The Untried Path: Exemplary Elementary School Teachers' Understanding of and

Experiences with Classroom Assessment

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Abstract

This qualitative phenomenological research study sought to describe teachers'
understanding of and experiences with AfL, AaL, and AoL when using 21st Century
approaches to teaching, learning, and assessment. Purposeful sampling was used to select
4 exemplary Canadian elementary school teachers who had a history of using a
professional blog for reflective practice. Data collection methods included elementary
school teachers' professional blogs and semi-structured interviews. Data analysis
revealed exemplary elementary school teachers' understandings and living examples of
classroom assessment in a 21st Century context. Results also illustrated how technology-
integrated assessment gave students the "power to create" and demonstrate their learning
in unprecedented ways and provided teachers with rich assessments of student learning.
The study discusses implications for classroom practice and educational research, and
offers some initial thoughts on the interactions among the purposes of assessment. The
study will be of particular interest to teachers who are interested in improving assessment
practices in their classrooms and will provide teacher education programs with insight on
how to best prepare teacher candidates for 21st Century education.

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Dedication

To my children's life narratives: it is the best manuscript I will ever help write. Thank you for all your sacrifices and the "mommy time" you missed as a result of me completing this dissertation. I hope this shows you what hard work and perseverance are made of and that anything is possible if you want it badly enough. For me, it was a balance between professional and family life.

Love you to the moon and back (times infinity!)

Lots of love,

Mommy

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CHAPTER ONE: INTRODUCTION

As we move ahead in the early 21st Century, it becomes clear that education will never be the same (Drake, Reid, & Kolohon, 2014; Robinson, 2011; Russell, 2009). The sheer influence of the Internet (and its derivatives) on society demands that education change (Lynch, 2015). Recently, three large technology corporations (Cisco, Intel, and Microsoft) have expressed concern about the skills of students graduating from school and university; specifically, that graduates are entering the workforce with skills that do not prepare them for employment in the digital age. Such companies identified a need for schools to focus on 21st Century skills because of shifting workplace requirements (Griffin & Care, 2015). Even more problematic, however, is that schools are not prepared to teach and assess 21st Century skills. It has been argued that traditional forms of instruction and assessment may not be suited to teaching and assessing 21st Century skills (Griffin & Care, 2015). Consequently, education must adapt to meet societal demands and better prepare students for the future. Failure to do so would be detrimental to our students. As John Dewey (1916) had predicted, "if we teach today's students as we taught yesterday's, we rob them of tomorrow" (p. 167).

Indeed, education change theorist Michael Fullan (2012) states that dramatic change is occurring in education. For him, the changes have three interconnected aspects: technology, new pedagogy, and teacher as change agent. The catalyst for this change is technology but the future of digital learning in classrooms will require more than just putting tablets in the hands of students to be successful (Bui, 2013). Technology provides a vehicle for teachers to change their delivery methods and to have a greater impact on learning but it does not replace good pedagogy, which is founded on a constructivist

platform, is inquiry-based, and fosters deep learning. Siwak (2013) comments in a recent blog about "globally connected classroom where inquiry, project and problem-based learning are the drivers" and how she has "seen first-hand the enormous impact these approaches have on student engagement, success and intellectual growth" (para. 4). A deep learning approach to learning combined with technology integration fosters a 21st Century learning environment for students. Classroom assessment plays a large role in new pedagogy as it helps teachers identify how well students have learned, what has been taught, as well as how to scaffold students' future learning experiences. Finally, Fullan (2012) claims that teachers must know how change happens and promote change in their classrooms and beyond the educational field. This dissertation is set in the 21st Century context.

This research was conducted in early part of the 21st Century, meaning that time contextualized this research. But, the term "21st Century" means a great deal more than solely a period in time in which this research was set. The progression of time is coupled with technological advancements, which in turn influences what gets taught, how it gets taught, and how student learning is assessed (Fullan, 2012; Popham, 2009). Consequently, technological advancements prompt schools to respond, providing classrooms with the opportunity to use innovative approaches to teaching, learning and assessment. For example, students can use educational technologies to apply knowledge to new situations, analyze information, collaborate, solve problems, and make decisions (British Columbia Ministry of Education, n.d.).

Utilizing emerging technologies in schools provides expanded assessment opportunities, which is crucial to the success of 21st Century teaching and learning

(EduGains, 2013). With that said, preparing students in the 21st Century is not solely about technology integration; it is also about personal and social responsibility, problem solving and critical thinking skills, collaboration, initiative, and cultural awareness. It is up to teachers to infuse possibilities for learning such skills and the infusion of technology to make classrooms as dynamic as the world in which students live. Therefore, when I refer to a "21st Century context" throughout this dissertation I am referring to a period in time (i.e., early 21st Century) but I am also encompassing innovative 21st Century approaches to teaching, learning, and assessment.

Assessment and Evaluation Landscape

Today, there are two seemingly opposite approaches to assessment and evaluation: standardized assessment and classroom assessment. A standardized test is defined as one that is administered and scored in a consistent manner (Popham, 2009). This type of test can be given to an individual student or administered to thousands of students at once on a larger scale. The purpose of large-scale testing is to compare school and student performance in relation to other schools and students of the same age and grade level (Cooper, 2006). Nationally as well as internationally, standardized tests garner a great deal of attention from administrators, policy makers, parents, the public, and often times teachers and students based on their large-scale and high-stakes nature. Large-scale testing can offer useful trend data to help inform accountability systems, school improvement planning, reform efforts, and school funding (Klinger, Deluca, & Miller, 2008). For example, a trend from the Grade 6 EQAO results in Ontario may show that year after year students have difficulty answering questions that require implicit information. Based on this trend, the principal and the junior-grade teachers may set

learning objectives to focus on retrieving implicit information and to make connections with their previous knowledge and experiences when reading. However, despite the usefulness of large-scale testing when making school improvement plans, it offers very little guidance into daily classroom practice (Popham, 2009; Volante & Beckett, 2011).

Wiliam (2011) defined classroom assessment as the gathering of reliable information pertaining to students' knowledge and skills. The purpose of gathering such information is to help make instructional decisions and inform students of their ongoing progress to ultimately promote student learning. Ongoing classroom assessments are most effective in personalizing teaching and learning to achieve the best learning outcomes. Evaluation, on the other hand, is the process of making judgments about student performance in order to quantify achievement or progress (Davies, 2011). Simply put, it is the act of adding a value (i.e., a grade) to students' work. This often happens at the end of a unit or term (Earl, 2007).

Even when using the most effective teaching methods, teachers cannot assume that learning occurs. It is well documented that students develop and learn at different rates (Angelo & Cross, 1993; Cashin, 1990; Sternberg, 1986, 2009) and teaching quality varies from classroom to classroom; therefore, teachers cannot assume all students have grasped what has been taught (Western and Northern Protocol for Collaboration in Education, [WNPC], 2006). As a result, classroom assessment and evaluation are needed to measure what students have learned.

Classroom assessment and standardized testing have unique purposes and therefore yield different types of information to inform teaching and learning on a variety of levels. Thus, though classroom assessment and standardized testing may appear to

have different purposes, they in fact are interconnected and complement each other. Twenty-first century assessment, then, is about balancing high-quality standardized assessments along with effective summative and formative classroom assessments to provide a reliable representation of student learning. It is the balance of both types of assessment that makes up the 21st Century educational landscape (Popham, 2009).

Types of Classroom Assessment

Classroom assessment research has established various ways to gather information about student knowledge and skills. It is usually beneficial for teachers to assess students before the beginning of a unit or lesson to identify students' previous knowledge and skills (Cooper, 2006). This is known as diagnostic assessment and it helps teachers to determine whether students lack skills and knowledge to continue with the intended lesson or if students are advanced in a particular area (Wiliam, 2011). Formative assessment, on the other hand, is carried out on an ongoing basis and used to inform instruction and student learning (Black, Harrison, Lee, Marshall, & Wiliam, 2004). Summative assessment is often coupled with evaluation and happens at the end of a unit or term to find out if students have met curriculum expectations (Earl, 2007).

The timing and the purpose of the assessment determine the type of assessment. Diagnostic assessment occurs before a lesson and/or unit whereas formative assessment occurs frequently throughout a unit. Therefore, diagnostic assessment is conducted before instruction occurs to identify what students already know, while formative assessment is done during or after instruction to see what students have grasped from instruction (WNCP, 2006). Still, the difference between diagnostic and formative assessment is not precise.

The current classroom assessment terminology used in Canadian schools has been further defined and conceptualized. Therefore, this dissertation will use the terms assessment for learning (AfL), assessment as learning (AaL), and assessment of learning (AoL) (Assessment Reform Group, 2002; Earl, 2003, 2007; WNPC, 2006). AfL is the combination of diagnostic and formative assessment, while AaL includes self-assessment, goal-setting, and metacognition. Flavell (1979) described metacognition as one's knowledge concerning one's own cognitive processes. AoL, also known as summative assessment because it takes place at the end of a unit, is used to make a judgment about student performance (Earl, 2007). This dissertation looked at classroom assessment as a balanced assessment program, meaning that each type of assessment had its purpose and relevance to classroom practice.

Technology-Integrated Assessment

Assessment and technology have coexisted in educational settings since the early 20th Century (Russell, 2009). In the past, teachers often used technology as a reward to reinforce positive behaviour, allowing students to work on the computer during free time (Levin et al., 2008). Today, technology not only has the capacity to be used for student enjoyment but can be extremely effective for assessment and learning purposes (Cassidy, 2013; Russell, 2009). Technology provides students with the opportunity to create and to show what they know in a variety of new ways. For example, students can create digital storyboards, learn to code using programs like Scratch in order to make objects move remotely, or create a hypertext essay. Because technology is multi-dimensional, it allows for modern assessment tasks to be more complex over traditional tasks and, therefore, provides students with deeper learning opportunities (Fullan, 2012).

For the purposes of this dissertation, I distinguish between *using technology* and *technology integration* (also referred to as technology infusion); the former refers to the random and sporadic use of technology to instruct students, while the latter is the planned, highly structured, and purposeful use of technology through which the ultimate goal is to help students understand the curriculum expectations and to engage them in new ways of thinking that might not otherwise be possible without technology (Educational Technology and Mobile Learning, 2015). The combination of new technologies with classroom assessment is transforming education (Fullan, 2012). Technology-integrated assessment can be defined as any technological tool used to: gather information about student understanding, inform instructional practices and student learning, or aid in student demonstration of learning. For example, Michelle Lampinen (2013), an English teacher from Biotechnology High School in Freehold, New Jersey, experimented with integrating technology into assessment by creating an interactive instructional rubric, which she posted on her blog. This rubric served as an AfL strategy (i.e., sharing expectations) because students were able to check if they were on target based on predetermined criteria. As well, the rubric came with a QR code so that students could access information from their mobile devices. Lampinen was pleased with how well the assignment was carried out and was overwhelmed by the success of student outcomes. This anecdote supports Fullan's (2012) argument that technology is one of the differentiators of 21st Century assessment.

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Research Problem and Rationale

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Education in Canada is a provincial responsibility. A common vision among most Canadian provinces is for schools to establish balanced assessment programs that include

AfL, AaL, and AoL (Ontario Ministry of Education, 2010; WNCP, 2006). Research demonstrates that AfL and AaL improve student learning when used properly (Black et al., 2004; Black & Wiliam, 1998a, 1998b, 2003, 2009; Gamlem & Smith, 2013; Hadwin & Oshige, 2011; Hattie, 2009, 2012; Valle & Andrade, 2012). Hattie's (2012) synthesis of 800 meta-analyses indicates that AfL and AaL strategies have a greater positive impact on student learning than any other related factors. However, despite the expansion and depth of classroom assessment research, the implementation of a balanced assessment program in a 21st Century context has been slow and superficial (Black & Wiliam, 2009; Dann, 2014; Griffin & Care, 2015; Hill, 2011; Volante & Beckett, 2011). Black and Wiliam (2009) explained that such sluggish implementation can be attributed to the lack of living examples that bridge the research–practice divide (i.e., that provide recognizable situations that teachers can explore in their classrooms), while Andrade (2009) and Brookhart (2009) cite teachers' inadequate understanding of the interactions among the purposes of assessment also impedes the implementation of a balanced assessment program.

As society increasingly moves toward technological solutions and as workplaces expect their employees to have new competencies, it is necessary for education to respond to these changes in order to best prepare students for life outside the classroom. Yet, it is evident from the Assessment and Teaching of 21st Century Skills (ATC21S, 2012) project that education is not keeping up with 21st Century demands. Griffin and Care (2015) identify a need for schools to focus on teaching 21st Century skills and the use of suitable assessments to evaluate such skills because traditional forms of instruction and assessment may not be appropriate to teach and assess many 21st Century skills.

Therefore, establishing new forms of AfL, AaL, and AoL can begin a fundamental change in how we can approach education (ATC21S, 2012).

Teachers need robust examples of how to integrate technology into classroom assessment to best engage students and prepare them for the 21st Century (Cassidy, 2013; Griffin & Care, 2015; Russell, 2009; Wilson et al., 2012). Kim, Lee, Spector, and DeMeester (2013) concluded that teachers recognized the importance of technology-integrated assessment to establish a 21st Century environment for their students; however, teachers felt they lacked the knowledge, skills, and tools to effectively integrate technology, pedagogy, and curriculum. Teachers required living examples of how to effectively integrate technology into all three purposes of assessment and often did not know how to overcome difficulties of implementation (e.g., training, costs, time commitment, and aligning curriculum with assessment and technology).

Purpose of the Research

The purpose of this study was to explore teachers' lived experiences with classroom assessment. Specifically, it sought to explore exemplary elementary school teachers' understandings of and experiences with AfL, AaL, and AoL when using 21st Century approaches to teaching, learning, and assessment. A second purpose was to explore elementary school teachers' experiences with technology-integrated assessment and their perceptions of its effectiveness.

Research Questions

The study sought to answer the following questions: How do exemplary Canadian elementary school teachers understand and experience classroom assessment in a 21st

Century context (i.e., AfL, AaL, and AoL)? How has technology influenced exemplary Canadian elementary school teachers' experiences with classroom assessment?

Background: What Do I Bring to This Research?

Moustakas (1994) recommends that phenomenological researchers identify their own biases and previous experiences at the onset of the study in order to bracket themselves out of the study. However, I agree with Creswell (2013) that it is impossible for researchers to bracket themselves entirely because "researchers have a personal history that situates them as inquirers" (p. 51). I bring assumptions about teaching and learning, scholarship, and a set of ethics to this phenomenological study that inform my research epistemologies, ontologies, and methodologies. Denzin and Lincoln (2011) refer to a researcher "as a 'multicultural subject'" (p. 12) and view the history, traditions, and conceptions of self, ethics, and politics as a starting point for inquiry. As noted feminist and social critic bell hooks (1994) states, "who we are shapes what we do and why we do it" (p. 16). Consequently, my story becomes the impetus for my research (Drake, 1992).

I often find myself thinking about and exploring the interplay of assessment and technology and how both factors, either individually or in unison, shape new pedagogy in the 21st Century. My interests stem from situated experiences: first as a struggling young reader growing up, then as an elementary school teacher experiencing first-hand the difficulties of technology integration, and now as a doctoral student and university instructor fascinated with new technologies and their implications for classroom assessment.

Struggling Reader

My experience as a learner began on a rainy day in a small village in southeast

England. I remember the day quite vividly—indeed, it is one of my first memories. When the school bell rang and my reception teacher opened the classroom door, I clung to my mother with all my might and hoped that the teacher wouldn't see me. My heart was pounding and I could feel the tears welling up in my eyes. I couldn't understand why I had to go to school and, more importantly, why my mother wasn't coming with me. The next thing I knew my teacher was prying me off my mother's blouse, so much so that two buttons popped off! I reluctantly let go of my mother and dragged my feet behind my new teacher into the classroom. All this anxiety ended pretty quickly after I settled into the classroom. I was enthralled by a classroom filled with toys and books!

I did not stay at this school very long as my family immigrated to Canada when I was 5 years old. Moving from England to Canada left me with a pronounced accent and an inability to properly sound out words with ease, and I often felt like an outsider. As time passed, I became terrified to read aloud in class, fearing I would encounter an unfamiliar word. Rather than following along while others read, I would count ahead to see which paragraph I was responsible for and then silently rehearse it beforehand. When my turn finally arrived, my hands would be sweating, my eyes blurry, and I would feel as though my throat was going to close up before I spoke my first word. Nevertheless, I would take a deep breath and begin to read. Without fail, I found myself stumbling over words and not comprehending what I read. I often think back to these moments as I question what my primary school teachers did to help me. Rather than using these choral reading activities as formative assessment, the teachers appeared to simply evaluate me as a poor reader. It was no surprise when I received another C in reading on my report card during my primary years. It wasn't until grade 4, when my teacher started using

summative assessments in a formative manner, that I started to receive the instruction that I needed to become a better reader. After being evaluated on my reading performance, I was sent home with extra activities to practice decoding words that were below the grade-level requirements but would help me catch up to my classmates. Although I didn't realize it at the time, it was not until my grade 4 teacher used information gathered from student reading evaluations that I had the differentiated support I needed for reading. If it wasn't for her, I do not think I would have re-experienced the same passion for reading I felt when I first started school on that rainy, yet promising, day.

Elementary School Teacher

One of my initial hands-on experiences as a teacher helped construct the foundation of this dissertation. For my teacher candidacy, I was matched with a grade 6 teacher who, though eligible for retirement 2 years earlier, continued in the profession while adhering to his traditional ways of teaching. Each of his lessons began with a customary, "Students, open up your textbooks to page…"; I could see the students' eyes glaze over as he began to read through the textbook, page by endless page, summarily followed by instructions to complete the exercise after each lesson with unfinished work constituting as homework. While some would agree that this approach worked in many classrooms for many years (Coughlin, 2011), today there seems to be a disconnection between students' digital home life and non-digital school life. This is not to suggest that teachers stop using traditional methods altogether but my belief is that students benefit from being stimulated, both at home and in school, in a similar fashion in order for them to be engaged and ultimately for learning to occur.

A great irony is that the associate teacher in question was also the school's head

of technology and, as a result, our classroom adjoined the computer lab (which was free more often than not). I thus spent the first few days at my placement questioning the reasons of such teaching methods: Was the teacher hindered by an inadequate knowledge of technology? Was our respective appreciation of technology markedly different, or was the teacher simply not aware of the benefits technology could offer the students? Indeed, how could teaching with technology be so important to me but of little interest to a fellow educator?

In the days that followed, I felt constrained by my associate teacher's preferred way of teaching. I felt both personally and professionally unfulfilled, along with a frustrated sense of responsibility to the continuously unengaged students looking up at me. By week 3, I decided I had had enough. I was going to take control of the situation. I planned a math lesson using Geometer's Sketchpad software, through which students were responsible for creating their own polygons through the use of this electronic medium. The lesson appeared to be a great success given my perceptions of the students' engagement level. I saw smiling students who at last were engaged in what they were learning. Shortly thereafter, my associate teacher's illness-related leave of absence prompted the principal to assign me as the class's primary teacher. I continued to teach from a position aligned with my core beliefs and thoroughly enjoyed every moment of the experience. My students regularly researched self-developed questions online, planned their writing using a semantic webbing program, and engaged in extensive reading through the use of hypertext documents. In comparison, I wondered how reading and writing engagement levels compared in other classes that did not have access to this same technology. Furthermore, I questioned if the technology, though obviously

engaging students, was being integrated in the most effective way for student learning. And finally, I wondered how I could integrate technology into my daily assessment practices. I firmly believed then, as I do now, that having flexible and constant access to technology made my classroom a challenging and unique learning environment that both benefited and embraced 21st Century learners.

Doctoral Student, Researcher, and University Instructor

While writing this dissertation, I often went to a local coffee shop or innovation centre and tapped into their wireless connection with my laptop. Online I searched for journal articles from my university's electronic databases, bought books, and searched for items that were not available in my local area. I also used a smartphone, iPad, and laptop and watched scores of people doing the same: speaking, listening, and texting. I kept in touch with my family, friends, and colleagues around the world through email, social networking sites, and Skype. In fact, some of my participant interviews and Ph.D. committee meetings took place on Skype. In short, all the ways in which I communicate, both orally and written, are mediated by technologies.

Technology provided me the opportunity to collect data in ways I had not done before. Rather than using teacher journals as a data source, I used teachers' professional blogs. This not only provided me with their daily writing of their experiences and reflections (as would a paper journal) but also allowed me to see their classrooms in other ways through images and sound and video files. I would argue that this gave me a much richer picture of what was happening in their classrooms than if I had solely read the teachers' paper journals.

My research interests demonstrate the importance I place on 21st Century teaching

and assessment. As a university instructor, I do not believe in using technology to complete traditional tasks in a different way (i.e., typing out a "good" copy of an essay or taking a computerized test). Rather, I strongly believe technology allows educators to make the impossible possible. It holds the power for students to create and demonstrate their learning in unprecedented ways, meaning that teachers have access to much richer assessments of student performance than ever before. Since technology has provided the classroom with amazing new possibilities, I am diligent in incorporating technology into my classroom in meaningful ways, such as Skype to connect with presenters nationally; student blogging to promote discussion and reflective thought; video to record student interaction and metacognition; and e-portfolios to document learning and growth. For example, in my courses I use video to record students' metacognitive thoughts while working through a task. This allows me to understand their thought processes and highlight areas of difficulty, which in turn informs my future instruction.

As a result of these experiences, I was attracted to exploring technology as an assessment and learning tool for my dissertation research. I come to this research as a teacher and a learner. My research agenda is driven by a thirst for knowledge. Ultimately, I believe that research makes us better teachers.

Summary of the Document

I began this chapter by describing the current assessment landscape and defining relevant terminology, followed by a summary of my research that attempted to fill the research gaps identified by prominent researchers (Andrade, 2009; Black & Wiliam, 2009; Brookhart, 2009; Dann, 2014; Earl, 2003; Gamlem & Smith, 2013; Griffin & Care, 2015; Hattie, 2012; Russell, 2009; Topping, 2009). I then described my previous

experiences that were the impetus for this research study.

Chapter 2 provides a comprehensive, relevant, and timely review of the literature on classroom assessment in a 21st Century context. It examines empirical research and pulls from recent research to provide the foundation and justification for my research questions. Chapter 3 is dedicated to the methodology that guided this research and provides a rationale for using a phenomenological framework combined with descriptions of the research site, participants, procedures, data collection sources, and data analysis methods. Chapter 4 presents each participant's profile, followed in Chapter 5 by a composite description of all four participants' lived experiences with classroom assessment and technology-integrated assessment. Chapter 6 discusses participants' experiences in relation to the literature and provides implications for research and classroom practice.

CHAPTER TWO: LITERATURE REVIEW

This chapter presents a comprehensive overview of the literature pertaining to classroom assessment and technology-integrated assessment in a 21st Century context. It begins with a chronological account of the history of classroom assessment, specifically the seminal works that underpin this research and the development of 21st Century assessment methods. It discusses the current international, national, provincial assessment landscape as well as the conceptual framework used by many provinces across Canada. It also presents a detailed account of AfL, AaL, and AoL in a 21st Century context.

History of Classroom Assessment

Many would argue that classroom assessment and evaluation have been a part of effective teaching practice for decades (Bloom, Hastings, & Madaus, 1971; Dewey, 1916), with testing being the most common method of evaluation (WNPC, 2006). Andrade and Cizek's (2009) *Handbook of Formative Assessment* attributes the origins of formative assessment to Scriven's (1967) work on program evaluation in the American Educational Research Association monograph series on curriculum evaluation. Scriven coined the term "formative evaluation" in the context of school effectiveness. Assessment was not yet defined, as it is today, and formative evaluation strictly served as an ongoing, evaluative function.

Bloom et al. (1971) further defined the concept of formative evaluation to include classroom use. They described formative evaluation as the progression of moving from a strictly summative evaluation paradigm to being much more formative in nature. Their depiction of formative evaluation indicates that they valued the process rather than simply the end product—a key component of present formative assessment practices (Wiliam, 2009). They sought out multiple methods and sources of learning as evidence of

achievement, which began the conversation around reliable classroom assessment (Cooper, 2009). They also argued that reducing the negative aspects of evaluation (i.e., diminishment of students' interest in what they are learning; preference for the easiest task possible; reduction in quality of students' thinking) would have a better effect on students' learning than on grades. Bloom et al.'s clear distinction between formative and summative evaluation was considered a foundational contribution to classroom assessment (Cizek, 2009; Guskey, 2009).

A shift occurred in the 1970s when testing became a heavily relied-upon measure required for graduation (Graue & Johnson, 2011). These assessment-driven reforms were directly connected to evaluation purposes and had serious consequences (i.e., graduation, failure), making the test a critical tool in monitoring quality of student learning (Shepard, 2000). Common practice during this time relied on teaching content, followed by testing students' retention, resulting in a pass or fail. Classroom assessments developed by teachers to monitor student learning, particularly various types of formative assessments, were often seen as idiosyncratic and lacking rigor (Graue & Johnson, 2011).

Natriello (1987) began to make people think about classroom assessment and evaluation differently. The primary purpose of his research was to identify eight purposes of evaluation but the turning point was in his suggestions for future research. In alignment with Bloom et al.'s (1971) earlier work, Natriello recommended that research would need to recognize different assessment purposes that exist in education in order for evaluation to inform classroom practice.

Yet, it was not until Black and Wiliam's (1998a) seminal literature review of 250 research articles that classroom assessment began to shift from a purely evaluative

function to one that was more centred on student learning and achievement. Black and Wiliam (1998a) described using a snowball approach from Natriello's (1987) and Crooks's (1988) references lists to gather research articles. They also scanned 76 journals that would most likely contain articles pertaining to assessment. Combined, these approaches yielded 681 publications. This pool of publications was then filtered down to 250 publications that seemed most relevant to formative assessment (i.e., studies related to feedback, student goal orientation, self-perception, peer assessment, self-assessment, teacher choice of assessment task, teacher questioning behaviour, teacher use of tests, and mastery learning systems). Each study was then coded related to its primary focus in which seven main themes emerged: effectiveness of formative assessment, assessment by teachers, student perspective and teacher role, tactics and strategies, systems, feedback, and prospects for theory of practice. Black and Wiliam (1998b) concluded that the research they reviewed "showed conclusively that formative assessment does improve learning" and that the gains in student learning "were the largest ever reported" (p. 61).

Despite the seminal (and highly cited) nature of Black and Wiliam's (1998b) conclusions, there are major caveats to their analysis. Although their literature review included 250 research studies, only eight studies were chosen as examples pertaining to their status as the most cited publication in *Assessment in Education*. For instance, the review relied heavily on Fuch and Fuch's (1986) meta-analysis investigating the effects of formative assessment on student achievement. Critics such as Dunn and Mulvenon (2009) saw two major limitations to Fuch and Fuch's research; first, the population studied consisted of 83% students with special needs, meaning that only 17% of the research population represented students without identified exceptionalities. Therefore,

generalizing these findings to all students was inappropriate. Second, the research articles included in Fuch and Fuch's meta-analysis ranged in quality from good to poor; of the 21 studies, four were considered good quality (defined as "no more than one methodological problem"), 15 were considered fair quality ("no more than two methodological problems"), and two were of poor quality ("at least three methodological problems"). Some of the methodological problems included "unequivalent subject groups, confounded experimental treatments, non-random sampling to treatments, and inappropriate statistical analysis" (Fuch & Fuch, 1986, p. 202). In other words, 81% of the studies in Fuch and Fuch's meta-analysis were methodologically limited.

Black and Wiliam (1998a) also reviewed another seven studies that collectively showed that formative assessment improves student learning, but all had similar methodological problems as noted above. Additionally, Bennett (2011) argued that Black and Wiliam's literature review was flawed because the research covered was too disparate to be summarized in a meaningful way. Therefore, it could be argued that Black and Wiliam (1998b) were premature in their conclusion that "research conclusively shows that formative assessment improves learning" (p. 61).

Yet, Black and Wiliam's (1998a) literature review inspired their own research study to examine their assumptions about formative assessment more closely. They recruited 24 teachers for their study in the U.K. who were trained during a 6-month period on the concept of formative assessment. The professional development sessions focused on techniques that aligned with the uses of the formative assessment rather than for evaluation purposes. The researchers hypothesized that students' standardized test scores, in this case General Certificate of Secondary Education (GCSE), would improve

if teachers implemented formative assessment into daily classroom activities. The findings indicated "improvements equivalent to approximately one-half of a GCSE grade per student per subject was achieved" (Wiliam, Lee, Harrison, & Black, 2004, p. 63). Although these improvements might seem insignificant, "if they replicated across an entire school they would raise a school from the 25th percentile into the upper half" (Wiliam et al., 2004, pp. 63-64). As a result, Wiliam et al. identified five areas of formative assessment that had the largest effect on student learning: sharing expectations, questioning, feedback without grades, formative use of summative evaluation, and peer- and self-assessment. These findings align with earlier and future evidence collected on formative assessment (Andrade, 2009; Brookhart, 2009; Crooks, 1998; Natriello, 1987; Popham, 2009; Stiggins, 2008; Wiliam, 2009).

More recently, Hattie's (2009, 2012) meta-analyses reported even higher effect sizes[1] (0.73-1.44) than those in Wiliam et al.'s (2004) study when formative assessment was implemented properly. Likewise, Bourke, Mentis, and Todd (2010) asked 964 teachers what types of assessment they used and why. Teachers reported using 24 different assessment approaches and valued each of them differently. For example, observations, checklists, and self-assessments were valued more highly than peer-assessment and standardized tests and therefore used more frequently. This demonstrates the need for further research on the perceived value and impact of formative assessment on 21st Century teaching and learning.

Current Assessment Landscape

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[1] Hattie (2012) explains effect sizes as "a useful method for comparing results on different measures… [and for] a particular intervention to be worthwhile, it needs to show an improvement in student learning of at least 0.40" (p. 3).

The following sections describe the current assessment landscape from international and provincial perspectives in Canada.

International Landscape

At present, many countries across the world rely on standardized tests to provide accountability evidence that schools and teachers are meeting public expectations and to provide country achievement rankings on a worldwide scale (Decker & Bolt, 2008; Popham, 2009). The Organisation for Economic Co-operation and Development's (OECD) Programme for International Student Assessment (PISA) is the world leader in education and assessment and is responsible for testing 15-year old students' competencies on an international level (OECD, n.d.). PISA aims at improving educational quality worldwide and for understanding what causes differences in international achievement (Dominguez, Vieira, & Vidal, 2012). Dominguez et al.'s (2012) extensive bibliometric analysis of academic publications concluded that PISA has considerable impact on scientific research, specifically in the areas of education where student performance is analyzed. These analyses often have significant impact outside of educational research such as policy decisions and or evaluating real estate.

Traditionally, PISA's tests focused on three main areas—reading, mathematics, and science (OECD, n.d.)—and were administered once every 3 years, alternating focus on each of the three areas. However, as society changes so do education and assessment requirements. Recently, PISA deemed digital literacy and collaborative problem solving as essential skills for the 21st Century. PISA's 2009 assessment introduced a digital literacy component; however only a small portion of the member nations were tested on this portion of the assessment. Students were tasked with evaluating online material,

assessing credibility, and navigating webpages to test their digital reading performance. Of the countries that participated, Korea, New Zealand, Australia, Japan, Hong Kong, and Iceland were the top performers (OECD, n.d.). Canada did not participate in the pilot round of the digital literacy test.

As well, PISA has proposed a Collaborative Problem Solving Framework for the PISA 2015 assessment (OECD, n.d.). It plans for students to work collaboratively in small groups to solve a problem. It is unknown at this time how this assessment will be measured. The Partnership for 21st Century Learning has also selected collaborative problem-solving (and ICT literacy) as two areas on which to focus. Hence, if PISA and the Partnership for 21st Century Learning deem these skills as important for the 21st Century and have determined how to properly measure such skills, there is a strong likelihood that schools will begin to emphasize these skills. In short, "what gets measured gets taught" (Popham, 2009, p. 9).

National Landscape

Education in Canada falls under a provincial/territorial jurisdiction. Each province is responsible for creating its own large-scale assessments, curriculum expectations (known as outcomes, standards, or competencies in different jurisdictions), and classroom assessment policies. Large-scale assessments in each of Canada's provinces vary in number and focus and are generally less frequent than their counterparts in the United States, Asia, and many European nations. Yet, provincial testing has taken a prominent role in education as schools are increasingly being held accountable for what and how they are teaching. The results of these evaluations are being used as a form of public accountability to identify whether curriculum expectations have been met and to

make decisions about educational policies and practices. For instance, New Brunswick currently holds the most comprehensive examination program in Canada with literacy and mathematics tests alternating each year from grades 2 to 9, with the exception of grade 6 (as the students are required to write a large-scale science assessment). In Ontario, large-scale testing has been said to be the least invasive, with students evaluated in grades 3, 6, and 10 for literacy and grade 9 for mathematics. Unlike other provinces, Ontario uses an arm's-length government body, the Educational Quality and Accountability Office (EQAO), which is responsible for the creation and administration of large-scale assessments. All assessments are designed and graded by experienced teachers and education specialists.

Alberta is currently undergoing replacement of its provincial achievement test (PAT), which takes place in grades 3, 6, and 9, to "modernize" and "evaluate students abilities more broadly" (Sands, 2013, para. 1). The province plans to adopt a new model that will focus primarily on competency-based assessments rather than content-based assessments (e.g., regurgitation of science definitions). For example, students might be asked to describe the interrelationship between respiration and photosynthesis and provide an example of this relationship within the students' own lives. These changes to the assessment will better reflect the desired 21st Century skills that are integral to students' development. All three territories in Canada also use Alberta's standardized tests with the exception of Nunavut, which uses a combination of Alberta's examinations in tandem with its own.

Educational assessment in Canada generally encompasses two categories: large-scale standardized testing and classroom assessment. Large-scale testing is mostly in the

hands of provincial governments or affiliates, while classroom assessment is ultimately the responsibility of teachers with support from school administrators. There is no formal requirement in Canada to use classroom assessment data for accountability purposes, although all provinces see AfL as an integral component of a balanced assessment program (Earl, Volante, & Katz, 2013; Klinger et al., 2008). For example, the Ontario Ministry of Education (2010) developed an assessment, evaluation, and reporting policy document for Ontario K-12 schools entitled *Growing Success: Assessment, Evaluation and Reporting in Ontario Schools*. This document, which became official policy in September 2012, aims to increase assessment literacy—an understanding of the principles and practice of sound assessment (Stiggins, 2008)—"by solidifying, clarifying, and updating best assessment and evaluation practices in schools across the province" (Ontario Ministry of Education, 2010, p. 3). As a consequence of this document, common goals for schools include improved student learning, maintenance of high standards, and the formation of better mediums of communications between students, teachers, administrators, and parents. As well, ministry programs such as Student Work Study Teacher (SWST), the Collaborative Inquiry for Mathematics (CILM), and the Early Primary Collaborative Inquiry (EPCI) are experimenting with innovative ways to observe student learning, study student work, and gain greater insight into effective instruction (Ontario Literacy and Numeracy Secretariat, 2012). Similarly, British Columbia's Accountability Framework promotes evidence-based, data-driven decision making with a focus on AfL (Government of British Columbia, 2015). Moreover, Saskatchewan has gone as far as creating AfL units (Government of Saskatchewan, 2012). Collectively, a broad scan of the Canadian landscape suggests "a growing recognition of the central

importance of policies that support AfL practices in 21st Century schools" (Earl et al., 2013, para. 1). Large-scale assessment and classroom assessment strive to build consistency of assessment and evaluation practices in order to provide all students with similar academic opportunities.

Current Understandings of Classroom Assessment in a Constructivist Paradigm

The current understanding of classroom assessment is that assessment is an integral part of instruction to support and enhance student learning (Bourke & Mentis, 2014; Dann, 2014; Earl, 2003; Griffin & Care, 2015; Shepard, 2000; Tierney, 2006; Wiliam, 2009). Shepard (2000) promotes this understanding by asking: "how might the culture of classrooms be shifted so that students no longer… work to perform well on a test as an end separate from learning?" (p. 10). She believes the answer lies in a seamless blend between instruction, assessment, and student learning in order to create a learning culture.

A learning culture approach to student learning is rooted in the constructivist paradigm (Drake et al., 2014; Shepard, 2000; Valle & Andrade, 2012). Vygotsky's (1978) social constructivist theories are especially relevant when creating a learning culture because, he argued, learning is co-constructed. "It is not a matter of content transmission by the teacher but an interactive interplay of minds in real contexts" (Dann, 2014, p. 151). Similarly, Shepard (2000) claimed that student learning is an active process of mental construction and sense making; specifically, the teacher activates the student to construct new understandings and acquire new skills. Constructivists believe that assessment can act as a tool to enhance both students' learning and teachers' understanding of students' current level of performance.

For teaching and learning to embody constructivist theories, Shepard (2000) argued that classroom assessment incorporates students' critical thinking and problem-solving skills, meaning that they are actively involved in their own learning. Shepard further argued that dynamic, ongoing assessment is most effective when it is at the centre of teaching and learning, rather than a mere after-effect, in order to create a learning culture that emphasizes learning over test-taking and grades.

Dynamic assessment, as referred to by Shepard, means finding out what students are able to do independently as well as what can be done with adult guidance (Jang & Wagner, 2014). Dynamic assessment is considered a constructivist approach because its assumptions are rooted in Vygotsky's (1978) theory of the Zone of Proximal Development. This type of interactive assessment allows teachers to provide assistance and feedback to students as part of assessment to promote student learning. It also provides teachers valuable insight about how student understanding might be extended and creates perfectly targeted opportunities to teach and provides the means to scaffold next steps.

