus has had a limited impact on reform:

If you are looking for a recipe-like answer to questions about how to teach fractions, reading, spelling, or history, my answer (that research has little merit) holds. The best research will not give you such answers. Though research in education has proliferated, most instruction today is no better than it was when I was a child. Indeed, because I went to a progressive, public elementary school, most of what goes on in today’s schools seems to me to be markedly inferior. (p. 23)

Cook, Landrum, Tankersley, and Kaufman (2003) further state, that there has been no lack of attention given to the gap between research and its application in schools, yet “as a field we have been particularly unsuccessful at abating the discrepancy between research and practice on a broad scale” (p. 346). Burkhardt and Schoenfeld (2003) argue there is “a lack of credible models of employing educational research to shape educational practice” and they further reason that “traditions of educational research are not themselves strongly aligned with effective models linking research and practice” (p. 3). Cook et al. (2003) acknowledges that while there have been some individual areas of success, overall “we are no closer to systematically adopting the use of effective practices than in the past” (p. 346). It has been suggested that there may even be
an inverse relationship between the effectiveness of a practice and its level of implementation” (Cook et al., 2003, p. 346). Simply put, the present conditions of partnership do not support the productive use of research (Hacker et al, 2009).

Interestingly, the concept of the research to practice gap implies that research of any value is originating only from the researcher. Dynarski (2010) cautions against using terms and phrases like "dissemination" and "research to practice” as these “imply that only researchers are generating knowledge and that the challenge is simply to get it to practitioners” (pp. 64-65). By not seeing practitioners as co-researchers, or as being vital in the research process, the application of this knowledge into intended sites of application faces more disconnection.

The Different Agendas of the Researcher and Practitioner

The dissimilar, sometimes opposing intentions driving research efforts and how research is valued is a commonly cited area of concern. St. Clair (2004) speaks to the different expectations held by “producers (researchers) and the intended consumers (practitioners)” (p. 227). These expectations are summarized as the desire for generalization prevalent in one type of research over the practicality of the other. Fox (2000) articulates that researchers often "want studies that address global issues in a way that is broadly applicable to understanding" while practitioners are seeking solutions to “common and every day issues” (p. 239).

With a history of limited success, the intent behind research from these different perspectives requires review. Questions of research usefulness must be explored and perhaps a prioritization of what it is needed for. St. Clair (2004) supports that both of these perspectives are necessary in educational research. Dynarski (2010) suggests that the expertise the
practitioner has about practical knowledge and the researcher has about research knowledge is ideally partnered for the best outcome:

The challenge is to develop an exchange between the two, and that exchange should be a broad one that goes well beyond the implications of research for the practitioner's district, school, or classroom. Rather, practitioners and researchers should swap ideas about topics to research, questions to guide the next set of studies, and models for matching findings with district questions and concerns. This feedback loop can help develop a strong research base that addresses questions of interest to practitioners. (p. 65)

In this way, a relationship between researchers and practitioners develop before studies are even started and continue throughout the research process.

Yet another concern is the conventional understanding of research and how it is conducted. Snell (2003) highlights this barrier by describing researchers’ perspective on what makes up good research. The tendency is for researchers to complete their investigations apart from practitioners as their involvement “complicates research protocol” because they speak a different language and “have discrepant perspectives and goals (p. 143). Another aspect of why researcher desire autonomy is that they are not able to control practice (St. Clair, 2004; Dynarski, 2010). In this way, not only the research but the application of research is identified as a flawed and imprecise process. Research is considered to be a scientific process that does not require practitioner involvement and may even be hindering by it. Finally, research in the university community is influenced by “‘publish or perish’ incentives which may impede the kind of problem-solving research that will best improve education” (Dynarski, 2010, p. 62). This further inhibits the coordination between universities and schools.
The Perceived Credibility of Research

Not limited to education, the inclusion of validating practices and products through research seems common place. The response to the “research says” statement appears to range from one extreme to another. On one hand the reaction is to accept the statement as fact or, on the other hand, it is being discounted due to a distrust of research in general. This reflects the experience of educational research in the public education arena. “Perhaps the acceptance of postmodernist and deconstructivist thought that espouses the untrustworthiness of data and the empirical method may contribute to an aversion to examining educational methodologies” (Maag and Katsiyannis, 2003, p. 37). In the article titled, “The New Stupid” written by Hess (2008), the use of research, has shifted from being absent to the abundant use of it, neither situation being ideal to guide practice:

Today's enthusiastic embrace of data has waltzed us directly from a petulant resistance to performance measures to a reflexive and unsophisticated reliance on a few simple metrics-namely, graduation rates, expenditures, and the reading and math test scores of students in grades 3 through 8. The result has been a nifty pirouette from one troubling mind-set to another; with nary a misstep, we have pivoted from the "old stupid" to the "new stupid." (p. 12).

This blind acceptance of research has fostered a negative concept of using studies and has set an inappropriate precedent. Ohi (2008) confirms the issue of teachers not choosing to “engage critically with research literature or policies given to them” and that they “readily (accept) the actions and decisions of those in responsibility above them as credible and (become) resigned to them” (p. 105). “Much of what (has been) called education research was ideologically driven
or based on opinion, supposition, or personal experience, and it was rarely replicable” (Anderson, 2000, p. 1). It is for some of these reasons that education research does not have much credibility “even among its intended clients, teachers and administrators. When they have problems, they rarely turn to research” for answers (Burkhardt and Schoenfeld, 2003, p. 3). The misuse of research has created a dysfunctional relationship between research and practice resulting in evidence-based practices being viewed with caution (Sandler and Apple, 2010; Dynarski, 2010).

**Applying Research Findings into Practical Contexts**

Educational research has been abundant but to a much lesser degree applied in real settings. The integration of research is impeded by issues with relevancy, the lack of practical considerations indicative of the school context, the format in which information is shared, research fidelity or the adherence to application recommendations, and the methods of access to stakeholders.

Teachers are more receptive to educational research that speaks to the important and local issues that impact their students and school. It is the information that provides solutions and remedies for dealing with the everyday problems that have appeal and are therefore more likely to be considered (Fox, 2000; Dynarski, 2010). Millar, Drill and Behrstock (2010) indicate the reason why research lacks influence is it is simply not used by teachers. According to Hallinan (1996), while researchers are concerned that the findings of their studies are ignored or misinterpreted by school personnel, educators argue that much research is incomprehensible or irrelevant to their concerns. St. Clair (2004) states that it is most common for educators to “use their own perspective-beliefs, values, and experiences-to decide whether a study” is of value (p
Research must contend with the understanding that teachers are more likely to use pedagogy that they are familiar with and can identify with (Everette, 2008). Unfortunately, their practices can often be a reflection of how they were taught. These beliefs of how to teach can become deeply entrenched (Lortie, 1975) and can make them less open to consider practices recommended by research. In addition, Maag and Katsiyannis (2003) suggest that teachers use methodologies based more on testimonials and faith:

> Individuals tenaciously hang on to their beliefs; perhaps partly because once a belief is formed, it tends to attain the status of fact. These beliefs are often reinforced with the spurious, yet frequently applied, logic that the effectiveness of something can be validated if its ineffectiveness cannot be disproved. (p 37)

Jones (2009) supports this applied notion stating that there is “the extensive use of ‘craft’ knowledge or reliance on individual experiences based on trial and error” that guide practice within classrooms (p. 101). This trend of school-based reliability often is valued over research that may appear too removed from the school culture. Maag and Katsiyannis (2003) identify that many educators ignore empirical data and may be instead swayed by the latest fads that are presented in “glitzy packaging” (pp. 36-37). This speaks to the perceived accessibility and applicability of knowledge being valued over the format and presentation of traditional research studies.

A further disconnection occurs because the nature of the school context is often not fully understood or appreciated by researchers. This comes across in studies, at times in indirect ways, where it is apparent that the researcher does not have practical experience in the school. Research implementation, to be effective, must consider the “multiple demands on teachers
within the classroom and broader school setting” (Jones, 2009, p. 103). The school environment experiences shortages in commodities such as time, staffing, and funds. In addition, other factors including curriculum requirements (Jones, 2009), scheduling, and additional functions the school provides limits the flexibility often needed for an easy application of research findings into classroom practice. St. Clair (2004) identifies timeliness as a concern.

It appears to be widely accepted that in conventional models, the process of application can take a long time. Findings that are not shared with practitioners in ways that foster application are ineffective. Unfortunately, traditional models of research to practice assume that the transfer of knowledge can take as long as 50 years. First, scholars conduct the research, then they publish findings in academic journals, then the academic articles form the basis for similar research and at the same time make their way into the syllabi of preservice academic training for teachers, and slowly the knowledge makes its way into classroom practice. (Gamer, Bingman, Comings, Rowe, and Smith, 2001, p. 8 as cited in St. Clair, 2004)

In schools there is an urgency to develop solutions that have an immediate impact. Conventional research procedures focus on the efficacy of the research protocol can delay results to the point that they are no longer relevant.

A less discussed issue is how research is presented and the access to it. Cook et al. (2003) share the concern of the “limited extent to which our research knowledge is truly available to practitioners” (p. 351). They go on to articulate:

That is, our research findings and literature base must (a) include results that engender confidence in consumers and especially practitioners (trustworthiness), (b) present
research findings in such a way that practitioners can easily translate and apply the
findings from research studies or syntheses directly into practice (usability), and (c) be
readily available to practitioners who may be seeking guidance from the research base
(accessibility). (Cook et al., 2003, p. 351)

If there is to be a greater use of research in classrooms, St. Clair (2004) suggests researchers
need to consider “how they disseminate their work to practitioners” and “practitioners who want
to use research more extensively might consider becoming more versed in the language of
research to make translation less difficult”(p. 240). Language and terminology has been one
aspect that has received attention in the literature. Anderson (2000) states that “there is little
common language between researchers and practitioners, which may explain the lack of
communication between the two groups (p. 2).

Certainly, there are habits of teachers and administrators that discount research due to
their beliefs and the need to be productive in day to day functioning within classrooms and
schools. Snell (2003) identifies that practitioners may contribute to the problem in the following
ways:

(a) ignoring what research says;
(b) failing to understand what research says;
(c) searching for quick fixes;
(d) selecting interventions based on the conformity criterion;
(e) looking only on the internet for solutions;
(f) using an intervention but giving up prematurely; and
(g) changing a proven intervention so that it is vastly different.” (p. 143)
Practitioners ignoring what research says and applying interventions inappropriately deal with issues of relevancy and fidelity. The other problems identified are language and format of delivering information, and teachers’ tendencies to use what is known, and access readily accessible.

Application of research also is circumvented by the way in which it is applied. This is referred to fidelity. Klingner et al. (2003) found that “high implementers” had the familiarity to apply research effectively however “low implementer” groups “used the practices least often yet made the most modifications to the practices either intentionally or inadvertently (p. 424). Researchers have a negative view on modifications directed by practitioners viewing this diluting the process and invalidating results.

**Positive Potential of Educational Research**

Research can be a support to school reform efforts that improved student achievement and encourage true innovation. It can provide the evidence necessary to educational stakeholders to support a change in practice from conventional methods. In addition, it can create a mindset that promotes ongoing exploration and modification of the learning environment to achieve greater success. With the use of appropriate methodologies, it can influence immediate changes in the learning environment.

Research has the capacity to address the stagnancy in educational delivery. Hiebert, Gailmore and Stigler (2002) contend, “to improve classroom teaching in a steady, lasting way, the teaching profession needs a knowledge base that grows and improves” (p. 30). They go on
to say that on average however, archived research knowledge has had little impact. There does need to be a perceived value of research for it to be used as an instrument for improvement.

Research also has a role in identifying effective strategies, reaffirming good practices in use, exposing outdated methods and discounting new fads that emerge. The separation of researchers from the direct school experience has the advantage of providing a critical review of educational delivery. St. Clair (2004) contends:

Critical writers assume, on a fundamental level, that research can expose lacunae or oppressions within practice. Educators, or those educating educators, can then use the written research products to highlight these features, hopefully leading to their being addressed in the classroom. (p. 230)

There is value in the generalizations and removed perspective that can inform educators in different ways. Colburn (2008) articulates this by saying:

Those of us viewing classrooms from our ivory towers can also provide valuable information-information gleaned from a distance that can help you make decisions about how to get your students to your chosen educational destination. (p. 10)

Research from the researcher can be seen as a way to solidify practices without the conflict of interest educators may be exposed to.

As part of the focus on standards, research has evolved in our current times where schools are encouraged to employ proven instructional strategies to improve academic performance. Opportunities for action research and the like help develop research that is relevant to the communities that are involved. Glanz (2003) and Stringer (2007) suggests that in
this way action research can be used to promote school renewal. Action Research gives teachers the skills needed to work on problems specific to their classrooms and their schools. By using an actual research procedure, researching teachers can resolve their own teaching challenges. They learn how to ask a focusing question, define terms, collect relevant data, use an analysis process that rules out bias, and includes methods that yield validity and reliability. The findings become immediately applicable to their individual situations (Reed, 2002; Stringer, 2007). Allowing local autonomy to consider and evaluate teaching methodology has the potential to effectively meet the unique needs of learners in a particular setting, however in reality, as the measures of success exclusively rest on standardized testing results, opportunity for growth is limited to using methodology that directly impacts test scores. In short, improving students’ ability to perform well on these types of tests alone does not lend itself to using methodologies to promote dynamic learning skill and ability (Center on Educational Policy, 2009). Blake (2008) conducted a study that revealed teachers felt high-stakes testing impacted instruction and contradicted teachers’ views of sound educational practice. Accountability in the form of high stakes testing creates disequilibrium in the balance between the orientations of process and product outcomes as measures of educational growth (Abedi, Herman, and Golan, 1994; Ravitch, 2010; Figlio and Loeb, 2011).

To have an impact in improving education using process-based research, it would need to be valued by those involved in the driving force behind the focus on standards and rigorous testing. The majority of influence is emphasized at a macro level or at the higher levels within the structures of hierarchy within our educational systems. In Canada and the United States, while stakeholders exert some influence, ultimately legislation at the federal or provincial levels guide practice. The emphasis on high-stakes testing maintains this power structure and dictates
the relationship between school-based education and stakeholders (Popham, 2001). A reaction to this primary focus of accountability has been the use of research to defend current practices aimed at improving student results on these tests. Often, mainstream research values the perspective of rigour through quantifiable constructs and generalized outcomes. Unfortunately, as Herr and Anderson (2001) and Jones (2009) identify, the impetus on traditional notions of rigorous research can become so disconnected from reality that it no longer is useful when dispensed down to the classroom setting.

Healthy research helps to create a mind set for exploration and altering the learning environment for success. Rather than a one directional process or a top-down mandated directive where research is presented for application, research can be more dynamic and interactive for greater success.

**Pragmatic Educational Research**

Research plays an important role in effective educational delivery and the improvement of student learning experiences. However, there have been long-standing issues with the usefulness and application of research. Fortunately, there conditions that support addressing this issues at this time. As Burkhardt and Schoenfeld (2003) state, “for the first time in the history of education, there is a body of research that addresses the essence of the education profession, namely, the effective instructional practices that make a difference in classrooms” (p. 4).

