EXPLORING THE EVOLUTION OF ASSESSMENT IDENTITY WHEN INFUSING TECHNOLOGY INTO EDUCATIONAL CONTEXTS

By

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Abstract

Classroom assessment is an essential component of the current standards-based education system. However, with the increase in classroom technology and sudden shift to remote learning, educators must alter and adapt their assessment strategies, even if they feel unprepared or uncomfortable doing so. Using teacher assessment identity (Looney et al., 2018) as a conceptual framework, this study explored the assessment practices and evolving assessment identity of educators as they implemented assessment via technology. This study utilized a secondary analysis drawing upon a subset of data collected during a collaborative program evaluation and responded to the following questions: (1) How do teachers leverage assessment via technology in their teaching practice to support the evolution of their classroom assessment conceptualizations and practices? (2) What can be understood about teacher assessment identity as they work to integrate technology in their teaching practice and expand their classroom assessment practices? Data was analyzed using an inductive, deductive, and hybrid approach using a four-phase qualitative analysis procedure (Bengtsson, 2016). Findings from the inductive analysis noted that teachers supported their reconceptualization of assessment through expanded assessment practices, seeking professional development, and developing core competencies for 21st century learners. The deductive analysis highlighted the interconnected nature of the five dimensions of the teachers' assessment identity framework and how these dimensions are informed and influenced by learning, catalyzed through reflection, collaboration, and a commitment to professional development. The findings and implications of this study are discussed in regard to research, practice, and policy to bolster an understanding of assessment, learning, and educational technology.

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Chapter 1: Introduction

Teaching is a predominantly stressful profession (Skaalvik & Skaalvik, 2018) and the pressure for effective pedagogy continues to soar through the increased demands for teaching responsibilities (e.g., administrative burdens, assessment and evaluation, classroom management, teaching instruction) (McCarthy, 2019; Moriarty et al., 2001). An important teaching responsibility is the effective implementation of classroom assessment (e.g., Biggs, 1999; Black & Wiliam, 2018), especially given the central role teachers' assessment practices can have on student learning and pedagogy (Black & Wiliam, 1998; Klinger et al., 2012; Popham, 2004). Yet, effective assessment can be a complex task (Mavrommatis, 1997) and many teachers frequently engage in assessment without adequate background or training (DeLuca, 2012; Lam, 2015; Xu & Brown, 2016). Some teachers do not feel prepared or confident with their assessment practices in the classroom (e.g., Koloi-Keaikitse, 2017), demonstrating an increased need for acssessment literacy in the field of education.

Assessment literacy can be conceptualized as a teachers' understanding of significant concepts of classroom assessment (Brookhart, 2011; DeLuca et al., 2015; Popham, 2013). First introduced by Stiggins (1991a), assessment literacy referred primarily to an educators' assessment skills, knowledge, and practices; however, assessment literacy continued to develop, and the way in which teachers perceived themselves as an assessor was connected to how they executed and built assessments in the classroom. Research is needed to further explore the role of the teacher as an assessor by going beyond assessment literacy to a point in which a teachers' assessment identity is developed (Adie, 2013; Looney et al., 2018).

A teachers' assessment identity is shaped by prior experience and context, often involving curriculum knowledge and skills, comprehension of effective assessment practice, confidence enacting assessment practices, and belief in the value of the assessment process (Looney et al., 2018). Educators experience a possible transformation to their identity and practice when achievement and standards have meaning established through the examination of accepted norms and processes of negotiation (Wyatt-Smith & Adie, 2019). In fact, "practice and identity may change, often innovatively and creatively, as the result of exposure to different artefacts or activities, and this may be different for each individual involved in the practice" (Lave & Wenger, 1991 cited in Wyatt-Smith & Adie, 2019, p. 404).