Shepard's idea of a learning culture anchors students to the centre of the teaching and learning process. She sees assessment as a tool to activate and scaffold student learning while providing teachers with information about student learning. Earl (2003) shares Shepard's vision of creating a learning culture to promote personalized instruction and the involvement students in the assessment process. To this end, Earl (2003) provides a conceptual framework (i.e. assessment triangles) that demonstrates the seamless interaction of instruction and assessment to create a learning culture as described by Shepard. The framework is based on three purposes of assessment, whereby she argues to

shift the balance of assessment purposes from strictly summative purposes to a culture much more grounded in learning through student self-assessment (i.e. AaL) and teachers guiding students through the learning process by using AfL strategies such as the ones suggested by Black and Wiliam (2003) (i.e. sharing expectations, questioning, feedback, formative use of summative tests). Consequently, under this framework students are "sense makers" and therefore an active part of the assessment process.

Earl (2003) uses terminology that reflects three purposes of assessment. In 1998, the Assessment Reform Group coined the terms: assessment of learning (AoL), assessment for learning (AfL), and assessment as learning (AaL). AfL is diagnostic and formative assessment; AaL is self-assessment, which is highly driven by student metacognition, and AoL is summative assessment. Based on these purposes of assessment, Earl (2003) offered a vision of "assessment as an integral part of learning— guiding the learning process and stimulating further learning" (p. 21). She illustrated her vision in a conceptual framework that further defined the three purposes of assessment. While Earl used the same terminology (i.e., AfL, AaL, and AoL) as the Assessment Reform Group (2002), she also contrasted how each of the purposes of assessment are used in traditional versus contemporary classrooms. The traditional model highly emphasized AoL as the predominant focus, measuring learning after the fact; AfL was secondary and informal, while AaL was rare, which is in agreement with Shepard's argument. This approach is familiar to most of us. Yet, it is important to recognize the origin of traditional views of assessment and appreciate how tightly intertwined these views were with testing (Shepard, 2000), because dominant theories continue to operate as the default framework affecting and driving current practices and perspectives (Dann,

2014; DiCerbo, 2014; Shepard, 2000). Personal experiences and teaching philosophies ingrain these old theories into current practices.

However, since this approach is not conducive to a learning culture, Earl (2003) proposed a reconfiguration of emphasis to suit 21st Century learning. According to Earl, an ideal emphasis stresses AaL and AfL as the major components of a balanced assessment program. AaL is at the core, driving assessment and learning. AfL, then, supports students' AaL and learning. AoL still plays an important role but is used only when summative evaluations are needed (i.e., to see if students have met curriculum expectations and for reporting purposes). Shepard (2000) argued that it would be worthwhile to change the social meaning of evaluation to a source of insight instead of an occasion for rewards or punishment. The reconfiguration of assessment purposes is timely because self-assessment and metacognition (i.e., AaL) have been highlighted as important skills for students to acquire to be successful learners in the 21st Century (AT21CS, 2012; Binkley, Erstad, Herman, & Raizen, 2012).

A Balanced Assessment Program

Many have argued that all types of assessment contribute to student learning in some way (Assessment Reform Group, 2002; Earl, 2003; Ontario Ministry of Education, 2010; WNCP, 2006). However, "the trick is getting the balance right" (Earl, 2003, p. 25). AoL, AfL, and AaL each have a specific purpose and hence a legitimate place in an assessment program but often times the purposes are muddled and the balance is incorrect (Volante & Beckett, 2011). For example, it has been documented that many teachers overuse AoL (e.g., testing for summative purposes) and underuse AaL (e.g., self-assessment) (Volante, Drake, & Beckett, 2010).

With that said, there are times when summative data about student achievement is needed, such as at the end of a unit to measure what students have grasped. Still, there are times when progress information is needed, such as during a multilayered performance assessment to ensure students are on target or if further instruction is needed. Likewise, peer assessment can be helpful in showing students the mistakes they have made in their own work. These examples demonstrate appropriate uses of AoL, AfL, and AaL in practice. Ultimately, teachers' professional judgment becomes critical when deciding the appropriateness of each purpose of assessment—whether it be a formative or summative approach, a normative or criterion-referenced test, a self-assessment, or peer-assessment—and how each purpose fits into their balanced assessment program that matters most. Bourke and Mentis (2014) recommend that teachers frequently ask themselves this question: "What am I attempting to assess, for what purpose and for whom?" (p. 388). This is because the same (or similar) tool could be used for formative or summative measures, depending on the purpose. For example, a teacher might use an instructional rubric to share curriculum expectations with the students (goal-setting) or as a progress check (formative) and then use the same rubric to evaluate the end product (summative). Therefore, a tool is not inherently formative or summative; the purpose defines its function (Bourke & Mentis, 2014).

Bourke and Mentis (2014) argued, "There is no recognized 'best practice' to assess the learning of students" (p. 386). It has been argued, however, that a balanced assessment program is anchored in AaL (Andrade, 2009; Brookhart, 2009, Earl, 2003; Valle & Andrade, 2012); that is, AaL drives daily assessment whereby students assess their own work and the work of their peers to become self-regulated learners. In

conjunction with AaL, assessment is most effective when AfL is used on an ongoing basis to support students' AaL and to inform daily instruction. AoL adds value to a balanced assessment program because it acts as a checkpoint to ensure students have met curriculum expectations for units. Bourke and Mentis offer an integrated assessment framework to conceptualize the integration of a range of assessment approaches to show how each contributes to student learning. The assessment framework portrays the dynamic interplay of various components of assessment in different contexts, across formal (i.e., standardized and normative testing) and informal (i.e., ipsative and self-assessment) contexts (Bourke & Mentis, 2014). Although Bourke and Mentis do a good job of providing an overall big picture view of the functions and appropriate use of each type of assessment, the framework is still lacking the micro interactions and interactions among the purposes of assessment—specifically, how teachers and students use different types of assessment to inform one another in practice (Brookhart, 2009). "It seems that the question is not so much whether formative and summative assessment mix in practice, but how that happens" (Brookhart, 2009, p. 295). For example, how does ongoing self-assessment inform and impact AoL? Or what impact, if any, does teacher feedback have on student metacognition? Therefore, the "correct" balance relies on students being an integral part of the assessment process and the implementation of teachers' professional knowledge and judgment. Earl and Katz highlight that "it is important for teachers to understand the three purposes of assessment, recognize the need to balance among them, know which one they are using and why, and use them all wisely" (as cited in WNCP, 2006, p. 14).

The following section expands on the effective assessment practices discussed above in a 21st Century context and discusses how technology can effectively be integrated into classroom assessment to better teaching and enhance student learning.

Classroom Assessment in a 21st Century Context

The phrase "21st Century teaching, learning, and assessment" has garnered much attention in recent years and yet many critics say the phrase has been overused and ill-defined, or at least defined inconsistently (DiCerbo, 2014; Griffin, McCaw, & Care, 2012). I've often called to question the merit of defining skills such as creativity and problem-solving as 21st Century skills: didn't people have to be creative and use problem-solving skills in previous centuries? However, Scardamilia, Bransford, and Kozma (2012) noted that in most cases these skills were only used by the elite class. Kozma and Roth (2012) argue that now, because of the ubiquity of technology, these skills are required in a much larger swathe of the population. As well, Griffin and Care (2015) perceived these skills as tangents of themselves, meaning that creativity and problem-solving take on new forms when immersed into 21st Century. DiCerbo (2014) recommended that students understand and apply 21st Century skills because technology, and as a result society, will require them to do so outside of the school environment. Therefore, because technology is changing which skills are valued and what is expected to be taught in schools, the way we teach, learn, and assess must adapt.

The Partnership for 21st Century Learning (P21) emerged as a major advocate for 21st Century teaching, learning, and assessment. This union of public, private, nonprofit, and educational groups created a framework that focuses on 21st Century outcomes (a blending of specific skills, content knowledge, expertise, and literacies) with innovative

support systems to help students master abilities required of them to be successful in the 21st Century (AT21CS, 2012). The P21 hosted the AT21CS project, which is an international group that has worked to define essential 21st Century skills and develop ways to measure them. This theoretical model uses Binkley et al.'s (2012) comprehensive definition of 21st Century skills, which outlines 10 skills across four categories: ways of thinking (i.e., creativity and innovation; critical thinking, problem-solving, and decision-making; learning to learn; metacognition); ways of working (communication, collaboration); tools of working (i.e., information literacy, research, and ICT literacy); and living in the world (i.e., citizenship, life and career, and personal and social responsibility). Now that these skills have been identified as markers of the 21st Century, more research is needed on how to assess and measure such skills in a classroom context (AT21CS, 2012; DiCerbo, 2014; Greenstein, 2012; Wilson et al., 2012).

DiCerbo (2014) illustrates how teachers bring pre-digital conceptualizations to a new digital world; he urges teachers to move ahead in measuring the skills needed for a 21st Century environment while "still being tied to old ways of assessing and evaluating in old environments with old conceptualizations" (p. 502). For example, Wilson et al. (2012) discussed how technology is being used in classrooms to replicate paper-pencil tests but Cassidy (2013) argues that the benefits of using technology extend beyond the replacement of traditional methods. Fullan (2013) argues that "in education we have just about reached the end of squeezing good out of an outdated school system. The current system is too costly, too ineffective, and as any kid will tell you, deadly boring" (p. 5). Fullan (2013) maintains that this can be changed and it will turn out to be easier than anticipated—"easier because the new alternatives are incredibly less expensive and

immensely more engaging" (p. 5). Bourke and Mentis (2014) discuss the changing ideas pertaining to assessment and the new possibilities technology offers 21st Century assessment rather than simply digitizing traditional methods.

Regardless of whether teachers choose to use traditional or 21st Century approaches in their classrooms, there still remains a teacher responsibility to maintain the integrity of classroom assessments under both conditions. That is, irrespective of whether an assessment is considered traditional or 21st Century, each "must demonstrate principles and criteria so that its quality is high" (McMillan, Hellsten, & Klinger, 2011, p. 57). Traditionally, assessment quality has been determined by the extent to which conditions of validity and reliability were met (and remains true for many large-scale tests across the country). However, in most classrooms such technical qualities have little relevance because the purpose of the assessment is different. That is not to say that ideas of validity and reliability are not important criteria for classroom assessment but high-quality classroom assessment involves many criteria as well, substituting technical types of validity and reliability with concerns about how the assessments influence learning and provide fair and credible reporting of student achievement (McMillan et al., 2011). High-quality assessments, then, are technically sound and provide results that demonstrate and improve targeted student learning and inform instructional decision-making (McMillan et al., 2011).

McMillan et al. (2011) suggest that high-quality assessments provide reliable, valid, fair, and useful measures of student performance. Quality is enhanced when a range of important criteria are met such as: different types of assessment to ensure reliability, validity in teacher inferencing when giving a grade, unbiased grading, et

cetera. Yet, arguably the most important criterion that needs the most attention when moving to 21st Century assessment approaches is appropriateness of the assessment method (McMillan et al., 2011). Although most expectations may be measured by several methods, certain methods measure certain expectations better than others (McMillan et al., 2011; Rogers, 2014), therefore when teachers implement new 21st Century approaches to assessment they are encouraged to ensure the method is best fit for the expectation being measured.

Teachers utilize technology for assessment purposes to varying degrees (Binkley et al., 2012; DiCerbo, 2014; Puentedura, 2014; Wilson et al., 2012). Some teachers experiment with technology by replacing traditional assessment methods with newer, digitized ones while other teachers infuse technology in unprecedented ways to transform the way they teach and assess. The SAMR model offers a framework to explain the progression of technology integration into teaching and learning (Puentedura, 2014). The first level is substitution, in which the new technology replaces the old technology but it does not change the task (e.g., when students use Google Docs solely as a word processor). The next level is augmentation; at this level, the technology is still a substitute but provides more functionality as students work to complete the same task. In the instance of Google Docs, it allows students to collaborate on a document and save to the Cloud, providing access from anywhere. The next level is modification, in which the technology redesigns part of the task and transforms students' learning. Students providing instant feedback to their peers on Google Docs is an example of modification. The final level is redefinition, at which level teachers are able to redesign and create tasks that were once unimaginable; for example, completing a joint written task on Google

Docs with a class across the world where students write about the differences between their cultures. As teachers move from substitution to redefinition, they are moving from enhancement to transformation of student learning. This framework is ideal in helping teachers create blended learning experiences for their students.

The Online Learning Consortium (2014), previously the Sloan Consortium, defines blended learning as the application of both traditional learning methods and technology-enhanced learning. Generally speaking, blended learning is viewed as the integration of didactic teaching methods and the use of technology, mainly online technologies (Online Learning Consortium, 2014). Under this framework, technology is used to develop and extend didactic, face-to-face teaching methods by increasing students' power to investigate, explore, and communicate (Martinovic & Manizade, 2014; Olive et al., 2010). While claims, mostly based on anecdotes, have been made about the relative effectiveness of various blended learning models relative to more traditional forms of instruction, little evidence has been collected to support these claims (Means, Toyama, Murphy, Bakia, & Jones, 2009; Murphy et al., 2014).

Technological Pedagogical and Content Knowledge (TPACK) is a framework that identifies the knowledge teachers need to teach effectively with technology. The TPACK framework extends Shulman's (1986) idea of pedagogical content knowledge. He believed that content knowledge and pedagogy were treated as mutually exclusive. To address this dichotomy, Shulman introduced the notion of Pedagogical Content Knowledge whereby it is valuable for teachers to possess a strong understanding of "what" to teach and "how" to teach. Content knowledge included the facts, concepts, and theories of the subject area while pedagogical knowledge included teaching and

classroom management strategies. Shulman noted that master teachers seamlessly integrate content and pedagogical knowledge to deliver effective lessons. Recently, technological knowledge has been added into the model to provide teachers with an understanding of how to teach and assess content with the integration of technology (Koehler & Mishra, 2009).

The following sections explore each purpose of classroom assessment (i.e., AoL, AfL, and AaL) in a 21st Century classroom and the possibilities for technology-integrated assessment.

Assessment of Learning (AoL)

AoL is summative and closely tied to evaluation of student work. It usually occurs at the end of a unit or term (Earl, 2007). Its primary goal is to confirm whether students have met curriculum expectations and are exemplified by end-of-unit tests, projects, term papers, and final examinations (Drake, 2007). Most teachers are comfortable with AoL because they grew up in a school system that relied heavily on AoL, particularly test taking (Kaufman, 2003). Most Canadian schools adopt AoL as it aims to see if students have met the specified, predetermined criteria and learning goals (Cooper, 2006). Airasian, Engemann, and Gallagher (2012) argued that the primary aim of AoL is to "provide students with a fair opportunity to demonstrate what students have learned from the instruction… rather than tricking students into doing poorly or ensuring all students receive an A" (p. 89).

Evaluation. AoL is often associated with evaluation because teachers judge student performance to evaluate performance and issue a grade. Allal (2013) discusses teacher professional judgment as a cognitive and social act; these judgments of end-of-

term grades involved two main operations: "gathering information from a variety of sources and combining information in an interpretative synthesis that sometimes includes an arithmetic algorithm" (p. 26). According to Allal, teachers rely primarily on quantitative student data while grading AoL tasks but use qualitative sources to aid in finalizing student grades when the numbers were inconsistent across assignments. Examples of qualitative sources included evaluations such as informal observations, interactions with students, and examination of students' daily work folders. Teachers also identified the socially situated nature of using professional judgment when grading student work and performance such as interactions with students, collaboration with colleagues and appropriation of rules and resources. The Ontario Ministry of Education's (2010) *Growing Success* argues against using socially situated evaluations to calculate grades. It recommends that grades not be confused with learning skills, therefore teacher evaluations of students' performances be denoted by a letter or percentage grade while other factors such as interaction with peers, effort, and conflict resolution be evaluated under the learning skills portion of the report card.

In general, grades are used for reporting purposes to communicate with students and parents about achievement level (Cooper, 2006), therefore consistency among grades would be an asset to the profession, meaning that a B+ given by one teacher would be the same B+ from another teacher. As well, often these judgments lead to grouping students and recommending whether students be promoted or placed in special programs.

Traditional versus performance-based assessment. AoL is categorized into either traditional or performance-based assessments. An example of traditional assessment would be either a test or a quiz that attempts to tap into students' "knowing."

Traditional tests are worthwhile when teachers are evaluating factual information. For example, tests are most effective when evaluating whether students have met content criteria. On the other hand, performance-based assessment permits students to "show what they know" (Drake, 2012). Koh, Tan, and Ng (2012) argue that unlike traditional assessments, performance-based assessment underscores knowledge construction, complex thinking, elaborated communication, collaboration and problem solving in authentic contexts. Drake (2007) argues that performance-based assessment "begins with a real-life context" (p. 37)—an essential component of 21st Century learning. Therefore, because traditional testing and performance-based assessment evaluate different types of learning, both are needed in a balanced assessment program.

Tests. Tests may be considered the oldest form of assessment still used in schools today. In the past, tests have taken the format of paper-and-pencil evaluations; however, most recently teachers have been experimenting with online, computerized tests for evaluation purposes to adapt to 21st Century demands (Cavanagh, 2013). Moving from paper-pencil tests to digitized ones most likely will not change the student experience greatly but it will allow teachers to analyze the data more easily.

Performance-based assessment. Performance-based assessments are effective in preparing students for the 21st Century as they focus on applying skills in a real-world environment (Barootchi & Keshavarez, 2002; Drake, 2012). The Buck Institute for Education (2015) encourages performance-based assessment as "students go through an extended process of inquiry in response to a complex question, problem or challenge" (para. 1). Assessments such as these help students meet curriculum expectations and practice 21st Century skills such as collaboration, critical thinking, and creativity (Buck

Institute for Education, 2015, para. 1). It is becoming increasingly important for skills to

be acquired and evaluated since information is becoming increasingly accessible on the

Internet. Therefore, the ability to apply knowledge and learn skills are differentiators in

21st Century learning. Based on these school successes, districts across Canada are

encouraging performance-based assessment in schools (Ontario Ministry of Education,

2010; WNCP, 2006).

Fullan (2012) also encourages performance-based learning and assessment in his

model for education. He describes "new pedagogy" for the purposes of deep learning as it

favours 21st Century learning. Fullan and Langworthy (2013) describe the notion of deep

learning:

> to seek to renew our goals for education and learning, to include skills that
> prepare all learners to be lifelong creative, connected and collaborative problem
> solvers and to be healthy, happy individuals who contribute to the common good
> in today's globally interdependent world. We need our learning systems to
> encourage youth to develop their own visions about what it means to connect and
> flourish in their constantly emerging world, and equip them with the skills to
> pursue those visions. (p. 2)

For instance, California's High Tech High facilitates deep learning through an inquiry-

based learning approach. The school's CEO, Larry Rosenstock, describes a vision for

education that embraces real-world learning that flows from personal interests, passion of

discovery, and a celebration of art, science, and technology. At the kindergarten level,

students were asked to choose a bird, an insect, and a flying machine that interested them.

The purpose of this project was to examine ratio and proportion in a real-life context,

driven by student inquiry (Sarda, n.d.). As a whole class and with mentorship from the

teacher, students made a full-size paper model of what a human being might look like if

they were capable of flight. The students discovered that a human would need "10-foot-

long arms to provide enough lift, a chest as big as a barrel to provide muscle power, a

head the size of an apple, legs the size of broomsticks, and hollow bones for weight"
(Sarda, n.d., para. 1). Since this was a kindergarten class, young students showed their
understanding by doing, showing, and telling, with kindergarten teachers using
assessment strategies such as observing, listening, and asking probing questions in order
to assess and evaluate student achievement (Ontario Ministry of Education, 2010).
Consequently, performance-based assessment is appropriate to measure learning
outcomes for this task with a young group of students.

Similarly, in a grade 6 class at the Calgary Science School,[2] students were asked
to brainstorm how they could help their local community. As a result, students
investigated whether the Weaselhead Natural Area produced enough oxygen to sustain
Calgarians (Connect Charter School, n.d.). This inquiry required the use of mathematical
skills, introduced students to the idea of assumptions and bias in science, reinforced the
need for accurate data, and provided an authentic investigation into an important natural
region close to the school.

Another advantage of performance-based assessments is that they can be used in
both a formative and summative manner. Teachers can monitor learning and provide
students with corresponding feedback during each component of the performance task
(i.e., performance-based learning) and evaluate the end product with a rubric (i.e.,
performance-based assessment). Because performance assessments are multifaceted and
include multiple assessment criteria, rubrics are a useful assessment tool to use to
evaluate students' performance (Andrade, 2000; Andrade, Du, & Wang, 2008).

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[2] Renamed as Connect Charter School on January 1, 2014.

Portfolios. Teachers have come to realize the benefits of using portfolios for assessment and evaluation purposes. Hibbard et al. (1996) define student portfolios as "a purposeful collection of student performances that exhibits a student's effort, progress and achievement over a period of time" (p. 188). In fact, Stiggins (2001) refers to portfolios as a way to tell a student's assessment story. Teachers and students choose work to be included in the portfolio; however Carmean and Christie (2006) argued that "to give portfolios purpose and structure it should be organized around curriculum expectations" (p. 37). Sometimes portfolios are deemed students' "best work" or "a work in progress." Regardless of the type of portfolio, artifacts may include but are not limited to: drawings, worksheets, photos, tests, self-reflection, and peer-assessment. Portfolios are a versatile venue for student work in that they can be measured against curriculum expectations while also providing a means of assessing growth over time. Traditionally, portfolios resembled a scrapbook that contained examples of students' work, which relied on large areas of filing cabinets to store. With more and more classrooms going paperless or migrating to the cloud, teachers are turning to e-portfolios. E-portfolios are essentially traditional portfolios, however they are created and stored electronically and have the ability to be multi-dimensional (i.e., various formats such as images, videos, blogs, hyperlinks, storyboards, etc.). Because e-portfolios are stored on the web, they can be shared with people outside of the classroom, thus creating a wider audience for student work (Cassidy, 2013). Many schools in Ontario are switching to e-portfolios (e.g., E-Learning Ontario adopted Desire2Learn's platform which houses e-portfolios).

Assessment for Learning (AfL)

For the past decade, there has been an ongoing debate over the definition of AfL (Bennett, 2011; Black & Wiliam, 2009; Earl, 2003) and as a result "the concept has become somewhat confused" (Bennett, 2011, p. 6). Bennett (2011) describes a "split" understanding of the term; some critics believe AfL is only an instrument or assessment tool while others view it as a process. Bennett further argues that neither viewpoint is entirely correct and that both are an oversimplification:

> It is an oversimplication to define formative assessment [AfL] as an instrument because even the most carefully constructed, scientifically supported instrument is unlikely to be effective instructionally if the process surrounding its use is flawed. Similarly, it is an oversimplication to define formative assessment [AfL] as a process since even the most carefully constructed process is unlikely to work if the instrumentation being used in that process is not well-suited for the intended purpose. (p. 7)

Therefore, neither the instrument nor the process defines AfL in its entirety. Consequently, further research is warranted to examine each component and its role in AfL and to pinpoint a strong conceptualization of the term.

For the purposes of this research, AfL is defined as the process of teachers and students gaining and using assessment information to improve teaching and student learning (Andrade, 2009; Assessment Reform Group, 2002; Black & Wiliam, 2009; Earl et al., 2013). For teachers, it is about seeking and interpreting evidence to decide where learners are in their individual learning compared to learning objectives, where they need to go, and how best to get there (Assessment Reform Group, 2002). Following this process may lead to revisions in class instruction or provide teachers with insight into how to best personalize instruction for the individual student. The primary purpose of AfL is for teachers to improve instruction and for students to learn how to improve learning and performance (Wiliam et al., 2004). Wiliam (2011) suggests that assessing student learning for instruction has proven to have "unprecedented power to increase

student engagement and to improve learning outcomes" (p. 13). Other classroom assessment researchers support this claim (Andrade, 2009; Black et al., 2003; Brookhart, 2009; Cizek, 2009; Hattie, 2012; Topping, 2009). As well, many researchers refer to this as evidence-based practice and the driving force for differentiated instruction (Tomlinson & McTighe, 2006). With concrete data for each student, teachers are able to personalize instruction and provide appropriate scaffolds in order to meet desired curriculum expectations. In the next section I discuss several AfL strategies that have been deemed effective by previous researchers.

Sharing curriculum expectation with students. In Canada, curriculum expectations are usually set by school systems rather than in consultation with students. Consequently, teachers and students may not have the same understanding of what is expected for each learning goal. Chappuis, Chappuis, and Stiggins (2009) argue that the assessor and the assessed must have a clear picture of what is being measured in order for effective learning to take place. Students are better equipped to achieve a learning goal if they understand the goal, assume some ownership, and self-assess their progress (Nicol & Macfarlane-Dick, 2006). Chappuis et al. found that students learn best when they monitor and take responsibility for their own learning. This finding implies that other students could benefit from taking ownership of their own learning along with teachers sharing curriculum expectations and learning goals in student-friendly language (Stiggins, 2004). Therefore, understanding the learning goal means that there is significant agreement between the goal set by the teacher and the students' conceptions of the goal (Hughes, 2009). This can be achieved by translating curriculum expectations into student-friendly language, sharing achievement charts and levelled anchors (i.e. performance examples at

each level of the rubric), and by focusing on the intended outcomes while staying accountable to what is taught and learned.

Stiggins (2007) posits that sharing expectations as an AfL is most effective when learning objectives are concrete and direct. However, Wiliam (2009) argues that when students engage in particularly creative work and explore possibilities, such precision would be neither possible nor desirable. By extension, Torrance (2007) argues that too much transparency of criteria leads to "criteria compliance" and produces students who are dependent on their teachers (p. 282). Finding a balance between these two extremes avoids the "playing the game" and "anything goes" mindsets.

Classroom "talk" and questioning. Oral questioning is a popular AfL technique for classroom teachers because some teachers ask as many as 200 to 400 questions per day (Brualdi, 1998). Classroom "talk" (which includes questioning) is defined as the conversation that happens between the teacher and students in relation to classroom learning (Hattie, 2012). Its purpose is to determine students' understanding and teachers' instructional effectiveness. As Hattie (2012) explains: "questions [as a part of classroom talk] are often the glue to the flow of the lesson … questions are enabling, keeping students active in the lesson, arousing interest, modeling enquiry, and confirming for the teacher that 'most' of the students are keeping up" (p. 83).

Depending on how they are posed by the teacher, questions can either stimulate lower- or higher-order thinking in students. According to Bloom, Englehart, Furst, Hill, and Krathwohl's (1956) taxonomy, recalling information is an example of low-level thinking, applying information to solve problems is mid-range thinking, while synthesizing ideas and evaluating material is high-level thinking. Teachers can address

these levels of thinking by using various types of questions. For instance, convergent questions have a single correct answer whereas divergent questions may have many appropriate answers. Divergent questions tend to demand more thought and are most effective when students have grasped basic concepts but convergent questioning is a quick way for teachers to know if instruction has been effective and if students comprehend basic concepts. Each level of questioning has a legitimate place in checking for various levels of understanding. Often, different levels of questioning will reveal to teachers the areas in which students are experiencing difficulty, hence aiding to personalize instruction to meet students' learning needs.

Questioning facilitates learning by stimulating thinking and inquiry and keeps students involved in the lesson. Teachers also use questioning to reinforce important points and ideas (Black & Harrison, 2001). Mayer et al. (2009) found positive effects from asking postsecondary students to answer adjunct questions throughout a lesson. In their study, students were asked to respond to the teacher's questions during a lesson using a "clicker" software tool that provided immediate feedback of the students' responses in the form of a graph. Therefore, Mayer et al. argued that student learning gains were from the immediate feedback and most likely because the students paid more attention to the lecture in anticipation of having to answer questions. They also noted that students developed metacognitive skills by self-assessing how well they knew the information and what material needed to be revisited before examination as they went through the lesson.

Questioning is also a way to stimulate productive "talk" amongst teachers and students (Hattie, 2012). Yair (2000) found that classrooms were dominated with teacher

talk for about 70-80% of the time. And yet, Alexander (2008) found that a balanced

dialogue between teacher and students had a powerful effect on student involvement and

learning. Features that were found to be most influential were teachers probing children's

thinking and understanding through the use of questioning, students asking more

questions than teachers, and giving students the opportunity to comment on ideas. As

well, Topping (2009) concluded that questioning allows students to hear their peers'

interpretations and explanations of ideas that can then be added to their own schemas.

Often, other students explain issues in ways that are more in tune with the minds of their

peers (Airisian et al., 2012).

    Summative assessment as AfL. Using summative assessment in a formative

manner highlights the blurred lines between the three purposes of assessment. Bennett

(2011) and Brookhart (2009) argued that ill-defined definitions of formative and

summative assessment is an area of contention for many teachers and researchers. Most

often, tests are seen as summative and are used to determine if students have grasped

content covered within a unit or term. Absolum, Flackton, Hattie, Hipkins, and Reid

(2009) argued that using tests as summative assessment provides little to no effect on

student learning. However, Shepard (2006) highlighted that preparing for a summative

test in itself can be a valuable learning experience for students, hence contributing to AfL

and AaL. Similarly, Rohrer and Pashler (2010) found that test taking can enhance

learning by strengthening the representation of information retrieved during testing and

can slow down the rate of forgetting. Black et al. (2004) claim that in order for tests to

contribute to student learning, it is ultimately the responsibility of teachers to use tests in

a formative way; that is, give students opportunities to see where they went wrong and

revise mistakes. Black et al. (2004) argue that learning occurs in the revisions of summative tests. Therefore, while the main purpose of summative assessment is to provide conclusions of student learning, it can be argued that summative assessment can also be used in a formative way to enhance student learning. The key here though is that the reasons for conducting the assessment (i.e., the purpose) is determined before the onset of the assessment to establish what teachers and students want to get out of the assessment and in turn the type of assessment most appropriate (i.e., AoL, AfL, or AaL).

Some researchers believe that using summative tests to inform instruction is against their essence and are not the intended purpose(s) of summative assessments (Assessment Reform Group, 2009). Bennett (2011) argued that if teachers are in fact using summative measures in a formative way, they need support in knowing how to properly use results (i.e., item analysis or coding) to accurately inform instruction. Black, Harrison, Hodgen, Marshall, and Serret (2011) explored how teachers can enhance their competence in summative assessment in ways that might have a positive effect on student learning. Consequently, teachers could benefit from considering the six key features described by Black et al. (2004) when implementing summative measures for learning: design of task, implementation, portfolios, marking, standardization, and moderation. They argue that when all six key features are implemented effectively, formative use of summative measures are warranted for AfL purposes.

More and more, teachers integrate technology not only to stimulate "talk" but also to expand the possibilities of how the curriculum can be taught and engage learners to deepen learning (Fullan, 2012). For example, the Ontario grade 1 Social Sciences curriculum expects students to learn about community roles and responsibilities (Ontario

Ministry of Education, 2013). To meet these expectations, some teachers have experimented with Voice over Internet Protocol (VoIP), most commonly known as Skype or FaceTime, to connect students with community professionals (e.g., doctors, astronauts, firefighters, miners). This gives students the opportunity to formulate their own questions to ask community experts. A popular example of this technology is when Chris Hadfield, a Canadian astronaut, skyped with classrooms while on a space mission (Woods, 2013). Students were able to see space in real-time as a result of this interaction. Hadfield also accumulated half a million likes on Facebook and went from 20,000 Twitter followers to over 1 million in just 5 months (Woods, 2013).

Some would argue that making connections with the community has been a long-standing practice in classrooms (Gruenewald & Smith, 2014; Henderson & Mapp, 2002). For example, in the past teachers have set up pen pals for students with other classrooms from around the world. The distinguishing factor between then and now is that technology, such as email, Skype, or instant messaging, has produced a new medium through which communication is virtually instantaneous. For example, WorldVuze is a new company whose flagship product is a platform for students to question and discuss topics with other students from around the world (WorldVuze, 2014). The WorldVuze founder, Julia Colborn, believes this platform will help students gain a deeper understanding of themselves and others, and how they relate to the world (Personal communication, September 5, 2013).

Blogging is another example of how teachers stimulate talk through the integration of technology. Some teachers have commented that blogging is a great way for students to be reflective about the curriculum and that it offers opportunities to

collaborate with peers (Cassidy, 2013). Many blogging sites offer file and video attachment options to share student work. One of the major benefits of student blogging is that it provides students with a real audience (Couros, 2013). Teachers, peers, parents, grandparents, and the public can comment on student work, provide feedback, and spark an online conversation related to the work. VoIP and blogging are two examples of how technology-integrated learning offers endless possibilities for fostering 21st Century skills.

Because questioning and talk are broadly defined and comprise a large variance in merit, Wiliam (2009) cautions that "not all elicited evidence is equally useful" (p. 33). For such evidence to be "instructionally tractable," it will need to be driven by a clear understanding of learning intentions and how student responses are used to gauge where they are in the learning compared to learning goals (Wiliam, 2009, p. 33).

Feedback. Feedback is conceptualized as "information provided by an agent (e.g., teacher, peer, parent, mentor) regarding aspects of one's performance or understanding" (Hattie & Timperley, 2007, p. 81). For the purposes of this dissertation, the term feedback simply means "teacher feedback on student schoolwork" (Brookhart, 2008, p. 1). Teacher feedback provides students with insight into how their work fares relative to curriculum expectations, learning progress, and often provides recommendations for improvement (Hattie & Timperley, 2007). Effective feedback often provides information specifically relating to the learning task which fills the gap between what is understood and the goal of what is to be understood (Brookhart, 2009; Jang & Wagner, 2014; Sadler, 1989; Vygotsky, 1978). This gap may be reduced through a number of different cognitive processes, including restructuring understanding,

confirming when students are correct or incorrect, indicating that more information is needed and/or available, offering students next steps for improvement, or indicating alternative strategies to understand the information at hand (Hattie, 2012).

The origin of feedback was rooted in a behaviourism paradigm. Skinner (1953) theorized that consequences of a particular behaviour reinforce or inhibit the reoccurrence of that particular behaviour. Specifically, desired behaviour is positively reinforced while undesired behaviour is punished. In the context of feedback, the teacher ideally reinforces proficient performance while minimizing mistakes. Frequent feedback encourages and maintains intended learning goals. Brookhart (2008) refers to feedback as the "double-barreled approach," tackling both cognitive and motivational factors simultaneously:

> Good feedback gives students information they need so they can understand where they are in their learning and what to do next—the cognitive factor. Once students feel they know what to do and why, most students develop a feeling that they have control over their own learning—the motivational factor. (p. 2)

Using behaviourist theory and Brookhart's analogy, one would expect that feedback is always effective; however, research tells us this is not always the case.

As the practice of feedback evolves, feedback moves further away from its origins in a behaviourist paradigm. Studies now show that not all feedback has a positive effect on student learning (Butler & Winne, 1995; Dweck, 2007; Gamlem & Smith, 2013; Kluger & DeNisi, 1996). Students' feelings of self-efficacy are often tied to their work, therefore even well-intentioned feedback can be destructive on their sense of self and performance level. For example, students may feel a sense of self-fulfilling prophecy—"I knew I couldn't do it" or "I quit because I'm too stupid for this task." Accordingly, it would be beneficial for teachers to create a classroom culture that permits students to

make mistakes and see the value in constructive criticism for self-improvement (Brookhart, 2008; Dweck, 2007; Shepard, 2000). Feedback now involves the conscious effort and thinking process of the student rather than merely the teacher fixing the mistakes. Effective feedback promotes deep thinking in students (Dweck, 2007; Fullan, 2012).

Feedback is about the student, and a process that does not end with teacher feedback. Effective feedback allows students the opportunity to make changes and learn from their mistakes. Effective feedback is time consuming for the teacher and relies on students to put forth a great deal of effort (Hattie & Timperley, 2007). Winne and Butler (1994) summarized feedback as "information with which a learner can confirm, add to, overwrite, tune and restructure information in memory, whether that information is domain knowledge, metacognitive knowledge, beliefs about self and task or cognitive tactics and strategies" (p. 5740). Brookhart's (2008) research recognizes that teacher feedback is filtered through students' perceptions (influenced by prior knowledge, experiences, and motivation). Students then are responsible for making meaning from their own perceptions and choosing which feedback is valuable to their learning. Making meaning requires students to use their own thought processes and metacognition. Butler and Winne (1995) offer examples of this thought process: deciding on intended learning goals, strategy use for reaching learning goals, and producing corrections. They referred to the process as self-regulation.

Butler and Nisan (1986) investigated the effects of grades, comments, or no feedback on a divergent thinking task. Their conclusions support Brookhart's analogy of feedback as a "double-barreled approach" in that they found that students who received

feedback on the first task performed better than those who received a letter grade who, in turn, performed better than those who received no feedback at all. The researchers concluded that grades emphasized quantitative aspects of learning, repressed creativity, fostered fear of failure, and weakened students' interest. In contrast, no negative consequences individualized feedback. In a subsequent study, Butler (1988) found that the group that received only comments specifically tailored to students' performance showed a significant increase in scores (by almost 30%) on a task. The group that received only grades showed a significant decline in scores, as did the group that received both grades and comments. Analysis of students' reports of interest in performing the task demonstrated a similar pattern, with interest being low for both graded conditions (Butler, 1988).

Bulter and Nisan's (1986) findings suggest that "the best feedback isn't a score or a grade; it's clear and specific guidance on how to improve" (as cited in Goodwin & Miller, 2012, p. 83). In contrast, Drake et al. (2014) found that students appreciated having both descriptive feedback and a percentage grade. The reason being is that students wanted to know if the feedback was in reference to a failing paper, a mediocre paper, or a stellar paper. It seems that without a sense of the normative, students had trouble judging the quality of their own work against performance criteria (i.e., a rubric). In addition, they found that when students received a grade and written comments, the grade trumped the written feedback. Some students felt they did not need to read the comments, as the grade was self-explanatory.