A revised process or model that improves the effectiveness of schools involves a reorganization of how research is conducted, imparted, and the roles of all stakeholders involved. It would not be understated to say that the shift needs to be substantial for there to be any meaningful improvement. While research may not initially provide immediate benefits to the
classroom (Burkhardt and Schoenfeld, 2003), the research model would require revision to allow for a stronger link to the practical aspect of schooling. Hofmeister and Lubke (1990) affirm:

Given that many educational research efforts have generated more speculation than valid practical applications, the consistency, generalizability, and applied nature of this body of research about effective practices is the foundation for change in education. This research demands the immediate attention of those concerned with the progressive and systematic improvement of the education profession. (as cited in Anderson, 2000, p. 3)

Even though research from universities may have the strength of providing unbiased findings, this benefit is far outweighed by the need for research to be meaningful and responsive.

The issue of fidelity has been identified as a barrier to the effective implementation of research. Rather than seeing it in this light, modification to the application of research more appropriately could be part of the research design, making the application of findings integral in the ongoing process of research. Maag and Katsiyannis (2003) recommend that decisions regarding interventions must consider “the extant data and eschew anecdotal and testimonial reports” (p.37). Profitable application incorporates contextual considerations, the characteristics of the student population, and the school and community culture.

Changes are necessary to both the role of the researcher and practitioner in an improved research model. A partnership between these two groups is vital throughout the entire process and practitioners are best treated as co-researchers. Millar, Drill and Behrstock (2010) encourage teachers to be viewed as “local experts” and to use their knowledge and strengths to help identify worthy research topics (p. 34). Teachers act as mediators as well to help bridge the
partnerships between universities and schools. St. Clair (2004) suggests that practitioners know both sides of the “research/practice divide” because applying research to practice requires both an understanding of the field of research (because of specific training) and knowledge of the field of practice (from experience)” (p. 234).

Researchers must consider relevant topics, approaches that represent the real-life contexts that exist, using formats that promote understanding and access to the professionals in the field, and attention given to improving results rather than valuing an adherence to traditional protocols. Educators must recognize that practice has, in most cases, been stagnant and that there is a resistance from them as well as other stakeholders to make the changes necessary to improve practice and educational delivery. Part of being a professional must include skills in working with research to become an informed user and to better apply research findings in practical ways. Hiebert, Gailimore, and Stigler (2002) envision that:

….researchers and teachers could work side-by-side as authentic partners in the new system, each gaining from the others' expertise. Teachers, for example, would use the wealth of their experience to test difficult-to-implement but promising new ideas and then, based on their own and the researchers' observations, new hypotheses could be constructed for future tests. Researchers, in turn, would have greater access to investigational contexts and populations, and gain a rich source of new ideas and hypotheses…. Rather than being made redundant or obsolete, the work of researchers could become more relevant with a system in place to digest and transform their general findings into professional knowledge for teaching. (p. 13)
Research has been and should continue to be reinforced in professional development and teacher training. Jones (2009) recommends:

… leaders of teacher preparation programs must design their curricula and coursework so that prospective teachers not only learn how to utilize validated practices but also develop skills in interpreting the research, making them wise consumers. When teachers can recognize quality practices, can use them effectively, and receive extensive support in the pre-service years and beyond, a positive impact on teacher satisfaction and retention as well as increased student learning and success will result. (p 115)

Teachers need not go beyond a basic understanding of research however. It is simply impractical to expect that they would have the available time culling through research journals to identify best practices but it is of value for them to learn the basics of strong research. Research is a shared responsibility by all stakeholders and their involvement is important throughout the process. The necessary shifts to support a new research model will occur when support is received from all stakeholders within the educational community. “There must be much closer coordination of effort between research, design, development, policy, and practice” (Burkhardt and Schoenfeld, 2003, p. 3).

Receiving less attention in the literature is the language and formats worth considering to improve the understanding of research, usability and accessibility. As mentioned previously, teachers are more likely to use tools that are familiar, reliable and easy to understand. Research presently requires modification if it is to be more user friendly, because “if it is less than accessible, is not applicable, is untrustworthy, or fails to be easily interpreted, it is likely that the
novice teachers will simply turn to another source such as their colleagues or familiar teaching approaches (Lortie, 1975).

Communication and structures that promote exchange on an ongoing basis are essential to maintain effective implementation. Ohi (2008) states:

In order to further strengthen the nexus between research and practice it is important to establish effective avenues of communication between them. It is recommended that teachers be provided with opportunities to better access current research. This could be achieved in a number of ways and should involve action at the university level for the pre-service teacher, the school level for the professional practitioner and the departmental level. (pp.106-107)

As part of an improved communication process, the written format and presentation of research findings requires adjustment. It is not enough to expect educators to become familiar with language of research. Even with an understanding of the traditional format, it lacks practicality to garnish key information in a timely manner. Millar, Drill, and Behrstock (2010) concur:

Adapt research materials to the needs of teachers rather than expect teachers to learn to read research. The peer-reviewed article is a cornerstone by which the academic community judges the quality of work, but it doesn't mean that it's the only format in which research should be presented. Researchers who want their research to be used by teachers should present it in an easily accessible way, even as they create separate, journal appropriate articles. (p. 34)
Technology and the access it provides to a wealth of information can be used to improve accessibility to research information. Jones (2009) found that “nearly all of the novice special educators identified the Internet as a source of access they currently use or would utilize when seeking information regarding practices to employ within their respective classrooms” and “some participants acknowledged the Internet as their sole source of information regarding methods and strategies to use in improving their instruction” (p. 114). By using the internet and various web based applications, research is made accessible through existing venues that are teacher-friendly.

Research does have the capacity to inform practice in positive ways. This is accomplished through stronger partnerships between organizations generating research and school districts. Any research must be conscientiously reviewed and applied within the school context before it has been blindly approved for implementation. Certainly, research needs to consider the needs of educators in the field and aspects of practical application to improve the access of opportunity for our ethnically and linguistically diverse student populations attending and receiving a public education.

**Synthesis**

Metacognition is generally defined as the ability of thinking about the process of thinking. Empirical evidence, as outlined in this review of the literature provides validity to the importance of metacognitive ability in the cognitive and academic development of children. As documented here, current research defends that explicit teaching of metacognition is required to have a positive impact on all learners. This is best accomplished in ways that integrate and imbed the teaching of metacognitive skills into curriculum areas rather than as an external
course. Additionally, there is the need for local leadership, including school administrators, senior administration and school board members, to balance the emphasis on testing results with use of sound pedagogy that promotes and yield metacognitive skills.

Effective implementation of metacognition into public schooling rests on a systematic approach of enhancing the skills of pre-service and in-service teachers. A natural link would be the incorporation of the skill of metacognition into the training of new teachers and the professional development of experienced in-service teachers. Developing metacognitive skill has compounded benefit as it provides a necessary tool for teachers to learn about self-regulatory thinking, and it provides experience in a methodology that they will use for problem solving and critical thinking.
CHAPTER THREE

Methodology

This chapter outlines the methodology of the study which was aimed at articulating the patterns associated with metacognitive ability in the adult population. Specifically, the desire for the research to inform future practical applications in K-12 settings was paramount.

The research approach includes the guiding research questions for the study along with the research framework. This chapter describes the research design implemented, the research inquiry and corresponding research tools, characteristics of participants included in the study, the data collection approach, and analysis of the data. An exploratory pilot study was conducted to test the approaches and make any revisions necessary for the final study.

Research Approach

An advantage of having been a practitioner in the field of public education, both as a teacher and an administrator, included benefiting from a deeper understanding of the culture of these educational contexts having lived in them. With an emphasis on research to guide practice and educational improvement, the practical implications of the classroom and school remain as a forethought in the development of the guiding research questions, the process, and possibilities of the findings utility.

For the purpose of this study and future applications, metacognition will be referred to as self-knowledge concerning our own cognitive processes. It involves an awareness of our strengths and weaknesses, being able to identify blocks to learning, and the ability to modify learning strategies and skills based on their effectiveness and the situation. An important
distinction is that metacognition involves more than just articulating cognitive strategy. Metacognition involves additional levels including the learner’s ability to identify the most efficient strategy for their learning style, contextual language, cultural connection, and to consciously choose how they will assimilate the information to have meaning and retention.

**Research Questions**

The design of this study was two-dimensional. First it was designed to engage adults in understanding how they presently think and learn. Secondly, to gain an understanding of how metacognition was encouraged or limited in public school contexts in their past learning experiences. The following questions guided the research:

1. What do adults identify as their learning epistemology? What is their ideal learning context and how do they organize their internal thinking processes?
2. What situations and conditions have supported adult metacognition? Where did adults learn about how they think? What human resources were involved? When did these first experiences occur?
3. What opportunities for metacognitive development are adults able to identify from their schooling experiences?

**Research Framework**

This study focused on metacognitive ability and the degree of exposure to metacognitive instruction individuals experienced in their public school experience. If opportunities for metacognition existed and were significant, as an adult there should be a recollection of these experiences, or the very least, they should still have benefitted from the outcome. Metacognitive
awareness and ability would be demonstrated by their ability to identify how they think and specifically how they think best.

The framework for this research included the Research Paradigm, Research Design, Research Inquiry and Research Tools. Figure 3-1 illustrates the research framework for the study, its mixed methods approach in the use of survey and inquiry methods to ascertain insights into adult learning epistemology.

Figure 3-1. Research Framework
Research Paradigm

The philosophical assumptions that guided methodological decisions in this research were derived both from a social constructivist and pragmatic world view. From the social constructivist perspective, there was importance in identifying the subjective meanings of individuals’ experiences. Creswell (2009) summarizes this research paradigm,

The goal of the research is to rely as much as possible on the participants' views of the situation being studied…Researchers recognize that their own backgrounds shape their interpretation, and they position themselves in the research to acknowledge how their interpretation flows from their personal, cultural, and historical experiences. The researcher's intent is to make sense of (or interpret) the meanings others have about the world. Rather than starting with a theory (as in postpostivism), inquirers generate or inductively develop a theory or pattern of meaning. (p. 8)

Particularly, the impetus and broad question of this study was to identify what adult’s perceptions were about their own learning process and where this ability was developed. The subjective perspectives provided value in this study as it was ultimately what the participants were able to recall, identify and apply that was deemed critical. Social constructivists recognize that subjectivity is part of the research process rather than through a modernist approach that seeks to establish bodies of systematic and objective knowledge that may not necessarily provide more accuracy. The “objectivity of the modernist worldview, with its emphasis on facts, replicable procedures, and generally applicable rules, easily ignores the specific, localized meanings of individual people” (Freedman and Combs, 1996, p. 21). As with research within
contexts that are multidimensional such as public education settings, there is a danger of seeking grand conclusions.

For many qualitative researchers however, the ability to generalize their work to the whole research population is not the goal. Instead, they might seek to describe or explain what is happening within a smaller group of people. This, they believe, might provide insights into the behaviour of the wider research population, but they accept that everyone is different and that if the research were to be conducted with another group of people the results might not be the same. (Dawson 2002 pp. 47-48) As Reissman (1993) argues, “realist assumptions from natural science methods prove limiting for understanding social life” (p. 1). Even though positivistic research may have the advantage of providing unbiased findings, this benefit is far outweighed by the need for research to be meaningful and responsive. Therefore, meaning is derived from interaction with participants involved in this research from this social constructivist perspective.

A pragmatic theoretical lens shaped how data was collected in this study and lent itself to problem-solving oriented research. Generally, pragmatism “…arises out of actions, situations, and consequences rather than antecedent conditions” (Creswell, 2009, p. 11) and the focus is on process and solutions. For this reason, there was flexibility towards research strategies and accessing all approaches available to gain understanding of the problem,

Pragmatism is not committed to anyone system of philosophy and reality. This applies to mixed methods research in that inquirers draw liberally from both quantitative and qualitative assumptions when they engage in their research. Individual researchers have a freedom of choice. In this way, researchers are free to choose the methods, techniques, and procedures of research that best meet their needs and purposes. (Creswell, 2009, p. 11)
History tells us that educational research has been less than effective in improving student learning experiences yet research does have the capacity to inform practice in positive ways. My years of experience in public schools was reflected in adhering to a pragmatic research design, one that attempts to prevent history from repeating itself by being relevant to and congruent with the culture of public learning environments. As a researcher, I must consider if my topic is purposeful, that the approaches I utilize represent authentic contexts, that I use formats that promote understanding and access to the professionals in the field, and that I value improving the implementation of research that may extend beyond an adherence to traditional protocols.

As this research topic was based on adult’s metacognitive functioning beyond the public school setting and their recall of their past learning experiences, there was not a direct practical application to public school settings. True to the current nature of research and its connection to application in schools, Burkhardt and Schoenfeld, (2003) warn, “educational research does not often lead directly to practical advances, although it provides useful information, insights, and ideas for improvement.” However, this research has potential for a indirect application. Dependent on the results, there may be incentive for further action to expand on findings which would lead directly to practical application in schools. The objective of the study was to contribute to our understanding of the nature and degree of adult’s metacognitive ability and the effectiveness of their public school experience in aiding in the development of this skill. Results identified if there would be a need to explore direct metacognitive instruction for students in school and for the teachers who teach them.
Research Design

Reliability and validity of the study was obtained by using mixed methods. In addition to a quantitative inquiry, qualitative data collection was incorporated to reinforce any identified trends, to recognize contradictions and to create direction for any further inquiry. As Greene, Caracelli, and Graham (1989) summarize that mixed methods provide triangulation; complementarity such as elaboration, enhancement, illustration, or clarification; initiation or any paradoxes and contradictions; development or using the findings from one method to help inform the other method; and finally expansion which sought to expand the breadth and range of research. “Data that has been gathered in one way can be used to check the accuracy of data that has been gathered in another way” (LeCompte and Preissle, 1993).

In addition, the rationale for using a mixed methods study was because it was the bias of the researcher that human dynamics are not accurately portrayed using traditional, positivistic approaches alone. As Merriam (2002) states,

The world, or reality, is not the fixed, single, agreed upon, or measurable phenomenon that it assumed to be in positivist, quantitative research. Instead, there are multiple constructions and interpretations of reality that are in flux and that change over time. Qualitative researchers are interested in understanding what those interpretations are at a particular point in time and in a particular context. (p. 4)

It was also hoped that the use of qualitative methods would contribute to the documentation of diverse perspectives on metacognition that have greater breadth and depth, which was a goal of this study (Greene, Caracelli, and Graham, 1989). The value of a qualitative approach is “it attempts to get an in-depth opinion from participants” (Dawson, 2002, p. 14). Qualitative
methods provide specific responses and emerging themes from individuals while the quantitative results only provide an overview and generalization of the patterns of the findings.