There are few empirical studies investigating the construct of assessment identity (e.g., Looney et al., 2018; Xu & Brown, 2016). Despite being an understudied area, it is known a teachers' assessment identity goes beyond merely *knowing* and *doing* assessment (Adie, 2013; Looney et al., 2018). From my experiences during my Bachelor of Education program, teachers approached assessment through a different teaching lens based on their prior work, volunteer, or educational experience. As a student in the assessment and evaluation concentration, taking two weekly 8-month courses, I was able to witness my own assessment identity shift (e.g., assessment terminology, challenges to traditional assessments based on personal experiences, beliefs about the purposes of assessment). The professors in the concentration were passionate about the topic and provided the necessary knowledgebase, practical tools and resources, and time to try-out assessment-related strategies in a low-stakes and collaborative environment, cumulatively allowing our assessment identity to evolve. In fact, going out on practicum, students who were not in the concentration were asking me to develop a rubric or plan a culminating task, because although they learned how to do those assessment-related activities, they weren't confident in transforming theory to practice. As Looney and colleagues (2018) described, "[teachers] may have knowledge of what is deemed effective practice, but not be confident in their enactment of such practice" (p. 455). Teachers' assessment activities have power to influence student learning; the ways teachers approach classroom assessment is heavily impacted by who they are as an assessor, their knowledge, confidence, feelings, beliefs, and roles about assessment.

The current context of schooling has changed and challenged teachers' assessment identity. Specifically, the high degree of technology integration within teaching and assessment has led to the need for teachers to learn and re-learn modern teaching pedagogy (Hubbard, 2018). Accordingly, little is known about how teacher assessment identity is influenced by technology, so this research begins to explore this linkage.

Assessment in Technology-Enriched Classrooms

Despite the already complex task of assessing students in the classroom, assessment has been made ever more complex as it becomes mediated through technology. Technology was present in education to varying degrees over the past decades and its necessity as a tool for teaching and learning was critical in response to the coronavirus (COVID-19) pandemic. The present COVID-19 context is a prime example of technology being called upon to provide students with access to educational opportunities beyond the physical reach and outside of traditional physical spaces of teaching and learning (Khan & Jawaid, 2020). Though remote learning is now a necessity, many educators have reported longstanding impressions of feeling unprepared or uncomfortable using educational technology in the classroom for teaching and assessment (e.g., Johnson et al., 2016; Levin & Wadmany, 2008). In our current context, where every classroom is a technology-enriched classroom, it is important to identify how assessment via technology advances a teachers' assessment identity.

Assessment via technology is a term I have used in this thesis to describe classroom assessment practices and identity constructs connected through the use of educational technology. In this thesis, assessment via technology encompasses all the strategies and processes related to assessing student learning (e.g., providing feedback, documentation) and utilizing educational technology. Educational technology refers to technology used to facilitate learning and improve performance through creating, using, and managing suitable processes and resources (Januszewski & Molenda, 2008). The term "technology" is inclusive of all devices (e.g., laptop, mobile phone, tablets, interactive whiteboards) that enable access to applications or websites with, but not limited to, an internet connection.

Technology in the classroom has been an area of increasing interest in educational research because of the opportunities it provides for making learning accessible and inclusive for students with different needs (Amiel & Reeves, 2008; Starcic, 2010). Research suggests that technology has the potential to support student learning (Kozma, 2014), but the potential for positive impacts of technology in learning environments remains contested by some (D'Arcy et al., 2014; Lynch, 2016). Researchers posit that educational technology can make learning more engaging and collaborative (Resta & Laferrière, 2007), increase motivation (Wu et al., 2011), and encourage self-paced learning with student independence (e.g., Montgomery & Marks, 2006). Additionally, technology can personalize instruction and assessment to meet the needs of all students (Kumar, Kumar, & Smart, 2004). However, debates about educational technology continue as researchers and educators caution that technological tools can be distracting, misguiding, increase opportunities for cheating, disconnect learners, and leading to the deterioration of students' competencies in reading, writing, and mathematics (e.g., Alhumaid, 2019; Bennett et al., 2008; Deubel, 2007). Nevertheless, limited research has been conducted specifically on how educational technology can *support* assessment practices and contributes to a teachers' assessment identity. Exploring assessment via technology may bring forth understanding, strategies, and practices that enable educators to develop confidence, take risks that increase comprehension, and support their learners.

Purpose and Research Questions

The purpose of this study was to analyze teachers' assessment identity as they were implementing assessment via technology. Using assessment identity (Looney et al., 2018) as a conceptual framework, this study responded to the following two inter-related research questions:

1. How do teachers leverage assessment via technology in their teaching practice to support the evolution of their classroom assessment conceptualizations and practices?
2. What can be understood about teacher assessment identity as they work to integrate technology in their teaching practice and expand their classroom assessment practices?