Although students in Drake et al.'s (2014) study felt that grades helped them judge the quality of their own work, the use of feedback alone (without grades) has been

seen as integral to student learning (Black et al., 2004; Brookhart, 2008; Goodwin & Miller, 2012). Gamlem and Smith (2013) explored how lower-level students perceived classroom feedback. Feedback usefulness was contingent on three broad orientations: feedback valence, feedback types, and relations and honest feedback. First, feedback valence referred to whether the students perceived feedback as positive or negative. Students described positive feedback as "feedback that gives approval of performance, achievement or effort and specifies what can be done to improve the work" (Gamlem & Smith, 2013, p. 159). Negative feedback was described as "feedback where students are told that they could have done a better job even when they believed they had done their best work, or when teachers say they should have worked harder or better in the future" (Gamlem & Smith, 2013, p. 159). The students in Gamlem and Smith's study described negative feedback as a "thorn" in their learning. For example, a typical student response was "if I knew more I would have written it; I don't know what more to write. Teachers should tell me what's missing" (Gamlem & Smith, 2013, p. 159). This perspective is in alignment with Wiliam and Leahy's (2007) research that describes positive feedback as being formative for students (i.e., improves learning) and negative feedback as leaving students dismayed, unmotivated, and not knowing what to do or where to go next.

Gamlem and Smith deemed honesty and relations as integral to effective feedback, meaning that feedback is most effective when the person giving the feedback (teacher or peer) is someone the students trusts, deems to be clever, and someone in which they have a positive relationship. As well, they found that feedback had a bigger impact on the learner when the person who was giving the feedback was honest about the

performance, referred to the learning objectives whenever possible, and provided cues for improvement.

    Feedback model. Hattie and Timperley (2007) offer a model of feedback, which informed my research. They claim that the main purpose of feedback is to "reduce discrepancies between current understandings and performance and a goal" (p. 86). Effective feedback must answer three major questions: "(a) Where am I going? (b) How am I going? (c) Where to next?" (p. 86). Hattie and Timperley suggest that these questions align with Frey's (2011) feedback model: *feed up* (where am I going?), *feed back* (how am I going?), and *feed forward* (where to next?). These researchers believe that answering such questions throughout the learning process will scaffold learning and narrow the gap of unknowing. The questions are dependent on the quality of feedback given and students' metacognitive abilities and efforts.

    Feed up (where am I going?) entails planning and goal setting. This principle aligns with a backwards design model whereby students "plan with the end in mind" (Wiggins & McTighe, 2006, p. 3). It is also important for teachers to share curriculum expectations and provide exemplars to students. By doing so, students can create a road map (paper or mental) about how to reach the specified criteria. In addition, students can think about a self-referenced goal, meaning that students provide a goal for themselves based on previous accomplishments and/or challenges.

    Feed back (how am I going?) involves a conversation (oral or written) between students and their teachers, peers, or self typically in relation to a set of standards. Hattie and Timperley (2007) believe that "feedback is effective when it consists of information about progress and how to proceed" (p. 89).

Feed forward (where to next?) is closely connected with previous student performance and teacher feedback associated with such performance. Both performance and feedback is used to determine next steps for instruction.

Rather than working in isolation, the aforementioned questions typically work together (Hattie & Timperley, 2007). More often than not, the answers inform each other and spiral through one another, and not always in a sequential as one might suppose. As Sadler (1989) once argued, closing the gap between where students are and where they aim to be leads to the power of feedback.

Based on the known positive effects of feedback (Black & Wiliam., 1998a, 1998b; Frey, 2011; Hattie, 2012; Hattie & Timperley, 2007), educational technologists recognize the value of including descriptive feedback in their programming. Skill and drill software have used reassurance feedback for some time (e.g., Good work! That's right! Try again!). This type of feedback reinforces correct answers and highlights mistakes but provides little direction on how to improve. Now, technology is becoming so advanced that some software is able to provide detailed feedback that helps students learn and improve. For instance, some educational software includes direct feedback to provide guidance to students and, in some instances, teachers. Khan Academy is a non-profit organization that provides free education worldwide via the Internet (Khan Academy, 2015). Recently, Khan Academy added a student data feature whereby personalized, direct feedback is given to students to avoid misconceptions, and the teachers can evaluate student performance and highlight problematic areas in real time. Because of these features, students can use Khan Academy without the presence of a face-to-face teacher. This emergent technology has definitely provided better ways to communicate and deliver feedback. This is an emerging

field that may foster higher-level thinking in distance learning as opposed to traditional means of feedback in a classroom setting.

Feedback is a direct way of making learning explicit (i.e., what is understood and what needs improvement), and it has a large part to play in helping students facilitate AaL. Andrade (2009) suggested that students develop error deduction skills through the feedback process, which can lead to their own self-feedback aimed at reaching learning goals. Such metacognitive skills can prove very beneficial in future strategizing and self-regulation.

Peer-assessment. Informed by Vygotskian notions, peer assessment is deeply rooted in social constructivism and collaborative learning models. Peer assessment involves learners in collaboration with others, who are seen as generators of feedback information about their own performance and those of their peers (Nicol & Macfarlane-Dick, 2006). Students often are matched with peers of similar ability levels for students to receive valuable feedback. With that said, some teachers find value in pairing a high-ability student with a low-ability student to provide a peer mentorship experience. As Smith and Higgins (2006) argued, the authentic use of peer feedback, whereby students are invited to review and debate peers' contributions and productions, resulted in not only a "more symmetrical distribution of talk" but also talk which was "noticeably more in-depth, exploratory and speculative" (p. 489). Furthermore, Topping (2009) concluded that students were able to see in others' work what they had omitted from their own. Similarly, students in Gamlem and Smith's (2013) study explained that "working with other students gives them a chance to discuss the assignments and receive support and feedback when a student was stuck" (p. 166). Equally as important, Willis (2011) concluded that peer assessment helps learners negotiate an identity as autonomous

learners or to become experts when they feel a sense of belonging within the classroom community of practice.

Despite literature supporting peer assessment as an important AaL method, the students in Gamlem and Smith's (2013) study described peer feedback as sometimes difficult because of "the lack of trust, honesty, and mutual respect… [that] prevents students from being honest when giving feedback" (p. 160). Students shared that sometimes peers used disapproving feedback to get back at students whom they do not like or peers with whom they do not get along (Gamlem & Smith, 2013). Additionally, Volante and Beckett (2011) found that teachers had difficulties implementing peer assessment. One teacher in the study noted that her students weren't able to reach the level of objectivity needed to complete a peer assessment exercise. Many students gave a high numerical grade even though their peers' work did not meet established criteria. As a result, Volante and Beckett recommend that student judgments be confined to qualitative feedback (i.e., comments without a numerical evaluation) to avoid outside factors interfering with the overall assessment (i.e., friendships, lack of content knowledge, interest).

The previous sections describe the research findings regarding effective ways to implement AfL into classroom practice. It is appropriate here to expand on the definition of AfL to demonstrate the affiliation of AaL with the goal of learner autonomy. Recent research claims that AfL is the bridge to AaL in practice (Andrade, 2009); that is, AfL can stimulate AaL. Willis (2011) further defines AfL as "assessment practices within the regular flow of teaching and learning with the purpose of informing and improving student learning to enhance learner autonomy" (p. 401). Willis's definition essentially

reveals the relationship between AfL and AaL. Willis found that AfL practices provided students with explicit guidance about what was expected by the teacher and supported students in negotiating roles and identities as autonomous learners. Dixon, Hawe, and Parr (2011) concluded that engagement in self- and peer assessment is an authentic way in which students can develop evaluative and productive knowledge and expertise, which are necessary prerequisites if they are to become proficient self-assessors. Consequently, the subsequent section describes students' role in the assessment process.

Assessment as Learning (AaL)

Despite improvements in classroom assessments in recent years, Cizek, Fitzgerald, and Rachor (2005) believe that "current indicators for evaluating students are limited and do not provide a valid or reliable assessment of their skills" (p. 93). Saddler and Andrade (2004) suggest the answer lies in "students' ability to develop metacognitive skills" (p. 49) and to become a part of the assessment process as students are the link between assessment and learning (Earl, 2003). The Assessment Reform Group (2002) refers to this process as Assessment as Learning (AaL) in which the emphasis is on the role of students not only as contributors to assessment and the learning process but also as the critical connector between them. AaL emerges "from the idea that learning is not just a matter of transferring ideas from someone who is knowledgeable to someone who is not, but is the active process of cognitive restructuring that occurs when individuals interact with new ideas" (WNPC, 2006, p. 41). AaL "occurs when students personally monitor what they are learning and use the feedback from this monitoring to make adjustments, adaptations, and even major changes in what they understand" (Earl, 2003, p. 25). This is considered the regulatory process in metacognition (Earl, 2003). Through

this process, students can participate in assessment by asking pertinent questions, goal setting, responding to teacher feedback, or completing peer- and self-assessment. The ultimate goal of AaL is for students to develop habits of mind and skills to be metacognitively aware with increasing independence (WNPC, 2006). If more schools begin to focus on AaL as a core component of a balanced assessment program, then the classroom focus will shift emphasis from grades to self-regulated, self-motivated, self-assessed, and student-owned learning (Hadwin & Oshige, 2011).

It is not overtly clear in current literature where AaL sits in our understandings of either assessment or learning (Dann, 2014). In her earlier writings, Dann (2002) promoted the concept of AaL, stating that "assessment is not merely an adjunct to teaching and learning but offers a process through which learner involvement in assessment can feature as a part of learning (p. 153). Earl (2003), however, suggested that AaL is a component of AfL.

Nicol and Macfarlane-Dick (2006) argued that when "assessment is exclusively in the hands of teachers, it is difficult to see how students can become empowered and develop the self-regulation skills needed to prepare them for learning outside [school] and throughout life" (p. 200). The primary goal of assessment is to provide teachers with feedback on student learning. However, Andrade (2009) argues that "students themselves can be thought of as the definitive source of such feedback, given their constant and instant access to their own thoughts, actions and works" (p. 90). Saddler (1989) claimed that ensuring students understand their learning gap (i.e., the gap between what they currently know and what they need to know) is crucial for learning. For researchers in self-regulated learning, this argument is not new (e.g., Butler & Winne, 1995; Pintrich,

2000; Pressley, Snyder, & Cariglia-Bull, 1987; Woloshyn, Elliott, & Kacho, 2001; Zimmerman, 2002). It is well established that effective learners tend to monitor and control their own thoughts, resulting in greater academic success in school (Pintrich, 2000; Sternberg, 2009; Velzen, 2013; Winne & Hadwin, 1998; Zimmerman, 2002). However, the argument that students themselves are a "definitive source of feedback" is a relatively new concept in the assessment literature (Andrade, 2009, p. 90). A substantial part of Dann's (2002, 2014) argument is to involve students in self-assessment with a focus on exploring processes such as self-regulation, self-efficacy, metacognition, and feedback as dimensions of both assessment and learning. There is of course a danger to this approach in that students do not always hold accurate beliefs of their own abilities. To overcome this challenge, it is imperative that teachers facilitate students' self-assessment, correct them when needed, and make the assessment process as transparent as possible so that students learn how to effectively self-assess.

Self-assessment. The consensus among researchers aiming to promote assessment literacy indicated that involving students in the assessment process is vital to student learning; however it seems that many teachers are reluctant to use self-assessment with their students. (Andrade, 2009; Brookhart, 2009; Earl, 2012; Dann, 2014; WNPC, 2006; Topping, 2009). A reason for this discomfort can be attributed to relinquishing authority and the requirement to change roles and responsibilities in the classroom (Volante & Beckett, 2011).

Metacognition. Student metacognition has received little consideration in the literature on AfL and AaL despite its key role in students' ability to self-assess (Andrade,

2009; Velzen, 2013). Researchers who study metacognition have presented the following definitions:

- "The knowledge and control children have over their own thinking and learning activities" (Cross & Paris, 1998, p. 131).

- "A form of executive control involving monitoring and self-regulation" (Schneider & Lockl, 2002).

- "Awareness and management of one's own thought" (Kuhn & Dean, 2004).

- "Knowledge of one's own thought process" (WNPC, 2006, p. 41).

- "The monitoring and control of thought" (Martinez, 2006, p. 696).

Simply put, metacognition is "thinking about thinking" (Flavell, 1979). Nelson and Narens (1990) developed a framework to describe the interplay between task performance and metacognition. They referred to the task as the "object level" and metacognition as the "meta level." Object-level processing refers to specific components of the task, "such as object recognition, phonological coding, and semantic processing" (Shimamura, 2008, p. 373) that work simultaneously and relatively independent of one another. Collectively, the tasks are monitored by the meta level. Meta-level processing is used to "evaluate object-level activations and, based on this evaluation, initiate feedback control" (Shimamura, 2008, p. 373). Nelson and Narens (1994) suggest that metacognition makes learning more efficient by shaping actions at various stages of task completion (i.e., performance).

The meta level (i.e., metacognition) consists of two components: knowledge and regulation (Brown, 1987; Flavell, 1987; Nelson & Narens, 1990; Paris & Winograd, 1990; Schraw, Crippen, & Hartley, 2006). Metacognitive knowledge includes knowledge

about oneself as a learner and the factors that might influence performance, whereas metacognitive regulation is monitoring one's own cognitive activities. Numerous frameworks have been developed in an attempt to better understand knowledge about cognition (Cross & Paris, 1998; Flavell, 1979; Kuhn & Dean, 2004; Schraw et al., 2006). Flavell (1979) defines cognitive knowledge as knowledge about one's own cognitive strengths and weaknesses, including the factors (both internal and external) that may interact to affect cognition. He expands on this definition by classifying cognitive knowledge into three categories:

1. "Person" knowledge—understanding one's self as a learner
2. "Task knowledge—understanding the demands of the task at hand
3. "Strategy" knowledge—understanding strategies that could be useful

Despite Flavell's visual depiction of each type of knowledge as being compartmentalized, in practice he believed that each knowledge base interacted with the others.

The second component of metacognition relies on the ability to regulate one's own cognitive processes; for example, knowing when to execute and/or discontinue a particular strategy. It also includes planning, strategizing, self-questioning, activating prior background knowledge, and goal setting. Regulation depends on self-evaluation in order to appraise performance and regulate cognitive processes (Schraw et al., 2006). Flavell (1979) attributes this to a "quality control" mechanism (e.g., "I am not understanding this"). It is responsive to inaccuracies in one's own work and redirects to new ways of thinking.

In practice, educational psychologists have long promoted the importance of metacognition for regulating and supporting student learning (Hadwin & Oshige, 2011;

Winne & Hadwin, 1998). As well, researchers argue that metacognition is a highly

valued component of a balanced assessment program (Black et al., 2004; Earl, 2003;

Hacker, Dunlosky, & Graesser, 2009; Metcalfe & Finn, 2012; Sternberg, 2009;

Veenman, van Hout-Wolters, & Afflerbach, 2006; Velzen, 2013). Although most

individuals engage in metacognition when confronted with a cognitive task, some are

more metacognitive than others (Livingston, 1997). Those with greater metacognitive

abilities tend to be more successful in their cognitive endeavours (Earl, 2012; Winne &

Hadwin, 1998). There are various approaches to teaching metacognition in the classroom,

such as cognitive strategy instruction (CSI) (Nelson & Narens, 1994; Ontario Ministry of

Education, 2012; Winne & Hadwin, 1998; Woloshyn et al., 2001). CSI is an instructional

approach that emphasizes thinking skills and the use of cognitive strategies to complete a

task. "The objectives are for students to become more strategic, self-reliant, flexible, and

productive in their learning endeavours" (as cited in Livingston, 1997, para. 15). But

even with such approaches, there is still lack of teachers' understanding and

implementation on the application of metacognition for classroom assessment purposes

(Andrade, 2009; Dann, 2014; De Bruin & van Gog, 2012; Panadero & Romero, 2014;

Valle & Andrade, 2012).

Teachers' role in AaL. Even though students are the primary actors in AaL, it

does not diminish the teachers' responsibility. Rather AaL extends teachers' roles to

design and deliver instruction, such as CSI, that facilitates students' metacognitive and

self-assessment skills (Dignath, Buettner, & Langfeldt, 2008; WNPC, 2006; Woloshyn et

al., 2001). Shepard (2000) made a case that learning how to learn (and assess) cannot be

left for students to discover on their own; it must be taught. Volante and Beckett (2011)

suggested a "lockstep process" to teaching AaL; that is, teachers provide guidance to students when cultivating evaluative knowledge and expertise and reflecting on what they have learned. According to Andrade (2009) teachers have a responsibility to provide students with criteria to base judgment. Often, this is in the form of an instructional rubric (Panadero & Romero, 2014; Saddler & Andrade, 2004). As well, it is suggested that teachers encourage students to make decisions about how to improve their work to foster learning autonomy (Andrade, 2009; Earl, 2012). It is advantageous for teachers to provide students with a pool of appropriate strategies to bring their own performance closer to the desired goal (Sadler, 1989). This argument is strongly aligned with Earl's (2003) conceptual framework of the three purposes of assessment because she believes teachers who establish an environment rich in AaL practices promotes student learning.

Teachers as Change Agents, Activators, and Evaluators

Earl's (2003) conceptual framework of classroom assessment relies on teachers to adopt a new philosophy of assessment; that is, assessment rooted in AaL and AfL rather than AoL. Fullan (2012) argued that dramatic change in education, such as a systematic change of the philosophy of assessment, will be introduced by outlier teachers who act as change agents. On a similar note, Hattie (2012) argued that teachers have a duty to act as activators and evaluators of student learning. The notion of activator encompasses "action, agency, and augmentation" while that of evaluator relies on the teacher to "attend to the worth and merit of the activation" (p. 96). By embodying these roles,

> teachers then are focused more on their impact on students, focused more on the
>
> quality of the outcomes that they wish to impact, and are placed in the position of
>
> seeing their effect more in terms of the consequences for students than in getting

through the curriculum, having students passing exams, and running excellent

lessons with engaging activities. (Fullan, 2012, p. 96)

Fullan recommends that teacher education programs "need to attend less to promoting

various methods and overemphasizing diversity, and more to how new teachers can

evaluate the impact of their teaching and assessment on students" (pp. 96-97).

CHAPTER THREE: METHODOLOGY

Qualitative research works within real-life settings and explores how people come to understand their world (Denzin & Lincoln, 2011). This research is a qualitative study as discussed by Denzin and Lincoln (2011), Merriam (2009), and Patton (2002). Merriam (2009) asserts the central characteristic of qualitative research is that "individuals construct reality in interaction with their social worlds … [and] the researcher is most interested in understanding the meaning of phenomenon for those involved" (p. 22). This is best achieved by listening to participants' voices in order to gain new insights about the phenomenon to ultimately construct a shared meaning of experience (Leedy & Ormrod, 2012). I used a constructivist theoretical framework to construct meaning based on my participants' interpreted experiences with classroom assessment.

Under a constructivist paradigm, meaning is not discovered but constructed (Dewey, 1916). Meanings are constructed as people engage with the world they are interpreting (Crotty, 1998). Merriam (2009) argues that qualitative research focuses on: how people interpret their experiences, how they construct their worlds, and what meaning they attribute to their experiences. She concluded from a constructive perspective that "the overall purpose of qualitative research is to understand how people construct meaning in their lives and of their experiences" (p. 23). In adopting constructivist principles in qualitative research, this study followed a phenomenological research design.

Phenomenological Methodology

This qualitative study used a phenomenological methodology to inform its research design. It is grounded in the broad philosophical assumptions of Husserl (1977), which has more recently been expanded upon by Moustakas (1994) and van Manen (2014). Looking

across these methodologists, the philosophical assumptions rest on some common grounds: the study of the lived experiences, the view that these experiences are conscious ones, and the description of the essence of the experiences. It requires careful description of conscious experiences of everyday life, which Husserl (1977) defined as "lifeworld." Simply put, it is a description of phenomena as one experiences them. To this end, phenomenology is a philosophical perspective that considers individuals' subjective experiences and the objective experiences of something in common with other people (Moustakas, 1994; van Manen, 1997). Therefore, it is a matter of studying everyday experience from the point of view of the subjects, and it shuns critical evaluation.

By exploring the universal essence of participant teachers' lived experiences with classroom assessment, a phenomenological approach is best suited to shed light on some best practices from which other elementary school teachers can learn. Each participant's profile presented in chapter 4 describes "what" the exemplary elementary school teachers experienced and "how" they experienced it (Moustakas, 1994). Specifically, each profile includes a structural description (i.e., setting, teaching philosophies and beliefs, contextual factors, and rationale for using a professional blog) that influenced the participants' lived experiences with classroom assessment and technology integration. As well, each profile includes a textural description to describe participants' understandings of AfL, AaL, and AoL and their experiences with technology-infused classroom assessment.

Max van Manen (1997) argued that the basic purpose of phenomenology is to reduce individual experiences to a description of the universal essence (of all participants). This study strived for common meaning from four exemplary elementary school teachers about their lived experiences with classroom assessment and technology-

integrated assessment. Consequently, a composite description is presented in Chapter 5 followed by an overall essence of participant experience.

An Emergent Design

Qualitative phenomenological research often has an emergent design through which the researcher "retains an openness to adapting inquiry as understanding deepens or situations change" (Patton, 2002, p. 40). Although my research proposal specified an initial focus that included the research problem and rationale, purpose, questions, and plans for data collection and analysis, the inductive nature of inquiry made it impossible and inappropriate to tightly prescribe every detail at the onset of the research (Moustakas, 1994; Patton, 2002). Lincoln and Guba (1985) further point out that emergent design "is not simply an effort to get around the 'hard thinking' that is supposed to precede an inquiry" (p. 225) but to also allow for a flexible design in order for the data to unfold naturally. "The key idea behind qualitative research is to learn about the research question from participants and engage in the best practices to obtain that information" (Creswell, 2013, p. 47). Patton (2002) noted that this approach to research stems from the open-ended nature of naturalistic inquiry as well as pragmatic considerations, which requires a high tolerance for ambiguity, uncertainty, and trust in the ultimate value of what inductive analysis will yield. Specifically for phenomenological research,

> Analyzing a lived experience is a complex and creative process of insightful invention, discovery, and disclosure. Grasping and formulating a thematic understanding is not a rule-bound process but a free act of "seeing" the meaning that is driven by epoche and reduction. (van Manen, 2014, p. 320)

With this in mind, I made modifications throughout the study to stay true to the organic nature of a phenomenological emergent qualitative design. For instance, although I created interview questions for my dissertation proposal, once I reached the data

collection stage I then personalized the questions based on information I gathered from the professional blogs. Also, I used probes during the interview to obtain greater depth in the participants' responses.

Achieving Rigor in an Emergent Design

Emergent design methodology has been heavily debated regarding its ability to maintain rigor (Patton, 2002), however prominent researchers (e.g., Creswell, 2007, 2013; Merriam, 2009; McTaggart, 1997; Patton, 2002; Rossman & Rallis, 2003) have highlighted strategies for achieving rigor in qualitative research. My study followed these strategies in order to maintain rigor:

- Data were produced over a period of time rather than in a one-shot manner (Rossman & Rallis, 2003). The writing of blogs took place over 22 months prior to the commencement of this study and then interviews with the blog authors (elementary school teachers) took place to gain greater insight into their reflections and additional details about how they experienced classroom assessment and technology integration.

- Data were cross-analyzed between research methods using an open coding approach to gain consistency in the findings and across participants to strengthen the robustness of the research (Patton, 2002).

- I used semi-structured interviews to establish a backbone of inquiry but at the same time to allow participants to share their perceptions and experiences with me that they deemed valuable to share (Patton, 2002).

- My findings aimed to best represent who and what was being researched. According to McTaggart (1997), "writing will often be an individual activity but

confirmation must always be collective" (p. 11). Although, I take responsibility

for the writing, it is important that all participants confirm or add to the

interpretation to be fair and faithful to the representations and intentions of the

participants (Rossman & Rallis, 2003).

In sum, based on the factors listed above, this study meets rigorous requirements for an

emergent qualitative design.

Purpose of the Study

The purpose of this study was to explore teachers' lived experiences with

classroom assessment. Specifically, it sought to explore exemplary elementary school

teachers' understandings of and experiences with AfL, AaL, and AoL when using 21st

Century approaches to teaching, learning, and assessment. A second purpose was to

explore elementary school teachers' experiences with technology-integrated assessment

and their perceptions of its effectiveness.

Research Questions

The study sought to answer the following research questions: How do exemplary

Canadian elementary school teachers understand and experience classroom assessment

(i.e., AfL, AaL, and AoL)? How has technology influenced exemplary Canadian

elementary school teachers' experiences with classroom assessment?

Data Collection

I corroborated two sources of data from four participants in this study to increase

trustworthiness and credibility of data (Creswell, 2013; Denzin & Lincoln, 2011;

Marshall & Rossman, 2006; Miles & Huberman, 1994; Patton, 2002). Locating themes

among different data sources increases rigor of findings (Lincoln & Guba, 1985). My

data sources included:

- Elementary school teachers' professional blogs: Blog posts were the primary data source in this research study. There were a total of 472 blog posts across the four participants over a 22-month period of which 344 were used for analysis. Blog posts were chosen based on relevance to my research questions.

- Semi-structured interviews: I conducted an interview with each participant to further explore and gather more details about teachers' understandings of and experiences with classroom assessment. Participants shared their experiential narratives, stories, anecdotes, and commentaries during the interviews, which developed a richer and deeper understanding of their experiences for me than what I understood solely from reading (and analyzing) their professional blogs. Initially, I developed a generic interview guide aimed at the overall research questions and purposes of the study (which underpinned all participant interviews). The questions then were personalized based on the data retrieved from each participant's professional blog. Although the overall focus of the interview remained the same for all participants (i.e., understanding of and experiences with AfL, AaL, AoL and technology-infused assessment), each participant was able to highlight various aspects of the topic more deeply. For instance, Sara's interview emphasized technology-integrated assessments for gifted students while Stephanie's interview focused on how to use technology for pedagogical documentation and accountability.

About Blogs

Although the research possibilities involved with online research methods are

relatively underexplored (Downes, 2004; Hewson, 2003; Hookway, 2008; Jimoyiannis & Angelaina, 2012; Mann & Stewart, 2000), it is generally recognized that the Internet, and the blogosphere in particular, offer new and exciting opportunities for educational research (Jimoyiannis & Angelaina, 2012). Recent publications have made significant practical, theoretical, and methodological contributions to the development of this field. Specifically, Hookway (2008) heralded blogs as the "new guardians of democracy, a revolutionary form of bottom-up news production and a new way of constructing self and connecting people with their communities" (p. 91). This is particularly pertinent for research because it provides a new addition to the qualitative researcher's data source toolkit offering an array of different formats to transmit information (i.e., video, audio, images, etc.). Even with these research possibilities though, Hookway (2008) cautions the ethical and legal difficulties (i.e., blogger representation and seeking morality, anonymity, and trustworthiness) that can arise when using blogs as a data source for qualitative research because blogging "fundamentally involves placing private content in a public domain" (p. 96).

Farmer, Yue, and Brooks (2008) define blogs (short for weblogs) as: "online journals where an author (or authors) publish a series of chronological posts on various topics, typically of personal interest to the author(s) and often expressed in a strongly subjective voice, on which readers are invited to comment" (p. 123). A blogger is a person who participates in a blog by posting and/or following a blog (Farmer et al., 2008). In the context of education, teachers who post blogs are often thoughtful and reflective about their professional practice.

Blogs have begun to populate the Internet and provide a new and intriguing form

of communication and personal expression. Researchers are only just beginning to realize the value that this media presents as a data source for research (Hungerford-Kresser, Wiggins, & Amaro-Jimenez, 2014; Jones & Alony, 2008). At their basic level, blogs are similar to journals in that they provide rich and deep personal reflections (Cigdem & Kurt, 2014; Jimoyiannis & Angelaina, 2012; Jones & Alony, 2008; Prestridge, 2014). This depth is a result of the freedom in the writer's topic selection. The unique richness of blogs, however, is derived from their longitudinal nature, easy access, geographical catchment, hyperlinks, and the online conversation among the blogging community (Eastham, 2011; Hungerford-Kresser et al., 2014; Jones & Alony, 2008). Since bloggers choose their own topics, their choices reflect areas of interest and pertinent issues in their daily lives. Generally, their writing is opinionated and candid as they are free to express their own views, providing valuable insight for researchers into the participants' experiences and the interpretation of those experiences. Plus, blogs are not subject to the influence or interference of the researcher, therefore making them infallible to many of the weaknesses and biases of other forms of data collection (Jones & Alony, 2008).

About Interviews

Moustakas (1994) and van Manen (2014) highly recommend using long interviews as a data source in a phenomenological study. A long interview involves "an informal, interactive process and utilizes open-ended comments and questions" (Moustakas, 1994, p. 114). Moustakas and van Manen both argue that interviewing individuals who have experienced the phenomenon is the principal way to deeply understand their lifeworld.

Many methodologists have argued that interviewing is not merely a neutral

exchange of asking questions and getting answers but also an "active" interaction of people that leads to the creation of a collaborative effort called the interview (Atkinson & Silverman, 1997; Fontana & Frey, 2005; Hertz, 1997; Holstein & Gubrium, 1995). Fontana and Frey (2005) suggested that the product of the interview is a "mutually created story" (p. 696). The focus of the interviews then encompasses the "hows" of people's lives as well as the "whats" of everyday life (Fontana & Frey, 2005, p. 698). This complements the purposes of phenomenological methodology as it seeks to find the "whats" and "hows" of participants' experiences, reducing the experiences to an overall essence.

Recently, interviews are moving toward new electronic forms—mostly for pragmatic reasons. Fontana and Frey (2005) define this type of interviewing as "the virtual interview" (p. 721) whereby Internet connections are used synchronously and asynchronously to obtain information. Researchers can now access (and view) participants from distant geographical locations. In this study, I used Skype to interview participants who worked far away from me (i.e., in a different province). This also gave participants flexibility of being able to connect from any location, including home or work (Mann & Stewart, 2000).

Participants

The participants in this study were selected by using a purposeful sampling method (Chein, 1981; Merriam, 2009; Patton, 2002). LeCompte, Preissle, and Tesch (1993) urged researchers to first determine selection criteria before choosing research participants. For this study, I selected exemplary Canadian elementary school teachers based on three criteria: (a) recognition from the wider educational community of effective curriculum and assessment practices; (b) consistency in writing a professional blog; and

(c) history of integrating technology in their classrooms. Other criteria were considered for inclusion in this study, such as having a research background or a graduate degree, but I decided against such criteria as it would not have benefited my study a great deal. I was most interested in classroom practice, not research ability. With that said, teachers in this study were well-accomplished people outside of the classroom by happenstance; one teacher was a graduate student and another was a published author. As well, despite finding some excellent blogs with reflective secondary teachers, I chose to exclude secondary teachers from this study. Limiting participation to elementary school teachers provided me with a distinct population of teachers to study. Furthermore, Merriam (2009) and Patton (2002) argued that the success of sampling lies in selecting information-rich participants from whom we can learn the most. For these reasons, I chose to include elementary school teachers who had been recognized by the educational community as exemplary and had a history of using technology-integrated assessments in their classrooms. Chapter 4 provides profiles of each teacher.

Before conducting this research, I gained research ethics clearance from the Research Ethics Board at my institution. Once clearance was received, participants were solicited for the study. I began participant selection by exploring the blogosphere, focusing on blogs solely written by teachers. I started with five elementary school teacher bloggers recommended to me by my doctoral supervisor. She referred these teacher bloggers to me because she had written about these educators in a recent book on exemplary 21st Century practices in curriculum and assessment. Then, I used a snowball approach (Goodman, 1961) to find the other bloggers; specifically I read one blog which then connected me to other blogs, and so on. I made sense of the blogs as they connected

to my research questions and my previous experiences with teaching and assessment research. I kept track of the bloggers who were most connected with my research interests by creating an Excel spreadsheet. I considered grade level, teaching location, blog post topics, and teachers' ability to reflect on their practices. These criteria helped me to narrow down and choose participants for my study.

I estimate searching through 100 teacher blogs to find the right participants for my study. While I did find some excellent blogs from teachers in the United States and England, I chose to exclude non-Canadian teachers from this study. Based on the differing international approaches to education, I thought it would be wise to limit my sample population to Canadian elementary school teachers. I then attended an educational technology conference, which attracted educators from across Canada. There I was able to meet many of the bloggers whose posts I had been reading. Attending their conference presentations assisted me in my selection criteria. I carefully considered their interests and overall professional goals and experiences to ensure they would be an appropriate fit for my study. I reconsidered their blogs to ensure they were the best fit for my research questions and that their blogs were reflective rather than descriptive in nature. That is, I was less interested in blogs that recounted lessons and more interested in teachers who shared their deep thoughts about assessment and technology integration. For example, teachers who posted lesson plans on their blogs were not useful in answering the research questions of this study. Rather, I was more interested in teachers who had taken the time to deeply reflect and make sense of their pedagogy and experiences with assessment. It was my hope that teachers who took the time to think through their assessment practices and document them on a professional blog would have great insight into current

classroom assessments and their effectiveness. After the conference, I shortlisted my participant list to 10 teachers. I then ranked them based on the predetermined criteria, as discussed previously, and chose who I thought would be the best candidates for this study.

Moustakas (1994) and van Manen (1997) asserted that a phenomenological study typically includes between three to 15 individuals who have all experienced the phenomenon being studied. I invited the top four (out of 10) candidates to join this study via email from me, with reassurance that choosing not to participate would not adversely affect them in any way. The invitation email detailed the various components of the study (i.e., analysis of their professional blog and interview) along with time commitments and ethical considerations. Fortunately, all four candidates accepted my offer to participate in the study. I confirmed with the participants about the awards they had received to provide credibility to their exemplary status. I then re-confirmed the legitimacy of each award with the organization's website that had granted the award or distinction. From there, each participant signed a consent form and I answered any outstanding questions they had. One participant asked how this research would be shared. I responded that I intended to present at conferences and publish from this research; however all participants would have the opportunity for member checking and I would send a copy of published manuscripts for their records.

All participants who took part in this study were elementary school teachers, teaching various grade levels from kindergarten to grade 8. Stephanie taught kindergarten; Rose taught a combined grade 1/2 class; Ava taught a combined 5/6 class; and Sara taught an intermediate gifted class. Chapter 4 provides detailed descriptions of

the participants in their individual profiles. All four elementary school teachers were female and had between 13 and 24 years of teaching experience at the time of this study.

Blog Post Selection

Teachers involved in this study hosted and managed their own blogs. The elementary school teachers' blog sites had similar appearances with a central blog post and an area for other bloggers to comment below.

Once the participants joined the study their blog posts were considered for selection based on a connection to my dissertation topic (i.e., AoL, AfL and AaL and the technology-integrated assessment). Within the blog post pool, there were 472 blog posts across four participants. Because I was faced with large amounts of data within the blog pool, I sought ways of managing, filtering and reducing the data to posts which were most illuminating in answering my research questions. To begin, I used a non-content specific scheme that relied on common sense reasoning (Schwandt, 2007). The criteria included the elementary school teachers who were chosen (and agreed) to participate in the study and time of occurrence of the posts. Blog posts that were written between September 1, 2012 and June 30, 2014 were considered for analysis. The second layer of blog post selection was much more rigorous since it consisted of content specific criteria and relied on my deductive reasoning skills to determine relevance to my research questions (Creswell, 2013). The criteria included keywords related to classroom assessment, assessment tasks and tools, assessment philosophies and practices, curriculum alignment, relationships between teacher, student, and peers, 21st Century pedagogies, technology-integrated assessment, and evaluation. To this end, I ranked each blog post on a 4-point Likert scale, with 1 having the highest relevance to my research

questions and 4 having no relevance to my research questions. I included blog posts that were ranked as 1 (highly relevant), 2 (mostly relevant), and 3 (somewhat relevant) and excluded 4 as they had little or no relevance to this study. Of the 472 blog posts, 128 were considered not relevant to this study. Therefore, 344 blog posts were included in the artifact analysis.

Procedure

Research suggests that blogs, when complemented with interviews, can provide an exploratory first step to further research (Acaster & Wild, 2009). My study began with an artifact analysis of elementary school teachers' professional blogs followed by an interview with each participant as a means of collecting the "descriptions of lived experiences" (Orbe, 2000, p. 610). In keeping with a phenomenological framework, the procedure of this study followed the suggested steps for a phenomenological study as discussed by Creswell (2013) and Moustakas (1994).

Blogs used in this study were considered to be historical data as they were written and posted during a 22-month period before the time of this study. Initially, each blog site was read to get a sense of the whole (van Manen, 1997) then each blog post was ranked based on relevance to my research questions. Next, blog posts were analyzed vertically (i.e., one participant at a time). The analysis focused mostly on the participants' blog posts rather than comments provided by other bloggers. With that said, I did consider relevant comments posted by bloggers when it added value to the discourse of the main post. The blog post analyzes informed the creation of the semi-structured interview for each participant. Specifically, I used findings from the artifact analysis of the elementary school teachers' blogs to personalize the generic interview guide for each participant.

At the beginning of the interview, I spent time building trust, credibility, and a strong rapport with my research participants. I used Patton's (2002) suggestions for an effective interview. He suggested that control during interviews is facilitated by: (a) knowing what you want to find out; (b) asking focused questions to get relevant answers; (c) listening attentively to assess the quality and relevance of responses; and (d) giving appropriate verbal and nonverbal feedback to the person being interviewed. I also considered Merriam's (2009) guidelines for a qualitative emergent design; she argued that "the researcher may not know ahead of time… all the questions that might be asked [during the interviews]. Hunches, working hypotheses, and educated guesses direct the investigator's attention to certain data and then to refining or verifying hunches" (p. 169). I followed Patton's (2002) suggestion that the researcher take notes throughout the interview as it "can help formulate new questions [or probes] as the interview moves along" (p. 383). Using probes helped "increase the richness and depth of responses and gave cues to the interviewee about the level of response that was desired" (Patton, 2002, p. 372). In addition, participants were given an opportunity at the end the interviews to provide freely any information about their experiences with assessment and technology that was not touched upon during the interview. By using this approach, I was able to obtain deeper and more detailed responses than I would have obtained had I not followed an emergent design. Consequently, the interviews provided further insight from the blogs about each elementary school teacher's understandings and perceptions of AfL, AaL, and AoL and how they used technology for assessment purposes and their perceptions of its effectiveness.