There can be a symbiotic relationship between the use of mixed methods that heightens the awareness, provides greater elaboration and understanding of the issue. Greene (2005), identifies the benefits of the mixed methods approach,

... a mixed method way of thinking seeks better, more comprehensive understanding of educational phenomena, understanding that is woven from strands of particularity and generality, contextual complexity and patterned regularity, inside and outside perspectives, the whole and its constituent parts, change and stability, equity and excellence and so forth. That is, a mixed method way of thinking seeks not so much convergence as insight; the point is not a well fitting model or curve but rather the generation of important understandings and discernments through the juxtaposition of different lenses, perspectives, and stances; in a good mixed methods study, difference is constitutive and fundamentally generative. (p. 208)

**Trustworthiness**

Trustworthiness in qualitative research refers to the credibility of the study, transferability, dependability and confirmability (Lincoln and Guba, 1985). This study was cognizant of making the data collection a process that sought out a truth value, the extent to which the findings would be applicable to other contexts, the method of inquiry would be applied with consistency, and neutrality in terms of how the findings were genuinely a reflection of the participants being studied. In the final chapter, the researcher will summarize the findings with these constructs as a guide.
Exploratory Pilot Study

In order to conceptualize and field test the research design ideas, an exploratory pilot study was conducted. Based on piloting the process and reflecting on participant responses, several modifications were identified to improve the process.

Initially, interviews on metacognition and adult learning experiences were conducted first and then were followed by a survey. The rationale was that the interviews would provide the general themes and patterns which could be targeted for further elaboration in a follow-up survey. In retrospect, partially due to the choice of questions in both the interview process and on the survey, there was a redundancy in the information collected that provided no improvement in quality of the data.

Analysis of the interview was conducted and interpreted. These findings provided information in its own right but were also used to help determine the specific questions and format of the survey. The survey was analyzed both in isolation but also connections or contradictions were identified between the quantitative results and qualitative results. Specifically six people volunteered to participate in the interview process. A general query was posted on a social networking tool (Facebook) that invited people to talk about how they learn and their public school experience. With any interest, direct and private communication was made with the individual to determine if they were interested and available to participate in an on-line interview that would be about their learning. The interviewing process was conducted predominantly through online discourse with one interviewee providing responses via a telephone conversation. Three of the individuals had their public school experience in the United States with the other three received their public education in Canada. There were three
males and three females that made up the interview group. Analysis of the exploratory interview process was conducted and interpreted. These findings provided information in its own right but were also used to help determine the specific questions and format of the revised survey used in this study. The survey was analyzed and connections or contradictions were also identified between the quantitative results and qualitative results.

**Research Inquiry**

Using the pilot study on metacognition and adult learning experiences, my epistemological position regarding this study was to collect: (1) data contained within the perspectives of people that were students in K-12 public education in Canada and the United States, and (2) to elicit authentic responses and perspectives from the participants. An “interpretive qualitative methodology” was used in partnership with quantitative measures to gain an understanding of how individuals understand the concept of metacognition and how they experienced this phenomenon in their world (Merriam, 2002). In this way, a phenomenological approach framed the qualitative research within this study. Specifically, phenomography has its roots in the investigation of students’ experiences of and approaches to learning (Ashworth and Lucas, 2000). According to Welman and Kruger (1999) “the phenomenologists are concerned with understanding social and psychological phenomena from the perspectives of people involved” (p. 189).

Key principles from grounded theory also influenced the nature of the study. This study did not start with a presupposed theory of the problem. Rather, as Dawson (2002) explains, …the emphasis in this methodology is on the generation of theory which is grounded in the data – this means that it has emerged from the data. This is different from other types
of research which might seek to test a hypothesis that has been formulated by the researcher. (p. 10)

Having stated this, as a researcher who has directly knowledge of the public school experience both as a participant and then as an employee working within this environment, my own perceptions influenced this study. Hammersley (2000) acknowledges that phenomenologists, in contrast to positivists, believe that the researcher cannot be detached from his or her own presuppositions and that the researcher should not pretend otherwise. The very root of the study, coming to know how adults understand their own learning, has been a topic that has been spontaneously explored over the past decade as a general area of personal interest. While informal, there were some distinct generalizations that were made from these interactions that impressed upon the need for research to formalize findings in how functionally adults understand their own learning and how they act on this knowledge. In this way, discussion from this investigation at times included my experiences but they were not used to influence the outcome of results. Rather they added relevance and richness to the conversations by providing personal learning experiences from school contexts.

The intention was to complete research that accurately depicts the typical response of adult understanding of metacognition and how this thinking was supported or hindered in their public school experience. Again, my own informal explorations provided a sense of what were some of the major trends but there was still a need to legitimize these experiences using a formal process. Based on my experience and literature review, I found that understanding and use of metacognition was often misunderstood or underutilized.
Research Tools

Figure 3-2 illustrates the research inquiry and methods used in this study. Guided through a survey and individual interviews, learners were encouraged to articulate the conditions in which they learn best, both the external factors as well as internal processes. A second research objective was to have adults identify the key factors in the development of their metacognitive skills. In the same manner, authentic responses were sought using direct and open questioning. Descriptive reflections and metacognitive identification were then coded. Comparisons and correlations were identified using descriptive and inferential statistical analysis to inform the research questions of the study.
Research Data Collection
And Inquiry Methods

Figure 3-2. Research Inquiry and Methods
### Research Tools

The following chart (Table 3-1) links research questions with study constraints, approaches used, and expected study outcomes:

**Table 3-1**

*Research Questions, Constructs, Data Sources and Collection Approaches*

<table>
<thead>
<tr>
<th>Research Question</th>
<th>Construct</th>
<th>N</th>
<th>Data Source &amp; Collection Approach</th>
<th>Expected Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. What do adults identify as their ideal learning epistemology?</td>
<td>Learning Epistemology</td>
<td>100</td>
<td>Survey</td>
<td>Description of individual methods of learning</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Coding techniques</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Statistical analysis</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>8</td>
<td>Interviews: auditory/written with reflective time allotted</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Coding techniques</td>
<td></td>
</tr>
<tr>
<td>2. What situations and conditions have supported adult metacognition? Where did adults learn about how they think? What human resources were involved? When did these first experiences occur?</td>
<td>Situations &amp; Conditions that Support Metacognition</td>
<td>100</td>
<td>Survey</td>
<td>Identification of places, support people and time frame in which metacognition was directly taught and supported</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Coding techniques</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Statistical analysis</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>8</td>
<td>Interviews: auditory/written with reflective time allotted</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Coding techniques</td>
<td></td>
</tr>
<tr>
<td>3. What opportunities for metacognitive development are adults able to identify from their schooling experiences?</td>
<td>Opportunities for Metacognitive Development</td>
<td>100</td>
<td>Survey</td>
<td>Identification of opportunities in public schools experiences contributing to metacognitive development as a child into adulthood</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Coding techniques</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Statistical analysis</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>8</td>
<td>Interviews: auditory/written with reflective time allotted</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Coding techniques</td>
<td></td>
</tr>
</tbody>
</table>
A survey comprised of both closed-ended and open-ended questions was used to elicit the lived and learned metacognitive practices and experiences of participants. Based on data collected during an exploratory pilot study of this research, prompting participants to identify any recent learning experience did not always result in responses that were focused on metacognitive ability. Therefore, a change was made to provide more context to the kind of learning experiences they will reflect and respond to.

Results from survey data was used to inform the development of questions used in the interview that were conducted in the latter phases of the study with a select number of participants (50% American and 50% Canadian). As suggested in Johnson and Onwuegbuzie (2004), a qualitative phase was conducted to inform a quantitative phase or the reverse. There is benefit in intertwining these two approaches, using them in a cyclic manner to more effectively gather relevant and meaningful data. Johnson and Onwuegbuzie further justify this approach, …although mixed research starts with a purpose and one or more research questions, the rest of the steps can vary in order (i.e., they are not necessarily linear or unidirectional), and even the question and/or purpose can be revised when needed…. mixed research involves a cyclical, recursive, and interactional process. Recursion can take place within a single study (especially an extended study); recursion can also take place across related studies by informing future research and leading to new or reformulated research purposes and questions. (p. 21)

Interviews were then used to ascertain dimensions of metacognitive experiences and as a way to determine what to clarify and provide additional insights into understanding participants’ thinking process. Following the guidelines outlined by Ashworth and Lucas (2000), “the most
appropriate means of obtaining an account [was] identified, allowing maximum freedom for the research participant to describe their experience” (p. 301). Phenomological studies often use individual interviews. Dawson (2002) recommends the use of semi-structured interviews:

…the researcher wants to know specific information which can be compared and contrasted with information gained in other interviews. To do this, the same questions need to be asked in each inter-view. However, the researcher also wants the interview to remain flexible so that other important information can still arise. (28-29)

**Research Participants**

Participants in this study were selected through nominations of people that were educated in public schools within Canada and the United States. A representative group of adults (50% American and 50% Canadian) was the desirable target number. From this group, eight volunteers were selected to participate in the interview process.

Initially, a nomination invitation was disseminated through SDSU and CGU university contacts who work with adults. The nomination process began with an initial contact to engage adults who were interested and willing to participate in a study dealing with metacognition (see Appendix A for consent form). In addition, a social networking site (Facebook) was used to invite individuals to participate in the survey.

With both the surveys and interviews, over 300 individuals were invited to participate who met the criterion of being of age (over 18) and had participated in K-12 in schools within the United States or Canada (for a minimum of 6 years). Table 3-2 identifies the categories and corresponding subcategories of the participants that were invited.
Based on findings derived from an exploratory pilot study on this research, an ethnicity category was removed as no significant differences were found between groups as well as it was difficult to achieve a representative distribution.

Table 3-2

<table>
<thead>
<tr>
<th>Gender</th>
<th>Age Group Categories</th>
<th>Education Level Completed</th>
<th>Socio-economic Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>Over 18</td>
<td>Less than High School</td>
<td>Under $40,000</td>
</tr>
<tr>
<td>Male</td>
<td>Categories established after all data has been collected</td>
<td>High School Diploma</td>
<td>$40,000 to $79,999</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Some College or University</td>
<td>$80,000 to $119,999</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Associate of College Degree</td>
<td>$120,000 to $159,999</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bachelor Degree</td>
<td>$160,000 to $199,999</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Graduate Degree</td>
<td>$200,000 or above</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Post-doctorate</td>
<td></td>
</tr>
</tbody>
</table>

While there was some attempt to invite a wide range of individuals to participate, there was caution taken to not be too deliberate. As Ashworth and Lucas conclude,

The selection of participants should avoid presuppositions about the nature of the phenomenon or the nature of conceptions held by particular `types' of individual while observing common-sense precautions about maintaining `variety' of experience. (p. 302)

Initially, using purposive sampling techniques, it was difficult to specify the number of people selected to participate but an estimated of 50 adults from Canada and 50 from the United States was the targeted number. The intention was to continue subscribing new participants until a point of saturation had been reached. As Dawson (2002) articulates that individuals are invited...
to participate until, “that time of your research when you really do think that everything is complete and that you’re not obtaining any new information by continuing” (p. 53).

Access to the surveys was through the internet, given that individuals have access to and comfort with communications using this medium, yet there is a recognition of an assumed bias in selecting the internet as a mode of access.

**Data Collection Approach**

The mixed methods incorporated surveys, interviews, coding techniques and statistical analysis as approaches to document the authentic schooling experiences of adult participants. To encourage participation and to access a more widespread geographical group, a social networking tool (Facebook) was utilized to recruit participants in the on-line survey and for those who were willing to further participate in an interview. For the interview phase, the type of engagement for interviews was presented as a choice to participants consisting of telephone communications, video chat or in person. In some cases, this choice was limited due to logistical issues. To access authentic experiences from adults, it was important to try and provide a variety of mediums for dialogue as individuals have a different way of interacting and may be more responsive dependent on the medium used. The skills of the moderator is to facilitate and guide the discussion (Kreuger, 1998). A key role of the researcher/facilitator was to ensure that the interview covered the required ground and allows the opportunity to re-visit specific points (Mansell et al., 2004). In this way, the role of the facilitator was in part to ensure that the topic of metacognition was brought to the forefront of discussion if it was in danger of being lost. In the case of the survey tool, access through internet connection had its goal to collect data anonymously.
Procedures

The overall process used in the study consisted of ten steps:

1. The researcher first submitted her proposal to the Institutional Review Board at two universities for approval. Once approval was given, the was actualized.
2. Nomination process - invitation to participate in the study (N=300) using established criteria (a minimum of 18 years of age and having participated in at least 6 years in a public education system within the United States or Canada.
3. Contact persons responding to invitation, presented with consent forms and assurance of confidentiality.
4. Selecting an N=100 with 50 Americans and 50 Canadians.
5. Monitor completion of survey sent to each participant through the internet website.
6. Survey data was collected and graphically documented. Open ended questions were coded for patterns and themes.
7. Participants identifying their willingness to be interviewed were sent consent forms (Appendix B) and contacted to set up a place, location and time to obtain further insights into their metacognitive thinking approach. If participants were unable to meet in person, live internet chat or telephone interviews were arranged.
8. Participants were interviewed.
9. Interviews were held with 8 participants, 4 American and 4 Canadian. The interviews were transcribed and notes were taken by the researcher.
10. All data from the survey on understanding metacognition were tabulated and analyzed and interview transcripts were coded for themes and individual insights on metacognition.
Qualitative data was collected to learn more about how participants define their learning in open-ended questions on a survey (Appendix C) and through an interview process (Appendix D). They were encouraged to reflect and write about a specified learning experiences and then about their learning in general. In the second part of the survey, questions asked about their learning style and how they came to understand their learning process with be presented close-ended questions that are multiple choice and categorical.

Much like the initial part of the survey, interviews engaged participants in a dialogue about how they learn and how they came to understand their learning. The interview followed procedures (Appendix D) that involved presenting an initial question asking individuals to talk about a recent learning experience they had. Further questions such as the following were asked as needed to obtain a greater understanding of the participant's learning process: “Were you able to identify a specific way that you learn?”, “How does your brain take in new information?”, and “How can you remember and comprehend new ideas?” Each interview consisted of approximately 60-90 minutes to complete.

**Analysis of the Data**

Different forms of analysis were used when analyzing the survey data. Descriptive and inferential statistics were used for the survey data and content analysis was used for the open ended questions in the survey. As Dawson (2002) recommends, “this type of analysis can be used for open-ended questions which have been added to questionnaires in large quantitative surveys, thus enabling the researcher to quantify the answers” (p. 118). As outlined by Creswell, Hanson, Clark Plano and Morales (2007),
(The researcher begins) with open coding, coding the data for major categories of information. From this coding, axial coding emerges in which the researcher identifies one or more of the open-coding categories (called the core phenomenon) and reexamines the data or collects new data to build a model around this core phenomenon. (p. 249)

In a systematic way, codes were assigned to specific words or characteristics within the text (Dawson, 2002). Resulting themes were used to answer the research questions.

Survey data was scrutinized using descriptive and inferential statistics for comparison, correlations and patterns. Frequency in percentage was measured for the number of participants that indicated a high degree of metacognitive awareness. The chi square statistic was used to determine the relationship between demographic categories (4) and various survey responses (5 closed-ended questions). Additional correlations between questions were investigated to determine the strengths and direction of the correlations.