Study Context: Assessment in Ontario Schools

The primary purpose of assessment and evaluation is to improve student learning (Ontario Ministry of Education [OME], 2010) which can be done by gathering relevant information about a students' process or performance (Lynch et al., 2016). Teachers are increasingly called to use assessments throughout their teaching to track, support, and report on student learning. Researchers have articulated this professional requirement through frameworks of assessment literacy (e.g., Schafer, 1993; Stiggins, 1999), assessment competency (e.g., Herppich et al., 2018; Smith, 2007), assessment capability (e.g., Colbert et al., 2012; Hill et al, 2010), and most recently, assessment identity (e.g., Looney et al., 2018; Wyatt-Smith et al., 2010). These multiple constructs have been used to develop instruments for self-reflection, measure teachers' assessment literacy, recognize areas of professional growth (e.g., Campbell et al., 2002; DeLuca et al., 2018); influence modern educational policies (e.g., Growing Success, Learning for All); and support and monitor classroom assessment practices. Underpinning these frameworks is an articulation of the skills, knowledge, and dispositions teachers need in order to effectively use and integrate assessment into their teaching.

Classroom assessment practices and constructs have been heavily influenced by the American Federation of Teachers (AFT), National Council on Measurement in Education (NCME), and the National Education Association (NEA) through their publication in 1990 entitled *Standards for Teacher Competence in Educational Assessment of Students.* The *Standards* provided a framework for many of the aforementioned assessment constructs, and outline seven standards that classroom teachers were expected to be skilled in. The seven standards include the ability to: (1) choose assessment methods appropriate for instructional decisions; (2) develop assessment methods appropriate for instructional decisions; (3) administer, score, and interpret the results of both externally produced and teacher-produced assessment methods; (4) use assessment results when making decisions about individual students, planning teaching, developing curriculum, and school improvement; (5) develop valid pupil grading procedures which use pupil assessments; (6) communicate assessment results to students, parents, other lay audiences, and other educators; and (7) recognize unethical, illegal, and otherwise inappropriate assessment methods and uses of assessment information. Although the *Standards* (AFT, NCME & NEA, 1990) have since been improved (e.g., Brookhart, 2011), they were the basis for several instruments designed to measure assessment literacy in the classroom (e.g., Mertler, 2003; Plake et al, 1993).

In Canada, education is a provincial/territorial responsibility under the constitution which allows for diversity across provinces and territories in the structure and organization of elementary and secondary school systems (Volante & Ben Jaafar, 2008). Assessment plays a critical role in education systems in all jurisdictions in Canada (Jang & Sinclair, 2017). In Ontario, current frameworks for assessment can be attributed to the Royal Commission on Learning (RCOL), a province-established organization that was created "to ensure that Ontario's youth are well-prepared for the challenges of the twenty-first century” (Begin & Caplan, 1994, para. 1). In 1993, the RCOL visited 30 Ontario jurisdictions and received over 3,300 submissions from citizens about the need for educational reform (Milburn, 1996). Based on the submission findings, in 1994, the RCOL released a final report offered two recommendations that informed today’s classroom assessment practices in Ontario: (1) the implementation of large-scale centralized testing and (2) the improvement of teachers’ classroom assessment practices (Jang & Sinclair, 2018).

In response to the Commission’s report indicating the public’s demand for accountability in the educational system, the Ministry of Ontario developed the Education Quality and Accountability Office (EQAO) in 1996 (EQAO, 1996; 2012; Jang & Sinclair, 2018). The purpose of the EQAO was to develop and implement large-scale assessments and report these results to the public. Furthermore, additional changes that resulted from the RCOL’s report included the creation of provincial curriculum, development of a standard report card, teacher certification and the Ontario College of Teachers, among others (Jang & Sinclair, 2018). The EQAO, responsible for Ontario’s province-wide literacy and numeracy assessments, targeted the accountability demand and large-scale school improvement initiatives of the RCOL report.

Concurrently, the Ontario Ministry of Education worked towards developing classroom assessment policies and resources to bolster the ability for teachers to meet the needs of student through formative assessment in the classroom (Black & Wiliam, 1998b; DeLuca & Volante, 2016; Jang & Sinclair, 2018). In 2010, the Ministry of Education released Growing Success, Ontario's policy on classroom assessment, evaluation, and reporting. Growing Success reflected an effort to balance formative and summative assessment practices and emphasized Ontario's commitment to support student learning and growth with reference to common standards (Jang & Sinclair, 2018). Growing Success provided legitimated conversations for some of the questions, ideas, and approaches to assessment that were emerging as part of the shift from grades to a focus on the importance of feedback and student learning. This shift was articulated in the policy as it recognized the importance of students' autonomy for self-regulating their own learning through assessment *as* learning (AaL) strategies (DeLuca & Volante, 2016). Documentation about the value of formative assessment, both assessment for learning (AfL) and AaL provided a pivotal opportunity for educators to reconsider how they were thinking about and enacting assessment in their classrooms. Growing Success also emphasized teacher competency in classroom assessment practices, signifying the importance of teachers' assessment literacy (DeLuca & Klinger, 2010; OME, 2010). Growing Success represented a landmark document for this province as the first of its kind to outline assessment as a professional responsibility.