The interviews ranged in length between 60 and 135 minutes. Two of the

interviews took place in-person while the other two took place via Skype. Specifically, for the in-person interviews I met one the teachers at her school and the other at a coffee shop close her school, respectively. I conducted the Skype interviews from my home office, while the participants were at their homes. I took notes during the interviews and they were also audiotaped.

Directly following each interview, I transcribed the oral data. Member validation of researcher transcription was used to help ensure accuracy of the findings (Koelsch, 2013). After completing the transcription, I emailed a copy of each transcript to each participant in order to confirm the raw data. Two of the four participants did not make any modifications while the remaining two participants submitted minor changes to the transcripts. Once the participant cleared the transcript, I proceeded to analyze the interview data. This entire process was then repeated for the other three participants in this study. I then analyzed the themes horizontally across all four participants to gain an understanding of the common themes that were experienced by all the participants, revealing the essence of the elementary school teachers' experiences with classroom assessment and technology integration.

Data Analysis

"Data analysis is the process of making sense out of the data" (Merriam, 2009, p. 175). In doing so, I followed a combination of Merriam's (2009) guidelines for qualitative analysis and Moustakas's (1994) systematic procedures for phenomenological analysis. To analyze the data, I used NVivo 10 software as a platform for analysis, which supports qualitative data sources (i.e., it is designed to handle non-numeric data such as interviews, images, and web content). For this study, each blog post and interview was

organized and stored according to a code, which included the participants' initials (pseudonym) and date of publication/interview. I then created a hierarchal structure of folders to organize my data for analysis. For instance, under *Internals* I created a folder for each participant and then included two subfolders: Professional Blog and Interview. Next, I imported the blogs through nCapture (an application that translates web files into image files). Since the blogs included various formats such as written text, images, and video files, NVivo software was helpful in managing different types of files within these folders. As well, I was able to record notes about images, annotate the images, and code the content of the image. Video files had a similar functionality where I coded oral data according to time.

I used Moustakas's (1994) guidelines for coding a phenomenological study, moving from narrow units of analysis (i.e., significant statements) to broader units (i.e., meaning units, as known as themes), and then to a detailed description (i.e., essence) that summarized the two elements of phenomenological research: the "what" and "how" of the experience. This process heavily relied on what Merriam (2009) describes as open coding. I was not looking for certain answers but instead wanted the findings to emerge from the data. It was worthwhile being expansive when identifying codes that might be useful in answering research questions (Merriam, 2009). Moustakas (1994) noted that significant statements related to the topic initially have "equal value" (p. 118). When significant statements were merged into meaning units, themes of higher (or lesser) value to the research findings became evident.

The bulk of the significant statements came from written text; however images and videos that were posted on the blogs were included. I was able to code image files

and videos using NVivo software. I recorded notes about images, annotated the images, and coded the content of the image. The content of the images was coded into significant statements, as was done with the written text. Video files had a similar functionality whereby I coded oral data for significant statements according to time. I then coded significant statements from all file types (written, image, and video) into meaning units (or themes) to make sense of the data. For example, NVivo refers to meaning units as nodes, which can be created at the beginning of a project; however, for my study I created them as they emerged from the data and then nodes from the first blog carried over to the second blog, and so on. I continually went back over the nodes and tried to group similar words and ideas together. Merriam (2009) recommends keeping a running list of codes (or nodes) so that they can be carried over to subsequent transcripts. As I moved through the blog posts, my running list of nodes continued to solidify concepts, which became the classification system reflecting the recurring patterns in the study (Merriam, 2009).

These patterns became the themes into which subsequent items were sorted (Merriam, 2009) which allowed me to record trends across participants. In fact, NVivo kept track of the number of sources (i.e., blog posts and interviews) and references (i.e., significant statements) associated with each node. As well, data could be coded to multiple nodes. For instance, a significant statement could be filed in both the "pedagogical documentation" node and the "21st Century Assessment" node.

As mentioned above, once all the blog posts from one participant were coded, I used those findings to personalize the interview questions. The interview was conducted and then transcribed by me. Then, I coded the interview transcript using nodes from the

blogs and created new ones as they emerged. By cross-checking nodes between the blogs and the interviews, I tried to increase accuracy of my interpretations of the data (Mertens, 2005). This process was repeated for the other three participants.

Subsequently, I printed the contents of each node (87 in total) and filed them in alphabetical order and placed them in binders. I then tried to make sense of each node and merged similar nodes together. These themes were integral in finding the composite description and essence of the exemplary elementary school teachers' experiences. Merriam (1998) wrote that "making sense of the data involves consolidating, reducing, and interpreting what people have said and what the researcher has seen and read—it is the process of meaning making" (p. 178). Consequently, the remaining themes were those that "seemed to reveal the essence of the data" (Orbe, 2000, p. 616).

Once I had a thorough understanding of the data, I began to write the results chapters of this dissertation. At first, I struggled with how to present the immense amount of data in this study as I wanted to ensure I was showcasing the teachers' exemplary work in the best way possible. After completing the entire manuscript, I sent it to the participants for a second member check to confirm my analysis and interpretation of their perceptions and experiences were accurate.

Limitations of the Study

The phenomenological methodology used for this study has some limitations. As I anticipated, it was difficult for me to completely bracket myself out of the study. I came to this research with my own knowledge, personal experiences, and biases about the phenomena being studied. I identify with van Manen (1997) who explained that interpretations of the data always incorporate the assumptions that the researcher brings

to the topic. Consequently, I put careful thought into how my personal understandings would be used in the study. For instance, I found it advantageous to use my previous knowledge and experiences while hosting the interviews and determining significant statements during data analysis; however, I chose to follow Giorgi's (2009) recommendation of not letting past knowledge and experiences interfere when determining the experiences of the participants.

The small sample size and context-specific needs, interests, and abilities of the participants in this study make it difficult to generalize the findings to a larger population. This study purposefully focused on elementary school teachers' understandings and use of classroom assessment and technology-integrated assessment, but not that of secondary teachers. It is assumed that elementary school teachers are the ones who will benefit most from this study as their contexts are similar to that of the participants. With that said, other elementary school teachers may experience classroom assessment and technology integration in different ways. This could be as a result of many factors, which may include: knowledge and skill level of integrating technology, training, perceived value, accessibility to technology, types of students, and the environment. As well, teachers' philosophies of assessment, technology integration, prior education experiences, and teaching experiences influence their practice (Britzman, 2012; Dewey, 1916).

Furthermore, this select pool of elementary school teachers was recognized by the larger educational community as being exemplary in the areas of curriculum, assessment, and technology integration. Therefore, it would be acceptable to assume that most elementary school teachers do not possess the same expertise and experiences as these teachers (hence the reason for these teachers being deemed atypical and exemplary);

there are not many other teachers like them. Yet, the purpose of this research was not to generalize an entire population of teachers but rather showcase the work of exemplary elementary school teachers so that other elementary school teachers in similar situations have access to living examples of effective assessment in a 21st Century context.

Using blogs as a data collection method has its own set of limitations. First, there was a lack of prior research detailing blogs as a data collection method with teachers. The few studies that have been conducted show positive results associated with increased collaboration among teachers and reflection on practice, however there is little guidance to date on how to implement and analyze this type of data. This study demonstrated to teachers that blogging is a viable and meaningful way to reflect on one's own practice and to become a part of a community of practice (Wenger, 1998). It also demonstrated to researchers that professional blogs are a viable and worthy data source for educational research.

Furthermore, blogs in this study are deemed as historical data, meaning that the teachers were not asked to write a blog for a specific purpose or research question. This was done purposefully so that the reflections were organic in nature. Consequently, I searched for relevant blog posts pertaining to my research questions but believe that this approach yielded "real" answers to my questions. As well, it was difficult to determine the authors' motivation at the time of writing the blog when reviewing it several days, weeks, and even months after posting. I was not always aware of the historical, cultural, and organizational contexts in which the posts were set, which made it difficult for me to decipher emotion in written texts and limited my capacity to place value or importance to some elements of the posts. I attempted to overcome this limitation by asking follow-up

questions during the interviews.

Interviewing is one of the most common and effective ways to research individuals (Merriam, 2009; Patton, 2002). However, I must consider the drawbacks to this data collection method. First, the researcher's presence can affect the participants' responses. This is an unavoidable product of interviews but I tried my best to build a strong rapport with my participants and made them feel comfortable throughout the entire interview process. Some of my interviews happened face-to-face while others were conducted online. It was more difficult to build a rapport and anticipate responses and cues in the virtual interviews.

Max van Manen (2014) stressed that the sole reason for phenomenological research is "to gather experiential material for the purpose of phenomenological reflection" (p. 311). And yet, experiential accounts are never truly identical to the prereflective lived experiences of the participants (van Manen, 2014). "All recollections of experiences, reflections on experiences, or transcribed conversations about experiences are already transformations of those experiences" (van Manen, 2104, p. 311). For example, an experience captured directly by a camera is already transformed at the moment it is captured—the context, for instance, can be easily lost (van Manen, 2014). This is particularly pertinent to my research because technology (i.e., blogs, cameras, images, videos, etc.) played a prominent role in data collection and interpretation. It is my hope that the meanings I brought to the participants' experiences are true and accurate and a limited amount of meaning was lost through the process of interpretation. I believe I overcame this limitation by member checking all of my data.

Issues of anonymity and confidentiality may present problems when

disseminating findings. One of the criteria for being involved in this study is that the larger educational community deems the elementary school teachers as "exemplary" (i.e., winning an award or publishing work). Award recipients' identities are most often available to the public, meaning that full anonymity cannot be achieved in this study. Consequently, giving credibility to my participants (i.e., awards won and published works are identifiers) may also become a detriment to the anonymity of this study. By extension, the interviews could be identified by association with the awards, publications, or blogs. So, the interviews were given with the understanding that they could be identified. As well, blogs are open to the public to read and therefore may identify schools and students associated with the blog posts.

Ethical Considerations

I was guided by ethical principles of research with human participants. Prior to conducting this research study, I obtained Research Ethics Board clearance from the University in which I study (File #: 13-052-DRAKE). In addition, I reviewed the Standards for Ethical Conduct of Research from the American Educational Research Association (2012). Consent forms were given to all participants along with a summary of the research purposes, procedures, and design. I was extremely cognizant of keeping the participants informed about what was going to happen next in the research study, appropriate deadlines, and the completion of the research. My contact information was provided to participants in case of any outstanding questions or concerns.

Reciprocity was a key feature of this study making certain that participants benefited from participating in this study. Ray and Hocutt (2006) examined K-12 teachers who created their own blogs and the findings suggested that blogs were effective reflective

devices. Teachers used the blogs not only to think about their own teaching, but also to look at what was going on in the classroom in terms of student achievement. Therefore, writing a professional blog was beneficial to teachers. As well, the teachers commented that participating in the interview was a form of professional development for them. One teacher highlighted that she had a difficult time finding professional development activities that are worthwhile but research studies, such as this one, are highly beneficial to her because "it helps me stay current, take a step back to reflect on my practices, and contribute to new understandings" (Sara, Interview, July 9, 2014).

Chapter Summary

In this chapter, I have explained the nature of this phenomenological research study and have detailed how I collected and analyzed the data. Additionally, I outlined the major limitations in my research design and the ethical considerations of this study. In the next chapter, I present the results from this research study.

CHAPTER FOUR: PARTICIPANTS' PROFILES

This inquiry used a phenomenological qualitative design methodology to investigate four Canadian exemplary elementary school teachers' understandings and experiences of classroom assessment. Qualitative data were collected through artifact analysis of elementary school teachers' professional blogs and semi-structured interviews. The research questions were: How do exemplary Canadian elementary school teachers understand and experience classroom assessment (i.e., AfL, AaL, and AoL)? How has technology influenced exemplary Canadian elementary school teachers' experiences with classroom assessment?

This chapter presents a profile of each participant to situate personalized experiences with classroom assessment in a 21st Century context and to describe how individual participants experienced technology-infused assessment. Structural and textural descriptions are interwoven to describe participants' experiences related to classroom assessment and technology integration. Each profile includes: a description of the type of teacher they perceive themselves to be and their respective 21st Century classrooms; distinctions that deem them exemplary; their assessment philosophy; how they experience classroom assessment and technology integrated assessment; and a rationale for participating in a professional blog.

Stephanie: Using Pedagogical Documentation for Assessment

Stephanie is a full-day kindergarten (FDK) teacher. She began her teaching career as a certified gymnastics coach and has been a classroom teacher for the past 21 years. During this time she has taught grades 1, 2, 3, and 6. She also spent 3 years as a curriculum consultant and is trained as a literacy coach. She is involved in the Literacy@School program in which other teachers (both novice and veteran) are

welcomed into her classroom to observe her literacy block in order to improve their own practice.

Type of Teacher and the 21st Century Classroom

When talking with Stephanie, I sensed her modesty and her pride in being a teacher. She feels that "teaching has a purpose and makes a difference in people's lives" (Interview, August 11, 2014). She takes her work seriously and said that she "loves seeing the learning process in action" (Interview, August 11, 2014). She sees herself not only as a teacher but also as a lifelong learner, an inquirer, and an action researcher. She is always thinking about her classroom, even when she is not in it. For example, during the summer holidays Stephanie visited Paris and spent many days wandering around museums. At the Musée des Arts Décoratifs, she was drawn towards a display of fans. The exhibit made her think about redesigning her media lessons. As she walked around the exhibit she felt an overwhelming feeling of disappointment because of all the missed opportunities that presented themselves; that is, she noticed many exhibits that she could have incorporated into past lessons to add a historical and real-world context.

A goal for Stephanie as an elementary school teacher is to produce students who are collaborators, problem solvers, critical thinkers, and digital citizens who can relate to the world they are in. Stephanie told me in her interview that

> teaching for the 21st Century is about showing students how to interact beyond the classroom, beyond the school and beyond the community... and technology really helps us engage students to show them how to interact in those ways and how to do so responsibility. (August 11, 2014)

She believes that even kindergarten students need to know how to act appropriately across different settings and therefore it is her responsibility to teach her students how to interact online (e.g., via a Skype call, a blog, or a YouTube video) and how to interact

offline (e.g., through a conversation with a teacher, principal, or a visitor in their school).

Through Stephanie's online Professional Learning Network (PLN), she connects with other teachers and classrooms both nationally and internationally which she highly values as a teaching strategy: "I feel very fortunate to have the equipment and the network to be able to connect with educators and students around the world" (Interview, August 11, 2014). For example, some teachers in her online PLN engaged in a project entitled "What Can You See?" that involved students taking photos of what they could view outside their classroom windows and creating a way to share such views online (e.g., using iBooks, Quicktime movies, comics, and blog posts to display what they could see in their schoolyard). Classes around the world discussed similarities and differences of the schoolyards. Over the course of the school year, some classes engaged in Skype calls to further their questions and comparisons of what they could see. As the seasons changed, students learned about the differences in a schoolyard in Ontario versus those in Saskatchewan, Mexico, Hawaii, and other locations.

During the coming year, Stephanie and her PLN will extend the project to encompass a social justice lens—"What Can You See and How Can You Help?"—which Stephanie describes as "this is what our school grounds look like and this is how we are helping in our community" (Blog, June 12, 2014). Stephanie believes that "as teachers we need to shift our uses of technology and not only use it to create but also to show social responsibility" (Blog, June 12, 2014). Stephanie hopes that the addition of the social justice lens will welcome collaboration from educators in other locations around the world.

Teaching Awards and Distinctions

The educational community and beyond has recognized Stephanie for her

exemplary teaching practices. Recently, Apple Inc. selected her as one of the company's

Apple Distinguished Educators (ADE), meaning that Apple saw her as an innovative

teacher who uses a variety of technologies in the classroom, which includes not only

Apple products. Through this highly recognized award, she was invited to international

workshops to network with teachers around the world. She viewed this as an entirely new

professional development network that was not previously available to her. She described

one of the workshops she attended:

> Two years ago I was in Ireland for a professional development session where I
> worked with teams of people from Australia, Japan, and Mexico. How I
> understood teaching, learning, and assessment was very different than other
> educators there. We had some really long evening debates about the project we
> were working on, what the terms meant, and what our philosophies were. This
> experience caused a big shift in how I perceive teaching, learning, and assessment
> and as a result modified my own practice. (Interview, August 11, 2014)

She highlighted that "while it's really cool to say that I am an Apple Distinguished

Educator, more importantly it has broadened my understanding of assessment and

instruction around the world" (Interview, August 11, 2014). Consequently, she further

described how her practices have changed as a result of her experiences as an ADE. For

example, her students now think beyond the classroom. She was able to achieve this

wider perspective with her students by connecting with a teacher in Mexico. She

explained how the connection was made: "I didn't know any kindergarten teachers in

Mexico so one of the teachers I met at the ADE workshop was able to connect me with

someone over Twitter and then our classrooms connected over Skype" (Interview,

August 11, 2014). Next, both classes made a book about their school and then met online

to share their books with one another:

> It was really good for our classes because we got to see what Christmas looked
> like in Mexico versus in Canada. My students also noticed that the Mexican
> school had guards outside their school, [therefore] we discussed some deeper

issues that I would not have been able to had we not experienced this connection through the ADE workshop. (Interview, August 11, 2014)

Being an ADE helped Stephanie realize that there are teachers around the world who want to collaborate and help each other: "Teachers get isolated in their own schools … but the ADE program really expands the network. If I am having a problem and someone down the hall can't help me, then someone online probably can" (Interview, August 11, 2014). Stephanie has also been recognized by the Discovery Educators Network Stars (DEN STARS) and Google Certified Teachers (GCTs) for her teaching and assessment practices which offer similar professional development opportunities as the ADE program.

As well, CTV News showcased her classroom to demonstrate to other teachers and families the amazing things that were possible in a 21st Century classroom. Stephanie's response to this clip was "sometimes I take what I do for granted; it's just what I do … sometimes I forget that it's not the norm" (Blog, May 12, 2013). Stephanie also shares her 21st Century classroom with others through hosting workshops on various aspects of her teaching practice and through her professional blog. She is highly recognized within the educational community as a teacher leader, which is exemplified in her well-attended workshops and her 4,000 Twitter followers.

Assessment Philosophy and Practices

Stephanie sees herself more as a facilitator of student learning than as a traditional classroom teacher; that is, she is confident in her students to solve problems on their own or with peers rather than always providing them with answers. She believes learning in is the process of figuring something out. Her role as a facilitator of learning is largely ingrained in formative assessment to inform her instruction and probes to guide students

toward correct answer(s) or acquire skills. Her assessment philosophy is rooted in helping students understand how to self-reference:

> I've never put too much emphasis on grades … if a student usually performs at a level 1 and they submit work that is a level 2 [above their typical performance] then let's celebrate! It shouldn't be all about the grades, it's about where the student is coming from and where to go next. (Interview, August 11, 2014)

She also sees her role as "getting to know how the students are performing according to curriculum expectations and how to help them meet their next goals" (Interview, August 11, 2014). In her role as facilitator, she relies on the use of the gradual release of responsibility model with her students. She feels that students at such a young age need extra support and direct instruction when learning unfamiliar content, and once they grasp the fundamental concepts then she slowly removes herself and encourages students to use critical thinking and problem solving skills to complete tasks independently.

Upon evaluation of a task, Stephanie includes her students through a discussion about their strengths and weaknesses as well as self-reference points. From her experience teaching older students and as a mother, she notes that grades become more important with age, and more so for some individuals than others. She gives the example of her own children: "my daughter was very motivated by grades whereas my sons couldn't care less. The irony in all this is that all my children have done well in school. Some students need grades as a motivation while some do not" (Interview, August 11, 2014). The reason Stephanie values grades and performance outcomes as an elementary school teacher is for communication purposes with her students and parents: "The grading system is a language that we [teachers and parents] both understand. By communicating with parents about where their child is and where they need to go informs them of how they can help their child's learning at home" (Interview, August 11, 2014).

Stephanie sees student learning as a partnership between her, students, and parents. She executes this model by engaging in daily emails, hand-written notes, a class blog, biweekly newsletters, Skype, and phone calls as methods of communication with the parent community. She attributes her biggest success in parent involvement to sending parents emails with photo attachments of their child learning throughout the day. Stephanie receives a great deal of positive feedback from families, such as "it makes my day when I receive a photo of [child's name] while I'm at work. I love showing my colleagues what my daughter is doing at school" (Blog, October 25, 2013). Stephanie found this to be one of the best ways to build positive relationships with parents and build a learning community (i.e., teachers and parents) for her students.

In Stephanie's classroom, she highly values assessment for learning and assessment as learning working together. In the following excerpt, Stephanie described how questioning and self-assessment can be used to guide further instruction and meet learning goals:

> I was doing a guided reading session with a struggling reader and he just stopped and said, "Hey, I know these words" and I said "How do you know these words?" This is the same word that's up there on our wall. And I said "what word it is?" He proclaimed, "said." I responded, "Go show me it" so he [went] over to the wall story (wall stories are photographs with written text to make a story). He went up and pointed to it: "it's the same word [on the wall stories] as in here [his book]." For him it was a big turning point because every time he saw a word he thought it was a new word that he had to decode but now he was able to articulate what he was thinking. (Interview, August 11, 2014)

Stephanie saw this guided reading session as assessment data because she now knew that

> when we read I need to bring the book we read the day before for comparison. For example, I can say "here's the word in the book we read yesterday and here's the same word in the book we are reading today." He needed me to explicitly make that connection for him. (Interview, August 11, 2014)

Through questioning and the student explaining his thinking, Stephanie could personalize

and be more explicit in her instruction. Consequently, Stephanie took a picture of the wall stories to use as a teaching point and also sent home the images to practice. She also explained that she "didn't need to do this for other students because they understood that words are repeated but for him it was necessary" (Interview, August 11, 2014).

This guided reading session was also a turning point in Stephanie's teaching career as she realized that assessment is targeted towards the next step. She divulged that when she started teaching her assessment was mainly assessment of learning and she "didn't have the toolkit to know what to do next. I would figure out that the student had some reading difficulties (from an AoL task) but I didn't know how to get them to the next step" (Interview, August 11, 2014). More recently, this can be seen with many student teachers with whom Stephanie works. She describes a typical student teacher in her classroom:

> They know how to evaluate students to say, "This is where they are," but they don't know how to gather information to make informed decisions about their future instruction. They believe assessment is about the child but for me assessment is all about what I am going to do next. I always ask myself, "So what?" What does this mean? It's not the end piece; it's more about how this is going to affect my practice in the next 10 minutes, hours, weeks, and months. (Interview, August 11, 2014)

Stephanie admits to thinking about the reconfigured assessment framework as described by Earl (2003) to ensure she is "looking at all things" (Interview, August 11, 2014). At the beginning of her teaching career, she admits she was only looking at the final projects and "didn't understand the value of conversations, conferencing with students, and observations" (Interview, August 11, 2014). Now, one of her goals for her Annual Learning Plan (ALP) is how to target observations, or as she put it, "what evidence am I specifically looking for in a cooperative learning activity or a morning entry?" (Interview, August 11, 2014). She explained that being more focused in her

observations would produce better assessment data and in turn better instruction.

Stephanie understands AoL, AfL, and AaL as described by Black, Harrison, Lee, Marshall, and Wiliam (2003) with a modification to AoL. She agrees with them that AoL is a final assessment, however she argues that AoL can be used at any point in time to evaluate where the child is relative to curricular outcomes, and not only at the end of a unit or term. She goes on to say that AfL and AaL are very closely linked together: "I find them interwoven" (Interview, August 11, 2014). She describes how she likes to use a document camera to help her students share their work:

> In circle time, students will put their work under a document camera and talk about their work (e.g., drawing) [with the rest of the class]. They will tell us about their drawing and whether they have written any letters and what their message is supposed to be. Through this exercise, peers and I will compliment the student. Giving compliments to other students make them self-aware and then we talk about their next steps: "Tomorrow, what can you try in your work?" Or, "now that you are looking at your work, what do you see you need to work on next?" (Interview, August 11, 2014)

The latter excerpt shows the complexity of the interaction between AfL and AaL, and engaging in the bi-directional relationship of AfL and AaL is integral to students' learning. As Stephanie notes,

> I see the dynamics of AfL and AaL to be very important for students—it's being able to get students to articulate, "this is what I do well, this is what I need to work on and this is what I will do next and this how I am going to get there." (Interview, August 11, 2014)

Stephanie explains that it is her job as a teacher to provide a structure for AaL to occur and to provide questioning and feedback to advance students' thinking and learning.

Stephanie heavily relies on photography for assessment in her classroom. Students are responsible for taking pictures of their work. She explains that "things are happening so fast in the classroom that I don't always get to write down what's happening, so students take a picture of their work and then at recess time or after school

I can review it" (Interview, August 11, 2014). Over the past school year, Stephanie was involved in a pilot project by Pearson entitled "Clic," a software that enables students to document their learning by uploading images. Stephanie likes to use the Clic program for several reasons: (a) it creates student accounts with students' profile picture; (b) images are linked to curriculum expectations, and it is easy to see how student work meets or doesn't meet curriculum expectations (she can click on the expectation to indicate if the expectation has been met); (c) she can write a comment (e.g., to indicate if the child has almost met the expectation, such as being able to count to 100 but missing 34 and 52); and (d) it is an effective way to share evaluation data with the Early Childhood Educator (ECE) in her classroom. She further explains that

> if students are building 3D shapes I can go around with the iPad and take pictures and ask them questions about the shapes and input the information into Clic and at the same time the ECE can be doing it. As a result, we have a document of all the students' work. (Interview, August 11, 2014)

As seen by the examples above, one of the cornerstones of Stephanie's 21st Century classroom is pedagogical documentation. In fact, Stephanie completed a year-long inquiry on documentation in her classroom. She decided to explore documentation because she was "in search of a new way, a more effective way, of keeping track of student work and perhaps a way that would benefit student learning" (Blog, October 20, 2012). What she had noticed in recent years is that "bulletin boards have become stagnant. They don't have the audience [and conversation] like a blog or a pic collage" (Interview, August 11, 2014). Stephanie commented that any type of camera is her favourite technological tool because it can capture learning in so many different ways. She combines photos to make pic collages, records students' thinking, and posts the images on their classroom blog and students' e-portfolios.

What Stephanie found surprising from her documentation inquiry was that her assessments and evaluations became much richer than ever before: "For the first time [in my teaching career], I actually know what my students are thinking. It has done wonders for my instruction because my AfL is much more tailored to my students' thinking" (Interview, August 11, 2014).

Rationale for Using a Professional Blog

Every school year Stephanie chooses an area in which she would like to improve and immerses herself in self-directed professional development. Among the many types of professional development in which Stephanie engages, her favourite and what she believes to be the most worthwhile is using a professional blog. She makes the distinction that her professional blog is for her own reflections, while her classroom blog is a space in which she blogs for families and other kindergarten classrooms.

She began a professional blog because she was a part of an iPad pilot project. Stephanie and another teacher had been chosen by their board to test the implementation of 10 iPads in their classrooms. The goal of this project was to figure out what worked and what did not work and how to use iPads effectively in the classroom. As she put it, "I thought it was awesome that I had been given so much responsibility and felt I needed to document the process and share everything I was learning with other teachers" (Interview, August 11, 2014). She explained that in order for the project to be successful,

> teachers needed to know what was working in my class and what were the struggles. It wasn't easy at the beginning and I am really glad I documented the experience so that when other teachers are asking for help I can go back to remind myself of the problems I experienced and how I worked through those problems. (Interview, August 11, 2014)

The professional blog not only helped remind her of the journey but more importantly made the experience transparent for other teachers who "can see how I numbered and

updated the iPads (sounds simple but become extremely important for the success of the project)" (Interview, August 11, 2014). What she learned from documenting the iPad pilot project was that "it's important to share what I do in my classroom with other teachers so that they too can learn and improve. It's not just about my students; it's how we can help all students" (Interview, August 11, 2014).

By extension of the iPad pilot project, Stephanie became more involved with her professional blog. She has carved out a place where she can reflect on what she was learning: "This thinking time helped me to better understand what I am doing and why I am doing it" (Interview, August 11, 2014). As well, Stephanie explained that she also uses a professional blog "to get feedback from her PLN and critical friends online. It's a venue in which I can post my own work and obtain critical feedback from other professionals" (Interview, August 11, 2014). She discussed how being a part of an online community has great value for her teaching practice. For example, she acquires a great number of ideas online on how to assess her students using different technologies. Other times, it's thinking about teachers' inquiries and how their approaches would fit within her classroom. While reading other teachers' blogs she often questions, "What would work in my classroom and what wouldn't work? Why would I want to use this approach in my classroom and why wouldn't I?" (Interview, August 11, 2014). It's a way she can engage in her own inquiry and sort through what others are doing in their classrooms.

Rose: Transforming Assessment Through Connected Classrooms

Rose is a grade 1 teacher with a nurturing demeanour. She thrives on teaching students and "gets up every morning to see students learn just a little bit more" (Interview, July 29, 2014). She has been teaching primary grades for more than 20 years

and is consistently looking for ways to improve her practice. She was one of the first elementary school teachers in Canada to have a classroom blog for her students. She believes that blogs help students become global learners and connect with the outside world, and document students' learning from the first until the last week of school.

Rose has written her own book about creating global learners through connecting classrooms to the outside world in which she makes a compelling argument for connecting young students through Internet tools and technologies. Her book presents both the rationale for connecting students at an early age and provides the how-to details and examples elementary school teacher involving students in blogs, Twitter, Skype, and other social media to become true global learners.

Rose went on to write another book as a part of a collection by Apple Distinguished Educators. Rose is thrilled to be one of these authors. The collection is based on the ways teachers transform their classrooms using Apple products. Her contribution examines how students use iPads, apps, and student blogs to document learning in the form of a digital portfolio. The e-book is multi-touch and offered for free on iTunes, along with the 101 other books in the collection authored by other Apple Distinguished Educators.

Type of Teacher and the 21st Century Classroom

It is evident from talking with Rose that she is a nurturing teacher who cares about her students. Her teaching philosophy is founded on the creation of building positive relationships with her students and facilitating student ownership as motivation for her students to learn curriculum outcomes. Most of Rose's classroom pedagogy is rooted in evidence-based practice. She values applied classroom research and attempts to

stay up-to-date with the latest findings by inviting teacher candidates into her classroom and participating in research studies (such as this one).

Rose was modest when I asked if her classroom was a 21st Century environment: "My classroom is never exactly where I want it to be and I hope that would signal that it is a 21st Century environment" (Interview, July 29, 2014). In her classroom, she teaches students how to be learners rather than to memorize facts and regurgitate information. Rose believes that in a 21st Century environment, "learning to learn with others from outside your own classroom, city, and country are important skills for the future" (Interview, July 29, 2014).

As made clear in her book, Rose is committed to the idea of connecting her classroom. She has witnessed a great deal of deep learning, both expected and unexpected, come from connected learning and attempts to use this approach as a teaching method for most curricular topics. She highlighted that in her teaching career, "no change in curriculum, program, or teaching philosophy has had the impact on my teaching that connecting my classroom has" (Blog, June 23, 2014). She also noted that

> To say I am pretty jazzed about the possibilities of connecting my classroom is a bit of an understatement. My class regularly learns from and with students and others from across North America, and in fact from around the world, using social media tools such as Skype, Twitter, and blogging. (Blog, June 15, 2014)

Although Rose infuses technology into her classroom in many ways, she admits that she "is not a big fan of using technology to do what can be done on paper" (Blog, March 22, 2014).

Teaching Awards and Distinctions

Rose has won several awards, including: the Canadian Innovative Teacher Award from Microsoft; the Canadian Regional Award for Reading and Technology from the

International Reading Association; the Kay L. Bitter Award from ISTE; and a Best in the Class Award from Best Buy Canada, which provided her the funds to deploy a 1:1 ratio of iPad to student. As well in 2013, Scholastic.com rated her blog as the number one classroom teacher blog.

Outside of the classroom, Rose hosts professional development presentations and workshops on early literacy and technology integration. For example, Rose was asked to present at the Building Learning Communities Education conference as a keynote speaker. Instead of having one person speak, four individuals delivered 15-minute TED-like talks on their diverse practices. She was honoured to be chosen as one of the presenters.

Assessment Philosophy and Practices

Rose perceives classroom assessment as "a shared process between the student and the teacher" (Interview, July 29, 2014). She believes that learning is most effective when "students know what the goal is, understand where they are along the way, and praise them once they get there" (Interview, July 29, 2014). For example, one of the assessments Rose does with her grade 1 students is keeping track of the number of sight words a child knows. When students begin grade 1 at Rose's school, the majority do not recognize any words. As a result, Rose sets a goal with her students to recognize a given number of sight words by the first reporting period. Since the students are aware of the goal and Rose offers feedback along the way, students take ownership of meeting the learning goal. If they meet the goal, then they set a new goal; if they do not meet the goal, they revise it, usually by extending the deadline.

Rose uses all types of assessment (i.e., AoL, AfL, and AaL) in her classroom and

rejects the notion of one being more important than another; she uses each for different

purposes. For example, AoL is most valuable when writing report cards and AaL is

useful when working with students on personalized outcomes. She did mention, however,

that she uses AfL most frequently because it informs her practice for the following day.

In practice, Rose sees the purposes of assessment as "incredibly intertwined"; for

instance,

> If I complete an evaluation [i.e., AoL] and find out that a student knows 15 out of 20 sight words I make sure I communicate this to the student. I discuss with them how they are going to learn the last five words [i.e., AaL] and then I keep checking back to make sure they are on track until they know all 20 words [i.e., AfL], helping them along the way. I will usually re-test to ensure they meet the goal of knowing 20 words. (Interview, July 29, 2014)

In this instance, it is clear that a teacher's evaluation (i.e., AoL) informed and prompted

students' self-assessment and strategy use (i.e., AaL), and AfL (i.e., teacher support and

assessment) continually supported students' metacognition (AaL) to complete the task

and meet the specified goal (i.e., AoL). Rose believes that there is always self-assessment

happening at some level, even in grade 1. It is the AoL and AfL that informs AaL to

either continue or highlights mistakes and offers new insight into a better way to

approach the task. The types of assessment are intricately intertwined between teacher

and student to support the complex process of student learning.

In Rose's classroom, not all student work is assessed and evaluated: "Sometimes

students just need to practice their skills without any assessment or evaluation taking

place" (Interview, July 29, 2014). Once students have had a chance to practice, Rose likes

to provide some choice for students in how they show what they have learned. She shared

that she uses formal assessments on factual, clear-cut tasks such as number of sight words

or adding integers. However, "problem-solving skills are more nebulous so I would say

there is some sort of assessment [i.e., feedback or observation] going on but much more informal" (Interview, July 29, 2014). A typical evaluation in Rose's class involves creating a rubric with her students, using the same rubric to evaluate their performance, and then talking with the students one-on-one about their performance. Usually, students would then post their work on their student blog for third-party feedback (e.g., from parents, grandparents, school principal). As well, the student blogs have become an effective self-referencing tool. At the end of the year, Rose makes a point to have her students look back at the work they have created over the year—especially their writing, in which there is such dramatic growth.

Rose no longer keeps a filing cabinet in her classroom housing bundles of student work. Now, it is all kept paperless in an e-portfolio. Rose prefers this approach for the obvious reason of having less clutter but also because she can use the work documented in the e-portfolio during a student-led or parent–teacher conference. It usually means that parents have already seen the work so they do not have to spend time explaining the activity. Then, the students can explain what they did well on the assignment and what they can do better. As well, third parties can provide instant feedback on the classroom blog to the students regarding their work. Rose acknowledges, "Sometimes the feedback is different to what I would have said so it's nice for students to get diversified feedback" (Interview, July 29, 2014). Rose also appreciates that students' e-portfolios provide much more detailed examples of their learning than what could be recorded on paper:

> I get so much more information from a screencast than I would from a worksheet—this is significant and worth talking about because this allows me to hear the students' thinking in a way that I would never know with them doing work on paper. (Interview, July 29, 2014)

Rose feels the mounting pressures of curriculum mandates and accountability,

which compels her to include assessment as a significant part of her teaching program.

She remembers 20 years ago when there was a lot less need for data:

> I still give as many grades now as I did then because I have the same number of reporting periods, but now there are more assessments along the way so that I know how my students are doing before the grade is given. (Interview, July 29, 2014)

Moreover, Rose acknowledges that she is continually using AfL in her classroom: "As I watch students, listen to their questions and answers, and see the learning artifacts they produce, I am constantly gauging their understanding of a concept and their readiness to move onto the next stage" (Interview, July 29, 2014). For example, when students engage in a Guess My Number Skype call, Rose admits that there is no formal evaluation:

> When students go up to the computer [in front of a group of students sitting on the rug] to ask or answer questions, I am thinking about if the student can demonstrate understanding of the concept. There may be a student who has not grasped the measurement concept yet and I make a mental note to work with that student following the Skype call. (Interview, July 29, 2014)

> Moreover, Rose noticed that there is self- and peer assessment happening during

Skype activities: "In students' minds, they are thinking 'oh he really gets it' or 'I really didn't understand what he just said'" (Interview, July 29, 2014). Rose noted that

> This is about the extent to which a grade 1 [student] can engage in peer-assessment. They just don't have an accurate barometer yet. If we do peer-assessment we do three stars and a wish and we don't do it very often because it is time-consuming but good to get students thinking that way. (Interview, July 29, 2014)

When it was time for evaluations, Rose shared that "at the grade 1 level, my evaluations are basically one-on-one. Most students at this level need assistance with reading etcetera in order for me to truly grasp what they know" (Interview, July 29, 2014). Rose said that to some extent "everything is formative until the very last day when I give the mark" (Interview, July 29, 2014).