Thematic analysis was used to analyze the results of the interview discussions that assisted in clarifying of describing the findings of questions. The data was analyzed using coding techniques to arrive at the identification of themes on thinking and learning and metacognition. As Dawson (2002) reminds, “…this type of analysis is highly inductive, that is, the themes emerge from the data and are not imposed upon it by the researcher” (p. 116). An adaptation of a procedure for thematic analysis created by Colaizzi (1978) was used that delineates seven steps to follow (Figure 3-3).
1. When interviewing participants, listen to their narratives (auditory and written accounts) and familiarized yourself with their words, feelings and the meanings inherent in the narratives in order to obtain a ‘sense of the whole’.

2. Now return to each of your participants’ narratives and focus only on the phrases and sentences that directly pertain to the phenomenon under study. List significant statements that pertain to the topic.

3. Formulate meanings by reviewing each significant statement and try to uncover its meaning and make sense of it in the participants’ own terms. What you are trying to do is to spell out the meaning of each significant statement according to its original context. This helps to bring out meanings that initially may be hidden.

4. Repeat this process for each interview (written account) and then organize all the different meanings into clusters of themes.

5. Then provide a detailed analytic description of participants’ feelings and perspectives contained in the themes. This is where you integrate all the clusters of themes into one account that articulates participants’ views of the phenomenon.

6. At this point, you attempt to formulate an exhaustive description of the whole phenomenon under investigation and identify its fundamental structure, or essence.

7. The last step is the ‘member check’ (Merriam, 2002) in which you take your findings back to participants, asking them if your description validates their original experiences.

*Figure 3-3. Interview Thematic Analysis Process*
To prevent this study from being disconnected from its purpose, it was necessary for the researcher/facilitator to ensure that participants were given the opportunity to speak about the use of metacognition as a tool within real educational contexts and from their personal life experiences.

The next chapter of the study describes the findings based on the analysis of the twelve question survey and interviews with eight selected participants.
CHAPTER FOUR
Research Findings and Assertions

This chapter provides statistical analysis and discovery from participant responses provided on the survey and through one-on-one interviews, discussed in Chapter Three. Using both qualitative and quantitative approaches including open-ended questions, closed ended questions, and candid discussions, the aim of the study was to: (1) encourage adults to reflect on their learning experiences from present to past; (2) document their understanding of how they came to identify their thinking and barriers to metacognition, and (3) explore the metacognitive ability of the adults who have completed their education in K-12 public schools within Canada and the United States.

The findings of this study are presented in this chapter. The overall design was aimed at understanding how adults presently think and learn and secondly, to understand how metacognition was encouraged or limited in public school contexts in selected adults past learning experiences. The data presented was collected to answer three research questions:

1. What do adults identify as their learning epistemology? What is their ideal learning context and how do they organize their internal thinking processes?

2. What situations and conditions have supported adult metacognition? Where did adults learn about how they think? What human resources were involved? When did these first experiences occur?

3. What opportunities for metacognitive development are adults able to identify from their schooling experiences?
Survey Research Findings

The survey consisted of 12 questions included demographic information, two open-ended questions as well as a Likert scale and multiple choice questions.

Demographics of the Participants

Through the nomination process outlined in Chapter 3, people were invited to complete an online survey to answer questions about their learning. One hundred fifty-five adults undertook the task but a number of these participants were removed from the study because they failed to complete the survey beyond the demographic questions or in its entirety. From the 155 participants in the study, only 104 (67.1%) completed the survey or had complete data. The age of the participants ranged from 18 to 71 years of age (Figure 4-1) and 40.7 was the average age. The majority of the participants ranged from those 26-35 years old (N=40, 38.5%), 36-45 years old (N=36, 34.6%), and 46-55 years old (N=17, 16.3%). There was a limited number within the categories of 18-25 (N=2, 0.0%) and over 56 years old (N=9, 0.1%).
Gender representation was distributed evenly with 44.2% (N=46) males and 55.8% (N=58) females (Figure 4-2). More participants attended public education in Canada (N=64, 61.5%) with the remaining 38.5% (N=40) having attended in the United States. Most (95%) of the participants had some post secondary education. Of these, 14.4% (N=15) had some college education, 14.4% (N=15) completed an associate or college degree, 30.8% (N=32) completed a bachelor's degree, 29.8% (N=31) completed a graduate degree, and 1.9% (N=2) completed post-doctoral studies. The remaining participants had some high school coursework (1.9%, N=2) or received a high school diploma (6.7%, N=7).
Most participants' household income was under $120,000 (81.7%, $N=85$). Included were 14 (13.5%) participants who had incomes that were under $40,000, 40 (44.2%) that had incomes $40,000 to $79,999, and 25 (24.0%) with incomes from $80,000 to $119,999 as shown in Figure 4-3. The remaining participants household incomes were between $120,000 to $159,999 ($N=8$, 7.7%), $160,000 to $199,999 ($N=8$, 7.7%), or above $200,000 ($N=3$, 2.9%).
Table 4-1 describes the characteristics of the participants with regards to age, gender, education, and household income. Specifically,

- 73.1% of the participants were between 26 and 45 years of age
- 55.8% of the participants were female
- 61.5% of the participants received their K-12 education in Canada
- 62.5% of the participants had a BA to Post doctorate education
- 68.25% had a household income between $40 thousand and less than 120 thousand
Table 4-1

*Frequencies for Survey Participant Demographic Information*

<table>
<thead>
<tr>
<th>Question</th>
<th>Response</th>
<th>Percent</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. What is your age?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18-25</td>
<td></td>
<td>0.0%</td>
<td>2</td>
</tr>
<tr>
<td>26-35</td>
<td></td>
<td>38.5%</td>
<td>40</td>
</tr>
<tr>
<td>36-45</td>
<td></td>
<td>34.6%</td>
<td>36</td>
</tr>
<tr>
<td>46-55</td>
<td></td>
<td>16.3%</td>
<td>17</td>
</tr>
<tr>
<td>56+</td>
<td></td>
<td>0.1%</td>
<td>9</td>
</tr>
<tr>
<td>2. What is your gender?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td></td>
<td>55.8%</td>
<td>58</td>
</tr>
<tr>
<td>Male</td>
<td></td>
<td>44.2%</td>
<td>46</td>
</tr>
<tr>
<td>3. In what country did you receive your grade school (kindergarten to grade 12) education?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Canada</td>
<td></td>
<td>61.5%</td>
<td>64</td>
</tr>
<tr>
<td>United States</td>
<td></td>
<td>38.5%</td>
<td>40</td>
</tr>
<tr>
<td>4. What is your highest level of education?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than High School</td>
<td></td>
<td>1.9%</td>
<td>2</td>
</tr>
<tr>
<td>High School Graduate</td>
<td></td>
<td>6.7%</td>
<td>7</td>
</tr>
<tr>
<td>Some Associate or College Degree</td>
<td></td>
<td>14.4%</td>
<td>15</td>
</tr>
<tr>
<td>Associate or College Degree</td>
<td></td>
<td>14.4%</td>
<td>15</td>
</tr>
<tr>
<td>Bachelor Degree</td>
<td></td>
<td>30.8%</td>
<td>32</td>
</tr>
<tr>
<td>Graduate Degree</td>
<td></td>
<td>29.8%</td>
<td>31</td>
</tr>
<tr>
<td>Post-Doctorate</td>
<td></td>
<td>1.9%</td>
<td>2</td>
</tr>
<tr>
<td>Household Income</td>
<td>Response Percent</td>
<td>Response Count</td>
<td></td>
</tr>
<tr>
<td>-----------------------</td>
<td>------------------</td>
<td>----------------</td>
<td></td>
</tr>
<tr>
<td>Under $40,000</td>
<td>13.5%</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>$40,000 to $79,999</td>
<td>44.2%</td>
<td>46</td>
<td></td>
</tr>
<tr>
<td>$80,000 to $119,999</td>
<td>24.0%</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>$120,000 to $159,999</td>
<td>7.7%</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>$160,000 to $199,999</td>
<td>7.7%</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>$200,000 or above</td>
<td>2.9%</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

**Chi-square Statistics**

Chi-square statistics were conducted to determine if any of the demographic characteristics had an influence on information collected in the survey in regards to metacognition. With two exceptions, age, gender, country where the participant attended a public school, educational level and household income showed no significant relationship with the remaining questions on the survey (Table 4-2). The correlations were found to be significant at the \( p < .05 \) level and at the \( p < .01 \) level.
Table 4-2

*Correlation between Demographic Characteristics and Metacognitive Factors*

<table>
<thead>
<tr>
<th>Factors</th>
<th>Demographic Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Age</td>
</tr>
<tr>
<td>Metacognitive self-assessment</td>
<td>.543</td>
</tr>
<tr>
<td>Metacognitive awareness (specific task)</td>
<td>.267</td>
</tr>
<tr>
<td>Metacognitive awareness (general tasks)</td>
<td>.146</td>
</tr>
<tr>
<td>Supportive environments</td>
<td>.056</td>
</tr>
<tr>
<td>Timeframe of metacognitive awareness</td>
<td>.794</td>
</tr>
<tr>
<td>Supportive human resources</td>
<td>.562</td>
</tr>
<tr>
<td>Knowledge of best learning process</td>
<td>.109</td>
</tr>
</tbody>
</table>

The first significant correlation \( r=15.681, N=104, p=0.028 \) was found between the gender of the participant and the personnel resources that were identified as facilitating their metacognitive development (Table 4-3). Resources included grade school teacher, college or university professor, parent, sibling, friend, instructor of a special course on learning, and an author of a book or article on learning. In addition, participants were provided with the option of "other" in which they could specify a resource. Out of the 44 participants that selected this category: most \( N=32 \) indicated themselves (self, myself, learned myself, etc.) or through trial and error, others mention coworkers or a boss \( N=4 \), counselor \( N=2 \), shop teacher, grandparent, a combination of human resources \( N=2 \), and 2 participants did not specify anyone.
Table 4-3

**Correlation between Gender and Metacognition Resources**

<table>
<thead>
<tr>
<th>Gender</th>
<th>grade school teacher</th>
<th>college or university professor</th>
<th>parent</th>
<th>sibling</th>
<th>friend</th>
<th>instructor of a special course on learning</th>
<th>an author of a book or article on learning</th>
<th>other (please specify)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>5</td>
<td>11</td>
<td>2</td>
<td>0</td>
<td>7</td>
<td>2</td>
<td>1</td>
<td>18</td>
<td>46</td>
</tr>
<tr>
<td>Female</td>
<td>6</td>
<td>4</td>
<td>8</td>
<td>1</td>
<td>2</td>
<td>6</td>
<td>5</td>
<td>26</td>
<td>58</td>
</tr>
<tr>
<td>Total</td>
<td>11</td>
<td>15</td>
<td>10</td>
<td>1</td>
<td>9</td>
<td>8</td>
<td>6</td>
<td>44</td>
<td>104</td>
</tr>
</tbody>
</table>

The second correlation (Table 4-4) was identified between level of education and individuals' self assessment of their metacognitive abilities ($r=30.223$, $N=104$, $p=0.035$).

Participants responded to the question, "I understand how I learn best. Select how true this statement is for you." by responding on a Likert scale from strongly disagree to strongly agree. Most either agreed ($N=64$) or strongly agreed with the statement ($N=28$). The remainder were either neutral ($N=8$) or disagreed ($N=4$). There was a positive correlation whereby, the higher the education level, the more likely participants were to indicate favourably in regard to understanding how they learn (Figure 4-4).
Table 4-4

*Correlation between Levels of Education and Self Assessed Metacognitive Ability*

<table>
<thead>
<tr>
<th>Level of Education</th>
<th>Self Assessment of Metacognitive Ability</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Strongly Disagree</td>
</tr>
<tr>
<td>Less than High School</td>
<td>0</td>
</tr>
<tr>
<td>High School Graduate</td>
<td>0</td>
</tr>
<tr>
<td>Some College or University</td>
<td>0</td>
</tr>
<tr>
<td>Associate or College Degree</td>
<td>0</td>
</tr>
<tr>
<td>Bachelor Degree</td>
<td>0</td>
</tr>
<tr>
<td>Graduate Degree</td>
<td>0</td>
</tr>
<tr>
<td>Post-Doctorate</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>0</td>
</tr>
</tbody>
</table>

*Figure 4-4. Self Assessed Metacognitive Ability Based on Level of Education.*
The third correlation (Table 4-5) was between level of education and metacognitive resources ($r=40.404$, $N=104$, $p=0.004$). Level of education was compared to the type of resources that participants found most helpful in their metacognitive development. The majority of participants indicated they gained metacognitive awareness through formal education opportunities in post secondary ($N=29$) or in grade school ($N=14$). The remaining chose home ($N=14$), work ($N=24$), or other ($N=23$). Predictably, those who completed post secondary education indicated college or university more as locations that facilitated metacognitive development ($N=28$) over their peers who did not received post secondary education ($N=1$). Simply put, those who did not attend college or university would not have had access to these resources. Of those participants that received a bachelor degree ($N=32$), nearly half ($N=15; 47\%$) selected college or university as the resource in which they received the most support.

<table>
<thead>
<tr>
<th>Resource that Facilitated Metacognitive Development</th>
<th>home</th>
<th>school</th>
<th>college or university</th>
<th>on the job</th>
<th>other</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level of Education</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than High School</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>High School Graduate</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>Some College or University</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>11</td>
<td>1</td>
<td>15</td>
</tr>
<tr>
<td>Associate or College Degree</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>4</td>
<td>5</td>
<td>15</td>
</tr>
<tr>
<td>Bachelor Degree</td>
<td>3</td>
<td>5</td>
<td>15</td>
<td>2</td>
<td>7</td>
<td>32</td>
</tr>
<tr>
<td>Graduate Degree</td>
<td>4</td>
<td>4</td>
<td>12</td>
<td>4</td>
<td>7</td>
<td>31</td>
</tr>
<tr>
<td>Post-Doctorate</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>14</td>
<td>14</td>
<td>29</td>
<td>24</td>
<td>23</td>
<td>104</td>
</tr>
</tbody>
</table>
Frequencies for Self Assessment of Metacognitive Abilities

A Likert scale question (survey Q#6) was used to have respondents identify their metacognitive awareness by responding to the statement "I understand how I learn best". Most participants agreed that they understood how they best learn (N=64, 57.9%). The remaining 26.9% strongly agreed (N=28), 7.7% neither agreed nor disagreed (N=8), 3.8% disagreed (N=4), and no respondents strongly disagreed with the statement (Figure 4-5). As mentioned previously, only the participants' level of education had any relationship with their perspective. For the purpose of this study, this self assessment of metacognitive ability should correlate with participant's ability to define their learning approach with clarity and to demonstrate conscious action to modify their learning environment or circumstance to best suit how they learn. The correlation of this self assessment with responses in the open-ended questions (survey Q# 8 and Q#9) in which participants were prodded to define their learning strategy will be discussed later in this chapter.
Qualitative Open Ended Questions on How Participants Define Their Learning

Qualitative data was collected through open-ended questions to learn more about how participants define their learning. The questions encouraged candid reflection without any boundaries given regarding the length of the written response or by providing a specific format. The first question guided participants to reflect on a specific task of remembering a phone number or another piece of vital information. This question was followed by another that prompted participants, much like some would experience in the follow-up individual interviews, to summarize how they learn best.

Specifically, the first question prompted participants to describe how they would remember a key piece of information, "Think about a situation where you must remember a
phone number or another vital piece of information. Take a moment to describe what you would need to do to store this information so it can be used at a later time." Responses were coded into three categories: 1) no specific reference made to a learning approach or style; description of effort or emotion, 2) use of generic strategies such as repetition with no reference made to the specific learning strengths of the participant, and 3) description of a process that the participant identifies as being meaningful and effective for them personally. A total of 29.8% (N= 31) made no specific reference to their learning style. Many responded with statements such as: "...write it down in phone book," "If it is a phone number, or other personal info, I use my blackberry to remember for me," or "Nothing because I can remember numbers really well." A third (35.6%, N=37) identified generic strategies that were used but did not reference why they chose this strategy and why it was specifically effective for them. Responses included: "I repeat something numerous times in my head, and then I write it down," and "I would have to write down the information." Another participant nicely outlined a mnemonic strategy for internalizing key terms,

For the CA bar exam I needed to memorize lots of legal words[.] I took the first letter from each word and formed sentences having almost all capital letters to represent a legal word and lower case letter which were meaningless to fill in a word. If it [was] numbers, I'd break the numbers into small groups and associate the number with something I know, such as a jersey number for a professional athlete.

In this and in the two previous descriptions, we are left with the question, "Why did you use this strategy?" Herein lies the missing link that shows the participants metacognitive awareness. In 36 (34.6%) of the responses, participants identified strategies that were personally effective: "I
need to write everything down to remember. I need to visually see something to remember it, "I need to be able to physically go through a process to be able to remember it. In this case of a phone number, I would need to physically dial the number 2 or 3 times before I can remember what the number is, "When I need to remember a phone number, I would visualize the number in my head. I would actually picture the numbers one by one in a white color font on a black background. Then I would say the number as I look at them individually. This would take [just] a second or 2 to do,"I need to write things down in order to recall them - i do not reference the note, but i can recall the image of it in my mind to remind me what i wrote down," and " I verbally repeat the number several times while listening to myself say the number. I concentrate on the cadence of the sounds and use that as a mnemonic. Sometimes I visualize the numbers written in large fonts while I speak the numbers, or I look at numeric keypad and visualize a line connecting the numbers in sequence..." In these examples, the participants indicate what they or "their brains" require to connect with and retain information.

The coded statements of the 104 participants were analyzed using content analysis on the metacognitive task. The cluster patterns of chosen particular strategies identified by the participants on how they learn specifically are reflected in Table 4-6.
### Table 4-6

**Metacognitive Awareness of Learning Related to a Specific Memory Task**
*(Remembering a Phone Number or Recall of Vital Information)*

<table>
<thead>
<tr>
<th>Levels of Metacognitive Awareness</th>
<th>Response Percent</th>
<th>Response Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level One: No specific reference made to a learning approach or style; description of effort or emotion</td>
<td>29.8%</td>
<td>31</td>
</tr>
<tr>
<td>Level Two: Use of generic strategies such as repetition with no reference made to the specific learning strengths of the participant</td>
<td>35.6%</td>
<td>37</td>
</tr>
<tr>
<td>Level Three: Description of a process that the participant identified as being meaningful and effective for them personally</td>
<td>34.6%</td>
<td>36</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
<td>104</td>
</tr>
</tbody>
</table>

In the second open-ended question on the survey, participants were prompted to "Describe your thinking process in general. In what ways do you learn the best?" Almost half the sample (47.1%, N=49) were able to show metacognitive awareness when they described their learning process (Table 4-7). The remaining 40.4% (N=42) used generic strategies such as repetition, re-writing notes, and other drill type strategies, and 12.5% (N=13) related their learning to emotional or motivational factors.

### Table 4-7

**Metacognitive Awareness of Learning in General**
*(Participants Description of How They Learn Best)*

<table>
<thead>
<tr>
<th>Levels of Metacognitive Awareness</th>
<th>Response Percent</th>
<th>Response Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level One: No specific reference made to a learning approach or style; description of effort or emotion</td>
<td>12.5%</td>
<td>13</td>
</tr>
<tr>
<td>Level Two: Use of generic strategies such as repetition with no reference made to the specific learning strengths of the participant</td>
<td>40.4%</td>
<td>42</td>
</tr>
<tr>
<td>Level Three: Description of a process that the participant identified as being meaningful and effective for them personally</td>
<td>47.1%</td>
<td>49</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
<td>104</td>
</tr>
</tbody>
</table>
Using the responses to the specific memory task (survey Q#7) and descriptions of general learning strategies (survey Q#8), Chi-square statistics yielded a significant relationship ($r=18.568$, $N=104$, $p=0.001$) between the metacognitive awareness demonstrated in describing learning strategies for a specific memory task and generalized learning strategies (Table 4-8). Both questions were coded into three levels: Level One) related to effort or emotion and No specific reference made to a learning approach or style, Level Two) included the Use of generic strategies such as repetition with no reference made to the specific learning strengths of the participant, and Level Three) included a description of a process that the participant identified as being meaningful and effective for them personally. Out of all participants, 26 who responded with a clear and personalized strategy for the specific task also provided the same when they summarized their general learning style and needs. Another 18 who used generic strategies for the specific memory task also defined their personal learning method in the same manner. Finally, 8 participants spoke about learning, both in relation to a specific memory task and in general in terms of how it impacted them emotionally or that success depended on effort rather than identifying any learning style.

**Table 4-8**

*Comparison between Participant Description of Metacognition in Specific and Generalized Learning*

<table>
<thead>
<tr>
<th></th>
<th>How They Learn Best</th>
<th></th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Level One*</td>
<td>Level Two**</td>
<td>Level 3***</td>
</tr>
<tr>
<td>Specific Memory Task</td>
<td>8</td>
<td>15</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>18</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>9</td>
<td>26</td>
</tr>
<tr>
<td>Total</td>
<td>13</td>
<td>42</td>
<td>49</td>
</tr>
</tbody>
</table>

* Level One: No specific reference made to a learning approach or style; description of effort or emotion
** Level Two: Use of generic strategies such as repetition with no reference made to the specific learning strengths of the participant
*** Level Three: Description of a process that the participant identified as being meaningful and effective for them personally
A correlation between participants' perception of their metacognitive awareness (survey Q#6) and their actual metacognitive awareness yielded a positive but not a strong correlation. Those who identified they understand how they learn best, should also be able to articulate their process beyond generic strategies such as repetition and association. However, using Chi-square statistics, there was no significant relationship that was identified between participant's self perception of metacognitive ability and demonstrating this understanding in response to a specific task ($r=5.797$, $N=104$, $p=0.446$) or in relation to how they defined their learning in general ($r=6.889$, $N=104$, $p=0.331$). This suggests that the greater a participant perceives their metacognitive awareness to be, it does not correspond with the coded level in which they describe their learning process (Table 4-9).

Table 4-9

<table>
<thead>
<tr>
<th></th>
<th>Specific Learning Task (Remembering a Phone Number or Recall of Vital Information)</th>
<th>General Learning Task (Participants Description of How They Learn Best)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metacognitive self-assessment</td>
<td>0.446</td>
<td>0.331</td>
</tr>
</tbody>
</table>

**Metacognitive Development Fostered**

Two of the survey questions (Q #9 and Q#11) were aimed at identifying the location and resources that facilitated metacognitive awareness while participants were attending public schools (Tables 4-10 and 4-11). To identify the key location or situation where participants believed they gained metacognitive awareness, after describing how they learn best they were then asked, "WHERE did you learn this is how you think or how you learn best?" Over half of

109
the participants felt that they either developed metacognitive awareness during college or university (27.9%, \(N=29\)) or on the job (23.1%, \(N=24\)). In both of these categories over 90% of the participants had an education past high school age, and it is somewhat predictive of results from another survey question (Q#4) that seeks to identify the approximate age grouping that most individuals feel they have become metacognitively aware. An equal number of participants \((N=14)\) selected each the home or the school. The remaining 22.1% \((N=23)\) chose the other category. The majority \((N=18)\) of those who selected this category provided extra clarification. Seven identified that they gained metacognitive awareness from "life" and another seven on their own using self experimentation. Four participants indicated it was through a combination of the locations or scenarios provided in which they believed their metacognitive awareness was fostered.

Table 4-10
Where Metacognitive Development was Fostered

<table>
<thead>
<tr>
<th>Response</th>
<th>Response Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>home</td>
<td>13.5% 14</td>
</tr>
<tr>
<td>school</td>
<td>13.5% 14</td>
</tr>
<tr>
<td>college or university</td>
<td>27.9% 29</td>
</tr>
<tr>
<td>on the job</td>
<td>23.1% 24</td>
</tr>
<tr>
<td>other ((22.1%, (N=23)))</td>
<td>&quot;life&quot; or &quot;self experimentation&quot; 13.5% 14</td>
</tr>
<tr>
<td></td>
<td>combination of sources 3.8% 4</td>
</tr>
<tr>
<td></td>
<td>no written explanation provided 4.8% 5</td>
</tr>
<tr>
<td>Total</td>
<td>100% 104</td>
</tr>
</tbody>
</table>
Table 4-11

*Human Resources Who Facilitated Metacognition Development*

<table>
<thead>
<tr>
<th>Human Resources</th>
<th>Response Percent</th>
<th>Response Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>grade school teacher</td>
<td>10.6%</td>
<td>11</td>
</tr>
<tr>
<td>college or university professor</td>
<td>14.4%</td>
<td>15</td>
</tr>
<tr>
<td>parent</td>
<td>9.6%</td>
<td>10</td>
</tr>
<tr>
<td>sibling</td>
<td>1.0%</td>
<td>1</td>
</tr>
<tr>
<td>friend</td>
<td>8.7%</td>
<td>9</td>
</tr>
<tr>
<td>instructor of a special course on learning</td>
<td>7.7%</td>
<td>8</td>
</tr>
<tr>
<td>an author of a book or article on learning</td>
<td>5.8%</td>
<td>6</td>
</tr>
<tr>
<td>other (42.3%, N=44)</td>
<td>&quot;myself&quot;, &quot;on my own&quot;, etc.</td>
<td>30.8%</td>
</tr>
<tr>
<td>coworkers</td>
<td>3.8%</td>
<td>4</td>
</tr>
<tr>
<td>various</td>
<td>7.7%</td>
<td>8</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
<td>104</td>
</tr>
</tbody>
</table>

The survey question eleven (#11), "Select who you feel MOST helped you understand how you learn best," guided participants to reflect and identify human resources that aided in their metacognitive development (Table 4-11). Post-secondary educators were identified by 14.4% (N= 15) of the participants and slightly less (10.6%, N= 11) indicated grade school teachers and family members respectively. Friends were a resource for 8.7% (N= 9) of participants. Only 7.7% (N= 8) gained awareness about how they learn through a specialized course and 5.8% from reading material on learning. Most respondents (42.3%. N=44) selected the "other" category. What was significant was the number of individuals (30.8%, N=32) who wrote "myself" or another phrase that indicated metacognition was something they developed on their own. Other noteworthy people who were identified as being supportive were co-workers.
(N=4). Instructors from grade school, post-secondary, or from learning courses represented 33.7% (N=35) of participant choices for resource people.

**Time Frame of Metacognitive Awareness**

When asked to identify a time period when they felt they understood how they learn, the majority of participants (63.5%) indicated after high school (Table 4-12). Less than a third (31.7%) identified that metacognitive awareness occurred during their K-12 grade school years. For a small number of participants (4.8%), metacognitive awareness or their ability to understand how they learn occurred within the first five years of their life.

<table>
<thead>
<tr>
<th>Stages</th>
<th>Response Percent</th>
<th>Response Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infant until preschool age</td>
<td>4.8%</td>
<td>5</td>
</tr>
<tr>
<td>Elementary age (kindergarten to grade six)</td>
<td>9.6%</td>
<td>10</td>
</tr>
<tr>
<td>Junior high or middle school age (grades 7 to 9)</td>
<td>5.8%</td>
<td>6</td>
</tr>
<tr>
<td>High school age (grades 10 to 12)</td>
<td>16.3%</td>
<td>17</td>
</tr>
<tr>
<td>Initial post secondary education or work force</td>
<td>42.3%</td>
<td>44</td>
</tr>
<tr>
<td>Graduate education or after being established in the work force</td>
<td>21.2%</td>
<td>22</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100%</strong></td>
<td><strong>104</strong></td>
</tr>
</tbody>
</table>

**Strategy That Works Best**

The last question of the survey (Q#12) asked, “When you are learning something new, select a strategy that you feel works best for your way of learning?” Repetition was the most notable strategy (N=20, 19.2%) people chose (Table 4-13). This included the 17 individuals who indicated it was their best strategy but also with an additional 3 who selected the "other"
category but included repetition within a combination of other strategies. Based on responses participants provided in the open-ended questions (#7 and #8), 32.7% (N=34) indicated repetition was the strategy of choice to remember critical information, and 21.1% identified it as a significant part of their overall learning strategy. Thus from both quantitative and qualitative data, repetition was identified as a key strategy used by a significant number of people.

Trial and error was also a more popular strategy choice (N=20, 19.2%) having been selected by 19 participants and mentioned again by one participant who selected the "other" category.

Table 4-13

<table>
<thead>
<tr>
<th>Best Strategy</th>
<th>Response Percent</th>
<th>Response Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>trial and error</td>
<td>19.2%</td>
<td>20</td>
</tr>
<tr>
<td>using auditory cues or methods (sounds, saying out loud, etc)</td>
<td>1.0%</td>
<td>1</td>
</tr>
<tr>
<td>repetition (rereading, rewriting, etc.)</td>
<td>19.2%</td>
<td>20</td>
</tr>
<tr>
<td>using visual cues or methods (pictures, colors, etc.)</td>
<td>4.8%</td>
<td>5</td>
</tr>
<tr>
<td>understanding the topic or problem from whole to part</td>
<td>8.7%</td>
<td>9</td>
</tr>
<tr>
<td>using concrete sequential strategies (put in order, sequential lists, etc.)</td>
<td>4.8%</td>
<td>5</td>
</tr>
<tr>
<td>using kinaesthetic cues or methods (hands on exposure, physical practice, etc)</td>
<td>17.3%</td>
<td>18</td>
</tr>
<tr>
<td>identify the patterns or logic related to the topic or problem</td>
<td>7.7%</td>
<td>8</td>
</tr>
<tr>
<td>meditating on the topic or problem</td>
<td>1.0%</td>
<td>1</td>
</tr>
<tr>
<td>communicating and sharing with others about the topic or problem</td>
<td>4.8%</td>
<td>5</td>
</tr>
<tr>
<td>using cue cards with key points</td>
<td>1.0%</td>
<td>1</td>
</tr>
<tr>
<td>using a metaphor that is familiar to give meaning to the topic or problem</td>
<td>2.9%</td>
<td>3</td>
</tr>
<tr>
<td>other (various)</td>
<td>7.7%</td>
<td>8</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
<td>104</td>
</tr>
</tbody>
</table>
Following the survey, individual interviews were conducted to triangulate findings and to also deepen the understanding of how adults identify their learning epistemology, what situations and conditions have supported their metacognitive development and how their earlier schooling experiences contributed to these. The survey results informed the development of questions for individual interviews.