Rose hopes that there is a strong relationship between the grades she gives her

students and what students actually know and can do. And yet, Rose is concerned that

"grades are becoming less and less of an accurate portrayal of what a child learns"

(Interview, July 29, 2014). As we move deeper into the 21st Century much of what we

value as a society is ungradable (e.g., responsibility, citizens' contributions to society,

ability to learn online, and problem-solving):

> There are no rubrics or place on the report card for these intangible outcomes. They [rubrics and report cards] are still very traditional and concrete in nature—can they subtract? But in the 21st Century I think we are more interested if they can problem solve rather than subtract—they can use a calculator for that. I think that grades are becoming less valuable all the time. (Interview, July 29, 2014)

Rose discussed the possibility of moving to a more outcomes-based format; however,

overall she sees this approach as problematic too because

> what if the outcome was to count to 100 but they miss 34 and 52? There is still progress happening and they are almost there but this would not be indicated as achieved on an outcomes-based report card. They either get it or they don't. (Interview, July 29, 2014)

Rose admits that she doesn't have better alternative at this time but cautions that "we

can't make the report cards any more complex or time-consuming than they already are"

(Interview, July 29, 2014).

Rationale for Using a Professional Blog

Rose acknowledged during her interview that technology had never been intuitive

for her. This is illustrated in the fact that she has never been interested in video games,

she never learned how to program the VCR, and can never figure out which remote to use

for the TV. But when five computers were introduced into her classroom with the

instructions to use them, it started her on a journey. Rose explained that the computers

had nothing but a word processing program and Internet access. She thought to herself, "I

have to find a way for these computers to be useful in my classroom" (Interview, July 29, 2014). She had heard of the word "blog" a couple of times prior and thought this might be a way for her "students to practice higher-order thinking skills and allow them to be more creative" (Interview, July 29, 2014). The classroom blog began by combining an activity the students were already doing on a daily basis called "Our Day" in which students write a sentence about what they had done that day and post it on the blog. Rose has never looked back. Originally the blog was a place for students to write but in the 10 years since it began it has developed into a digital portfolio of student work. The technology has also changed, "allowing us to now post pictures and screencasts of what the students are learning" (Interview, July 29, 2014). Furthermore, "it's a way for us to show the whole world what's going on in our classroom" (Blog, June 23, 2014).

After seeing the success of her classroom blog, Rose decided to start her own professional blog to document her learning. At first she admits "I wasn't sure if I wanted to put myself out there. … I saw other people doing it and finally I jumped in" (Interview, July 29, 2014). The professional blog eventually served several different purposes for her: First, it is a space to be reflective; second, it is a place for constructive criticism; third, it is a place to share what she is doing in her classroom and at presentations with other educators; and lastly, it is a place of inspiration.

Most of Rose's blog posts are used as part of her reflective practice: "Like my students, I too am on a learning journey. I get choice in my learning goals and my professional blog is my space to reflect and document about those learning goals" (Interview, July 29, 2014). Other people, mainly educators, also comment on her blog post. Often the comments or critical questions from others challenge Rose to think in new

ways or to defend her stance on a certain topic. For example, in her blog post titled "What Would You Have Said," Rose defended her position of being in favour of students creating a digital footprint (Blog, November 3, 2014). The blogger was quite critical of Rose putting her students' work online and argued that it represented an unsafe practice and that she should stop using a blog. This reminded Rose that not everyone shares the same opinion and pushed her to reflect on why she has a blog, the benefits of having a blog, and the precautions she takes to protect her students. She concluded that the benefits of having a blog far outweigh any possible risk to her students:

> With the safety features I have built into the blogging process in our classroom (e.g., no student face is ever shown in a picture or video) and the ongoing discussion I have with my students, there is no contest. Blogging has opened too many doors for us. (Blog, November 3, 2014)

Although this was an uncomfortable experience for Rose, she appreciates the blogger's input because it made her revisit the reasons why she blogs and the benefits that are created for both her and her students.

When Rose reads other educators' blogs, she considers "how does that compare with what I do and how could I make what I am doing better?" (Interview, July 29, 2014). She often thinks "Wow, that must seem so simple to them but to me that is profound" (Interview, July 29, 2014). She disclosed that she has "changed the whole way I think about teaching in the last 10 years because I am reading what other teachers are doing and because I am more reflective as I contribute online" (Interview, July 29, 2014). She mentioned that while her students may not even be aware that she participates in a blog, she feels it makes her a better teacher and it is only to their benefit. It is obvious that Rose appreciates having an online learning network of educators as they "continue to inspire me. … I cannot overestimate the impact these people, most of whom I have never

met, continue to have on my own learning" (Blog, March 31, 2014).

Ava: Assessment in a Collaborative Environment

Ava loves to teach. She dreamt of being a teacher since she was a child and cannot imagine spending her days doing anything else: "I come to school every day with a smile on my face and I leave with one too. Teaching is not a job for me—it's my passion!" (Blog, December 18, 2012). She gave an example of her passion for teaching when she told a story about being on the Bill 115 picket line:

> As I walked in circles for 3 hours, I spent lots of time talking to different teachers. We didn't talk about what we did on the weekend though or about our holiday plans—we talked about school. We spoke about our classroom programs and what we think we're doing well and what we think we need to change. We exchanged ideas. We spoke about what we can do to help more students and ensure that all students become independent learners. On the picket line, we created our own professional development. (Blog, December 18, 2012)

Despite Ava's passion for teaching, school never came easily to her. While her work ethic was impeccable, she describes her performance as "never making the grade" (Blog, September 23, 2012). In grade 2, a battery of psychological tests revealed that she had a non-verbal learning disability. She recalls when the doctor gave her parents her prognosis: "Due to the severity of your daughter's learning disability, she will always struggle with school and will be lucky to make it to college" (Blog, September 23, 2012). In this instance, Ava had thought "in other words, forget university and my dreams of becoming a teacher" (Blog, September 23, 2012). Needless to say, she was devastated. But when Ava looks back on her journey to become a teacher, she reflects that

> I could have given up at that point. I didn't though. Despite having a learning disability, I also had some really significant strengths. I learned how to capitalize on those strengths. Also, my Mom and Step-Dad taught me strategies to be successful. I ended up graduating high school on the honour roll and even received the presidential scholarship from my university. This was an *aha* moment for me: anyone can learn. (Blog, September 23, 2012)

She believes her own experiences taught her to never give up on her students and she always needs to find a way to ensure they all succeed. Her classroom runs on the motto: "If they don't learn the way you teach, teach the way they learn" (Blog, September 23, 2012).

Ava has spent most of her 13 years of teaching in the primary grades; however at the time of this study Ava taught a grade 5/6 split class. One characteristic that differentiates Ava from other teachers is that she chooses not to have a teacher desk in her classroom, even when she teaches junior grades! She said "as a primary teacher for most of my career, I've never had a chance to sit at a teacher desk, so I chose not to have one" (Blog, September 1, 2012). She enjoys having the extra space in her grade 5/6 classroom and has noticed that students thrive when they can move to quieter spaces or to different types of furniture (e.g., couch, bean-bag, computer chair, rug) to work.

As well, she sees a great deal of value in having various technologies available to her students in her classroom. She is a teacher who goes to almost all of her meetings with a device in hand and can rarely find a pencil or pen. She is the Webmaster for her school, meaning that all emails from the website come to her (between 50-100 emails per day), which she then forwards to the appropriate recipient. She is a teacher who practices what she teaches; she uses similar technologies as her students.

Type of Teacher and 21st Century Classroom

It is obvious to anyone who talks with Ava that she is very passionate about her students and values their input in every aspect of her classroom. She highly values student collaboration as a teaching strategy and has her students working in groups more often than not:

> I am not the type of teacher who has a quiet classroom with all my students sitting in rows. In fact, most of the time students don't even sit at their own desks and

my classroom is noisy! It feels uncomfortable when the classroom is quiet. (Interview, July 29, 2014)

Ava believes that noise is an indicator of her students getting work done together. With this said, students in Ava's class do write tests from time to time, EQAO being one of them. In preparation for EQAO she wanted her students to understand how it felt to be in a testing environment and as a result had the students move their desks into rows. She described her students' reaction to rows: "a silent group groan" (Blog, April 19, 2012). She explained that

the room feels wrong when students are sitting in isolation. I know a testing environment should be silent but the silence feels wrong. I love the hum of collaboration. It's great to see students working and learning together. Learning is social. (Blog, April 19, 2012)

Ava explained that after the students handed in their tests "they quickly regrouped together. Some moved into the hallway, others used Google Docs or Twitter to share online, another group sat at the guided reading table to peer assess their geometry project" (Blog, April 19, 2012). While this was happening, Ava thought to herself "ahhh, order restored" (Blog, April 19, 2012).

Ava's class runs on students' voice and choice, as she strongly believes that "students know how they learn best. … When students take charge of their own learning, I find I have better results" (Blog, May 3, 2012). Ava asserts that she still respects the Ontario curriculum and follows it closely but students' involvement when deciding how to teach the curriculum is integral to students' ability to meet learning outcomes.

Typically, textbooks are a common learning resource. However when Ava taught kindergarten through grade 2 she seldom used a textbook. When she moved to junior grades, she "had more textbooks than students," including multiple mathematics textbooks ranging from *Math Makes Sense* to *Math Quest* to *Quest 2000* (Blog, March

19, 2013). Because many teachers rely on textbooks, most students are familiar with learning from them. Hence, when Ava started teaching the 5/6 split class, it took her students "some time to get used to doing math without always opening a textbook or completing a workbook page" (Blog, March 19, 2013). Despite her reluctance to use a textbook with her students, she often finds herself looking through it and using it as a guide for her lesson plans. She uses many of the questions as starting points and adds more open-ended problem-solving and real-world application exercises.

Ava believes her classroom is evolving into a 21st Century environment. She also said that if she thought she had a 21st Century classroom, then it would not be a 21st Century classroom; she believes a characteristic of a 21st Century environment is that it is always changing and there is no set end goal. She infuses technology fluidly into her teaching for the purpose of "pushing students' learning forward," meaning that students "create and apply knowledge using technology rather than just finding answers online" (Interview, June 24, 2014). She adds that "if technology is not useful then it is not used" (Interview, June 24, 2014). Her goal is for technology to be invisible to her students and to act solely as a vehicle for learning.

Ava has always believed strongly in the home-to-school connection. She uses weekly phone calls, regular emails, and a professional and classroom blog to give parents a look and voice inside her classroom. In one of her blog posts, she discusses her admiration for the parent–student engagement consultant for her board and highlights one of his blog posts. This post along with a discussion at the Minds on Media conference prompted Ava to use a radio station called The Hive 105 to broadcast Thinking Thursdays (e.g., students' reflections from their novel study). This way parents can listen

to their child at school and join in the discussion through the use of a backchannel, either on Today's Meet or Twitter. It did not end with parents though; the community was also invited into Ava's classroom. A principal from a neighbouring school and a teacher from a different city listened to the broadcast and offered some feedback on the backchannel discussion. Within the school itself, students were noticing how they can "flatten" a school. While Ava's class were broadcasting from upstairs, another class was tuning in from downstairs in the library. The Hive 105 experience showed Ava that "a 21st Century classroom is about opening up the learning environment and getting students collaborating, questioning, and learning together" (Interview, June 24, 2014). She continues by encouraging more parents, teachers, administrators, and community members into her classroom. She wrote on her blog that "our classroom door is wide open!" (Blog, November 9, 2012).

Teaching Awards and Distinctions

The Canadian Government recognized Ava for her excellence in teaching. She received the Prime Minister's Award for Excellence in Teaching in 2013. This award honours outstanding and innovative teachers who instill a love for learning in their students and utilize technologies to better equip their students with knowledge and skills needed to excel in a 21st Century society and economy. As well, like other participants in this study, Ava was selected as an Apple Distinguished Educator. Because of this program, Ava is a part of a select, global community that has been acknowledged for using Apple products in and outside classrooms to "explore new ideas, seek new paths, and embrace new opportunities" (Apple Inc., 2014, para. 1) to ultimately transform education. In addition, Ava's fellow bloggers nominated her for the Liebster award,

meaning that she is well recognized in the blogging educational community. Lastly, Ava has been featured in several teaching journals, such as the Elementary Teachers' Federation of Ontario's journal *Voice*, for her innovative approaches to technology-integrated assessment.

Assessment Philosophy and Practices

Ava's classroom assessment and evaluation program is guided by the Ontario Ministry of Education's (2010) document *Growing Success*. She understands classroom assessment as having three components outlined by Earl (2003): AoL, AfL, and AaL. She admits that she used to be a teacher who focused solely on the end product (i.e., AoL) until the first year of this study when she began using an inquiry approach to learning and realized that learning is more about the process than the final product. In paying more attention to the process, she found that AfL and AaL were integral to her teaching practice. For instance, Ava said she spends more time "sitting, looking, and thinking about how I can offer the feedback piece to my students throughout the learning process rather than just at the end. Because what use is feedback at the end of an assignment?!" (Interview, June 24, 2014). Ava acknowledges that she still evaluates final products to communicate with students about their overall performance but also includes a process rubric—which she often designs with her students—and through this rubric offers feedback to her students along the way.

Moving from the primary grades to a 5/6 split class, Ava realized that student productivity runs on AaL. Deep learning and genuine motivation happens when students are self-directed in their own learning and when they know what quality looks like. One of Ava's most positive assessment stories was when her students self-assessed their own

learning skills on a rubric and then justified to Ava why they deserved the grade they gave themselves. It was interesting to Ava "how students came to understand their own performance, how they judged their own performance according to certain criteria, and then how they were able to plan next steps" (Interview, June 24, 2014). Ava also said that students were more likely to follow through with the next steps when they are the ones who created them: "It's almost as though they police themselves" (Interview, June 24, 2014). Ava disclosed that the learning skills marks shown on report cards often come from the students' self-assessments. She often juxtaposed student-led conferences with the self-assessments to discuss marks students had given themselves and how they will accomplish their next steps. This was particularly evident with her two students with autism; modified classroom assessment forms allowed them to reflect on what they know and what they can do to make a difference in their own learning, which Ava had not experienced before with students with autism.

Ava believes that her role as teacher has changed since her classroom runs on AaL. Her role is to teach students how to self-assess and self-regulate, regardless of the grade level, and to provide feedback (i.e., AfL) to students' metacognitive thinking and performance. Many students in Ava's 5/6 split class struggled with self-assessment at the beginning of the year. Ava reasons that this was because the *Growing Success* document is still relatively new and not many elementary school teachers are putting it into practice. Students are used to taking tests and receiving grades rather than being involved in the assessment process and understanding where the grade came from. Ava hopes that teachers will begin teaching self-assessment in the primary grades so that "self-assessment would happen more organically by the time students reached the junior grades and be more

effective in helping students realize quality performance" (Interview, June 24, 2014).

Ava relies on various forms of technology (e.g., video and Goggle Docs) to document students' self-assessment and metacognitive thoughts. The technology provides Ava with an authentic view of students' understandings as it "sums up the learning that has taken place" and allows her to provide instant feedback to her students (Interview, June 24, 2014). For example, when using Goggle Docs she can comment and make changes to student work while or shortly after students complete an assignment. She also noted that "documenting student work keeps me accountable to my students, parents, administrators, and myself" (Interview, June 24, 2014). She is able to look back at what she calls "the story of the day [i.e., listen to recordings or see tweets on the backchannel]" in order to make an assessment of where the students are in their learning, what she needs to do next, and plan accordingly (Interview, June 24, 2014).

Ava hopes that by orchestrating a self-directed classroom, students will learn for "learning's sake and not just for the grade" (Interview, June 24, 2014). Because the current educational system is run on grades, Ava tries to ensure grades represent students' true learning but acknowledges that this might not always be a reality. She explains that the current grading system is difficult to align with an inquiry approach as it has a bigger focus on the process versus the product. Ava aspires to a system that uses feedback rather than grades. She gives the example of the FDK report cards: "looking at what students can do and how to move them forward (without grades), similar to a benchmark approach" (Interview, June 24, 2014).

Rationale for Using a Professional Blog

Ava sees reflection as an integral part of teaching to understand "what worked and

what didn't work" (Blog, March 27, 2013). Ava enjoys blogging about her regular classroom reflections and sharing her learning journey with the world. She admits that she could keep a journal, however it wouldn't allow for the ensuing conversation derived from blogs. She values the feedback she receives from other bloggers and appreciates the ideas she gains from reading others' blogs. For example, she made a change to the fractions unit after reading a blog post of how a particular teacher introduced fractions: "It was different than I had planned and done before but it gave me a better grasp of where the students were coming from and what they still needed to learn" (Blog, May 31, 2014). Another example is one that involved her vice-principal, who is an expert in inquiry learning; Ava noted that after trying an inquiry approach in her classroom, which ended in disaster, her vice-principal helped Ava take another look at how inquiry can work in the classroom.

As well, she values the fluent dialogue with administrators, which is a result of contributing to a blog. During the time of this study, her principal promptly and frequently responded to her posts, generated conversation, offered good advice, and asked good questions, which in turn pushed Ava to be more reflective. And yet, Ava mentioned that very few teachers in her school use blogs. As far as she is concerned, there are many missed learning opportunities from not using a professional blog. As illustrated in the examples provided by Ava, blogging can be an instant, impromptu professional development session for teachers. In addition, Ava uses blogs to open a window into her classroom; it is a way for parents, other teachers, and community members to see the proceedings of her classroom and discuss online.

Sara: Alternative Assessment in a Real-World Context

Sara is an educator, a blogger, a speaker, and a technology in education leader.

Her focus is on helping educators and administrators see the potential of social media and Web 2.0 technologies as a means for thinking critically about their own learning as well as making pedagogical choices in classroom instruction and assessment. She has taught grades 1 to 8 as a homeroom teacher in her 15-year teaching career. She has also taken a leave of absence for 3 years to teach full-time in the Faculty of Education as a cohort leader and an instructor of Integration of Technological Tools. She continues as a part-time instructor to date. Sara is currently a full-time itinerant teacher for an inclusive and self-contained Gifted Program. All of the students in her class have been identified as gifted and consequently each student has an individualized education plan (IEP). In addition, she runs an enrichment and innovation centre for her school board whereby she takes selected groups of students, who are deemed gifted in grades 5 to 8, and hosts workshops on various topics such as technology integration and alternative assessment methods in the 21st Century. She loves teaching and, like many of her colleagues, finds that working extra hours participating in trips, plays, concerts, and sports is a huge advantage of the profession.

Teaching children with special needs is close to her heart and mind because she suffered with a learning disability. Working memory and processing deficits were barriers for her as a learner, and sometimes still are. She remembers

> spending hours trying to memorize vocabulary tests only to get half the words correct. Math wasn't much of a problem until I was forced to memorize formulas. I never understood why they wouldn't just give me the formulas and let me apply them to something useful. (Interview, July 9, 2014)

This is why, as a teacher, Sara advocates so strongly for alternative assessment and a more liberal handheld device policy, meaning that students should be allowed to bring their own devices to school and use them at their discretion.

Type of Teacher and the 21st Century Classroom

Sara's classroom is driven by inquiry, problem-solving, and self-directed learning. She recognizes that collaboration and creativity are the cornerstones to student learning. In order to achieve her pedagogical goals, Sara believes she must build a trusting relationship both with and among her students: "Students know if they trust each other and they trust me, I can get them to do whatever I want them to" (Interview, July 9, 2014). She confesses that it is somewhat of an exploitive approach but trusts herself enough not to use the approach in a negative way:

> I know I trust them enough that if I gave them negative feedback they aren't going to go home and cry their eyes out. They recognize that I care about them. Establishing a community where everyone trusts each other and believes in one another and takes each other seriously is one where students thrive. (Interview, July 9, 2014)

Sara acknowledges that building trusting relationships in the classroom "takes work, effort, and vulnerability on everyone's part" (Interview, July 9, 2014). She states that "the better the teacher develops and fosters relationships, the better the assessment is—it's authentic" (Blog, September 4, 2012). Sara is convinced that students show their vulnerabilities once they feel they are in a trusting relationship; on the other hand, students will hide their weaknesses if a trusting relationship is absent, which in turn prevents authentic assessment and genuine, deep learning.

During the course of her career, Sara's resource pool has grown from a single textbook or course article to many sources and people, including her students. She has become more critical of information and resources, which has led her to think more deeply and reflect more authentically on her pedagogy.

Also, she requires her students to use current tools to support their learning. She acknowledges that some fellow teachers complain about "too much technology and that

we should get back to the basics," however Sara argues that "we are living in a world

where information is easily accessible so that in itself changes the way we are teaching

and learning" (Interview, July 9, 2014). She recalls

> The learning I did when I was a kid—there weren't as many opportunities
> because it was so different back then. We were constantly waiting for news from
> the day before and relying on radio and newspapers to give us the information.
> Today news sources are coming from around the world and we have more
> connections with people such as Skype and Google Hangout. So this in itself
> needs to change our pedagogy and we no longer need to be looking backwards,
> we can be looking forward. (Interview, July 9, 2014)

Consequently, Sara argues that "we need to teach our students how to be aware of

information, how to access information, and apply it properly" (Interview, July 9, 2014).

She discloses that she "rarely ever stands in front of the class to give a lesson" (Interview,

July 9, 2014). She often gives instructions to her students but rarely lessons. She relies on

her students to use real-world materials and resources to learn curriculum expectations.

For example, she took her students to the market and had them conduct one-on-one

interviews with the vendors and customers. One of the students wrote an article following

the interviews that was later published by the Canadian Education Association. She

discussed the importance of students being able to experience the world outside the

classroom and understanding their civic obligation to their communities.

Another example that demonstrates Sara's 21st Century learning environment is

that she insists her students apply current issues to the curriculum content regardless of

the subject. For instance, her students often used *Raise the Hammer*, a local website

detailing current issues and problems in the area. In one case, Sara's students were asked

to use geography, social studies, and mathematics curriculum to provide ideas for how to

effectively use a particularly desolate area in the local community that the government

sought to improve. Their ideas were sent to city hall. Sara concludes that the "problems

we give students have to be real. … It is our role as teachers to guide them in the problem solving process" (Blog, January 28, 2014).

Sara believes that her students "are no longer at the mercy of a single, all-knowing, knowledge possessing teacher/leader" (Interview, July 9, 2014). Sara strives to teach her students how to learn in various formats and how to self-evaluate until they are certain that they fully understand the skill. In fact, she believes that other students are one of the best sources of learning:

> When students engage in a learning task such as a project, a written work, or oral presentation they speak their thoughts and share their ideals—they empower others. When they write, share stories, and interact with one another, they risk causing ripples in others' ideals and maybe, just maybe, they might cause other students to question, to ask, to wonder, and to seek more from themselves and others. Maybe their actions, whether it be the hours of training for a marathon or the hours learning in schools make them catalysts for change, inspiring others to join the endeavour or create their own (whatever it may be). (Blog, October 24, 2012)

She admits that she does not think her pedagogy would be any different in a regular classroom than she does with her gifted students; the only difference is that she can go a bit faster: "These students are very quick to learn content and think outside the box but socially they are very awkward" (Interview, July 9, 2014). For example, when she taught in a regular classroom her students participated in South Pole for Kids, an activity in which they followed an expedition across the South Pole by using GPS and Skype. They followed their trip online on a daily basis and periodically spoke to the expedition personnel via Skype. Sara commented that her students were "fully engaged and learned a great deal about geography" (Interview, July 9, 2014). Because of the success of this project, she decided to do a similar project with her gifted students 3 years later.

The same team completed another expedition called the Bruce Trail Trek for Kids. Before their first Skype call, her gifted students were intrigued by the people who

were completing the expedition. After some student-directed research, the students found

out that the hikers were CEOs of Fortune 500 companies. Consequently, in the Skype call

one of the gifted students asked, "Don't you feel that by using the pretense for the Bruce

Trail Trek for Kids that you are actually promoting your own company and in the process

exploiting us kids?" (Interview, July 9, 2014). Sara describes the latter query as an

example of depth of thinking that occurs with gifted students that she has not experienced

with non-gifted students; however, while gifted students may be intellectually superior,

they lack social cues and etiquette required in the real world. Sara commented, "While

my student asked a good question, it wasn't the time nor the place to do so" (Interview,

July 9, 2014). Regardless of the differences between gifted and non-gifted students, her

pedagogy and philosophy remain the same: give meaning to their learning, involve them

in real-world activities, and mold them into self-directed learners and assessors.

Assessment Philosophies and Practices

Sara acknowledged that she is "opposed to most assessment methods" and her

"feelings about assessment are quite extreme" (Interview, July 9, 2014). This is why she

enjoys teaching gifted students, as all of her students are on an IEP. She purposefully puts

"alternative assessment methods" on each of the IEPs (e.g., providing oral assessments).

First and foremost, Sara's assessment program is grounded in students' ability to

self-regulate; that is, "knowing what to learn, knowing when they get it and when they

don't" (Interview, July 9, 2014). She thinks self-regulation is a critical ingredient to

successful lifelong learning:

> I tell my students if you don't know something you can always figure it out. I
> don't know everything either but I don't wait for someone to direct me. I ask my
> students how many of you ask your teacher what to do when you are done; why?
> Why do you want your teacher to be in control of your learning when you can

self-direct and control yourself? (Interview, July 9, 2014)

Sara fosters student self-regulation by offering students a pre-assessment prior to beginning a unit:

> [At the beginning of a unit], I ask them to look at the curriculum to identify where their needs are. And so if they can identify where their needs are this can guide my teaching. The students will say, "Here's what I want to learn in this unit." Or I'll ask them to look at the curriculum and pick three expectations they're really not sure about and then we focus on these expectations. (Interview, July 9, 2014)

Sara believes her role is to facilitate students in "learning how to learn and applying what they learn to a real world context" (Blog, January 28, 2014).

In addition, Sara believes self-regulation involves being able to monitor one's learning: "Students need to recognize when they need to go back to learn more or relearn something" (Interview, July 9, 2014). Sara teaches her students how to recognize when learning is hindered by using a process such as self-assessment and self-scaffolding. Sara has found that these processes rely much on students' metacognitive skills, which require frequent practice. It is critical for students to recognize when they "just don't get it and which strategies to use and when" (Interview, July 9, 2014). These AaL skills fuel Sara's AfL and AoL program.

The main reason Sara uses AfL and AoL in her classroom is to guide instruction and communicate student performance to her students and their parents alike. In her classroom, all work is assessed but not evaluated. When asked if all work gets assessed, Sara's response was "Probably not. But does all work get assessed for the way I teach? Most likely. Most tasks get assessed because I'm evaluating myself" (Interview, July 9, 2014). She further explained, "If a student fails a test I tend to take it personally" (Interview, July 9, 2014). She asks herself, "What did I do wrong?" or "How could I have taught this material better?" Sara shared that

> It drives me crazy when my teacher candidates teach a lesson and then go away. I would tell them "always be looking." It's constant data collection and the information can always be used in some way. … I am constantly using the incoming data to constantly adjust my teaching. Assessment should always be happening. (Interview, July 9, 2014)

If Sara gives her students a test, she believes they are ready to take the test; and if they fail, then she missed something in her formative assessments: "I would never give a final test unless I knew they were ready" (Interview, July 9, 2014). As an example, she notes that "If I was to run a marathon and I only completed 20 kilometers, then I wasn't ready. I needed more practice and more scaffolding" (Interview, July 9, 2014). The same goes for her students when learning new material.

Sara related one of her most positive assessment experiences to an instance when she gave her students a Science test and told them that she "didn't mind if they talked through the test as long as they got the right answers" (Interview, July 9, 2014). She gave everyone the test and instead of asking the students to be quiet, she wanted them to find out the answers from each other: "To be honest, I wasn't really evaluating their knowledge of the Science curriculum; instead I was assessing their ability to communicate, think through answers, and to find answers from one another" (Interview, July 9, 2014). This really excited Sara because she saw her students act differently than usual: "It was an odd scenario but eye-opening for me to watch" (Interview, July 9, 2014). Students who were usually low performing in language were excelling because they weren't seeing it as a language assessment; they were seeing it as Science task. Moreover, she had the students reflect on the experience on their student blog. One student's blog post was called "My Teacher Has Gone Crazy: Is It Collaborating or Cheating?" This particular student was a non-writer so when Sara first opened the blog post it showed a great number of spelling and grammatical mistakes (such as lowercase i's).

However, Sara thought that his ideas were strong and a personal best. Consequently, she tweeted out his post. The next day Sara went back to look at the post and all the spelling mistakes were fixed. She asked him, "Why did you go back and fix all the mistakes?" His reply was, "Because people were reading it" (Interview, July 9, 2014). Therefore, he used self-assessment without being asked to so because there was a public audience.

Sara realized in that moment that it wasn't about the student not being able to spell; he could do it, but it was a choice he was making. As soon as he realized that the assignment was an authentic task and people were going to read his work, he fixed the mistakes. Sara admits she was a passive observer for much of the assignment but it gave her important information about the student and his abilities. Although this assessment was an eye-opening experience for Sara in relation to this particular student, it also left an unsettling feeling in her stomach because she realized that "our assessments are not truly measuring what students know and do" (Interview, July 9, 2014). If she had not made her student's work public (an authentic task), she wouldn't have known what he was truly capable of.

Two other incidents made Sara question current assessment methods. One of her students was reading a novel by Stephen Hawking at home along with university-level textbooks on physics and yet his report card showed a C in reading. As well, Sara's son struggles in school and yet he built a computer from scratch during the summer holidays. "Everything he did was based on problem solving, collaboration, proper research, application, reading, and writing. And yet, he's not in alignment with his school assessments" (Blog, n.d.) Based on these situations, Sara concludes that "most often teachers are evaluating students inappropriately and according to our standards rather

than what they actually know and can do" (Interview, July 9, 2014).

Sara blames invalid assessments on the lag in assessments keeping up with the curriculum and 21st Century tools. She acknowledges, "Students know a lot more of the curriculum than we give them credit for" (Interview, July 9, 2014). Often, "it is not curriculum content that students have difficulty with but how they express themselves, especially for students with learning disabilities" (Interview, July 9, 2014). In addition, Sara has witnessed other teachers using assessments that are not conducive to the task or a 21st Century context. For example, Sara was teaching a self-contained gifted class when her students' rotary teacher came to her and said, "[the student] didn't hand in his health project." Sara's response was "Well, does he know it?" The rotary teacher said, "Yes but he hasn't handed in the assignment." Sara suggested that she "just ask him." The rotary teacher left and Sara called the student over to her desk. She gave him a Livescribe Pen[3] so that he could orally express what he knew about the Science curriculum expectations in question, and he knew them all. Sara said, "He could have been getting 100% but because he wasn't physically displaying what he knew the way the rotary teacher wanted him to, he received a lower grade" (Interview, July 9, 2014). She questioned the teacher: "Are we assessing how he could display the information or his understanding of the concept? Teachers often miss this in education" (Interview, July 9, 2014).

Sara cautioned that there is a drawback to always using students' preferred assessment mode in that they are not working to improve their weaknesses. However, Sara feels this can be overcome by balancing strengths, weaknesses, and modes. She also relies on the curriculum to guide which assessment mode is best suited for students to

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[3] Livescribe is a paper-based computing platform which includes a digital pen, digital paper, and software applications. For more information: https://www.livescribe.com/en-us/solutions/k12/

display specific curriculum expectations. Curriculum expectations often suggest what type of assessment mode to use and if they do not, then Sara feels it is up to the students to decide which assessment mode will best express their knowledge of the content.

As Sara's teaching career progresses, she feels she is more confident in being able to measure students' understanding and performance: "I don't need a piece of paper that says 20/20 to confirm that students have grasped the material. I learn much more from talking with my students and providing them with alternative means of assessment" (Interview, July 9, 2014). Fortunately, Sara's classroom is full of technology to help assess and evaluate her students in alternative ways. Each year, Sara is given a large budget to add more technology to her classroom (for the 2014-15 school year, she was given $45,000). With these funds, she purchased Raspberry Pi computers and a 3D printer, among other tools. She says, "by using these innovative tools I am able to get a rich picture of what my students genuinely understand" (Interview, July 9, 2014). As well, she is able to document students' learning much more easily which makes her more accountable as a teacher:

> I've seen administrators question their teachers about how they came up with a grade and the teachers were only able to recall 10% of the grade. Technology allows [teachers] to document student learning and justify a grade. Good teachers use the one-touch paper rule. It's about always giving constant feedback, learning together, and moving on. If you have to keep going back and looking at it means that you yourself didn't process the information. Teachers should be able to make changes immediately. That's why I like audio because it's quick. I know it's there; I have it stored. (Interview, July 9, 2014)

On a similar note, Sara uses questioning with the Livescribe Pen as a quick way to check for understanding: "Sometimes I just need to know if they know one specific expectation. So I literally take the Livescribe Pen and ask them the expectation. Confirmed; they know it and it's documented" (Interview, July 9, 2014).

However, this method when confronted with report cards creates some tension for Sara:

> When I went from teaching primary grades where we used A, B, C, or D to teaching middle school where we use percentages I was stuck. I would question myself, is it an 85% or an 89%? What is the difference between and 85% and 89%? Because at the end of the day I don't really know what they know. They could know more than I'm giving credit for or less than I'm giving credit for. (Interview, July 9, 2014)

Sara often asks her students, "Do teachers really know what you know?" and students respond with a giggle: "No, teachers don't really know what we know." Because of this, Sara thinks that "teachers are missing an integral piece of assessment—is it that we can't truly measure what students know or is it because we don't measure well enough?" (Interview, July 9, 2014). Even as a parent Sara does not put much worth on report cards. She admits that her son's report card was in his backpack for 2 days before she looked at it: "I just do not believe in them. Teachers just cut and paste comments and have nine different subjects to evaluate and I just don't think it's an authentic way to measure" (Interview, July 9, 2014). She would prefer a pass or fail system.

Sara has confidence that a pass or fail system rather than grades would provide an environment much more conducive to learning. She relies on feedback and conversations with her students to best assess their performances and guide further instruction. Her most preferred ways to provide feedback with her students is through using a Livescribe Pen or Google Docs. For example,

> Usually, I won't give students a grade but write feedback with my Livescribe Pen on post-it notes. Then the students find a quiet corner in the classroom, take their headphones, and listen to my feedback. Then they restructure their work based on the feedback they received from me. But then they could do the same thing—they could use the Livescribe Pen to comment back to me. For example, they might say, "here's what I really meant." So then that changes my course of action. (Interview, July 9, 2014)

Another way she uses a Livescribe Pen is to provide students with more information on a given topic:

> I create an audio wall on the topic we are studying, for example fractions, so students can learn how to decompose a fraction. They take the piece of paper off the wall, open it up, take the Livescribe Pen and listen to the lesson and answer questions on decomposing fractions. So they can self-direct their own learning. (Interview, July 9, 2014)

She said, "regardless of which tool I am using it is imperative that constructive feedback includes critical questioning to help students think more deeply or look at a topic from a different perspective—'well done' doesn't teach the students anything" (Interview, July 9, 2014). A piece frequently missed by many teachers is providing the students the opportunity to use the feedback on the same task:

> I always give my students an opportunity to revise their work based on the feedback I (or their peers) give them. I also tell my students they can change their mark anytime they want. For instance, if they get a B on an assignment and then they go back and use the feedback to fix the mistakes I change the mark to an A. Because I want them to see that it matters [to go back and fix the work and learn by doing so]. (Interview, July 9, 2014)

Sara further explained that she "sometimes mix[es] AoL, AfL, and AaL because evaluation can act as an evaluation [giving grades] but if they fix the evaluation it becomes more of an assessment to create a learning opportunity" (Interview, July 9, 2014). Sara hopes that all her students take part in making an evaluation into a learning opportunity. Sara questions: Does it matter if students "get it right on the first try? Do I reward the students who get it right the first time or does it not matter? My belief is that as long as they get to the finish line it doesn't matter how long it took" (Interview, July 9, 2014). Sara recently came to this realization during her son's grade 8 graduation:

> As I watched the kids walk across the stage at my son's graduation, there were some kids who hadn't even hit puberty and other kids who looked like men and women. These kids are changing at different rates physically, mentally and emotionally. Their brains are developing at different rates and yet we want them

to get to the finish line all at the same time. Physically they are not at the same stage and neither are they intellectually. If it takes one student four times to get the right answer and it takes another student only one time, should I evaluate them differently or the same?

If we were to run a marathon and I was to finish after you, does that diminish my achievement? No I don't think so, I still finished the marathon. Who cares about the time, it's irrelevant. For me, it's about getting students to the finish line. … Nowhere does it say they have to do it in a certain time frame; it's that they get there. (Interview, July 9, 2014)

Rationale for Using a Professional Blog

Sara is one of the five founding educators in North America to use a blog for educational purposes. She initially began blogging to share her ideas with other educators. Over time blogging has become a much more multi-purpose activity for her. Her blog has become an e-portfolio—a place for reflective practice rather than just a means to share. This can be seen in a change of writing style from her first to her most recent blog posts. Earlier posts were about sharing resources while her most recent posts are much more reflective and critical about education. She said,

> I could keep a journal but I find making my thoughts public, a possibility that someone might read my blog, forces me to be conscious about my statements and my feelings. I have to be very articulate. I have to think and reflect more. I ask myself, "Do I really believe this?" Because if I don't truly feel this then I am not going to write it down. (Interview, July 9, 2014)

Sara feels she must uphold her integrity throughout her blog whereas if she were keeping a journal she would "write whatever comes to mind and might not agree with it on a second read through, it was just how I was feeling at the time" (Interview, July 9, 2014). She also feels that the comments that her fellow educators write on her blogs push her to think more deeply and look at topics from new angles.

Sara referred to her blog as her "online home." It is a place where she houses her digital identity and leaves her online footprint. She tells her pre-service students that "you can start a blog from day 1 of your teaching career. For me, 15 years of blogging would

be an amazing resource to me and to others teachers!" (Interview, July 9, 2014). She

wished she could go back and look at her classroom when she first began teaching and

see the growth that has occurred.

Sara said blogs are her go-to news source and her number one professional

development tool. She sets a rule for herself to read and comment on a certain number of

blogs per week. She admitted that

> Blogs are how I learn. In fact, if I follow certain people I know my program can
> be solid for next year because those people are guiding me. I guess in a lot of
> ways other people's blogs help guide my program. (Interview, July 9, 2014)

Although Sara follows a few selected bloggers to improve her practice, she confessed that

many of the blogs she reads lack depth. She has had discussions with five founding

bloggers and the consensus is that "they are getting bored" (Interview, July 9, 2014). Sara

attributed this to "teachers' technology gap" (Interview, July 9, 2014). As she explained,

> We [five founding educational bloggers] were the first to start a lot of this stuff
> and people are now just starting to blog and integrate technology. So I question
> "what's next for us?" I feel like I am done with a lot of what teachers are
> currently blogging about but I can't be because most people are just starting.
> While I do look at other people's blogs as it is my preferred source of professional
> development I am careful about which ones I read to make sure I'm moving my
> thinking and practice forward rather than making it stagnant with things I already
> know. (Interview, July 9, 2014)

She compared the "teachers' technology gap" to the gap that we see in elementary

schools between students from lower income families and higher income families. She

noted that "There's always going to be a gap and we need to encourage that gap"—which

is contrary to what most people think: "Close the gap" (Interview, July 9, 2014). Sara

believes that "we should keep the gap because we [exemplary teachers] need to move

ahead too" (Interview, July 9, 2014). In addition, Sara explained that "there are very few

conferences and places that I've gone that I feel a deep connection of learning"

(Interview, July 9, 2014). She mentioned that most of her fellow teachers are "just

starting to use Twitter." She often questions,

> How do exemplary teachers move forward when they don't have the guidance of
> research? For example, there wasn't any research on blogging in the classroom
> when I began blogging in the classroom. When my principal or a parent would
> ask, "What is best practice here"? I would have to respond with "there isn't one."
> (Interview, July 9, 2014)

A big part of her professional development has had to change because of this inherent gap.

As a result, Sara has had to rely on exemplary blogs and other forms of social

media such as Twitter as a main source of professional development. For example, she

recently was funded to have a 3D printer in her classroom. She said

> if I look back 10 years ago at how I learned to use a new technology it would be
> overwhelming. I would have had to go to a conference or read a whole book to
> learn the product! But now, I follow tags and see other people's examples on
> Twitter of how to use 3D printers—this is what guides me. (Interview, July 9,
> 2014)

As well, she is a part of a group called Unplugg'd comprised of educators who are

spearheading technology integration in classroom practice. Every other year, a group of

approximately 40 international educators meet in Algonquin Park, Ontario to discuss

"what's next in technology integration" and how can they move their practice forward.

Chapter Summary

The profiles presented in this chapter detailed teachers' individualized

experiences with AfL, AaL, AoL and technology-integrated assessment. It is clear from

the profiles that these teachers are exemplary in many ways. They sought out new ways

to support student learning through assessment and maximized the possibilities

technology offers student learning, assessment, instruction, and evaluation.

Chapter 5 presents a cross-analysis of participants' understandings and

experiences of AfL, AaL, AoL and technology-integrated assessment to reveal common

themes across all participants.

CHAPTER FIVE: COMPOSITE DESCRIPTION AND ESSENCE

In the previous chapter, each profile illustrated the exemplary elementary school teachers' unique understandings of and experiences with classroom assessment and the modernization of infusing technology into their assessment practices. This chapter extends from the findings in the previous chapter and focuses on the reduction of participants' experiences to a composite description; that is, it identifies participants' common experiences to ultimately reveal a universal essence of experience from the participants in this study. Analysis of each participant's experiences through coding and categorizing into significant statements as described by Creswell (2013), Merriam (2009), Moustakas (1994), and Patton (2002) revealed an array of interdependent and interconnected factors among teachers' understandings and implementation of classroom assessment. Max van Manen (1997) suggests that the basic purpose of phenomenology is to "grasp of the very nature of the thing" (p. 177); that is, to reduce individual experiences to a description of the universal essence.

In this chapter, seven broad themes are identified: A blended learning approach to 21st Century assessment; an inquiry approach to foster deep student learning and personalize assessment; collaborative learning transformed; classroom assessment driven by AaL; pedagogical documentation for assessment and accountability; teacher-leaders and self-directed professional development; and teachers' learning differences as a motivator for change and alternative assessment. Through a cross-comparison as described by Creswell, Merriam, Moustakas, and Patton, the role of each theme in a participant's classroom assessment pedagogies was compared and contrasted with those of the other

three participants. A description of each theme within a 21st Century context follows.

A Blended Learning Approach to 21st Century Assessment

All four elementary school teachers in this study defined a 21st Century classroom as a lens in which their classrooms operate. They recognized collaboration, creativity, problem solving, critical thinking, and digital citizenship as pillars of 21st Century teaching and learning within an inquiry, problem-based, deep learning approach. They understood assessment as a measure to inform instructional next steps and to guide students' self-assessment and awareness of their own learning, whereas they understood evaluation as a means to ensure students have met desired curriculum expectations, to communicate to students the quality of their work, and for reporting purposes.

Elementary school teachers in this study understood a 21st Century classroom as one that infused technology into many facets of the teaching, learning, and assessment process. However, as Rose noted, the primary purpose for using technology was not to "allow us to do traditional [teaching, learning, and assessment] in a different way but to allow us to do things that we thought were not possible" (Blog, March 22, 2014). For these elementary school teachers, technology made it possible for students to create and show what they knew in ways that were not previously possible. It gave students new formats to express their knowledge and abilities while giving teachers a richer picture of students' understandings and capabilities. As Stephanie observed, "Technology allows us to see more closely what a student can do" (Blog, March 22, 2014). When infused properly, these elementary school teachers believe technology becomes invisible to the students—simply an organic part of the learning process.

More thorough assessments required students to be digital literate, which all four

elementary school teachers believed is an important literacy to have while "growing up in an online age" (Rose, Blog, January 5, 2013). Digital literacy in their classrooms evolved from students independently finding information online to knowing how to access proper information, learning how to connect globally, and learning how to apply curriculum expectations to current events and real-world problems for a social cause. Both teachers who taught junior grades noted that they try to stay current and in tune with the technologies that students are using at home (e.g., Minecraft, Google) and attempt to infuse them into classroom tasks.

As Sara noted, "Often people complain about too much technology: 'We need to get back to the basics'" (Interview, July 9, 2014); however, all of the participants disagreed with this notion. Rose explained,

> The days of students reading only books, writing only on paper, and becoming literate in an isolated classroom have passed. This type of classroom is outdated. … We are living in a world where information is easily accessible so that in itself should change the way we are teaching and assessing. (Blog, July 28, 2013)

Consequently, all four elementary school teachers in this study embraced a blended learning framework in their classrooms. They used both traditional and modern approaches to teaching, learning, and assessment through the use of a variety of technologies and mediums. Sara explained:

> Online, there are communities and resources where students can engage in rich discussions, problem-based tasks, and authentic inquiries with a variety of supports and mediums. While in-class, students and teachers can share meaningful discussions and use their understanding of the entire person ([e.g.,] voice, body language, eye-contact, physical/mental health) to guide needs and next steps. Teachers can coach students through thoughtful and provoking questions and as a way to get them to think more deeply about a topic. (Interview, July 9, 2014)

The elementary school teachers believed technology held an integral place in their 21st Century classrooms but cautioned other teachers on their professional blogs not to

abuse or misuse it. Ava shared, "I try to use technology fluidly to help students learn

something more deeply or to share their learning but if it's not useful then it's not used"

(Interview, June 24, 2014). Similarly, Rose commented,

> I'm not a big fan of using technology as a digital way to do what can be done on paper. I've seen lots of online examples of students using iPads to make a good copy of their writing or to practice number facts but to me that is like buying a Ferrari to only drive six blocks to church each Sunday. It works, but what a waste! The power of technology is the power to create. (Blog, March 22, 2014)

Rose further explained the value of using technology in a blended learning framework:

> Using technology does not mean keeping students entertained with digital worksheets, or practicing skills with animation, or using computer time instead of a red checkmark as a reward. Instead, use technology when it allows students to do something in a better way than they've done before or to do something that was formerly impossible to do. (Blog, January 5, 2013)

A blended learning framework for these elementary school teachers meant that they

carefully chose when it was appropriate to infuse technology or when it was better to stay

with traditional methods. Rose made a comparison to books:

> Having access to books does not mean that the students in my classroom will learn to read. I need to make careful pedagogical choices and use books in a way that will gently and purposefully help students become independent readers. Very few students can make this leap themselves. Most need a thoughtful teacher to guide them. (Blog, June 15, 2014)

In the same way, Rose noted that "having technology in my classroom does not

mean that my students will discover how to use it as a learning tool. I have to carefully

select and structure what it is used for so that it becomes truly educational" (Blog,

January 5, 2013). In addition, Sara (the gifted teacher in this study) highlighted that it is

the teacher's responsibility to teach how to use technology for learning purposes:

> I've come to realize, as both a parent and a teacher, that unless [technological] tools are explored, discussed, shared, and scrutinized collaboratively by the students and a knowledgeable and informed teacher … students are going to have little opportunity to learn how to use them and show what they know effectively … and learn from them. (Interview, July 9, 2014)

Despite the benefits of infusing technology into learning tasks and instruction, one teacher highlighted that not all tasks require technology to be considered a blended learning classroom. Teachers still value tasks that are free of technology (hence the "blended" approach). For example, Rose shared that "this past year, my students were fascinated by what they could do with dominos—both with setting them on their ends and watching them fall and with seeing how high they could be stacked" (Blog, July 30, 2013). Rose emphasized that her students did not use their iPads for every activity or in every spare moment: "They still liked other classroom tools such as Lego, dominos, and drawing on paper but iPads were a popular choice as there are so many different ways to use it" (Blog, July 30, 2014).

In sum, the elementary school teachers in this study realized the immense impact that a blended learning program has on assessment data and student learning in a 21st Century classroom. All four elementary school teachers admitted that their classrooms are never where they want them to be; Stephanie noted that "It's never static and always evolving—a true indication of a 21st Century classroom" (Interview, August 11, 2014). Rose ended one of her blog posts by sharing "thanks to advances in technology we now have powerful tools to help teachers assess and students learn in unique ways" (Blog, March 30, 2014). Moreover, Sara advocates that

> We know that cell phones and similar technologies are becoming the way of the future. It is for this reason that parents, educators, teachers, instructors, professors need to step back from the teaching podium and find ways to integrate, moderate and balance the safe use of these tools for learning and assessment purposes instead of banning them. (Blog, October 18, 2013)

After all, as Sara observes, "students have [technologies] in their pockets" (Blog, October 18, 2013).

An Inquiry Approach to Foster Deep Learning and Personalize Assessment

Although elementary school teachers in this study highly valued an inquiry

approach to learning, they still had difficulty defining what it looked like and how to properly implement such an approach. Stephanie shared her feelings about using an inquiry approach in kindergarten classrooms: "Many kindergarten teachers say they are doing inquiry all day long but when I observe their classrooms there is very little evidence [of an inquiry approach]" (Interview, August 11, 2014). Stephanie explained that inquiry as an approach is still "murky" in its definition but "it certainly is not an anything-goes approach where students do whatever they want to do and the teacher has 20 inquiries happening all at the same time. It is the teacher's responsibility to direct inquiry" (Interview, August 11, 2014). On a similar note, Rose explained that it is up to the teachers to "find resources and lead inquiry in the area of student interests [to foster deep learning]" (Interview, July 29, 2014).

For example in Stephanie's class, some students began wondering about frogs after a walk to the pond, and together they recorded their wonderings. After school, Stephanie and the Designated Early Childhood Educator (DECE) discussed how they could support the five students who had expressed curiosity about frogs. The DECE suggested putting some frogs in the water table and then observe the student talk that occurs to support further instruction. The students discussed at length the fact that the frogs were jumping and they needed some rocks and lily pads. One student said, "we need some lily pads for our frogs to jump" (Blog, October 20, 2012). This led to another inquiry about lily pads and how the students could make them for the frogs. They then tested the lily pads. Stephanie concluded, "so much learning, expected and unexpected, came out of this activity" (Blog, October 20, 2012). As Stephanie and the DECE observed this learning experience they too learned about students' learning

needs and performance level.

An inquiry approach for these elementary school teachers is based on integration in which multiple subject areas merge into one inquiry. Ava said "an inquiry approach provides a lens to look at one topic from many different perspectives (i.e., Science, Mathematics, Language Arts)" (Interview, June 24, 2014). For example, Stephanie shared that her kindergarten class "was looking at nesting boxes outside and the students started wondering" and that she "looked for books and videos on birds and their nesting abilities to embed into the literacy block and then in Science we discussed properties of nesting materials" (Blog, June 22, 2014). Teachers experienced difficulty when it came time to evaluate students' final projects. The more integrated the assignment, the more difficult it was to evaluate and report on the particular work. Ava said she tried to overcome this obstacle by creating a rubric that included curriculum expectations from each subject area—specifically, Language Arts expectations, then Science expectations, then Social Studies expectations, et cetera were delineated separately. Therefore, although projects that used an inquiry approach were integrated, the evaluation was categorized to meet reporting requirements.

Despite the reporting requirement set by the Ministry of Education, Sara quickly learned that "an inquiry approach is not necessarily all about the final product" (Interview, July 9, 2014). For example, if her students were to build a bridge, the end result would be a bridge. However, she did not see the end product as important as the process. She questioned, "What did they have to do to make a working bridge? And what were the trials and errors?" She deemed the peer-to-peer conversations about why one bridge was working and why another wasn't as the real learning experience in this

assignment. Because the inquiry approach heavily emphasizes the process and the thinking that happens during the process, elementary school teachers in this study believed that AfL becomes vital to student learning. In the same way, Ava commented that her

> Assessment has changed in many ways. I was a person who looked at the end product. … Until this year where a greater look at assessment for learning piece came into play largely because I switched towards an inquiry approach where it's not just about evaluating the final product but assessing the process. I spent more time sitting, looking, and providing feedback. (Interview, June 24, 2014)

All the elementary school teachers in this study agreed that feedback is integral to learning. Sara shared that "Feedback from me and their peers is the best way for my students to be notified of their misunderstandings and correct their mistakes. It's important for students to experience [the curriculum] and then get feedback on what they don't understand" (Interview, July 9, 2014). However, Stephanie acknowledged that in an inquiry environment the feedback cycle becomes complicated:

> I understand why some teachers struggle with inquiry learning in the classroom. It presents a totally different feedback cycle. [The feedback cycle] might be different depending on the learner, the task, and the skills needed. There is not a specific formula. We are always searching for one but it doesn't exist. That's what makes our profession so interesting and so essential. We need to be constantly differentiating our feedback based on our learners, our tasks and our experiences. (Interview, August 11, 2014)

In spite of the endless obstacles that teachers experienced when using an inquiry approach, they still said that the benefits to students outweigh the difficulties. Ava commented on her blog that "Inquiry is awesome! Students benefit so much from posing questions, uncovering information using various online and offline sources, and making sense of information. … I love hearing about what they've discovered" (Blog, September 7, 2013). Ava also noted that her students are so much more engaged in classroom activities: "Because students pose their own questions and wonderings, they all have an

entry point for learning" (Blog, September 7, 2013).

Collaborative Learning Revisited

The four elementary school teachers in this study greatly valued student collaboration as part of their teaching pedagogy. Rose learned early on in her teaching career that "kids learn best from kids" (Interview, July 29, 2014). She explained that "I could teach them the same thing in many different ways and then another kid explains it in a way I could have never explained and they just get it" (Interview, July 29, 2014). Likewise, when Stephanie's students wondered aloud about what it would be like to move, Stephanie had some picture books handy but the learning was far deeper when the students asked another student in the class who had actually moved. Consequently, Stephanie realized "even the best book or digital program is no match for personal contact" (Interview, August 11, 2014). On a similar note, Sara makes an effort to start each morning with circle time. They might play a game, talk about a current event, or gather ideas for an upcoming lesson. She reasons that "the circle brings the class together as one team, a group of co-learners, and a support structure they will need for our collaborative learning environment … and the real world" (Blog, September 4, 2012). Similarly, Ava strives to instil a collaborative nature in most of the assessment tasks in her classroom. As discussed her in profile, she feels uncomfortable with students working quietly and independently at their own desks. She feels that her classroom is supposed to be a "beehive of activity with students all learning together" (Blog, April 19, 2013).

Students not only learn from each other but can also assess each other's work if given the proper instruction and resources. Elementary school teachers in this study discovered that collaborative learning environments are conducive for peer assessment.

Students use a document camera each day in Stephanie's class to share their work:

> In circle time, students will put their work under the camera and talk about their work [e.g., drawing]. So they will tell us about their drawing and whether they have written any letters and what their message is supposed to be. Through that the students will then compliment the student: "Oh, I would like to compliment you on using good colours—you used orange for a pumpkin," or they'll notice you used a "p" and that's the beginning letter in pumpkin. (Interview, August 11, 2014)

Through the use of peer-assessment, Stephanie realized that giving compliments to other students sparked their own self-assessment and made them self-aware of their own performances. It would highlight the areas they need to improve upon in comparison to how their peer performed. This provided an opportunity to discuss next steps and how the students would approach another (similar) task. Stephanie noted:

> This is where I see AaL very important for kids—getting students articulate enough to say "this is what I do well, this is what I need to work on and this is what I will do next and this is how I am going to get there." Believe it or not, they can do this at age 4. (Interview, August 11, 2014)

Therefore, peers are an effective assessment resource for students in collaborative contexts.

In contrast to what some teachers might think, technology has not relegated students to learning individually with their tablets in hand. In fact, elementary school teachers in this study would argue it has encouraged further collaboration. This proved to be the case in Rose's classroom when her students did not want to use only iPads; they wanted to share them. Rose said, "The hum of voices excitedly talking to their peers about what they were doing was just the same as it has always been. They just had different things to share" (Blog, July 30, 2013). This showed up in an interesting way in her classroom; Rose described what happened to student collaboration when iPads were being used:

> The couch was a popular place to work [with the iPads], but once the couch was full some students pulled chairs next to the couch forming a line of learners sitting

side by side … when the line was full, the next students would make a line in front of the couch. (Blog, July 30, 2013)

Rose thought that the only logical explanation for doing this was for the ease in sharing what was on screen.

As well, Sara experimented with Kinect[4] in her classroom to teach Math, Social Studies, and Language Arts. She found that it was a very fun way for students to work together in solving problems, debating stories and characters, and thinking through puzzles and math games. Sara concluded that "allowing students to move around, challenge one another, and discuss the creation and process of the game itself was an incredibly insightful assessment for me and meets them in their world" (Interview, July 9, 2014).

By extension, the exemplary elementary school teachers in this study took collaborative learning to the next level. Because of the advances in technology, these elementary school teachers collaborated with distant classrooms, connected with experts in the outside world, and in some instances gave students an opportunity to become teachers themselves. Rose explained:

> It used to be that my class was isolated. Our learning community was just my 20 or so students and I, working together, with occasional forays into the other classrooms in the school. Now, we routinely practice and learn with other classes around the world. We use Twitter as a backchannel while we look for characteristics of fairy tales or use Skype to do Reader's Theatre with classes in Florida and Pennsylvania, or to practice phonics rules with students in South Carolina, we are learning in new ways. Ways that allow us to grow in knowledge and skills from our contacts with other learners. (Blog, July 28, 2013)

It is evident from these examples that classrooms are using technology to link with other classrooms and experts to ask questions, compare experiences, and learn together.

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[4] Kinect is an accessory for the Xbox 360, where motions and gestures control game functions. For more information: http://www.kinecteducation.com

Rose has witnessed unprecedented strides in how her classroom functions and the depth of student learning because of connected learning. She admits that she "tries to incorporate this [connected learning] as much as I can" (Interview, July 29, 2014). She further explains, "By watching what other students in other places are doing, students are serendipitously learning together. Kids are learning from kids who are most often different from themselves which creates a deep learning experience for all involved" (Interview, July 29, 2014).

Furthermore, elementary school teachers in this study believed that technology is for sharing with the world. Rose expressed that

> The environment that our students are growing up in is wired for sharing. The hardware and the software that is available makes it easier every day for children to share what they are learning with the world. Even young children can share their learning using drawings, images, blogs, video, and digital portfolios. By sharing their artifacts digitally, students invite the involvement and support of their parents, grandparents, and anyone who sees their work. (Blog, January 5, 2013)

Rose also noted that "It used to be that students learned to write by writing on paper. Sometimes they wrote in notebooks and sometimes they wrote on single sheets but no matter how they wrote, I was the intended audience" (Blog, July 28, 2013). Now students from all four classrooms in this study write for multiple audiences (i.e., parents, grandparents, other students, community members), not just for their teacher. If nothing else, this demonstrates to students that assessment tasks are authentic because others are reading their work.

As beginning readers and writers, Rose's and Stephanie's students first read and compose tweets as a class until they are able to do so independently. As they develop throughout the school year, they play Guess My Number, tweet secrets about Santa, and share riddles they composed. As well, Sara's gifted class followed Chris Hadfield, the

Canadian astronaut whose photos, videos, and tweets inspired her students' interest in space. In addition, Rose's class follows some classes that tweet in French. This demonstrates to her students that "other people speak and write in this language that we practice together" (Interview, July 29, 2014). The giving nature of others on Twitter continues to astound Rose. Her students are thrilled that people they have never met help them with their reading and writing.

In Stephanie's grade 3 classroom, the students Skyped with a class in Alaska. The teacher held up the camera so that Stephanie's students could see their backyard and to their surprise they saw real volcanoes in their schoolyard! This led Stephanie's class to question all of their Skype callers, "What do you see when you look outside your classroom window?" from which the What Do You See project was born. This project grew from two classes serendipitously learning about each other's schoolyards to many classes around the world learning from one another (Blog, October 23, 2012). One of Stephanie's followers wrote on his blog, "I feel that people are agreeing to participate in this [What Do You See project] because it is a simple concept that can yield a lot of learning" (Blogger, November 4, 2012). Because of the learning that took place with this project, Stephanie continued the project with her kindergarten class the following year. Another example of learning through other classrooms was the 1-minute dressing challenge, in which two teachers (and their students) in this study participated, among others. Stephanie's kindergarten class learned that Rose's students who lived in another province also had recess during the winter time and they didn't get dressed very fast either. These exercises gave much more credence to their learning because they were seeing other children practicing the same skills. Essentially, they acknowledged that there

was something greater than themselves.

Backchanneling has become a prominent AfL strategy in three of the four elementary school teachers' classrooms. Ava described backchanneling as "the background (usually online) discussion that happens during a lesson, presentation, or in my class's case a radio show" (Blog, December 7, 2012). Thinking Thursdays (usually a student's novel study reflection) were broadcasted on The Hive 105's radio show. Each week a few students were chosen to host the radio show while the remainder of Ava's students comprised the audience for the show. Through the use of Twitter or Today's Meet, the audience reflected on and challenged the hosts' thoughts. Ava found this to be an effective way to formatively measure her students' understanding. Plus, it was a way for all students in the class to be engaged in student presentations. On the other hand, Rose's class had experienced backchanneling with whiteboards but never online with their iPads. She decided to give it a try and she observed as her students listened, watched, reflected, wrote, and read together. Her students supported each other as they learned and at the same time they were able to clearly show their learning. Consequently, Rose deemed this to be an effective AfL strategy for her classroom.

A caveat mentioned by all elementary school teachers is that collaborative and connected learning is not conducive to the current grading system. All elementary school teachers confessed to always evaluating students on an individual level and never as a group. They relied on student-teacher conferences, consistent feedback cycles, continual observations, and individual components to assessment tasks to ensure accuracy of their evaluations and that each student was meeting curriculum expectations. Ava shared that her students were usually on board with an individual component to the assessment tasks

as they often self-evaluated differently than others in the group, hence the students saw the value in individual marks over group marks. Ava did mention that "it took a while for students to be able to accurately self-evaluate but through the use of lots of anchors and conferencing with me we were able to get there" (Interview, June 24, 2014).

All elementary school teachers agreed that learning from others is the key reason for connecting classrooms. To be clear, Stephanie declared that "connecting with others is not in addition to our curriculum; it is a way to do our curriculum" (Blog, December 8, 2012). Rose asked her grades 1 and 2 students what they learned from connecting their classroom; her favourite answer was "because we can learn more stuff" (Interview, July 29, 2014). It is clear from the latter student's response that learning through connecting with others just seems obvious to students. The limitations of technology such as social media are based on the teachers' imaginations of what they can do with it. As Sara indicated, "We learn best from people and technology connects us with people" (Interview, July 9, 2014).

Classroom Assessment Driven by AaL

When elementary school teachers in this study were asked to define a 21st Century classroom, all of them responded with some element of AaL. Rose acknowledged "there's always self-assessment going on. … In students' minds they are thinking, 'oh he really gets it but I didn't really understand it'" (Interview, July 29, 2014). And yet, Rose believes that teachers do not use this to their advantage: "[Self-assessment] is often left out of assessment despite the high value it offers student learning" (Interview, July 29, 2014).

Still, the general consensus among teachers was that students are the best assessors of their own work. As mentioned in Sara's profile, she believes that teachers cannot always accurately measure what students know based on a variety of different

barriers, such as how well suited an assessment mode is to a student, the limitations in measuring understanding, narrowness of expectations, or limitations of the technology being used. Because of these barriers, the teachers have confidence in students assessing themselves as the most accurate representation of what they know. All four elementary school teachers when asked to share their most positive assessment experience told a story centred on student self-assessment and students regulating their own learning.

Because the elementary school teachers highly valued AaL, it drove their balanced assessment programs. Sara said that "all assessment and evaluation is set around influencing students' understanding of their own learning [AaL]" (Interview, July 9, 2014). A balanced assessment program to these elementary school teachers did not mean an equally balanced system whereby one-third of the classroom assessment was devoted to AfL, one-third was devoted to AoL, and the remaining third was devoted to AaL. In fact, they believed that AaL is always happening on a variety of different levels, such as setting goals, evaluating progress, error correction, making mistakes, self-assessment, and peer assessment. AfL is an approach to complement students' AaL and inform teacher instruction. Namely, teachers use AfL strategies such as sharing expectations, questioning, feedback, anchor charts, and student talk to inform students' metacognitive thoughts and to guide further instruction to bring students to new understandings or improve a skill. Additionally, AoL is a way to measure students' performance and how well AaL was able to help them meet their learning goals. It seems that there is not (and cannot) be a standard equation for a balanced assessment program because this dynamic system changes across subject areas, inquiry models, grade levels, and teachers, among other factors. But teachers did say that AaL must be at the front and centre, complementing AfL.

Recently elementary school teachers in this study have made great strides in trying to incorporate AaL into daily classroom tasks. Ava mentioned that "Since I have adopted an inquiry approach to learning [over the past school year] I have been forced to use much more AfL and AaL in my classroom" (Interview, June 24, 2014). She attributes this change to the dynamic nature of an inquiry approach, meaning that because students are constructing knowledge on their own they are required to regulate their learning and continually be engaged in self-assessment and metacognitive thought. As well, Stephanie noted that when using an inquiry-based approach, the feedback cycle (between teacher and student) changes and relies on trial and error learning, forcing students to use AaL. She acknowledged that AfL has to be extremely prominent in an inquiry-based approach because it relies much more on personalized, small-group instruction rather than on direct instruction to the entire class. Stephanie admitted that she is still learning the feedback cycle in such an approach but recognizes that AfL needs to be used frequently in an inquiry approach as students do not have direct instruction as a foundation to their learning; however, she questions

> how much [feedback] is too much? How do I provide mucking about time [without interfering with feedback] while still ensuring to meet curriculum expectations and the varied needs of students? When is it okay to let your students struggle to find new meaning? I think that this creative time allows for so much learning to happen, but when do I coach and when do I let them be? This something that I'm forever considering. (Interview, August 11, 2014)

She goes on to say,

> In kindergarten this is one of the hardest parts because we want to jump in right away and say you need to do this, this, and this. … So it's about a delicate balance of knowing when to extend their learning and when to wait and see if they're ready for the next step. (Interview, August 11, 2014)

Furthermore, participants noted that they use AfL and AoL as a means to influence students' AaL. Stephanie provided the example of

when I question a student [in attempts to error correct] this interrupts students' thought processes. The more I question, the more the student realizes that they are on the wrong track. The student then uses AaL to get back on track. (Interview, August 11, 2014)

In addition, elementary school teachers in this study recognized AoL as a means to communicate with students about the quality of their work. Sara mentioned that "all summative tasks in my class can be formative, if students choose to do so [learn from and revise their work]" (Interview, July 9, 2014). She divulged that she is "always willing to change a mark if students learn from the summative task but they have to show me the improvements" (Interview, July 9, 2014). Likewise, Rose shared that "no work in her class is ever summative until the very last day" (Interview, July 29, 2014). As is evident from these examples, the participants used AoL to inform students' AaL (i.e., how students would approach a similar task next time) but ultimately to inform students' metacognitive thoughts. Consequently, the elementary school teachers recognized the intricate and complex interactions among the three purposes of assessment.

As the elementary school teachers' assessment programs move towards a larger focus on AaL, they described the changes in their role as teachers. Rather than being traditional teachers who stand up in front of the class to deliver a lesson, they act as facilitators of student learning, helping students to understand themselves as learners and incorporating a great deal of AfL to guide student learning and inform next steps for further personalized instruction. For example, Stephanie shared the following:

> I sat with a group of boys and asked them to tell me about their structure. One boy said it was a ramp, and another said it was a bridge. They argued a bit over what it really was and discussed the differences between ramps and bridges. So this week I will add some photos of real bridges and ramps and let students explore. (Blog, January 8, 2013)

As well, Sara noted, "I've learned I need to take a step back and trust my students. I need

to provide time, support, and facilitate the groups to allow them to discover for themselves the different possibilities, avenues, and perspectives of an issue" (Blog, January 8, 2013). Furthermore, Stephanie and Rose believe that students work best when teachers support them through modeled, shared, and guided experiences. As Rose explained,

> For anything that will become a learning routine in my early years classroom, whether it involves technology or not, I model, model, model it and then we practice it together until the students can do it independently. Even once that independence has been established, I still have to monitor how and what the children are doing to ensure the best learning outcomes. (Blog, January 9, 2014)

Similarly, Ava described her role as a teacher at the junior grade level:

> Many students may just need a quick reminder of what to do, and a short lesson followed by some practice time could assist them. Others may need more support, and this is where I'm going to need some guided math groups, where we can do more questions together and talk through the steps in the process. (Blog, September 14, 2013)

In sum, elementary school teachers in this study highly valued AaL in order for students to recognize quality in their performances and to become metacognitive thinkers and independent learners. Producing an environment conducive to cultivating students' AaL seems to be an area that elementary school teachers are still working towards but based on the discussion above, they are making great strides in doing so.

Pedagogical Documentation for Assessment and Accountability

When asked to define pedagogical documentation, Ava answered "it is an efficient way to keep track of student work and stay accountable. I no longer keep filing cabinets in my classroom to store student work" (Interview, June 24, 2014), while Stephanie said that "it's a way to better understand student learning" (Interview, August 11, 2014). Sara commented that pedagogical documentation "takes place during the natural flow of the day and isn't a mere after-the-fact. It's a way to capture ongoing

assessment that is true and in real time" (Interview, July 9, 2014). Ava in turn said that pedagogical documentation "provides a story of the day with lots of evidence!" (Interview, June 24, 2014).

Stephanie shared that when she first started teaching, "it was all about the binders and the bulletin boards" used for "my purposes and no one else's" (Blog, October 20, 2012). Stephanie admits that she still uses bulletin boards but "I don't find them as effective. … Bulletin boards are stagnant; it doesn't have the diverse audiences that our classroom blog does" (Blog, October 20, 2012). Stephanie's first choice of classroom technology is an iPad for its camera: "I always have the iPads handy and it's second nature for me to be taking photos of everything that is happening in my class" (Blog, January 8, 2013). She then uses an app called Pic Collage to organize the assessment data she collects. She works with groups of students to arrange the photos and then type their thoughts. Stephanie believes "this is so much easier than using Bristol board panels. I also believe it's faster and I'm able to capture the learning moments right when they happen" (Blog, January 8, 2013). Likewise, Sara found that the documentation process could be used for more than just her own teaching practice and accountability; she strongly believes that "the documentation process should also be used for students to reference and build upon their knowledge base. It's a way for them to observe their own learning and witness growth" (Interview, July 9, 2014).

The teachers felt the pressures of accountability. Ava noted that she is "accountable to students, parents, administration, and the public"; therefore, as she notes, "pedagogical documentation is evidence" (Interview, June 24, 2014). Sara explained further that "if a principal were to ask how a grade was calculated, many teachers would

only be able to recall 10% of the grade" (Interview, July 9, 2014). To avoid this type of

situation, pedagogical documentation was used for Sara's own accountability: "I know

it's there, I have it stored, and it's there when I need it" (Interview, July 9, 2014). As

well, two of the teachers mentioned that they strive to include many different forms of

student work to increase reliability of their assessments and evaluations. Although all of

the elementary school teachers deemed accountability to others as an important element

of schooling to maintain a consistent public school system for students, the elementary

school teachers felt it was equally as important to their pedagogy to document student

learning. As Ava shared,

> When I look back at the story of the day, I listen to recordings, I read tweets, I
> watch videos and I see where I need to go next. It allows me to plan accordingly
> based on the assessment I make of student work. (Interview, June 24, 2014)

The elementary school teachers found pedagogical documentation to be

invaluable to their AfL and AaL practices. Stephanie said "It is a great way to capture

data to inform my instruction" (Interview, August 11, 2014), while Ava admits "I do go

back and look at the work but I don't necessarily give the work a mark. I use

documentation more for assessment for learning than any other assessment" (Interview,

June 24, 2014). Sara likes to provide her students with feedback on the work students

document (usually with a Livescribe Pen) and Stephanie intends to record her feedback

for students so that the documentation process becomes more formative in nature in her

classroom. Moreover, Rose mentioned that the benefit of digital portfolios

> Is that as the children and I are constantly assessing their learning in a formative
> and summative way, the students are also demonstrating their growing knowledge
> for a wide audience and learning about digital citizenship and appropriate online
> behaviour. What great by-products of the assessment process! (Blog, July 5,
> 2013)

Furthermore, advances in technology provided the elementary school teachers

with innovative ways to observe student learning and gain greater insight into students' thought processes. The four elementary school teachers agreed that documentation provided rich assessments that are deeply personalized. Specifically, Stephanie said, "I can now find out more about how students learn and think" (Interview, August 11, 2014). Rose gave an example of how screencasting provided richer assessment data than work done on paper: "Screencasting allows me to hear students' thinking in a way that I would never know with them just doing work on paper" (Interview, July 29, 2014). As an example, Rose said:

> I recently asked my grade 2 students to record their thinking while solving a two-digit math equation that involved "borrowing." They were all able to demonstrate to me that they could do the process involved in solving this kind of equation. If I had been using paper for this, that would have been the end of my understanding. But because the students had recorded their thinking at the same time using a screencasting app, I could tell that although they could all do the mechanics of the problem, most of them could not enunciate that they were actually borrowing a 10. Clearly more learning needed to be done. If I had been using worksheets, I would not have realized this. (Blog, March 22, 2014)

In similar situations, Sara mentioned that through screencasting "I can hear confidence or hesitation, self-corrections, or errors in perception" (Interview, July 9, 2014). Rose and Sara agreed that a worksheet might show that students can get the correct answer but a video shows that they deeply understand and can explain the concept, which they deemed valuable in transferring learning to other situations.

In conclusion, through making learning and thinking visible, elementary school teachers in this study found they could better understand students' thought processes and, as a result, they were better able to help students learn and personalize instruction. As well, Sara felt that assessments will only get deeper and more personalized as advances in technology take place: "Using technology for pedagogical documentation is a promising process understanding student learning and classroom assessment" (Interview, July 9,

2014).

Despite the benefits of using the iPad for the documentation process, three of the four elementary school teachers in this study expressed how they struggled with ways to document the learning process. In fact, many followers from the elementary school teachers' professional blogs admitted grappling with how to effectively document student work. A blogger on Stephanie's blog commented that

> I am struggling too with how to effectively document the different learnings in our classroom. From iPad to flip camera to writing down conversations and including a photo, I am finding at times it becomes an organizational nightmare that I am trying to contain. We want assessment to be visible for the students and their parents, and the classroom is such a busy place with so many inquiring minds I am finding it can be boggling trying to capture all in effective ways. (Blog, October, 21, 2012)

Similarly, Stephanie expressed her challenges with documentation and how she is overcoming such struggles:

> I was really struggling with how to capture and document the inquiry learning process in my room. I felt a little boxed in. I was believing it must look a certain way. Now, I feel as long as I can have students truly explain and reference their learning, it doesn't matter what format it is in. Pretty bulletin boards, Bristol board panels, Pic Collages, or audio stories. I will use a variety of ways to show the learning that is happening in our classroom. (Blog, October 20, 2012)

Because many teachers are still figuring out the documentation process, Stephanie chose to explore it as a full-year inquiry for self-directed professional development. She expressed that after a year-long inquiry she has "a better handle on the most effective ways to capture certain types of learning, with students being key players in capturing learning moments" (Interview, August 11, 2014). She explained that with many students all learning at once, it was imperative that students participate in the documentation process as well.