**Interview Research Assertions**

The interviews were analyzed in isolation but also to identify connections or contradictions between the quantitative results and qualitative results. Eight people volunteered to participate in the interview process. A general query was presented to participants who completed the survey and also posted on a social networking tool (Facebook) in which people were invited to talk about how they learn and their public school experience. Direct and private communication was made with individuals who indicated interest. In-person interviews were preferred but due to location and scheduling difficulties, three of the six interviews were conducted over the phone or though online messaging.

Four of the individuals had their public school experience in the United States with the other four having theirs in Canada. There were four males and four females that made up the interview group (Table 4-14). For improved clarity, fictitious names were assigned to the eight interviewees.
Table 4-14

Interview Participant Demographics

<table>
<thead>
<tr>
<th>Interviewee &quot;1&quot; - Sam</th>
<th>Age</th>
<th>Gender</th>
<th>Location of Public School Experience</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interviewee &quot;2&quot; - Karen</td>
<td>31</td>
<td>Female</td>
<td>United States</td>
</tr>
<tr>
<td>Interviewee &quot;3&quot; - Colin</td>
<td>34</td>
<td>Male</td>
<td>United States</td>
</tr>
<tr>
<td>Interviewee &quot;4&quot; - Sarah</td>
<td>45</td>
<td>Female</td>
<td>United States</td>
</tr>
<tr>
<td>Interviewee &quot;5&quot; - Trevor</td>
<td>39</td>
<td>Male</td>
<td>Canada</td>
</tr>
<tr>
<td>Interviewee &quot;6&quot; - Greg</td>
<td>44</td>
<td>Male</td>
<td>Canada</td>
</tr>
<tr>
<td>Interviewee &quot;7&quot; - Connie</td>
<td>42</td>
<td>Female</td>
<td>Canada</td>
</tr>
<tr>
<td>Interviewee &quot;8&quot; - Shannon</td>
<td>29</td>
<td>Female</td>
<td>Canada</td>
</tr>
</tbody>
</table>

The facilitator guided the interview process with the purpose of gathering authentic information and informing the research questions:

1. What do adults identify as their learning epistemology? What is their ideal learning context and how do they organize their internal thinking processes?

2. What situations and conditions have supported adult metacognition? Where did adults learn about how they think? What human resources were involved? When did these first experiences occur?

3. What opportunities for metacognitive development are adults able to identify from their schooling experiences?

The intent was to have a conversation that would reveal the interviewee's perception of how they think and how they developed this understanding. A general guideline and questions were
followed (Appendix D) but there was flexibility to engage participants in a casual, conversational manner.

A distinction was to identify metacognitive processes rather than effective but generic strategies in the responses. Many times, this researcher would listen to an individual recount strategies they used such as repetition, or having individual assistance as beneficial practices to help them learn best. They also would indicate that understanding the material was critical to their understanding. These are important strategies and components in the learning process but they are not specific enough to show significant metacognitive awareness. How and why does the individual repeat a key point? Are they using visual, auditory, kinaesthetic or a combination of them while they repeat? If they receive individual attention, why is this helpful? What has been enabled by having personalized time? Is it talking out loud about the material or some other factor? What makes the process more effective in that situation? And understanding material is naturally going to improve retention for most. With understanding we are able to make more connections in our brain to other concepts. More connections improves our ability to understand and retain. The question is how is this understanding achieved? How are connections made to other concepts or previous knowledge? Is it effective to have a sequential story or pattern? Is a connection made by grouping the new concept spatially with similar ideas already known? Uncovering answers to questions such as these provided a clearer picture of adult's metacognitive ability which is the foundation of this study.

Having informally discussed metacognition with people in professional and informal settings over the years, this researcher wanted to delve deeper into the personal learning signatures of the participants. The anticipation was that they would be able to articulate their process and provide evidence and further clarification to support their understanding. However,
even if they were unable to succinctly outline their learning process it was hoped that they could be guided to uncover perhaps an unconscious process. The critical aspect of this discovery was not to simply have individuals identify a process they use, but also be able to articulate why they use this process and how it helps them.

After interviewing all eight participants, three main themes emerged from their conversations about how they learn and how they came to understand their learning. These themes included the focus on learning conditions, the type of learning strategies that were highlighted, and the time frame in which participants identified as achieving metacognitive awareness.

**Thinking About "How You Learn" Generates a Focus on Learning Conditions**

When asked to recall how they learn and earlier learning experiences, half of the interviewees initially highlighted their emotional reactions, motivational factors and interpersonal dynamics of learning settings. They provided general impressions of the learning culture rather than articulating their specific learning style or preferences. While not in their initial response, the remainder of the interviewees, also discussed these aspects.

Adherence to regulated learning behaviors in formal educational settings occurred early on, often to the detriment of academic success and emotional well-being. Sam indicated that during his elementary school experience he could tell that he was having learning difficulties in a particular subject, but asking questions and seeking support in different ways was not well received,

At the time I felt helpless...I started thinking (and) I was questioning more and I was asking (more) and they would say, "We just explained this three times, what do you
want??" I stopped asking questions. I started believing I was not as good, because I was an A student in all the other disciplines. I started thinking in math I am not that good. (I) started doubting myself. At that level you just learn to shut up. You don't want to do anything. So I'd just get by.

Sam continues on to say. "...people learn math differently even if they say there is one way." In a similar way, Karen stated, "There was a very set curriculum and a very set way of responding in writing and speaking about it .... " Colin described his learning journey as a past trauma and that his understanding of how he learns came from the desire to achieve despite non-supportive conditions,

I think I understand what makes me so eager to learn and push myself, it (was) when someone denied me the right to learn. I had a teacher make fun of me one time in class, in the inner city and over populated with students...and I had ADHD really bad. So I needed more explanation, I needed to see pictures, and he made fun of me... and I was always afraid since then to raise my hand.

Greg talked about being restricted to follow his own method of learning:

One thing I found personally in school (was) a lot of times I would get frustrated or bored with how I was taught. For example, in math they give you a formula and they expect you to go through the formula and you get the final answer. But in my mind, I got the same answer but came about it in a different way...but I was still wrong. So, (pause) they kind of discouraged my thinking and my thought process.... I wish they had of (pause) I
guess spent more time in trying to develop an individual... on how they see things, and how they learn, and how they understand things.

Later he reiterated, "They expect you to go on their line (method of learning)... well like, that is not the only line."

In all of these cases, the educational environment was perceived as oppressive and acted as a barrier in promoting metacognitive development and learning success in general.

To uncover more depth about how each participant learned and their understanding of this, further direct questioning was used. Questions were also needed to redirect participants to share specific information about their metacognitive awareness, “Were you able to identify a specific way that you learn?” and "We may have to go back to your previous experiences when you were learning new things. What I hope to capture is if you have an understanding of HOW you learn?” With all the participants, further prodding was necessarily to get beyond generic strategies and included questions such as, “How does your brain take in new information?” and “Why is that strategy effective for you?” In response to these more pointed questions, there was still a lack of clarity for a few individuals about their learning process. These respondents identified learning conditions such as Sarah who is completing a college degree for the first time in her late forties,

I need to have a quiet and organized space. I get everything in order, all my index cards and my books, and my highlighters in place and then I am ready to start…
Trevor also mentioned that he needed to have some level of active engagement in a learning situation or he would drift off. The common lecture format proved to be difficult for him.

These responses were typical of the type of feedback over the years that I received when I asked a person how they think. Most often, external conditions for learning were identified.

**Learning Strategies Identified were Basic and Were Developed as a Way to Survive**

Interestingly, a better understanding of the participants' learning became clearer after the formal interview period, when I had stopped recording the conversation. During this time, I shared some of my findings and both my personal and professional experiences. This is when six out of the eight participants were able to add to their description of their learning. They were able to be more insightful by relating to some of the experiences that were shared. Through the interview process, they were provided with a 'space' to think about their thinking explicitly and in more depth. They were then able to when they were asked to summarize their learning method. The interview process itself had become educational in their metacognitive development!

If learning strategies were mentioned, they were often those basic and rudimentary skills so often used will all ages of students. Repetition was a common strategy as Connie shares: “...I need write good notes and sometimes I will write these over again to help remember and understand.” Sam also highlighted repetition as a key strategy in receiving instruction that was meaningful to him,

You see...in my case, repeating the math, just repeating. I am not asking a wizard-like mathematician to teach me, but if ...they had the patience, enough patience, to repeat to
me enough so I could get down the demonstration I would have probably been in the sciences now.

Sarah identified the use of color to help her in her learning process. “…I write the key points on cue cards and now I use different coloured cue cards to help organize my information” When asked why she used the color cue cards, she indicated it was just to keep things more interesting or to separate information from chapters but not specifically because it was a memory technique in and of itself.

Trevor spoke about the use of repetition but goes further to identify the application of the skill or how kinaesthetic understanding improved his retention. In addition, using these strategies as well as demonstrating the skill to another person were deemed effective:

I learned grappling just by drilling the techniques and trying to implement them into my grappling when I grappled with other students. I have a good memory, so it's easy for me to pick up on things. If you show me at least three times and I get a chance to demonstrate it, I'll learn it.

In this context of learning, since his learning experience was related to acquiring a skill in sports, the environment in general often follows this format of kinaesthetic application and demonstration to others.

Five of the eight interviewees described their actual learning process based on the common and widely-used categorization of learning styles from Fleming's VARK model which includes: 1) visual learners, 2) auditory learners, and 3) kinaesthetic learners. The terms were
often not used, but statements such as "I learn by doing," "Watching helps me," and "I need to see the word" indicated that they individual identified with these main strategies of learning.

While a few of the participants were able to immediately identify strategies that needed to be in place for them to be more effective in a variety of learning environments, understanding why these strategies were effective was not easily explained. In addition, participants often did not often identify the way they made their learning setting more productive. One of the components of metacognitive development is adapting conditions to enable your personal learning needs, not only understanding your learning process.

While not mentioned earlier in the interview, Colin came to identify himself as a visual learner, "...I made myself pick up a book, or watch my grandfather do it once, and I knew how to do it afterwards. I am a 'visual.'"

In the conversation with Trevor, he indicated he was a kinaesthetic learner. However, his need to be engaged physically had more to do with his need to maintain focus. When questioned about an environment that was not conducive to kinaesthetic learning, he had no solid alternate strategy:

Interviewer: "Are you aware of how you learn and what you would need to do so you could learn as best as you could...?"
Trevor: "Yeah, I need to do it... I learn by doing."
Interviewer: "Do you find then... if there is no way of doing it in the class...you make sure you 'set it up' so you can 'do it' later?
Trevor: "I'll try to ... as best I can so I can understand it, but I also realize I get lost, I sort of drift off too. So that's why I need to learn by doing stuff."
Greg described his method as "making things more concrete' which could be interpreted as kinaesthetic and visual,

...I find a lot of times when I am just taking information it doesn't necessarily 'stick.' So I need to (points down to table) regurgitate that usually with a pen I find, even computers. It doesn't 'stick'... when I use a pen and write it down ...it tends to stay in as a thought more. And it is concrete because you are actually writing that thought down. It becomes the word.

After considerable probing and identifying a specific learning scenario (learning a dance choreography), Connie was able to identify that she was predominately a visual learner using some auditory cues. However, it seemed these strategies were not always helpful to her. She later mentioned she will right out notes of dance moves but they will not necessarily help her remember. She was not able generalize how she learns overall, except in terms of the generic strategy she uses as previously mentioned.

Shannon indicated a strategy, "I do pretty well reading information...." but was not able to really identify why this was an effective strategy when prompted. Karen spoke to conditions of her learning environment and her journey through her formal education experiences but failed to articulate any specific learning strategies even when asked directly on a number of occasions.

**Metacognition Developed as an Adult**

While some interviewees indicated that there was an awareness that they were not meeting their learning potential, or that there was a disconnection with the methods for learning in the classroom and on their own, only later did they have the ability to take ownership of this
and find clarity. Based on what this study defines as metacognition, most indicated that this occurred late in or after their grade school experience. As Sam explains, he felt a disconnection in elementary school:

When I started being aware of how I learn, I think I voiced it or thought about it to myself during college (pause) to see it 'clear.' Like I would have [learned] that this way, not this way. In high school you were saying, "Yeah, that's bad'" but you were not thinkin’ I could change that; I could do it another way.

Colin had a similar experience:

I remember science class as a kid. I knew I had a problem because I would look at a simple reading of a few paragraphs, there was visual in there, but I couldn't get started. I had a hard time getting started, my mind was so scrambled with all the information that I couldn't break it down. I had to relearn and sometimes I have to reread things over and over again.

Trevor shared he had difficulties learning in school as well and it wasn't until he connected with neighbours, a mother and her daughter, that he came to understand his unique learning needs and how to adjust for them,

...her daughter was ADD. She has a learning disability. And (the mother) had to do a lot of the same things to me, to get me to remember stuff that she would do with her daughter. And so it was based mainly on her experience. She would sorta talk about it and she asked me, "When I am in class do I drift off?"  (Trevor:) Yeah, I do.
(Neighbour:) How do you learn best? And I said, "I learn best by doing stuff." She came
to that conclusion (that I was ADD) on her own.

Trevor indicated it was with ongoing discussions with his neighbour that he was able to understand how to manage his learning and that prior to then, learning was 'awkward.'

Connie shared that understanding her learning at a deeper level was unnecessary until she attended university. Before this time she was able to successfully go from one grade to the next and rarely needed to study. At the university level, it took her longer to study and she needed to formulate her thought for papers. As she explained, in grade school it was enough to memorize information.

There was often a connection made to personal connection and empowerment when interviewees discussed understanding their epistemology. Karen affirmed she became cognizant of her learning after grade school,

(I came to understand how I learn at) two main points in time I would say. They were both at the university level. And one was in my women studies courses because that was, I feel, the first time where personal experience was validated as a form of learning and knowledge. And what I mean by that is it wasn't just what you read in the books, or what somebody else had to say about philosophy or literature or theory, but you could say today I went to the grocery store and this happened (pause) and it is a meaningful experience (pause) its real. And that was more valuable because sometimes you are reading about what other people think, but how does it relate to how you think, and what you do, and your experience?
Despite significant prompting after this response to have her articulate then how she has come to understand how she learns specifically, Karen continued to speak to the conditions and philosophical foundation of the coursework but failed identify how this actually helped her understand how to manage and retain critical information.

When Shannon was asked when it was she started to know how she thought, she responded: "I don't know if I really... like, thought about it so much as I really like to read so I would just read all the time." Like her cohorts, strategies were used without much thought as long as there was some success experienced.

When pressed to recall a time in their public school education when they began to understand how they specifically learned, not one of the participants was able to identify any experience that enabled them to better understand their specific learning style or their learning strengths. The majority of their discussions highlighted conditions that were supportive in general. Sarah spoke of a teacher that was strict but had high expectations for all her students. This motivated her to do well in school and she saw this female physics teacher as being a role model basic on this and because she represented a small group of females who taught in the sciences. Sarah also shared about the attention given to learning in her home and how a place was set aside to study. Gordon spoke about understanding how he learned in his last year of high school and the role a teacher played:

Greg: ... it was more so because of an English teacher I had. She has a big influence on me and how I started thinking about things even...