To overcome the organizational difficulties of documentation, two teachers in this

study were involved in a pilot project with Pearson. They tested a product entitled

Capturing Learning in the Classroom (Clic), which is an app that stores student work in

an electronic format and matches the work to provincial curriculum expectations. The

reason Rose (the grade 1/2 teacher) found this app useful was because "things are

happening so fast in my classroom so I don't always get to write down what's

happening"; with Clic, "students can take a photo of their work and upload it to Clic and

then at recess time or after school I can take a look at it and put in a comment"

(Interview, August 11, 2014). Stephanie found the app worthwhile because it matched the

work to curriculum expectations: "I upload a picture, or video, or audio file of the

student's work and then click on the expectation that they have met by completing the

assignment" (Interview, August, 11, 2014). As well, it was valuable for Stephanie's

kindergarten classroom because it was a way for her and the DECE to document learning

at the same time; for example,

> if the students are building 3D shapes I can go around with the iPad and take
> pictures and ask them questions about the shapes and input the degree of learning
> into to Clic and at the same time the DECE can be doing it. Then, we have a
> record of all of the students' work in individual accounts so it's a true
> collaboration tool between the two of us. (Interview, August 11, 2014)

Teacher-Leaders and Self-Directed Professional Development

The elementary school teachers in this study thought of themselves as facilitators

of student learning more so than teachers. That is, they perceived that other teachers

relied heavily on traditional teaching methods in which the teacher instructs the whole

class and then requires students to complete assignments, often in the form of worksheets

or textbook questions. This style was rarely used by teachers in this study. They mostly

relied on an inquiry approach, small-group instruction, and collaborative learning models.

Moreover, these elementary school teachers saw themselves as inquirers and lifelong

learners. To this end, all elementary school teachers felt it was necessary to be in control of their own professional development rather than relying on what the school or school board provided. Stephanie said, "As the years have gone on I have become an action research teacher. This way I can pick something to improve upon and engage myself in self-directed learning" (Interview, August 11, 2014). Sara too described her approach to professional development:

> How I acquire information and "knowledge" is no longer dependent on a single source or text, but on my ability to gather a variety of ideas, opinions, and research that are ever changing and then employ collaborative and ongoing change. It also depends on a burning question or an inquiry that I simply MUST know. Quite honestly, it is inspiring and empowering to find my own answers and exciting to know that my answers lead to more ideas, more information and more knowledge. (Interview, July 9, 2014)

The elementary school teachers in this study were deemed exemplary based on criteria set out by the primary researcher of this study but they were exemplary in other ways as well. All four elementary school teachers were highly reputable in the field and seen as mentors to other teachers, both novice and veteran. Other teachers sought out workshops and conference presentations hosted by these elementary school teachers and followed their professional blogs; in short, they are seen as a source of professional development for other teachers. This is evident in the number of followers all four of these elementary school teachers have on Twitter (e.g., as noted in her profile, Stephanie has more than 4,000 Twitter followers). In spite of this, all of these elementary school teachers are humbled by their following.

The elementary school teachers in this study have been showcased in other ways as well. For instance, Stephanie was asked to share her class story on CTV news. Following the airing, some teachers contacted her to ask how she found people to Skype with or how they could implement similar practices in their schools. But more

importantly, the news clip became an advocacy for unblocking Skype (and the like) in many school district networks across Canada.

Similarly, Rose's book has been a useful resource for many teachers who are trying to create a connected classroom. Rose said that she frequently gets emails from primary teachers asking for help as they begin to add technology in their classroom: "These teachers have a lot of questions. They want to use technology but there always seems to be problems or glitches along the way" (Blog, January 9, 2014). And yet, Rose admitted experiencing bumps along the way too, such as a lack of knowledge of how to most effectively merge curriculum, pedagogy, and technology to best benefit student learning, a deficiency in bandwidth at her school, and backlash from a community member with regards to using a classroom blog with young students (which caused Rose to question technology integration in her classroom altogether).

Although these elementary school teachers act as mentors to other teachers in the field, they struggle with how to advance their own professional development and in turn their practice. Sara often questions:

> How do [exemplary] teachers move forward when they don't have the guidance of research? For example, there was no research on blogging in the classroom when I began blogging. So when my principal would ask "what is best practice here?" I would have to respond with "Well, there isn't one." (Interview, July 9, 2014)

Sara continued by describing the current gap among teachers:

> If you think of the gap that elementary students experience, the same thing happens with teachers. There's always going to be that gap but we need to encourage that gap. It's the opposite to what everyone thinks [i.e., let's close the gap] but in fact I think we should keep the gap because we [exemplary teachers] need to move ahead too. There are very few conferences and places that I've gone that I feel a deep connection of learning because when I go to these conferences they are all learning how to use Twitter whereas deep learning for me happens during these kinds of conversations [i.e., the research interview]. I would say a big part of my PD has had to change because of this. (Interview, July 9, 2014)

Like other elementary school teachers in this study, Sara had to seek out other avenues to advance her professional development. Fresh outlets for professional development for these elementary school teachers included newly released e-books, professional blogs, self-created Professional Learning Network (PLN), principal collaboration, and groups designed for exemplary teachers by industry partners such as Apple, Google, and Discovery Education.

It is evident from the examples above that these elementary school teachers have learned to create their own PLNs. They have realized that professional development isn't contained to a division or even a school. Teachers like the ones in this study have transformed PLNs by using the benefits of being online, allowing teachers to make professional development much more personalized and targeted towards other professionals that suit their professional needs. Ava pointed out, "We can learn from anyone. Even though I teach grades 5 and 6, I'm thrilled to have people in my PLN that teach different grades (from JK to University). It's amazing how much we can learn from each other!" (September 7, 2013).

An example of elementary school teachers in the study seeking help from their self-created PLN is when a group of kindergarten and grade 1 teachers gathered on Twitter to brainstorm lesson ideas. One of the teachers in the group started a Google Doc and together ideas were generated on directions they could take their classes. Then, a collaborative blog for teachers was created to share ideas and connect. Upon reflection, Stephanie realized that teachers who took part in the PLN "grew as educators as we bounced ideas off each other and gave each other advice" (Interview, August 11, 2014).

Because of the gap in teacher thinking, all elementary school teachers sought out

external means for furthering professional development. For example, Sara is involved in a group called Unplugg'd:

> It's for spearheaders in Education who want to continue to move their PD and practice forward. … It happens every other year and about 40 international educators gather at a secluded resort in [a national park]. Last time we met, we wrote a book. Everyone wrote a few pages and then each group became a chapter. The premise of the book was how exemplary teachers are moving forward when barriers are so prevalent. (Interview, July 9, 2014)

As noted in their profiles, all four elementary school teachers are involved in groups run by external partners. Often, these elementary school teachers were either nominated or personally selected to be a part of these elite groups, such as Apple Distinguished Educators, Google Certified Teachers, and Discovery Educators Network Stars. The elementary school teachers found these groups to be learning opportunities that effected change in their thinking and practice. Rose suggested that it gave them a chance to interact with teachers similar to themselves—that is, teachers who are visionaries and execute "things that others teachers wouldn't have thought of or thought to be impossible" (Interview, July 29, 2014).

In conclusion, elementary school teachers in this study agreed that one-shot professional development sessions can launch ideas but mentoring from other teachers is the best way to sustain change towards 21st Century teaching, learning, and assessment.

Teachers' Learning Differences as a Motivator for Alternative Assessment

The elementary school teachers in this study have unique personal and professional experiences that crafted them into the teachers they are today. For example, two of the teachers in this study self-identified as having learning differences. Because of this, the participants' prior assessment experiences, both as a student and as a teacher, influenced their philosophies about assessment and, in turn, motivated them to use

alternative assessment methods to meet the personalized needs of their students. For example, Ava shared during her interview and on her professional blog that she was diagnosed with a severe non-verbal disability. For her, making it through high school and receiving the presidential award at her university demonstrated to her that anyone can learn. Similarly, Sara (a gifted education teacher in this study) acknowledged that she suffers from working memory and processing deficits. She attributes the use of alternative assessments with her students to the negative experiences she faced as a learner.

Because Ava and Sara experienced learning differences in their own learning, it made them sensitive to classroom assessment and drove them to make assessment a positive experience for their students. Sara mentioned giving students choice in the assessment mode (i.e., oral, written, or kinesthetic) to best address their personalized learning and assessment needs. She even prompts her students when they are weak in expressing ideas in written format; she provides them with alternative options to be tested orally. Another example is that Sara gives her students the opportunity to use technology to learn or for evaluation purposes. She believes technology is a levelling tool for students with learning differences, meaning that technology can be integrated into the assessment task to compensate for students' learning difficulties. Therefore, these teachers claim that learning differences are one of the biggest motivators in seeking new and better ways to assess students. Both Sara and Ava alluded that their learning differences urge them towards their unorthodox assessment philosophies and practices and have also resulted in an aversion to conventional assessment methods for their students[5].

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[5] Although there seems to be a connection between the elementary school teachers' learning differences and innovative assessment practices, the participants did not explicitly make this connection. My committee urged me to explore this relationship as it emerged from the data. Because I did not intend to answer such a research question, the findings are incomplete and therefore this is an area of further research

By extension, the elementary school teachers in this study perceive themselves apart from other elementary school teachers not only because of their learning differences but also because of their visions to strive for unforeseeable goals in their assessment practices, willingness to change emphasis of assessment from AoL to AfL and AaL, continuous reflective practice about assessment in their classrooms, and perseverance to innovate their assessment tasks with technology.

All four elementary school teachers in this study had a progressive vision of what teaching, learning, and assessment looks like in the 21st Century—that is, a classroom built on collaboration, problem solving, critical thinking, and assessment as learning in and beyond the real world context. Although they acknowledged that they did not know exactly what the end goal looked like (what they were preparing their students for), they designed their classrooms around acquiring 21st Century skills. They were not afraid to try something new or innovate current practices in attempts to prepare their students for an unknown future.

As well, these elementary school teachers continually innovate their practices through the use of technology. Yet, the way they view technology is important to their pedagogy as well; it isn't added onto assessments but infused seamlessly. Rose offered advice for teachers who were trying to add technology into their classroom:

> The first bump in the technology road involves a new way of thinking. Don't view technology as just one more thing to add to your day. If "integrate" means (as it often does) adding one more thing to your already heavy load, then we probably need a better word. Technology should help us to teach better and in more meaningful ways. … It should not be something that you do in addition to everything else you already do in your classroom. If technology is something that you try to add after you have planned your reading, writing, and math, you are destined to fail at "integrating" technology. (Blog, January 8, 2013)

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for me.

This change in thinking has been the pillar that transformed these elementary school teachers' classrooms. Rose offered advice on her blog to other teachers who were trying to infuse technology into their classrooms; she asserts that using technology can be a bumpy road but "we need to begin thinking the way our children do. We use technology not just because it is technology but because of what we can do with it" (Blog, January 8, 2013). Sara added, "How can I, as an educator, put barriers on the very tools that students are using in the real world? Isn't that my job as a teacher to prepare them for the world they are living in now and the future?" (October 18, 2013).

Toward an Understanding of the Essence of Classroom Assessment in 21st Century Elementary School Classrooms

Exploring the essence of this phenomenological study, the elementary school teachers in this study experienced classroom assessment as a way to promote and enhance student learning. They continually strive to create deep learning cultures for their students, emphasizing learning over grades. Towards this end, these teachers encouraged students' AaL as the primary driver in classroom learning. Teachers then supported students' AaL through the use of AfL and AoL strategies. At the same time, teachers used the AfL and AoL data to inform instructional next steps. For them, learning was continuous with no end. This bidirectional relationship between AaL and AfL/AoL became the crux of the teachers' balanced assessment program within an inquiry-based approach to learning.

As well, these teachers were able to modernize classroom assessment in unprecedented ways; they transformed the way in which classroom assessments are conducted. Students now have the opportunity to "show what they know" far beyond

what was previously possible. Moreover, technology-integrated assessments provided much richer data, making teaching much more deliberate and teachers more accountable. Pedagogical documentation is a worthy bi-product of technology-integrated assessment— the true game changer in classroom assessment and teacher accountability.

The most unexpected essence of participant experience was the impact that the professional blogs had on teachers' professional development. Coming into this research, I was solely using the blogs as a data source and yet, unexpectedly, the blogs became an interesting point of research. For instance, "why do teachers blog and what are the benefits?" In sum, teacher blogs are a powerful professional development tool for exemplary elementary teachers.

In chapter 6, participants' assessment practices are examined further and related to the literature and conceptual models of assessment of, for, and as learning used to guide this inquiry. The chapter also discusses implications for theory, practice, and research.

CHAPTER SIX: DISCUSSION

In this inquiry, phenomenology was used to investigate exemplary elementary school teachers' understandings and experiences with classroom assessment in a 21st Century context. While previous investigations have explored classroom assessment (Andrade, 2009; Black & Wiliam, 1998a, 1998b; Bourke & Mentis, 2014; Brookhart, 2009; Dann, 2014; Popham, 2009), there is a dearth of research documenting the living examples of classroom assessment and how 21st Century technologies can be infused into assessment practices to benefit instruction and student learning to best prepare students for life outside the classroom (Black & Wiliam, 2009; Brookhart, 2009; Dann, 2014; Griffin & Care, 2015; Russell, 2009).

In this chapter, participants' experiences are related to existing understandings of classroom assessment. I begin by revisiting teaching, learning, and assessment for 21st Century classrooms. Then, I relate exemplary elementary school teachers' understandings of a balanced assessment program to textual and composite descriptions in the literature. Next, I discuss factors that influenced the use of technology-integrated assessment and how teachers' professional blogs contributed to their understandings and implementation of assessment. The final sections present my personal reflections as a researcher and the implications for further research and classroom practice.

Revisiting Teaching, Learning, and Assessment in 21st Century Classrooms

Recent literature on 21st Century teaching, learning, and assessment largely has been critiqued for its ill-defined terminology (DiCerbo, 2014; Griffin & Care, 2015), and even though the participants in this study exemplify the potential of 21st Century education, they too had trouble articulating a concise definition. The most comprehensive

definition of 21st Century learning to date has been coined by Binkley et al. (2012) who outlined skills across four categories: Ways of thinking (i.e., creativity and innovation, critical thinking, problem-solving, and decision-making; learning to learn, metacognition); Ways of working (i.e., communication, collaboration); Tools of working (i.e., information literacy, research, and ICT literacy); and Living in the world (i.e., Citizenship, life and career, and personal and social responsibility). The elementary school teachers in this study were not familiar with the latter definition but they valued many of the skills described in this framework and consequently infused teaching and assessment of such skills into classroom pedagogy. In fact, creativity, critical thinking, problem solving, collaboration, and digital literacy were 21st Century skills that the elementary school teachers specifically focused upon during assessment tasks.

What was surprising though is that none of the teachers mentioned innovation as a valuable "way of thinking" for the 21st Century, despite Binkley et al.'s (2012) recognition of the latter as a 21st Century skill. Indeed, the teachers' lived examples and their students' assessment tasks discussed during the interview and in the teachers' professional blogs represent some of the most innovative assessment practices and tasks that I've witnessed in schools. For example, Ava only used two paper–pencil tests with her students during the entire school year; the majority of student evaluations were completed in collaboration with peers, solving real-world problems, and using technology to demonstrate their learning in alternative ways. The elementary school teachers in this study relied heavily on peer collaboration as a learning and assessment strategy in their classrooms; teachers shared that their students' learning was deeper and more diverse when they worked in groups rather than individually. All four teachers admitted that

summative performance tasks are almost always done in group format. This is a significant finding as it confirms Binkley et al.'s argument that collaboration is the primary "way to work" in a 21st Century environment.

However, Wagner's (2012) study tells a different story. His findings showed that many schools still reward individual competition over collaboration. The teachers in Wagner's study valued facilitating individual expertise; that is, teaching each student to be able to exercise sound judgment and to execute every skill. Wagner cautioned that in group scenarios students are only practicing parts of the assessment task while their peers complete the rest. While Wagner's argument is legitimate to some degree, teachers in my study would argue that the advantages outweigh the disadvantages. That is, the elementary school teachers in my study witnessed deeper and more extensive student learning when students worked alongside their peers. Although students may not participate in the entire project as Wagner described, the participants in this study felt that students develop other skills in subsequent tasks throughout the school year. Therefore, it was evident that the exemplary teachers in this study agreed with Binkley et al. (2012) and did not ascribe to Wagner's view. In fact, the participants spoke of facilitating group assessment tasks with their students that took place outside the classroom and that were meaningful to the extracurricular world.

For instance, students in Sara's classroom engaged in projects using the *Raise the Hammer* website discussed earlier to help solve a real-world problem (such as water quality in a local river), whereby in most cases each student took on a role in the group (i.e., leader, organizer, secretary, creator, etc.). These types of tasks gave students purpose and real meaning to their assessment tasks. During such projects, teachers

promoted teamwork whenever possible and fostered learning environments that encouraged risk-taking, experimenting with different group roles, and learning from mistakes. It is clear that these teachers' practices are aligned with Binkley et al.'s (2012) definition of 21st Century teaching and learning because the teachers focused on applying curriculum to real-world problems in a collaborative environment. To this end, the elementary school teachers in this study helped their students to find purpose, develop passion, and explore real-world topics that stimulated their desire to learn deeply and to continue to learn outside the classroom in collaboration with others.

Fullan (2012) shares similar ideologies to Binkley et al. (2012) regarding the need for technology integration, collaboration, and real-world application for 21st Century learning. He expands on Binkley et al.'s definition and discusses how change towards this type pedagogy can happen. He states that positive change in education is dependent on three interconnected factors—technology, good pedagogy, and teacher as change agent—which he calls the "Stratosphere" (2012, p. 1). Fullan argues that this powerful synergy can produce impressive results for learning, much like those experienced by the teachers and students in this study. Although this study did not attempt to make correlations between new pedagogy and technology to student achievement, it described teacher experiences and perceptions with new pedagogy, and the effectiveness of technology-integrated assessment, student engagement, and student performance. The participants recognized that the components of the Stratosphere described by Fullan (2012) were major factors in facilitating change to their previously outdated classrooms and promoted sustainable changes in their schools. When transforming to a 21st Century environment, three of the four elementary school teachers made it a priority to change

their teaching method to an inquiry-based approach, which Fullan (2012) described as an integral element of new pedagogy because it fosters deep student learning and applies student learning to a real-world context.

The elementary school teachers admitted that changing to an inquiry-based approach was a worthwhile but difficult task. This is because it required them to uproot their beliefs, philosophies, and practices about education and then relearn how teaching and learning could manifest in a 21st Century context when using an inquiry-based approach. Consequently, once their instruction methods changed from didactic to student inquiry, they came to realize that classroom assessments and evaluations had to deviate from their usual practices to reflect the changes in pedagogical approaches and technology integration. Stephanie mentioned how the traditional feedback model described by Hattie and Timperley (2007) did not work with an inquiry-based approach because it relied on students learning through experimentation and self-directed learning. This was difficult for Stephanie and the other teachers in this study because it resulted in them changing the frequency of their feedback (e.g., less often at the onset of learning) and giving students more time for learning through trial and error, experimentation, and peer collaborations. The teachers admitted they were still trying to determine appropriate timing and best ways to provide feedback when using an inquiry-based approach to promote good pedagogy.

Still, Fullan (2012) argues that good pedagogy is incomplete without technology integration, because technology permeates all sectors of the workplace outside of schools, making schools more efficient and productive than ever before. Since schools are considered a microcosm of society, they are being forced to keep up with technological

advancements to provide students with a meaningful 21st Century experience that is valuable to them once they leave school.

Equally as important, technology offers teachers innovative delivery methods and opportunities for students to learn differently and demonstrate their learning more clearly than ever before. Yet, it was evident from this study's findings that it is the teachers' responsibility to reconcile how technology can be used for learning purposes and provide the richest data possible to transform student learning to be meaningful, deep, and relevant to the real-world context (Fullan, 2013). To this end, Puentedura (2014) believes that teachers could benefit from redefining assessment through the use of technology in order to transform student learning. That is, teachers can adopt technology to teach and assess in ways that were previously unavailable, such as the use of webcams to view distant or foreign environments, collaborative word processors to provide instant feedback, and Voice over IP (VoIP)[6] to connect with interesting people around the world. It is no longer a mere hypothesis that technology could change the way we teach and learn; recent research, including this study, demonstrates living examples that are compelling, but ultimately it is exemplary teachers like the ones in this study who make change happen.

The participants in this study were dedicated to transforming their classrooms with technology to meet students' learning and assessment needs. They were attuned to how the latest technologies could support students' learning needs while providing innovative opportunities for students to learn and be assessed. Fullan (2012) described this as the third component of the Stratosphere: teacher as change agent. The elementary teachers in this

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[6] VoIP is a group of technologies for the delivery of voice communications and multi-media sessions.

study recognized this need for change and consequently have spearheaded the implementation of 21st Century approaches to education. Principally, they overturned their traditional teaching philosophies and practices in favour of the acquisition of 21st Century approaches (for themselves and their students) and offer an array of 21st Century technologies to their students in order to give them the opportunity to learn, create, and demonstrate curriculum expectations that best meet their assessment needs. For example, Ava chooses students from her class to host Thinking Thursdays, a local radio program whose community listenership provides students with relevant and real-time feedback. Sara uses QR codes and a Livescribe pen to provide immediate, personalized feedback to her students. Rose in turn uses Skype to connect her students with community members (e.g., firefighter, nurse, lumberjack) to learn about the different roles and responsibilities within a community. She also connects her classroom with other classrooms around the world so that students can learn about communities different than their own. These examples demonstrate how the transformation of traditional classrooms has the potential to provide students with a variety of personalized learning while staying connected with technological advancements and good pedagogy.

Still, despite how technology can enhance pedagogy, the elementary school teachers shared with me that transforming a classroom into a 21st Century environment is not an easy task. The gradual transformation involved a process that Klein (2008) refers to as "learning, unlearning, and relearning" (p. 80); that is, in order for teachers to make drastic changes in their classrooms, they "need to let go of deeply held assumptions about what it means to be a teacher, what classrooms look like, and what the essence of teaching and learning is" (p. 80). Sara commented, "I needed to let go of the image[s] and

stereotypes of what a teacher 'should be' and go with my gut feeling of what my students needed in a teacher" (Interview, July 9, 2014). Klein states that once teachers let go they must relearn, meaning that they "create new understandings and behaviours around the same concepts (such as what it means to be a teacher or what assessment looks like in a 21st Century classroom) but in new contexts" (p. 80). For the teachers in this study, unlearning required them to question and often challenge their philosophies and assumptions about teaching, learning, and assessment. They admitted that traditional assessments such as paper–pencil tests were insufficient in 21st Century contexts mainly because they limit what students can demonstrate. As a result, the teachers experimented with new assessments to evaluate student performance, especially when using technology.

Such experimentation supports DiCerbo's (2014) call for new assessments and evaluations that are better suited for 21st Century learning. For the teachers in this study, it meant challenging the current reporting system and justifying ideals and practices with other teachers, administrators, and parents. Some of the teachers indicated they initially received a great deal of resistance from others regarding their new assessment and evaluation methods (such as student blogs, Minecraft, oral tests, and self-assessments) but in the end these contentious conversations made them more confident in their decisions for change. The teachers shared that they constantly engaged in reflective practice and tried to justify to themselves (and others) the rationale for their newly adopted pedagogical approaches. This reflective practice, usually in the form of a blog post or face-to-face conversations, helped the elementary school teachers envision an untried path (i.e., assessment program driven by AaL, innovative delivery methods, and

technology-integrated assessments) that other teachers had yet to explore. This meant experimenting with new technologies for pedagogical use, using an inquiry-based approach to learning, teaching students how to regulate their own learning, using assessments more than evaluations, and relinquishing some control to students when making decisions about their learning. In short, it was about teachers experimenting, taking risks, and relearning how to teach in a way that is conducive for 21st Century learning.

Although the participants in this study were recognized by the educational community for their exemplary teaching, an unanticipated theme that emerged from this study was that the teachers did not believe they were running a fully operationalized 21st Century classroom. Rather, the teachers said they strived to establish but never fully attained a 21st Century learning environment. Rose described her classroom as "never being where I want it to be" (Interview, July 29, 2014). This comment brings to light an important feature of 21st Century classrooms, in that they are always changing, adapting, and evolving without achieving a fixed goal. That is, if classroom pedagogy and students' assessment tasks remained static, then the teachers in this study would no longer consider such classrooms as 21st Century environments. New technologies are constantly introduced and therefore schools have a responsibility to adapt and evolve to meet society's needs.

Exemplary Teachers' Understandings of a Balanced Assessment Program

The participants described classroom assessment as an essential aspect of their 21st Century classroom programs. Although technology has brought about many changes to their classroom pedagogy, a balanced assessment program remains a key ingredient in

their classrooms because it helps to provide quality instruction, meet students' learning needs, and ensure students have met curricular expectations. Specifically, the elementary school teachers in this study deemed AoL, AfL, and AaL all to be vital components of their balanced assessment programs but put less value on external, large-scale standardized testing (Bourke & Mentis, 2014; Graue, 1993; Shepard, 2000; Volante & Beckett, 2011). While participants appreciated the use of such data for school improvement programs or when determining "big ideas" for cross-grade initiatives (i.e., implicit inferencing), they placed little value on large-scale testing results for daily classroom practice (Popham, 2009; Wiliam, 2009). In fact, one participant said that EQAO results have no influence on how or what she teaches. Still, she deemed a balanced assessment program of AoL, AfL, and AaL as a powerful way to learn about her students and how to best prepare daily instruction (Earl, 2003; Dann, 2014; Popham, 2009; WNCP, 2006).

Not surprisingly, all four elementary school teachers found that each type of classroom assessment had its purpose and place in a balanced assessment program (Cizek, 2009; Dunn, Ben Jaafar, Earl, & Katz, 2013; Earl, 2003; Natriello, 1987). Teachers understood AaL as the students' role in the assessment process, AfL as the teachers' role in supporting student learning, and AoL as a judgment of students' performance typically in reference to curriculum expectations. It is worth noting though that the elementary school teachers in this study rejected the notion that one type of assessment was more important than another, or that AaL, AfL, and AoL should be granted equal time; instead, they admitted to using AfL most often and striving to make AaL the driver of student learning in their classrooms. In other words, these teachers

perceived a positive impact on student learning when assessment focused on students' recognition of their own strengths and weaknesses and teachers' use of AfL to support students' self-assessment and metacognition (Andrade, 2009; Brookhart, 2009). Many educators would attribute this approach to assessment as advanced classroom practice (Andrade, 2009; Bennett, 2011; Brookhart, 2009; Earl, 2012; WNCP, 2006)

Furthermore, this research confirms that boundaries between assessment and learning are often blurred, as with summative and formative assessment (Bourke & Mentis, 2014; Brookhart, 2009; Dann, 2014). It was often difficult for teachers to determine if teacher feedback and student talk were part of a lesson, or an assessment, or both. Marzano (2007) and Dann (2014) question the worth of creating boundaries between assessment and learning. Drake et al. (2014) similarly encourage teachers to think about assessment, instruction, and curriculum simultaneously instead of separately. Embedding assessment into instruction makes it difficult to distinguish one from the other; for example, when teachers pose questions to students throughout a lesson to ensure students understand the content, is the questioning part of the lesson or an assessment of student learning? The elementary school teachers had trouble answering this question but I argue that questioning is an assessment strategy that, if used properly, is seamlessly interwoven into instruction. Ideally, teachers use students' responses to questions (i.e., assessment) to guide the direction of the lesson. After all, as Marzano (2007) noted, assessment is just good teaching.

Teachers' Understandings and Implementation of AoL

A discrepancy appears between the theoretical definition of AoL and how the teachers in this study defined AoL in practice. Earl (2003, 2012) and Volante and Beckett

(2011) described AoL as the assessment that takes place only at the end of a unit or term, whereas the elementary school teachers in this study viewed AoL as any time they engaged in evaluation or produced a grade for reporting purposes; simply put, whenever the elementary school teachers made a judgment about the quality of student performance, they believed they were engaging in AoL. Therefore, the elementary school teachers in this study did not practice AoL as described by Earl (2003) and Volante and Beckett (2011).

Teachers in this study found AoL data useful to communicate back to students about their progress (i.e., self-referencing) and the quality of their performance according to curriculum expectations (i.e., criterion-referencing) (Cooper, 2006). They also used AoL data to inform instructional next steps (mainly whether students were ready to move on to a subsequent lesson or unit, or if students needed to revisit particular content). In other words, the elementary school teachers did not see the end of a unit as the end of learning, in contrast with how Earl (2003) and Volante and Beckett (2011) described AoL, but rather as a continual (re)judgment of student performance pending students' mastery of the required knowledge and skills. Rose, the grade 1 teacher in this study, shared that her "students have until the very last day of school to learn the grade 1 curriculum" (Interview, July 29, 2014). On a similar note, Sara acknowledged that "all students develop and learn at different rates" and therefore "to use AoL strictly as summative would be doing a disservice to her students" (Interview, July 9, 2014). Therefore, Rose and Sara find it worthwhile to evaluate continually throughout a unit and not solely at the end for reporting purposes.

Additionally, the elementary school teachers in this study used AoL less

frequently than AfL and AaL, but perceived AoL as important as AfL and AaL because it ensures that students have met curricular expectations and communicates with students and parents the quality of student performance (Drake, 2007; Earl, 2007).

Koh et al. (2012) categorize AoL as either traditional or authentic assessment. All four elementary school teachers in this study disclosed that they use authentic assessment whenever possible as it is best suited for an inquiry-based approach, which Fullan (2012) described as good pedagogy. In the previous school year, Ava used traditional tests only twice. The elementary school teachers in this study believe, as Barootchi and Keshavarez (2002) and Fullan (2012) argued, that authentic performance-based assessments prepare students for life outside of the classroom because they focus on the application of skills pertaining to a real-world environment. This fits well with how Fullan (2012) described authentic assessment as a component of "good pedagogy" that yields deep student learning. Sara agrees with Fullan, as she believes her students take the assessment more seriously when it is administered in a so-called real-world context. This was evident when one of her students improved his paper once he discovered it was posted on a public blog where others could read his work. One of the main reasons the elementary school teachers in this study preferred performance-based assessments to traditional ones was because the former emphasized a process rather than a product approach. Authentic and performance-based assessments allowed elementary school teachers in this study to use AfL and encourage student AaL throughout the process, which according to the teachers resulted in a richer learning experience for students, more so than a one-time test. However, it appeared that the elementary school teachers in this study were atypical compared with other teachers in the field, because Allal (2013) noted that most teachers

in her study used tests as the primary source for determining end-of-year grades.

Teachers' Understandings and Implementation of AfL

Black and Wiliam's (1998b) comprehensive review of formative assessment concluded that formative assessment is effective in promoting student learning. With that said, they claimed "formative assessment is not well understood by teachers and is weak in practice" (Black & Wiliam, 1998b, p. 20). More than a decade later, Dann (2014) argued that Black and Wiliam's findings were still valid despite subsequent studies on the topic. Yet, the elementary school teachers in this study seemed to understand the principles of AfL relatively well and offered many diverse examples of AfL, even when using 21st Century approaches (perhaps because of their exemplary nature). The elementary school teachers in this study mainly used AfL as a means to communicate with their students on an ongoing basis about the quality of performance and to inform instructional next steps (Earl 2003, 2012; WNCP, 2006, Wiliam, 2009). Some examples include: providing instant feedback on Google Docs, asking personalized questions about a student's piece of work using a Livescribe Pen, and facilitating peer discussions on a radio show.

At times, it was difficult for the elementary school teachers to identify if AfL was an instrument or a process, as identified by Bennett (2011). Three of the four elementary school teachers appeared to use AfL as both as instrument and as process (e.g., feedback cycle), which Bennett would identify as being an advanced practice. The fourth teacher, however, mainly used AfL as an instrument, meaning that she implemented AfL strategies but was missing AfL as the process defined by Bennett. For example, she would provide feedback to her students as an AfL strategy but did not follow through

with the entire feedback cycle, meaning she did not give her students an opportunity to correct work based on the feedback provided or to transfer what they learned from the task to future assignments.

The elementary school teachers in this study found AfL—particularly questioning, classroom talk, and feedback—to be particularly helpful because it offered personalized assessment for each student, making subsequent teacher instruction deliberate and precise. For example, teachers promoted classroom talk by asking various questions to different students to propel student thinking in the direction of the correct answer(s) (Hattie & Timperley, 2007; Mayer et al., 2009). One elementary school teacher in this study noted that some students required more feedback than others to successfully complete an assignment. She identified this as a difficult task for many teachers because they would need to judge when enough feedback had been provided for the student to figure out the answer or when more guidance was needed. She believes it is beneficial to refrain from giving students complete answers when they struggle with a concept and instead encourage them to ask more questions and use problem-solving skills to work through a problem (Yair, 2000). This belief confirms Hattie and Timperley's (2007) and Fullan's (2012) view that effective teacher feedback used in an inquiry-based approach involves prompts to guide students in a viable direction rather than simply giving students the correct answer.

The elementary school teachers in this study identified closely with Gamlem and Smith's (2013) definition of feedback; the teachers agreed that positive feedback congratulated students on their performance whereas negative feedback, also known as constructive feedback, highlighted areas of needed improvement. However, Gamlem and Smith's study concluded that negative feedback left the students feeling frustrated and

unsure of where to go next. This is contrary to what the elementary school teachers in this study experienced, as they found that negative feedback was constructive in helping restructure student understanding and improve performance. This can be attributed to teachers building trusting relationships among and with their students and creating an environment in which students feel safe and able to make mistakes. Constructive feedback also informed students' AaL and helped them develop a deeper understanding of their performance and to know what to do next to improve their work. Teachers said negative feedback prompted students to think, "Perhaps I don't entirely understand the concept?" or "What am I missing?" The literature on this topic has also identified a risk of students' self-fulfilling prophecy to fail when teachers overemphasize mistakes over strengths or in situations where students' self-confidence is low (Brookhart, 2008; Dweck, 2007; Gamlem & Smith, 2013).

Brookhart (2008) identified feedback as being a double-barrelled approach for students, including both cognitive and motivational factors. The elementary school teachers in this study commented that students' feelings of efficacy are always a factor when providing student feedback. Rose commented that "my students are usually proud of their work regardless of its quality and whether it meets curriculum expectations." She explained that she is cautious when providing assessments to her students because some become emotionally attached to their work, meaning that even well-intended feedback can be destructive (Brookhart, 2008; Dweck, 2007). She explained that grade 1 students usually are not aware of curriculum expectations. For them, it is more about the experience and if they enjoyed what they did. Sara expanded on the literature as she has found from her experiences at a higher grade level that student self-fulfilling prophecy

can be overcome by creating positive learning partnerships between student and teacher, and student and peers. She believes that reducing self-fulfilling prophecy is dependent upon establishing a safe environment in which students can make mistakes and value constructive criticism for self-improvement (Brookhart, 2008; Dweck, 2007; Gamlem & Smith, 2013). Sara mentioned that she takes time to build a trusting relationship with her students so they value what she has to say when she provides negative feedback, and consequently they perceive the feedback as useful and use it to improve their work. By the same token, Sara highly values her students' input and often engages in student-teacher conferences to discuss student work.

Teachers' Understandings and Implementation of AaL

Teachers understood AaL in the sense of Earl's (2003) description involving students' role in the assessment process and AaL's ability to facilitate students' ability to become self-regulated and directed learners. AaL as the driver of classroom assessment is a relatively new belief among the participants. They admitted to previously following an assessment program rooted in AoL. Some aspects of AfL and AaL were included in their practice but only by happenstance. Although they believed in the positive evidence found in studies by Black and Wiliam (1998a), Bourke and Mentis (2014), and Hattie (2012), they admitted it was difficult to change their assessment in the direction of AfL and AaL because of the well-established grading culture (Hill, 2011). Ava admitted that she switched her assessment emphasis in the previous school year from AoL to AaL when she adopted an inquiry-based approach. She noted that student productivity increased when she switched from a classroom that revolved around AoL to one that is grounded in inquiry learning in which AaL was at the heart of classroom assessment. Over the course

of the school year, Ava learned to emphasize learning over grades and as a result she now designs strategies that work around the grading culture (Popham, 2009).

The participants experienced student AaL similar to Sternberg's (1986) earlier findings showing that students who think metacognitively do better than those who do not. That is, participants in this study acknowledged that students in their classrooms who engage in regular self-assessment (i.e., AaL) perform better overall than those who do not use AaL. These findings are significant because they highlight that students' metacognition plays a major role in the assessment process which ultimately affects their overall achievement.

However, the elementary school teachers believe that effective AaL can only be achieved by teaching students how to self-assess and think metacognitively (Dignath et al., 2008; Valle & Andrade, 2012; Volante & Beckett, 2011; WNPC, 2006; Woloshyn et al., 2001). These skills are not innate and students require instruction from teachers to achieve them (Earl, 2012; Valle & Andrade, 2012; Volante & Beckett, 2011). Sara and Ava recommend that these skills be taught as early as possible to teach students to think in such a way. The teachers in this study felt that when students reach intermediate grades and secondary school, where self-assessment and metacognition are highly valuable skills, students would be able to tap into such skills with ease (Winne & Hadwin, 1998).