Interviewer: So she kinda gave you some strategies...? Did she actually talk about the idea of... asking how you thought and tried to help you navigate that?

Greg: Nope.
Interviewer: ...or was it more she gave you some examples and you were able to... use that?

Greg: Yeah, and she pushed you to think outside of that box...that they were offering...she was trying to get everyone to push beyond that.

Interviewer: Okay, so even though she never necessarily...help people understand their own thinking. She also did suggested or put it out there that people shouldn't just take the way things are given to them. There are other possibilities out there.

Greg: Yeah.

Interviewer: So that was enough to help you on your road to...

Greg: (nodding)

While there was not direct metacognitive instruction provided, there was an attitude that encouraged students to explore and find effective ways to learn.

Shannon spent a bit of time trying to recollect and responded, "I can't think of anything in particular." Colin responded. "I really had no guidance." He went on to say, "I didn't really start learning in school until I was after 13." There was an absence of any beneficial experience that aided metacognitive awareness in their grade school experiences.

**Summary**

Three key themes emerged from the interview process of the eight selected participants to ascertain greater clarity of the survey findings. First, participants responded vaguely when articulating their learning process. Second, the learning strategies that participants described were often generic rather than personalized. Finally, participants indicated that understanding
their metacognitive process was something that occurred later in their public schooling experience.

It is important to emphasize there is a distinction between an individual describing the conditions of learning environments rather than descriptively identifying how their brain best processes and stores information. Generally, participants required a great deal of discussion to come to the point of being able to articulate how they earn best and when they did, it was often using common strategies which were not necessarily effective.

Learning strategies were discussed in terms of what was necessary to survive or cope in a particular scenario rather than participants coming to understand their particular learning signature. Participants also indicated that metacognitive understanding happened as an adult or as they approached adulthood. Finally, none of the participants indicated they received any direct instruction in grade school. Overall, research findings showed that participants, despite a generally favourable response in regards to understanding their own learning process, were not able to consistently identify their process of learning or articulate it in open-ended responses. This reinforced similar findings from the survey data.

Chapter Five will summarize the overall findings on the three guiding research questions of this exploratory study on metacognition in the context of learning in our public school. It will further identify limitations of the study and provide recommendations for further research.
CHAPTER FIVE
Discussion

The purpose of this exploratory study was to contribute to the understanding of how the skills of metacognition, specifically the awareness of one’s own thinking, and the explicit selection of cues to understand and attach meaning to new concepts have developed or been limited in traditional schooling contexts. Uncovering if metacognition develops without direct teaching on the subject was examined. Over 104 adults who completed their education in K-12 public schools in Canada and the United States participated in the study.

The literature review within this study reinforced that metacognition and the practice of imbedding instruction of how to learn implicitly had promise in improving students' academic success. Specifically, this study investigated adults' metacognitive awareness and based on their recollections, how this developed over time. The researcher’s experience as a education practitioner (both as a teacher and as an administrator in public school settings) also informed the discussions that follow.

Findings

The exploratory research of this study on metacognition was guided by three research questions. The findings of each are summarized.

*Research Question One:* What do adults identify as their learning epistemology? What is their ideal learning context and how do they organize their internal thinking processes?
Survey findings indicated that most people (over 84%) identified themselves as being aware of how they learn however this did not prove to be an accurate perception of their thinking process. The results indicated only a third (34.6%) of the participants were able to identify personalized strategies when describing their learning process. This was further validated in the interviews, where only after significant prodding were participants able to demonstrate some degree of metacognitive clarity. The conversations with participants about how they think best related more to how they survived learning environments and less about how they had come to understand their personal learning signature.

In regards to responses on open-ended questions that had participants reflect on how they are able to learn a phone number or other critical piece of information, over 65% identified generic strategies without any particular reference to their learning style, individual needs, or participants provided no strategies at all. There was a significant absence of dialogue about their own learning strengths overall. There was a deliberate attempt to illicit participants' responses with a situation they should have some familiarity with and to seek specific strategies. In the initial exploratory pilot study for this investigation, a specific example was not provided which resulted in vague and in some cases off topic responses. Providing a scenario of a learning task did result in more relevant feedback, but it also appears that it was an activity that many people accomplish without much new forethought. In hindsight, this familiar learning task may have invited participants to describe strategies that they used for many years, whether effective or not, that have become entrenched and almost reflexive in nature.

A clear description of an individual's learning signature was not readily forthcoming indicating that there was an absence of previous reflection on this topic. The organization of thinking processes were more based on the content area of learning rather than on how an
individual identified how they learned best. Overall, 47.1% of participants were able to provide learning strategies that were aligned with their particular way of learning.

**Research Question Two:** What situations and conditions have supported adult metacognition? Where did adults learn about how they think? What human resources were involved? When did these first experiences occur?

Grade school settings and resources were not identified as playing a significant role in facilitating metacognitive development for participants. The post-secondary education environment, work related experiences or simply life experiences in general were predominant in aiding metacognitive awareness and ability. Based on survey results, over half of the participants (51%) indicated they developed their metacognitive awareness either during their post-secondary education or on the job. The remainder identified life experience, the home or grade school as contexts which facilitating their awareness. Congruent with these findings, 63.5% of survey participants indicated the time frame in which they developed metacognitive awareness occurred after high school.

**Research Question Three:** What opportunities for metacognitive development are adults able to identify from their schooling experiences?

Only 13.5% of participants indicated that their metacognitive development was facilitated during their grade school experience, or from the support of a grade school teacher (10.6%). Interviewees did not provide even one example of gaining metacognitive awareness during
grade school. In the qualitative responses from the survey and during all the interviews when directly asked, there was no indication of any teaching on the topic of metacognition or any programming directed towards improving metacognitive awareness. Not surprisingly, less than a third (31.7%) identified that metacognitive awareness occurred during their K-12 grade school years.

**Interpretation of Findings**

The majority of the study participants self-identified as having metacognitive awareness yet results from the survey and interviews indicated that participant awareness highlighted more of the conditions of learning they had been required to address and the measures they employed to have some effectiveness in these situations. At the core of these interactions was the philosophical understanding participants had about how we learn and our ability to engage on a deeper level with how our brains function. Learning was viewed as a passive activity in which learners would receive information in whatever method of delivery and context was determined by the educators and educational organization. Both in regards to learning epistemology and in identifying the ideal learning context, most learners described their experiences as *reactions* and identified themselves as subjects with a limited capacity to influence or control these factors. While participants were able to describe more ideal learning conditions, which varied from learner to learner, if the features of these contexts were not congruent with their ideal, they identified themselves as victims of the environment rather than feeling empowered to adapt the delivery of knowledge in that situation to one which was more meaningful to their learning signature.
In discussion with educational colleagues, during the exploratory pilot study and based on research that identified metacognition as developmental (Flavell, Green and Flavell, 2000; Georgiades, 2004; Kuhn, 2000; Pintrich, 2002; Hacker, et al., 2009; Kolencik and Hillwig, 2011) there was a hypothesis that age may play a part in participants metacognitive awareness. This was not validated in the findings of this study. A comparison of metacognitive awareness on both the open-ended questions was not attributed to a connection to any particular age group.

A goal of this research was to validate the direct teaching of metacognitive awareness and to start this process with learners in upper elementary if not earlier. Results of this study have not been able to inform this due to the absence of direct metacognitive teaching overall. Instead, individuals identify any metacognitive development was accomplished in isolation or "on their own". The results also show, without any intervention, metacognitive ability does not mature until the learner has mostly completed their public school experience. Time of perceived metacognitive awareness had the majority of the participants identifying a time beyond high school. With the current research on metacognitive awareness linked to academic achievement with students in the upper elementary levels, there is promise in providing opportunities for individuals to have greater metacognitive ability much earlier than this study has demonstrated.

**Implications of Study Findings**

There was not a high degree of sophistication used when the majority of the adults defined their learning epistemology especially in terms of articulating their internal thinking processes. Only through active and ongoing discussion and exploration was a learner able to summarize the essential qualities of their learning methods and needs; which was not the case with the majority of participants involved in this study. More were able to describe the best
contexts for their learning but these again did not necessarily relate to how they developed metacognitively.

A range of resources, both human and otherwise, were identified as being supportive for participants in understanding their own way of learning. Of significance, one third of the participants acknowledged that metacognitive awareness was established themselves. In the interview process, participants identified a variety of resources but in further discussion, while they may have received support or were able to learn in some helpful environments, the process of identifying their learning remained a lone act. This would suggest that the resources they selected may not represent any direct support for their metacognitive development. There would be an inflation of the actual number of individuals who developed whatever metacognitive awareness and ability they have on their own than what was determined in this study.

There was a notable absence in the role public schooling aided in the development of metacognitive awareness and ability. While there were positive and supportive experiences that were spoken of, the specific support of teaching students how to think better in the way best for them was non-existent. The direct teaching of metacognition was not recalled by any of the participants.

During the process of my research, there has been a disconnection at many junctures when attempting to engage people in the process of metacognition and having people understand the concept itself. Much of what people were referring to was more about reflection but lacked the complexity of metacognition. And in a simple event, I came to realize that there was a fundamental difference in our understanding of the brain and its connection with learning. The simple event was a discussion between myself and an individual about how we remember important information. We were talking about learning in ways that were meaningful to us and
the topic came up about how the connections in the brain are influenced by our thoughts and actions. While the body stops generating new brain cells, connected pathways continue to be generated. The individual was surprised that there was a physiological aspect in learning and did not realize that thoughts created tangible connections in the brain. Many years ago, when research on the brain filtered into educational realms, I too was fascinated to learn about the psychological aspects of learning. Without realizing it, I assumed others would have been exposed to this information as well. I had been part of and witnessed the new concepts of brain research being discussed in many different contexts throughout the years. Yet, education is a stagnant field where many find themselves thinking about learning in ways that have been the standard for so long that new information has a difficult time permeating the filter of familiarity. I realized this idea of the brain being malleable was a novelty to many, especially those not directly involved in the education of others. The idea that we can actually shape our brains is not commonly understood and explains why my understanding of metacognition has not been easily integrated in this study and beyond. To be truly empowered by the process of metacognition, an individual must identify with their brain like it is a ball of malleable clay and something that continues to evolve physically. Every time we consciously choose to connect one idea with another or make a space for it in our brain, it is like we are actually pushing a wire into the clay solidifying a connective pathway. Understanding this creates a new perspective on learning and how we need to take greater ownership of directing our own learning for improved understanding and retention.
Limitations of Study

As a critical educator and researcher having lived the public school experience as both as a participant and then as an employee working within diverse educational environment, I acknowledge that my own experiences and perceptions may have influenced the interpretation of data collected in this study.

The exploratory study while intended to contribute to the understanding of transformation within the school contexts within Canada and the United States did not compare the schooling of the 104 participants of metacognitive differences in the two international contexts. The adult participants involved attended public school settings in these two countries (for a minimum of six years). There was no intention of differentiating between these two criteria but rather to locate the participants in the two contexts the researcher has been engaged as an educator.

The study involved 104 participants that were predominantly college graduates and between 18 to 45 years of age. A larger survey would represent a greater variety of educational levels may yield results with a higher degree of accuracy of the general population.

Another limitation was that adult recognition and recall of their childhood learning experiences may be viewed as an incomplete and inaccurate representation of their actual experience. This limitation could also be viewed as being informative. After all, the case could be made that what is often remembered is what has been significant to their learning. The thinking and learning of one’s past experiences as adult, provides a reflective depth that may not be otherwise be obtained from interviewing children immersed in the learning environment they are to reflect upon.

This study lacked a group that received some level of direct metacognitive training so comparison was limited. Initially, it was hoped that the study would reveal a group that had the
advantage of instruction in learning pedagogy but this was not the case. As mentioned earlier, no participant identified a time in their schooling where they received any direct teaching to aid their understanding of their own learning.

Lastly, theories in education continue to be in a transition period whereby many changes are continuing to occur. New approaches are emerging that guide our practice thus creating a need for constant re-evaluation. The material in the last five years has been considered but the study cannot account for any new significant trends that may proceed soon, other than the increased focus on technology as an educational tool.

**Reflections on the Significance of the Study**

This exploratory study presented a perspective on the degree of metacognitive awareness of adults and how their public schooling experience contributed to this understanding. In addition, it also shed light on other resources that aided in the discovery of participants' own epistemology. When direct teaching of metacognitive ability was absent, results revealed if individuals were able to develop this ability without it.

This study provided a starting point for coming to understand how our public school systems have failed in providing the direct teaching of metacognitive skills. By involving participants that were predominantly college graduates and between 18 to 45 years of age, the investigation provided a landscape of any educational changes that may have occurred over time in the direct teaching of metacognition. Providing the skills needed to be life–long learners has its beginning in public education and success in part will be demonstrated by the adults that are a product of this system. With an absence of metacognitive understanding, we have failed in part to capitalize on the human potential within our communities. With the high cost of ineffective
educational systems and the use of superficial interventions that only exacerbate the waste of resources, it becomes more critical for us to reconsider the benefits of process based interventions.

**Recommendations for Future Research**

While this study did not reveal much in terms of any relationship between age and metacognitive ability, a review of the literature suggested that metacognition is developmental. A larger survey with a higher percentage of adult participants under the age of 30 is necessary to examine if a significant differences between age, metacognitive ability and perhaps other factors are correlated. In addition, given that 73% of the participants were between the age of 25 to 45, it would be of interest to examine if the educational policies and practices in the 1980’s and 1990’s that influenced K-12 public schools hindered or promoted metacognition.

In addition, to fully appreciate the significance of direct metacognitive education and training, future research needs to create conditions where this type of training is provided and then a review of findings would be necessary to identify the impact of this instruction. One recommendation would be to conduct a study that would investigate if upper elementary students are capable of developing a critical understanding of their learning process. A guiding research question would be: How does the explicit training of metacognitive skills impact the acquisition and retention of new concepts in upper elementary students (grades 4 to 6) within public schools? The study would be focused on articulating the key components of metacognition and demonstrating how these impact learning in young students. From this, clarity would be achieved regarding the process of empowering students in becoming aware of their learning and therefore, enabling them to make conscious choices on how to attach meaning to new concepts.
as a means of improving understanding and retention. This research and other studies are needed to build and enhance the field of metacognition.

Considerations for future research are creating practices that bridge findings with practical applications for the K-12 setting as well as supporting the development of protocols for direct metacognitive instruction. Shift from the traditional foundations and practices that are so prevalent are necessary to incorporate metacognition into classrooms. For metacognition to fully be realized as an effective instrument to improve academic success, deconstructing current practices will be part of the process (Figure 5-1).

*Figure 5-1. Possibilities for Future Research and Exploration*
Conclusion

Based on the researcher's considerable experience in public schools, a review of the literature and the focus of this exploratory research on the absence of metacognitive instruction, considering the direct teaching of metacognitive awareness and ability has merit. More in-depth research is necessary to "fill the gap" that currently has existed in this area to demonstrate the improvement in academic success and beyond. Schools have an obligation to not only educate students in content based methodology but also to help students learn how to learn. This study reveals that this is an area that has not received any significant level of attention or contribution.
REFERENCES


Horn, C. (2003). High-stakes testing and students: Stopping or perpetuating a cycle of failure? Theory into Practice, 42(1), 30-41.