Interactions Among AfL, AaL, and AoL

Previous research highlights a lack of conceptual knowledge regarding the relationship of the three purposes of assessment (Andrade, 2009; Brookhart, 2009), and more specifically how teachers and students use different types of assessment to inform one another in practice: "It seems that the question is not so much whether formative and

summative assessment mix in practice, but how that happens" (Brookhart, 2009, p. 295). Similarly, Dann (2014) argued that there is little known about the influence of AoL and AfL on AaL.

All four elementary school teachers in this study mentioned that assessment is a shared process between the student and the teacher. The elementary school teachers described a healthy dichotomy whereby the teacher is responsible for AfL and the students are responsible for AaL (Brookhart, 2009; Earl, 2003; Dann, 2014, Vygotsky, 1978; WCNP, 2006). I would extend this notion by arguing that AfL and AaL have a symbiotic relationship, meaning that AfL and AaL are two distinct processes and yet are dependent on one another for optimal instruction and student learning. Active student learning relies on students' ability to self-assess and self-evaluate, however teachers in this study argued that this cannot be fully achieved without the artful infusion of AfL. AfL has many forms (e.g., questioning, verbal feedback, written feedback) and transfers from a teacher, mentor, or peer to the student. Vygotsky (1978) referred to this as social constructivism through which teachers scaffold student learning, in this case through the use of AfL strategies. According to Stephanie, a main goal of assessment symbiosis is about "getting students to be able to articulate 'this is what I do well, this is what I need to work on, this is what I know now and this is what I will do next, and this is how I am going to get there.'" This is consistent with Hattie and Timperley's (2007) and Frey's (2011) feedback models that encourage teacher feedback to promote this type of student thinking. It would appear that the latter researchers and the teachers in this study agree that answering such questions scaffolds students' learning and narrows the gap of what is understood and the learning goal.

Additional research on this topic would be quite valuable for studies in education because the Partnership for 21st Century Learning (n.d.) has identified self-directed learning (which greatly depends on AaL) as one of the life and career skills necessary to prepare students for postsecondary education and the workforce (Andrade, 2009; Dann, 2014; Griffin & Care, 2015). This lack of understanding resonated with teachers in this study as they recognized a symbiotic relationship between the purposes of assessment, but sought to better understand how it happens to improve their assessment practices. For example, Stephanie wondered how the oral feedback she gives her students affects their cognitive thoughts and how it brings them to new understandings (Interview, August 11, 2014). It is clear from Stephanie's gap in understanding as well as from Bourke and Mentis's (2014) and Woods and Griffin's (2013) studies that a framework to support teachers' understanding of the interactions among the purposes of assessment might be useful. Similarly, van Manen (2014) argued that conceptual analysis can be a helpful tool for phenomenological research because it reveals and brings meaning to how participants understand and experience their world.

My initial conclusions also are rooted in Shepard's (2000) argument that assessment is most effective when it is at the centre of teaching and learning instead of being a mere after-effect. Shepard argued that learning is an active process of mental construction and sense making in conjunction with constructivist theory, hence AfL and AoL feeding into AaL. Likewise, Brookhart (2008) recognized that teacher feedback is filtered through students' perceptions (influenced by prior knowledge, experiences, and motivation). Students are then responsible for making meaning and establishing an understanding of a concept, which requires students' own thought processes and

metacognition (Brookhart, 2008). The major theoretical premise of my initial conclusions is that assessment mentally engages students in a process that serves to develop self-regulation (Valle & Andrade, 2012). The elementary school teachers in this study confirmed (from their experiences) that students with advanced self-regulatory skills rely less on teachers and engage in deeper, more meaningful learning (Hadwin & Oshige, 2011; Valle & Andrade, 2012).

At the outset of this study, I intended to create a conceptual framework for teachers to demonstrate how the participants collectively experienced the interactions among the purposes of assessment (juxtaposed with what research already tells us about classroom assessment and self-regulated learning). However, the data fell short. The exemplary teachers in this study are still trying to figure out answers to this question and therefore their perceptions and reflections on the matter were incomplete. Additionally, students' cognitive interactions turned out to be an important factor when trying to understand the interactions among the purposes of assessment (which was beyond the scope of this research). Since this area turned out to be much more complex than I originally anticipated, with an array of factors at play, it was extremely difficult to make firm conclusions. In fact, this phenomenological research gathered rich accounts of teachers' experiences with classroom assessment to deeply understand AfL and AaL on AoL but it would be worthwhile to contrast this study with studies that closely examine student cognitive function during AaL tasks. I intend to conduct further research in this area and hopefully create an integrated assessment framework that demonstrates the symbiotic relationship between AfL, AoL, and students' cognitive functions (i.e., AaL) as they relate to assessment.

Technology-Integrated Assessment

The modernization of classroom assessment underscores this dissertation; that is, the study investigated how 21st Century technologies influence exemplary elementary school teachers' experiences with classroom assessment. Many people think of technology as anything that came into popular use after they reached adulthood (Jones, Buntting, & de Vries, 2013). For Rose's 6-year-old students (as well as for most students in school today), computers, tablets, smartphones, and interactive boards are viewed not as technology but rather as a part of their everyday lives; it is teachers and parents who consider these items to be something new or unusual (Interview, July 29, 2014). As Rose noted, "Students are comfortable using these devices to communicate and to find information. To them, tools and apps are just another part of the world they inhabit. These tools have the power to become the stuff of teaching and learning" (Interview, July 29, 2014). She suggested: "Don't think of them as technology. They are just part of the fabric of life around us. And therefore, students need to be shown how to use them for learning purposes" (Interview, July 29, 2014). The latter comment resonated with me because as Rose points out students require direction on how to use technology for learning purposes. It is not worthwhile for teachers to assume that students' penchant to operate new technologies for entertainment means that they know how to learn with and from them. It is the teachers' deliberate teaching of how to use technology for assessment purposes that will have the largest impact on student learning. Therefore, 21st Century teaching relies on teachers' technological and pedagogical knowledge to teach students technological literacy (Koehler & Mishra, 2009).

There were varying degrees of technology integration among the participants.

According to the SAMR model, there are four levels of technology integration from substitution to redefinition (Puentedura, 2014). Judging from the evidence in this study, Stephanie appeared to integrate technology mostly at the modification level while Rose, Ava, and Sara seemed to integrate technology primarily at the redefinition level. This study's findings demonstrate how these elementary school teachers transform teaching, learning, and assessment in new ways that were previously unimaginable. For instance, Rose's grade 1 class not only collaborated on a Social Studies assignment with a class from a different country but also Skyped with their international classmate peers daily. As Rose noted, "It almost felt as though they are working in an adjacent classroom in our school but we had a cultural experience too" (Interview, July 29, 2014).

But what really stood out was the participants' ability to seamlessly integrate technology into their teaching practices. According to Mishra and Koehler's (2009) TPACK framework, being able to negotiate teacher content and pedagogical knowledge with technological knowledge fosters a 21st Century learning environment for students. Because of their strong combined technological, pedagogical, and content knowledge, these elementary school teachers have made the fundamental shift from traditional to innovative ways of assessment in meaningful ways. This accomplishment is noteworthy, as Binkley et al. (2012) found that innovative approaches to assessment are lacking in schools.

By extension, Martinovic and Manizade (2014) argue against using technology for traditional tasks; they believe that technology is for creation purposes. The elementary school teachers in this study concurred with this notion. Rose indicated that "technology should not be used for what can be done on paper … technology is the power to create"

(Interview, July 29, 2014). Therefore, she found digitization of traditional methods worthless and a waste of time. It is important to note that the exemplary elementary school teachers in this study did not infuse technology into every lesson they taught, nor did they require students to use technology for every task they complete. The elementary school teachers in this study are excited about technology because it allows students to do things in ways they were not able to do before. Consequently, participants in this study followed a blended learning framework in which they used traditional methods and technology-enhanced methods depending upon what was most appropriate for the task.

Bourke et al. (2010) found that teachers who use multiple forms of assessments within their teaching practice create a comprehensive narrative of student learning. Ava referred to assessment narratives as "my students' assessment stories" (Interview, June 24, 2014). This study revealed that technology has the potential to enrich assessment narratives and make assessment more convenient and accessible. Technology adds a new feature to assessment narratives as it provides innovative ways to efficiently document and store student learning. The elementary school teachers in this study chose to use either e-portfolios and/or student blogs to neatly organize and store students' assessment narratives. All four participants organized the e-portfolios and student blogs around curriculum expectations to reflect the learners' growth towards those expectations (Carmean & Christie, 2006; Stiggins, 2001).

The elementary school teachers in this study also elaborated on Stiggins's (2001) list of artifacts that could be included in an e-portfolio such as digital audio files, screencasts, and metacognitive pieces. To some extent, the elementary school teachers did not agree with Stiggins's list; they believe items such as worksheets or tests should

remain paper-based while photos, videos, and screencasts are more appropriate to upload to the e-portfolio or student blog. Stephanie added however that if a paper-based assignment was important to students' learning and development, then they could take a picture and upload it to their e-portfolio [or student blog] (Interview, August 11, 2014). As well, the elementary school teachers agreed with Black et al.'s (2011) view that a singular task or test cannot accurately measure all expectations of a unit, and therefore the primary rationale for using digital assessment narratives was to create a space in which multiple forms of assessment could be stored to demonstrate ability and growth. To this end, these teachers met assessment reliability conditions of high-quality assessment by including multiple assessments over the course of the term.

Additionally, technology-enhanced assessment narratives provided a way to achieve what Rinaldi (2011) referred to as pedagogical documentation. The teachers saw it as a way to make students' thinking visible and gain richer assessments of their performance. Teachers commented that technology has made assessments much more revealing, resulting in precise and deliberate instruction. For example, teachers relied on various forms of technology (video and Google Docs) to document students' self-assessment and metacognition. These technologies provided not only a clearer picture of student learning but also instant feedback to students. Earl (2007) acknowledged that teachers are the critical connector between assessment and improvement, and pedagogical documentation helps them to fulfill this role. Students also benefit from pedagogical documentation in that the potential for engagement and learning increases because students reflect on their own learning during rather than at the end of the learning process (Turner & Wilson, 2010). Through this process, students practice higher order

thinking and metacognition (Ontario Literacy and Numeracy Secretariat, 2012). In addition, the elementary school teachers in this study shared that pedagogical documentation has provided them with greater accountability and better demonstrates learning and growth to students, teachers, principals, and parents alike. Participants commented that documentation gave them confidence when making professional judgments or defending a position (e.g., justifying a grade).

In sum, of all the educational benefits associated with technological advancements, the two most significant impacts have been the opportunity for students to create and for teachers to have access to insightful assessments that allow them to provide precise and deliberate instruction to their students.

Maintaining High-Quality Classroom Assessment

This research exemplifies how 21st Century assessments can be innovative and engaging for students; however, critics question if these assessments meet fundamental principles of high-quality assessment (Griffin & Care, 2015; Masters, 2013). Such critics argue that 21st Century classroom assessments must be grounded in the same fundamental principles of high-quality traditional classroom assessments in order to be deemed rigorous.

As discussed in chapter 2, high-quality traditional and 21st Century classroom assessments both have the potential to provide reliable, valid, fair, and useful measures of student performance; however, quality is enhanced when assessments meet important criteria. For example, McMillan et al. (2011) and Volante (2006) suggest that the major criteria for establishing high-quality assessments in the classroom include: matching assessment methods to curriculum expectation(s); corroborating different types of

assessment methods to ensure reliable student data; and providing students with reasonable opportunities to demonstrate their learning. As well, Stiggins and Bridgeford (1985) argued early on that effective classroom assessment is a process, rather than a one-time event. Many education experts followed suit supporting the notion that process produces reliable classroom assessment, suggesting that high-quality assessment is ongoing and mainly for the purposes of facilitating student learning and informing teacher instruction (Dann, 2014; Earl, 2003; Hattie, 2012; Stiggins, 2001; Wiliam, 2009).

In line with McMillan et al.'s (2011) principles of high-quality assessment, the elementary school teachers in this study practiced alignment by first determining what to assess according to provincial curriculum expectations and then how to best teach and assess the curriculum corresponding to student learning styles and needs, much like Wiggins and McTighe's (2006) Backwards Design Model. Rose acknowledged that she chooses the most appropriate method to assess the expectation, regardless of whether it is considered a traditional or 21st Century assessment. Still, Rose admitted that she typically leans more towards 21st Century approaches to assessment because they "are more engaging [for the students], facilitate student creation, and provide me with insightful information about my students' learning" (Interview, July 29, 2014). Ultimately, Rose's choice of assessment method depends on how well the learning criteria are met. All of the elementary school teachers in fact recognized that the match between the curriculum expectation(s) and the assessment method is of the utmost importance for maintaining high-quality assessments (McMillan et al., 2011; Volante, 2006). In other words, it is not necessarily the technology under criticism but rather the fit between the curriculum expectation(s), technology, and method used. Moreover, the elementary school teachers

acknowledged that most curricular expectations can be measured using several types of methods, but most did caution that certain methods are better than others to measure an expectation. To this end, McMillan et al. (2011) provide a scorecard to determine the relative strengths of different methods in measuring different expectations in order to provide high-quality assessments. Regardless, it is the teacher's responsibility to ensure that the best method is used to gather accurate and reliable information about student learning (Cooper, 2006; Earl, 2003; Wiliam, 2011).

Choice is another element of 21st Century assessment that was highly regarded by the elementary school teachers in this study, however choice has been contested as a potential hindrance to high-quality assessment. The teachers in this study equated giving choice to their students as fair assessment and an integral component of their 21st Century assessment programs. According to Heubert and Hauser (1999), fair assessment provides all students with an equal opportunity to demonstrate achievement and yields scores that are comparably valid from one method to another across multiple individuals. Fair assessment problematizes high-quality assessment because by offering various methods to students often results in the assessment potentially losing some or all of its reliability. In spite of this, one of the main advantages of using 21st Century approaches to classroom assessment is the ability to offer students choice by providing a variety of tasks to choose from in order to best show their knowledge and skills, meaning that not all students are required to complete the same task, only similar ones that meet the same learning outcomes. In order to maintain rigor across student assessments, it would be advantageous for teachers to question why do these students (who performed different assessment tasks) get a similar grade? Perhaps the similar grade is justified for different

reasons but a warranted reason nonetheless.

Surprisingly, teachers in this study were not fazed by the multiplicity of assessment possibilities. In fact, they encouraged uniqueness of assessment tasks as long as the assessments aligned with curriculum expectations. They heavily relied on curriculum expectations to guide their assessments and they used anchors (i.e. leveled performance examples) to demonstrate to students what quality looked like. One teacher, however, used anchors with caution. She felt that anchors limited her students' creativity and facilitated a replication model. Nonetheless, her principal strongly advocated for anchors to be posted in her classroom, and as a result she conformed to administrative suggestions and is beginning to see the benefits of posting anchors for student reference and adding quality to her assessment program.

Overall, the elementary school teachers were not overly concerned with validity and reliability of their classroom assessment (compared with large-scale testing) because they were confident in their professional judgment of student learning. It is worth noting that the participating elementary school teachers had been teaching for more than 10 years at the time of this study and they seemed to share the same understanding described by Sara: "I know what I know and have learned to recognize student learning and growth. It's a learned professional skill that comes from years of teaching experience" (Interview, July 9, 2014).

AfL largely relies on teachers' professional judgment and wisdom, which Tierney (2014) argued can thwart the reliability of classroom assessment. To overcome such caveats, Stephanie made an effort to assess alongside her teaching partner (a DECE) while using a 21st Century assessment tool called Clic. This tool in particular allowed

them to collaborate on student profiles and to electronically document and add grades and comments to student work. They often correlated evaluations between themselves and tracked student growth using Clic. As well, they often had discussions about the discrepancies in grading and whether the assessment task demonstrated students' true ability of the curriculum expectations. Other teachers in this study also discussed using multiple assessment methods (i.e., performance tasks, tests, portfolios, etc.) with the same student to increase assessment reliability (Cooper, 2006; Earl, 2003; WNCP, 2006).

Despite the elementary school teachers' confidence in their professional judgment, they maintained rigor in their 21st Century classroom assessment by using reference points discussed by Cooper (2006). Ava explained that her assessments were rooted in criteria that demonstrate curriculum expectations; Kathy and Stephanie valued referencing student growth over time against students' own progress by using student blogs and Clic; and Sara discussed using normative referencing by comparing her students' performance with developmental milestones. Ultimately for all teachers in this study, classroom assessment was about seeing student growth over time and using these three reference points to help scaffold the learning process.

My dissertation is based on teacher perceptions; therefore, the evidence of this research is subjective and based solely on the participating elementary school teachers' experiences with classroom assessment. Yet because these teachers are exemplary and possess a depth of knowledge of 21st Century classroom assessment, it seems that much can be learned from their experiences. In conjunction with classroom assessment literature, these teachers felt that 21st Century assessment is "so much more than assessment. It's about student learning, informing instruction, student engagement,

growth and development, communication, relating to the real world, among other things"
(Stephanie, Interview, August 11, 2014). As much as these teachers are advocates for 21st
Century assessment, they agree that certain fundamental principles of high-quality
assessment be considered when using alternative assessment methods to maintain rigor
and accuracy of what is being measured, as discussed by Cooper (2006), McMillan et al.
(2011), Tierney (2014), and Volante (2006). Examples were provided throughout this
dissertation to demonstrate how these exemplary elementary school teachers maintained
high-quality assessments when using 21st Century approaches to classroom assessment.

As the primary researcher, I recognize there are caveats to 21st Century
assessment and recommend that further research be undertaken to identify how teachers
can maintain high-quality assessment as we continue to modernize classroom assessment.
After all, the elementary school teachers in this study have shown amazing possibilities
for classroom assessment and student learning, and therefore it would serve students well
to explore this further.

Exemplary Elementary School Teachers' 21st Century Professional Development

An unexpected theme that emerged from this research pertained to the lack of
professional development available to exemplary teachers. Most of the teachers in this
study complained that the professional development available to them is outdated and
irrelevant to their classroom practice. One teacher commented that "the professional
development workshops offered by our board are not useful to me. The topics they are
discussing I was implementing 3 to 5 years ago" (Sara, Interview, July 9, 2014). These
comments support the role of the Internet and new technologies in securing additional
and useful professional development to exemplary teachers. Consequently, the

elementary school teachers in this study relied on self-directed professional development (such as professional blogs, participation in research studies, third-party professional development groups, and self-directed reading) to propel their 21st Century learning.

As a result of the lack of professional development opportunities available to exemplary teachers, the participants found professional blogging to be a worthwhile activity to support further learning. Although each elementary school teacher in this study began writing a professional blog for different reasons, they all agreed that their professional blogs are now their main source of professional development. By nature, these teachers were highly reflective practitioners who voluntarily spent time reflecting about their classroom practices in their professional blogs, and therefore the blogs were an easy and fitting professional development endeavour for these teachers. They commented that they appreciated the blogs as a means to collaborate with like-minded teachers and to receive feedback and criticism from others, which often made them think about teaching, learning, and assessment in new ways. They also found reading other educators' blogs to be insightful and inspiring. These experiences are congruent with what previous research on the role of blogs in teachers' professional development described: teachers build an online community of support, much like PLN, with other educators from whom they learn and seek advice (Eastham, 2011; Hungerford-Kresser et al., 2014; Ray & Hocutt, 2006). The teachers in this study also agreed with Poling's (2005) view that blogs create a shared electronic space that allows professionals who typically are isolated from one another to come together to share ideas, ask questions, dialogue, and discuss topics.

One of the most surprising elements of professional blogs for participants was the

role of others (who were most often unknown to them) in their professional learning. Rose shared that she was astonished by the amount of feedback and professional conversations stemming from a single blog post. She was impressed by the amount of professional support she found online and how teachers whom she had never met inspired her change to change her classroom practices. The participants described experiencing "aha moments" when reading or writing on their professional blogs. Max van Manen (2014) refers to these thematic insights as "insight cultivators" (p. 324) that enhanced the participants' reflective interpretive process, providing a sense of "Oh, now I see!" Insight cultivators helped the participants interpret their lived experiences of classroom assessment, recall experiences that seemed to be relevant to their own classroom practices, and stimulate further creative insights and understandings with respect to classroom assessment and technology integration (van Manen, 2014). Rose noted that her students probably were not aware that she engaged in a professional blog but they were the ones who benefited most from her taking the time to reflect on what worked and what did not work in her classroom. All four elementary school teachers mentioned that using a professional blog for reflective practice became a part of their sense-making process and positively impacted their teaching to ultimately make them better teachers.

Sara noted that being involved in research studies, such as this one, pushed her to question and reflect more deeply about her classroom pedagogy. Consequently, these elementary school teachers relied on their capacity to reflect and the experiences of others to consolidate best practices for classroom assessment and make changes to their pedagogy. This indicates that teachers' reflective practice and collaboration with other teachers can shed some light on the processes of classroom assessment. Using research to

showcase living examples of exemplary teachers is a worthwhile undertaking to establish best practices in classroom assessment.

Implications for Practice and Research

As we move further into the 21st Century, it is clear that the world is changing and that education must keep pace with such changes. It is clear from this study that students could highly benefit from acquiring both the skills of traditional education such as literacy and numeracy and also 21st Century ones such as problem-solving, creativity and design thinking. Scholars recommend a constructivist approach to teaching and learning to allow for such a wide range of goals. This study has focused on assessment. The literature has promoted AfL with its constructivist grounding for classroom assessment not only to assess but also as a way to enhance learning. While the literature provides evidence of sound fundamental assessment practices, it has not illustrated specific examples of classroom assessment using 21st Century approaches to teaching and learning (Black & Wiliam, 2009; Dann, 2014). The exemplary elementary school teachers in this study demonstrated that a balanced program of AoL, AfL, and AaL effectively engages students and creates a positive learning environment. Thus a focus on such a balanced program that lessens reliance on pencil and paper testing as the sole means of measuring achievement is important for the future of education.

Implications for Practice

The educators in this study demonstrate that technology need not be viewed as mere mechanical devices used to entertain students, but rather as tools that can enhance and deepen learning and act as a catalyst for change. In 2001, Cuban argued that technology had brought minimal change to schools, but today technology has a greater influence in

schools because most students have a mobile device in their pockets, school systems have been digitalized, and a grassroots social media based professional development movement has emerged (Drake et al., 2014). Teachers also are beginning to recognize the incremental improvements that technology can have on teaching and assessment because it provides richer data about student learning. That is, technology can make student learning more visible and make instruction increasingly more precise and personalized.

Yet not all educators have embraced AfL or integrated technology into assessment practices to enhance learning, even though AfL is mandated in school boards across Canada (Drake et al., 2014; Dunn & Mulvenon, 2009; Lawler, 2012). Consequently, teacher professional development is an increasingly important medium through which to introduce teachers to balanced assessment programs and technology integration for the purposes of enhancing student learning. Such professional development can be facilitated by the plethora of accessible and inexpensive online technologies that support teacher collaboration, such as professional blogs, TeachOntario, Twitter, and Massive Open Online Courses (MOOCs).

Teachers. Implementing AfL is best suited under constructivist philosophy, yet not all teachers incorporate such an approach in their practice. This study suggests that teachers would benefit from discovering ways to reflect on their own beliefs about the best way to teach and assess. This might be as simple as pausing during instruction to assess if students are following the lesson or it may involve more extensive activities in the form of journal entries, blog posts, or even online PLN discussions. For some teachers, these types of reflection exercises not only would facilitate unlearning and relearning assessment practices but also would revamp their way of thinking and

envisioning what classroom assessment could look like in a 21st Century context.

In addition, this study highlighted that AaL is an integral part of managing a balanced assessment program. But students are not predisposed to think metacognitively; they must be taught how to do so and to understand how such cognitive processes impact self-assessment and the recognition of performance quality. Rose argued that AaL be taught as early as kindergarten so that students practice this way of thinking early on, making it easier for them in later years when it matters most.

One of the pitfalls of technology in the classroom is its use for entertainment and rewards rather than for learning purposes. This study reminds us that the method must fit the learning outcome when choosing 21st Century approaches to assessment. To ensure an appropriate fit, teachers can ask themselves, "Does this assessment method properly measure the curriculum expectation I set out to measure?" and "Which assessment method (i.e., traditional or 21st Century) best suits the expectation(s)?" By answering such questions, teachers are incorporating the principles of high-quality classroom assessment.

The influx of technologies available to teachers and students provides an opportunity to embrace multiple methods so that students can show what they know and can do in different ways according to their learning needs. Thus, the findings from this study encourage teachers to adopt multiple methods for summative assessment in order to gain a valid representation of students' ability. Giving students a choice in their assessments is in line with Cooper's (2006) argument that it is important to assess the student, and not only the assessment method. A word of caution, however, is that although choice gives students a sense of ownership and engagement and provides the

teacher with a valid representation of ability, it must still fit curriculum expectation(s).

This study brings to light the merit of using technology in a bottom-up approach for teacher professional development. The exemplary elementary school teachers in this study recognized the dearth of valuable professional development opportunities available to them and, as a result, they took it upon themselves to discover new meaningful learning opportunities. All four elementary school teachers in the study agreed that a professional blog was their preferred means of professional development as it was formative and organic; that is, their online PLNs became a critical part of their reflective practice. What was most valuable from these types of PLNs was the dialogue that emerged from their reflections. Previous professional development programs had not fostered the feedback teachers received through their blog posts and the ideas they gained from reading other teachers' posts, and the exemplary teachers in this study considered such technology to be a "game changer" in their professional learning as 21st Century educators.

Ministries of education and school districts/divisions. These teachers' perceptions suggest that such approaches can, when used properly, enhance student learning. Indeed, teachers in this study went as far to say that ideally AaL underpins all classroom assessment. And yet, provincial policy documents pertaining to classroom assessment and evaluation fall short in providing a comprehensive understanding and implementation of AaL strategies. For example, Ontario's *Growing Success* document included a chapter on AfL and AaL but less than half a page directly addresses AaL practices. This study suggests that policymakers could focus more on a comprehensive understanding of AaL and the value of AaL integration, and formulate best practices for

educators to achieve such integration.

If living examples of AfL and AaL are useful in promoting widespread adoption of a 21st Century balanced assessment program, then it is imperative to find effective ways to disseminate these examples to the teacher population (in addition to revising policy documents as mentioned above). Grassroots professional development such as networked-based MOOCs, blogs, TeachOntario, Twitter chats, courses available through Powerful Learning Practice (see http://plpnetwork.com) are becoming more popular among teachers in the current educational landscape. This study's exemplary teachers are dispersed across Canada and in the networked world such living examples can extend beyond local, provincial, and international boundaries. It is important to find ways to locate these exemplary elementary school teachers and showcase their philosophies and practices to influence other teachers. District school boards can support this type of knowledge mobilization by creating platforms through which teacher learning can happen organically.

The elementary school teachers in this study described searching individual blog pages or resorting to social media venues such as Twitter. A social media suite, for example Hootsuite, would be advantageous for teachers to consolidate their social networks and easily link them together. As well, networked-based MOOCs (such as OSSEMOOC) provide like-minded teachers with a platform to construct new knowledge through diverse connections and explore and share resources based on teachers' interests, expertise, and desirable professional learning. The findings of this study show that the participants were highly responsive to online PLNs as a professional learning activity, which implies potential benefits of widespread adoption of 21st Century approaches to

teacher learning. With that said, ministries of education would be responsible for the implementation of such 21st Century professional development activities to ensure successful uptake. These strategies would require little monetary expense for ministries of education and/or district school boards but can greatly benefit teacher professional learning and classroom practice.

The participants showed great willingness to help other teachers who are interested in integrating 21st Century assessment into their classroom practice, which implies that it would be worthwhile for ministries of education to host workshops with exemplary teachers showcasing living examples that have been tried and tested. Follow-up programs could be established in which teacher trainees (i.e., workshop attendees) engage in a mentorship program with exemplary teachers (i.e., workshop hosts) who guide and assist them with the implementation of new 21st Century pedagogies. This will require release time for both the exemplary teacher and teacher trainees for subsequent classroom observations and face-to-face discussions. Follow-up mentorship could happen virtually via professional blogs or a structured virtual PLN platform, as discussed previously, and would encourage other teachers to reflect on a professional blog, share ideas, and gather constructive feedback from fellow educators.

Faculties of education and new teachers. This research has implications for teacher education programs to best prepare teacher candidates for effectively implementing a balanced assessment program. Based on the teachers' perceptions and experiences from this study, it would be beneficial for Faculties of Education to provide teacher candidates with the fundamental principles of high-quality assessment while staying attuned to new, innovative methods of instruction and assessment. Teacher

candidates might benefit from studies such as this one as it showcases living examples of exemplary 21st Century practices that are primarily rooted in fundamental principles of high-quality assessment.

Even though traditional testing is a valuable method for certain types of learning, it would be worthwhile for teacher education programs to encourage teacher candidates to experiment with other types of assessment such as performance-based, authentic, and technology-integrated assessment. New teachers would benefit from learning how to best match assessment methods with learning goals and how to use professional judgment in student evaluation.

It is worth noting that teacher candidates and new teachers alike understand that technology is not inherently beneficial to 21st Century learners, and thus it is recommended that they take the time to critique and match the assessment method to curriculum expectation(s), keeping in mind that learning goals not be lost. The participants in this study were adamant that technology improve or enhance teaching, learning, or assessment for it to be considered worthy and secure a place in classroom pedagogy.

Implications for Research

One of the major goals of this study was to examine exemplary teachers' assessment practices to see what is possible; this research rarely touched on what happens in typical classrooms. To determine the extent to which these results are context specific to exemplary teachers, research using a similar methodological approach with typical teachers would be beneficial. Investigating a larger number of exemplary teachers also would be worthwhile to determine if trends exist among exemplary teachers or if the

exemplary teachers in this study were unique.

The elementary school teachers in this study agreed with the Partnership for 21st Century Learning in that self-regulation is a necessary skill for postsecondary education and the workforce, and yet they still grappled with how to effectively integrate AaL (e.g., self-regulation, metacognition, self-assessment) into their balanced assessment programs. Therefore, teachers could benefit from further investigation of how to effectively teach students to use AaL and the new role that teachers play in learning environments in which AaL is at the heart of classroom assessment (e.g., feedback cycle, frequency of questioning, role of peers vs. teacher). As well, while this research begins to explain the symbiotic relationship between AfL and AoL on AaL, further research would shed some light on the micro level interactions of assessment and the impact teacher assessment has on student thinking.

Lastly, the elementary school teachers in this study valued technology as a large part of their assessment programs, and therefore such approaches warrant further research. It would helpful to determine exactly how pedagogical documentation can be used for accountability purposes and to create rich assessment data whose ultimate purpose is to inform instruction and improve student learning.

The title of this study corresponds well to the research implications. "The Untried Path" refers to teachers who take risks and adopt innovative approaches to education, knowing that the learning that takes place along this previously untraveled road is well worth it, even if the end goal remains unknown. In short, the exemplary teachers in this study set out to make the impossible possible. This suggests that other teachers could take similar risks and challenge their philosophies and practices about classroom assessment.

As Hattie (2012) argued, change comes from outlier teachers who approach pedagogy differently.

My Personal Reflections as a Researcher

I am a changed researcher as a result of research. What I learned through planning, conducting, analyzing, and writing this research was both expected and unexpected. What I expected to learn was a much deeper understanding of the literature and the discourse among researchers who either complement or contradict one another, a thorough understanding of the philosophies and procedures for conducting phenomenological research, as well as the endurance and persistence needed to write a doctoral dissertation. Yet what I did not expect was how much more I would learn both about conducting research and about myself as a researcher. In the following sections I discuss some unexpected learnings that occurred during my doctoral research.

Researching with Blogs

From a research perspective, I learned a great deal about the advantages and disadvantages of working with teachers' professional blogs for research purposes. As outlined in chapter 3, I conducted extensive research while learning about blogs; selecting, organizing, reading, and ranking blog posts according to my research questions; and then analyzing various types of content contained in the blogs to inform the results of this research. During the planning stages, I anticipated that much of my results would be based upon direct quotations from teachers' professional blogs; however, although I did include some, they were not as heavily weighted (compared to the interviews) as I had anticipated. Upon reflection, I realized that the blogs were an exploratory venture. Specifically, I wanted to learn about these exemplary elementary

teachers' assessment practices without prompting or directing the teachers to include specific information pertaining to this study on their blogs. I then used the interviews to focus on the areas that were particularly pertinent to this research. Therefore, there was a great deal of overlap between the blogs and the interviews, and because the interviews were more focused it gave the participants a chance to elaborate on their blogs and be much more eloquent and precise in their responses.

Consequently, in most cases I chose to use the participants' interview responses rather than their blog reflections. As well, it was difficult to cite each paraphrase in the results section. I felt as though almost all of what I wrote in chapters 4 and 5 was derived either directly or indirectly from the interviews or professional blogs. Therefore, each sentence that is not presented as a direct quotation is essentially paraphrased. However, I chose not to cite every sentence for the ease of the reader. It can be assumed that paraphrased text in chapters 4 and 5 came from either of the two data sources.

Lastly, I chose not to include alternative formats such as images and videos in the results of this research in order to avoid saturating this thesis with too much data. With that said, I did use alternative formats from the blogs during data collection and analysis to inform the research findings and to provide greater insights into and a broader picture of the exemplary teachers' classroom assessment practices.

Researching Exemplary Teachers

Throughout this study I developed a growing appreciation of just how exemplary the teachers in this study are. They represent so much more than what typically defines a teacher. They embody deeper, unique characteristics such as lifelong learners, inquirers, innovators, technologists, and action researchers. The educational community has

deemed them exemplary, and yet these teachers are still looking for ways to improve their practice and take risks (e.g., student blogging and connecting classrooms). They teach far beyond their classrooms and design learning in real-world contexts. As well, they possess an inner spirit for innovative teaching to transform student learning and they themselves infuse technology into their daily lives. For example, Ava is a teacher who attends almost all of her meetings with a device in hand and can rarely find a pencil or pen. With technology being tightly woven within their own lives, it is easy for them to make it an integral part of their classrooms.

In addition, these teachers have made the fundamental shift from traditional to innovative ways of assessment (Earl, 2003; WNCP, 2006). As DiCerbo (2014) highlighted, many teachers are still stuck in traditional ways of teaching and learning and only use technology to perform traditional methods in the same way; for example, using an online test rather than a paper–pencil test. But teachers in this study were markedly different. They set out to make the impossible possible. They saw technology as a way to practice assessment differently. They encouraged their students to do things with technology that otherwise would have been impossible. Technology provided students with unprecedented ways to demonstrate thinking and learning. Most often this results in teachers collecting richer assessment data that are much more informative to their teaching than ever before.

I believe their motivations for using alternative assessment methods, usually technology-integrated assessment, were driven by their own experiences as learners. Two of the four teachers self-identified as having learning differences and as a result described facing challenges with traditional assessment methods. In fact, Ava described having an

"aha moment" that "all students can learn" (Interview, June 24, 2014) after overcoming her own learning differences. Similarly, Sara disclosed that "many traditional assessments did not work for her" (Interview, July 9, 2014). She knew the information but the traditional assessments being imposed upon her were not conducive to her learning style or learning differences. Consequently, both of these teachers have set out to perform assessment differently to meet their students' diverse needs. In doing so, they discovered new ways to assess while completely uprooting their philosophies of classroom assessment. I can identify with both of these elementary school teachers because I too encountered learning differences as a child. I can attribute the reading assessments as a game changer in my learning journey. Although I did not like what the assessment results revealed about my reading ability, it was a turning point in my learning because my teachers were then able to personalize instruction. I believe these experiences, albeit subconsciously at times, have driven me as a university instructor to be innovative with assessment and infuse assessment into all aspects of instruction. As equally as important, my learning differences have motivated me to conduct this dissertation research focusing on alternative approaches to classroom assessment in a 21st Century context.

I felt honoured to work with the elementary school teachers in this study and I am proud to showcase their work throughout this dissertation. It is my hope that this manuscript provides some insight on how to conduct research related to teachers through the use of professional blogs juxtaposed with interviews. My participants made my role as researcher thoroughly enjoyable because they themselves were reflective practitioners, which made their blog posts be extremely informative and engaging. They constantly

evaluated their own practices and reflected both on what worked as well as on what didn't work in their respective practices. I also believe this is why all four elementary school teachers enjoyed participating in a professional blog. They valued being a part of an online community in which they could ask questions, gather ideas, obtain feedback from professionals, and see how others' approaches fit in their classrooms. Simply put, they are always looking to improve.

Fullan (2012) and Hattie (2012) argued that dramatic change in education is going to come from outlier teachers who act as change agents. I argue that the exemplary teachers in this study are outlier teachers who are changing teaching, learning, and assessment in Canadian schools. They act as activators and evaluators alike; that is, they take action to innovate and as a result transform students' learning experiences (Hattie, 2012; Puentedura, 2014). As well, they are evaluators who continually reflect on their professional blogs about what impacts student learning and how to attain the highest quality of outcomes (Hattie, 2012).

Fullan (2013) believes teachers who share with other teachers are more likely to enjoy and sustain change. That is, "sharing real life experiences that are engaging, precise, and specific that ensue a high yield (good benefit relative to effort), higher order thinking (creativity, problem solving and innovation), and have a collective benefit" are more likely to have an impact on teacher change (p. 3). For this reason, I believe it is worthwhile to showcase these teachers' exemplary practices in a variety of different venues, such as this dissertation, for other teachers to gain insight into how to improve assessment practices in a 21st Century classroom.

It is my hope that this research has induced a sense of wonder in its readers—

wondering how they too can improve assessment to better student learning. Or perhaps it provides researchers with a sense of wonder to continue research in this area or with new data sources such as blogs. Whatever the wonder might be, I hope this research is provocative in enhancing various aspects of education, particularly related to classroom assessment and technology integration.

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