APPENDICES
APPENDIX A

CONSENT FORM

(Survey)
You are being asked to participate in a research project conducted by Shawna Rodnunsky in the College of Education, Claremont Graduate University (CGU) and in the College of Education, San Diego State University (SDSU). Before you continue, it is important that you read the following information.

**PURPOSE:** The purpose of this study is to understand how adults think and learn. The intent of the study is to understand the level of metacognitive ability of adults and the conditions involved in this development.

**PARTICIPATION:** Approximately 100 participants are desired for the survey. Participants need to be 18 years old or older and have had their K-12 schooling in Canada or the United States. If you do not meet these criterion, your responses will be deleted from the results.

Participants will be asked to reflect on their prior educational learning experiences in school in a survey. The survey involves 4 background questions, 2 open-ended reflective questions, and 5 multiple choice or scale questions. All the questions relate to how you learn. The survey should take approximately 15-20 minutes to complete.

**RISKS & BENEFITS:** None of the survey questions used in this study are experimental in nature. The only experimental aspect of this study is the gathering of information for the purpose of analysis.

This study will hopefully be beneficial in understanding how adults think about their own thinking and how effectively their public school experience supported this. If it was not effective in supporting this development, this will also show a need for public schools to improve in this area. Individuals participating in this study may gain additional awareness on how they think. I cannot guarantee, however, that you will receive any benefits from participating in this study.

**VOLUNTARY PARTICIPATION:** Participation in this study is voluntary. If you decide to participate, you are free to withdraw your consent and to stop your participation at any time without penalty or loss of benefits to which you are allowed. You also have the right to refuse to answer any question(s) for any reason, without penalty. Your decision whether or not to participate will in no way affect your current or future relationship with CGU and SDSU or faculty, students, or staff of these institutions.

**CONFIDENTIALITY:** Information from this research will be shared with universities, including but not limited to CGU and SDSU. In addition, findings potentially will be presented to other stakeholder in education such as political representatives, school districts, community agencies and groups, educators, and individual community members. Your individual privacy will be maintained in all publications or presentations resulting from this study. Participants completing the survey will not have any of their responses connected with their name including the name they identify themselves with on the social networking site (Facebook).

If you have any questions or would like additional information about this research, please contact me or my advisors: Dr. Dreyer and Dr. Ochoa using the contact information listed below. The CGU Institutional Review Board, which is administered through the Office of Research and Sponsored
Programs (ORSP), has approved this project. You may also contact ORSP at (909) 607-9406 with any questions. In addition, you may contact the Division of Research Administration San Diego State University at (619) 594-6622 or email: irb@mail.sdsu.edu.

Your affirmative response and by continuing to take the survey process indicates that you have read the information and that you agree to be in the study. You can change your mind and withdraw your consent to participate at any time. By affirming consent, you are not giving up any of your legal rights.

Shawna Rodnunsky
PhD Student, SDSU
Shawna.Rodnunsky@cgu.edu
(619) 565-4127

Dr. Philip Dreyer
Professor, CGU College of Education
philip.dreyer@cgu.edu
(909) 607-1239

Dr. Alberto Ochoa
Professor Emeritus, SDSU College of Education
aochoa@mail.sdsu.edu
(619) 594-6676
APPENDIX B

CONSENT FORM

(Interview)
You are being asked to participate in a research project conducted by Shawna Rodnunsky in the College of Education, Claremont Graduate University (CGU) and in the College of Education, San Diego State University (SDSU). Before you continue, it is important that you read the following information.

**PURPOSE:** The purpose of this study is to understand how adults think and learn. The intent of the study is to understand the level of metacognitive ability of adults and the conditions involved in this development.

**PARTICIPATION:** Approximately 8 participants are desired for the interview. Participants need to be 18 years old or older and have had their public schooling in Canada or the United States. If you do not meet these criterion, you will not be able to participate in this study and any results collected in whole or in part will not be used.

The interview will be conducted in person or through on-line messaging based on the location and the preference of the participant. The interview will ask an initial question asking individuals to talk about a recent learning experience they had. To uncover more about how each participant learned and their understanding of this, further question may be asked. The interview should take approximately 15-20 minutes to complete.

**RISKS & BENEFITS:** None of the survey questions used in this study are experimental in nature. The only experimental aspect of this study is the gathering of information for the purpose of analysis.

This study will hopefully be beneficial in understanding how adults think about their own thinking and how effectively their public school experience supported this. If it was not effective in supporting this development, this will also show a need for public schools to improve in this area. Individuals participating in this study may gain additional awareness on how they think. I cannot guarantee, however, that you will receive any benefits from participating in this study.

**VOLUNTARY PARTICIPATION:** Participation in this study is voluntary. If you decide to participate, you are free to withdraw your consent and to stop your participation at any time without penalty or loss of benefits to which you are allowed. You also have the right to refuse to answer any question(s) for any reason, without penalty. Your decision whether or not to participate will in no way affect your current or future relationship with CGU and SDSU or faculty, students, or staff of these institutions.

**CONFIDENTIALITY:** Information from this research will be shared with universities, including but not limited to CGU and SDSU. In addition, findings potentially will be presented to other stakeholder in education such as political representatives, school districts, community agencies and groups, educators, and individual community members. Your individual privacy will be maintained in all publications or presentations resulting from this study. Participants completing the survey will not have any of their responses connected with their name including the name they identify themselves with on the social networking site (Facebook).
If you have any questions or would like additional information about this research, please contact me or my advisors: Dr. Dreyer and Dr. Ochoa using the contact information listed below. The CGU Institutional Review Board, which is administered through the Office of Research and Sponsored Programs (ORSP), has approved this project. You may also contact ORSP at (909) 607-9406 with any questions. In addition, you may contact the Division of Research Administration San Diego State University at (619) 594-6622 or email: irb@mail.sdsu.edu).

Your affirmative response and by continuing to take the survey process indicates that you have read the information and that you agree to be in the study. You can change your mind and withdraw your consent to participate at any time. By affirming consent, you are not giving up any of your legal rights.

Shawna Rodnunsky  
PhD Student, SDSU  
Shawna.Rodnunsky@cgu.edu  
(619) 565-4127

Dr. Philip Dreyer  
Professor, CGU College of Education  
philip.dreyer@cgu.edu  
(909) 607-1239

Dr. Alberto Ochoa  
Professor Emeritus, SDSU College of Education  
aochoa@mail.sdsu.edu  
(619) 594-6676
APPENDIX C

THINKING AND LEARNING SURVEY
Survey

Q1. What is your age?

Q2. What is your gender?
- Female
- Male

Q3. In what country did you receive your grade school (kindergarten to grade 12) education? You must have had at least six years in one or both of these school systems.
- Canada
- United States
- Other

Q4. What is your highest level of education?
- Less than High School
- High School Graduate
- Some College or University
- Associate or College Degree
- Bachelor Degree
- Graduate Degree
- Post-Doctorate

Q5. What is your household income?
- Under $40,000
- $40,000 to $79,999
- $80,000 to $119,999
- $120,000 to $159,999
- $160,000 to $199,999
- $200,000 or above

Q6. I understand how I learn best. Select how true this statement is for you.

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

Next there will be two open-ended questions followed by four multiple choice questions. Please be as thorough as possible for written questions.

Q7. Think about a situation where you must remember a phone number or another vital piece of information. Take a moment to describe what you would need to do to store this information so it can be used at a later time. Allow yourself 3 minutes for reflection then write a paragraph describing your scenario and learning process.

Q8. Describe your thinking process in general. In what ways do you learn the best? Allow yourself 3 minutes for reflection then summarize your learning process in 3-5 sentences.
Q9. WHERE did you learn this is how you think or how you learn best?
- home
- school
- college or university
- sports team
- on the job
- other (please specify)

Q10. Which category best represents the TIME when you feel you first understood how you learn best?
- Infant until preschool age
- Elementary age (kindergarten to grade six)
- Junior high or middle school age (grades 7 to 9)
- High school age (grades 10 to 12)
- Initial post secondary education or work force
- Graduate education or after being established in the work force

Q11. Select who you feel MOST helped you understand how you learn best. Only select one descriptor.
- grade school teacher
- college or university professor
- coach
- parent
- sibling
- friend
- instructor of a special course on learning
- an author of a book or article on learning
- other (please specify)

Q12. When you are learning something new, select the strategy that you feel works the best for your way of learning:
- trial and error
- using auditory cues or methods (sounds, saying out loud, etc)
- repetition (rereading, rewriting, etc.)
- using visual cues or methods (pictures, colors, etc.)
- understanding the topic or problem from whole to part
- using concrete sequential strategies (put in order, sequential lists, etc.)
- using kinesthetic cues or methods (hands on exposure, physical practice, etc)
- identify the patterns or logic related to the topic or problem
- meditating on the topic or problem
- using musical cues or methods (rhythmic sound, words put to music, etc.)
- communicating and sharing with others about the topic or problem
- using cue cards with key points
- using a metaphor that is familiar to give meaning to the topic or problem
- other (please specify)
APPENDIX D

INTERVIEW GUIDING QUESTIONS
UNDERSTANDING METACOGNITION AND CRITICAL COMPONENTS OF THINKING AND LEARNING IN PUBLIC EDUCATION CONTEXTS

Interview Questions

The interview should take the participant approximately 30-60 minutes to complete.

Initial question:

Think about a recent learning experience you had. Describe the experience with reference to your learning process.

Further questions such as the following may be asked to obtain a greater understanding of the participant's learning process and how they came to understand this process:

“Were you able to identify a specific way that you learn?”

“How does your brain take in new information?”

“How can you remember and comprehend new ideas?”

“How did you come to understand your learning process?”

“What was a time you can recall where you understood how you learn best?”
APPENDIX E

INTERVIEW TRANSCRIPT

(Greg)
Interview Transcript

Participant: Greg
Date: June 4, 2012
Time: 2:00 p.m.

Interviewer: If I asked you about... how you think? Can you tell me how you think best? Perhaps you want to put it in a context, such as you are taking a new course or something like that, do you know how you would set things up so you would learn best in that environment?

Greg: Uhh, for myself its- I find a lot of times when I am just taking information it doesn't necessarily 'stick.' So I need to (points down to table) regurgitate that usually with a pen I find, even computers. It doesn't 'stick '... when I use a pen and write it down ...it tends to stay in as a thought more.

Interviewer: Oh, okay.

Greg: And it is concrete because you are actually writing that thought down. It becomes that word.

Interviewer: When you are writing it, are you saying the words in your head or are you just...

Greg: Uhh, yeah (nodding).

Interviewer: Or sometimes you are thinking the sentences... that would make it more auditory...

Greg: Well, I also put it into my own words. I don't take it verbatim from what they are saying to you. I put it into my own thoughts (pats the table).

Interviewer: So you summarize it or regurgitate it in your own way.

Greg: Yeah.

Interviewer: What if it is a physical thing? Let's say you are taking a sport or something like that? How would you...

Greg: Uhh, for a lot of that learning is by doing for me.

Interviewer: Okay. So you don't need to modify much in that environment?

Greg: Yeah, I just need to understand- so what they say to you- do this and that to get this outcome (gesturing with hands). I need to understand why they are asking that question.

Interviewer: Okay.
Greg: I mean, a lot of times it doesn't become clear until I really understand I am doing this because of this (gesturing with hands) to get that outcome.

Interviewer: Mmmhmm

Greg: So I need those (hand gestures indicating increments going down the table) 'lines' in there as well.

Interviewer: Okay

Greg: And then once I do it, then it all kinda falls in place, right?

Interviewer: Okay.

Greg: (Pause, nodding head in reflection) Probably last year of high school. Probably.

Interviewer: Yeah, okay.

Greg: ... it was more so because of an English teacher I had. She has a big influence on me and how I started thinking about things even. It was more than- it got me thinking , it was more than just the words on the page but try to understand what those words meant in a story. And then relating that in my own way (gesturing writing sentences).

Interviewer: So she kinda gave you some strategies...? Did she actually talk about the idea of... asking how you thought and tried to help you navigate that?

Greg: Nope.

Interviewer: ...or was it more she gave you some examples and you were able to... use that?

Greg: Yeah, and she kinda pushed you to think outside of that box- that they were offering. It was more than just text on a page she was trying to get everyone to push beyond that.

Interviewer: Okay, so even though she never necessarily...help people understand their own thinking. She also did suggested or put it out there that people shouldn't just take the way things are given to them- that there are other possibilities out there.

Greg: Yeah.

Interviewer: So that was enough to help you on your road to...

Greg: (nodding)
Interviewer: So you are saying that the last year of high school. (Pause) Now, I am going to tell you a little story of my background and experience. The very thing about understanding how you think and then also being able to work with that... so if I know I think a certain way then I take action. If I know sitting in a class and listening will not be enough I might draw pictures or I might come up with movements- various things people can do... so, metacognition is how you think... and also using that and influencing your learning environment. (Shared a learning experience with upper elementary students where direct teaching of metacognition occurred). These students came to understand what often people need to wait until after high school to (achieve). What do you think the implications would have been if you started to understand more about your thinking style instead of late high school at late elementary?

Greg: Ahh. It probably would have changed the path for me for sure. A lot of times, for myself, after high school I was still kinda lost as to what I really wanted to do and- yeah, I think if I had started learning earlier and understanding myself more and how I think, and thinks that are important to you, perhaps you would choose a different path (hand gesture in different direction).

Interviewer: Okay. Hard to say in high school, but I was always curious to hear what people say. Some people make that comment, "Gosh, if I knew this what I should have been doing back then, it would have saved me so much frustration."

Greg: Yeah. And it could have been easier. (Shrugs shoulders). An easier path or thought process.

Interviewer: Was there any other experiences you had that helped you understand how you learn? So the first one was a high school teacher- what else helped you shape how you needed to...

Greg: Yeah, I think life experiences. As you went on in (hand gestures indicating increments going down the table)- different environments for working, or people you met, or different things you tried- so you pick up different ways of learning.

Interviewer: So just - it was really quite random. You would see somebody doing something and you would say I am going to try that?

Greg: Yeah, or if you try new things or new experiences- something you have not tried before- every time you try something new you are going to have to learn. And you pick up new techniques on trying to learn things, right?

Interviewer: Okay.

Greg: And that develops as I grew older you start thinking I am going to take a little bit of what I did hear (hand gesture) and apply it to what you are doing now. Or learn a better way to do things.
After the formal interview, the interviewee also made the following comments:

"One thing I found personally in school (was) a lot of times I would get frustrated or bored with how I was taught. For example, in math they give you a formula and they expect you to go through the formula and you get the final answer. But in my mind, I got the same answer but came about it in a different way...but I was still wrong. So, (pause) they kind of discouraged my thinking and my thought process.... I wish they had of (pause) I guess spent more time in trying to develop an individual... on how they see things, and how they learn, and how they understand things."

"They expect you to go on their line (method of learning)... well like, that is not the only line."