Although assessment identity is a relatively new construct, the underlying ideas and concepts are evident in the Ontario Ministry of Education Policy/Programme Memorandum No. 155, Diagnostic Assessment in Support of Student Learning (OME, 2013b). This policy expanded on Growing Success to highlight the professional judgement of teachers as the “cornerstone of assessment and evaluation” (OME, 2013b, p. 1 cited in Jang & Sinclair, 2018). Teacher professional judgement is influenced by assessment identity, which takes into consideration the variability of educators in different contexts, with different philosophies, beliefs, and perspectives (Aporia Consulting Ltd., 2010).

This research study took place in one school district in Ontario that had received funding to support the growth of educational technology. The Ministry of Education did not mandate how the funding was to be allocated or used, rather the district decided to purchase educational technology for teachers and students in Grade 7 to 10. Teachers of these grades who were interested in learning more about integrating technology into their teaching and learning could participate. Participants voluntarily engaged in a professional learning community to learn about how to leverage assessment via technology in alignment with the principles and reporting policy in Growing Success (OME, 2010). Data collected for this study took place three years after the policy was released and in the initial year that the district purchased the laptops. The data collected provides a glimpse into educator practice as they grapple with shifting assessment practices and the implication of these changing practices to their assessment identity.

Educational Significance

Assessment is an essential component to the teaching-learning process (Neumann et al., 2019) and can enhance student achievement, motivation, and teaching (Broadfoot & Black, 2004; Cauley et al., 2010). Nevertheless, effective assessment is complex because “teachers need support to plan and implement high-quality assessment tasks, interpret evidence, develop outcomes appropriate to assessment purposes and types, generate feedback, report, and engage students as active participants in their assessment and learning (Looney et al., 2018 cited in Neumann et al., 2019, p. 8). Through the complexities of assessment, teachers develop an assessment identity that aids in the understanding of their role, their confidence as an educator and assessor, and the decisions they make about future assessment practices. This research is significant because it offers insight into the teachers' assessment identity of the participants as they engage in a professional learning community and identify the implications this learning has on their assessment identity.

Even without the present COVID context, technology has affected many aspects of learners' lives; it is not surprising that technology is increasingly integrated into learning and school experiences. In fact, educational technology has been heralded by some as having the potential to transform schooling (e.g., Kozma, 2003; Papert, 1993). However, some educational stakeholders, including teachers, school leaders, students and parents, may continue to wonder, what are the assessment approaches used with technology and the conditions required for students to be effectively assessed using technology? This research offers deepening insights related to teachers' assessment identity and offers practical examples of assessment via technology.

Positionality of the Author

The world around us is changing, evolving, and influencing youth in ways many of us could not have predicted. School-aged children are now in possession of iPads, laptops, and cell phones earlier than ever before. In comparison to my peers, I grew up with limited access to technology; my parents adopted the philosophy that my brother and I could learn through exploration of the world and conventional activities of "being a kid" – talking on the landline and playing outside. While these experiences were valuable to me, I noticed the use of technology around me was changing the way others engaged with the world. When I joined my first undergraduate course at the University of Ottawa, I noticed the potential devices can have in a learning setting. What piqued my interest, however, is how the personal devices were being used to support course content; yet, assessment methods were primarily traditional multiple-choice tests. I wondered: *how could a device have transformed assessment methods in K-12 and post-secondary education? What would it have looked like if there was alignment in the ways technology was supporting teaching, learning, and assessment?*

Many years of learning passed and my questions about teaching and assessment continued to grow. My passion for assessment blossomed as I completed my Bachelor of Education degree. As an Ontario Certified Teacher, my approach to assessment is student-centered, personalized, balanced, and inclusive, with a philosophy built upon the fundamental standards set in Growing Success (2010). Through my time as an educator, spanning roles as a teaching assistant in a Faculty of Education and an occasional teacher in Grades K-8, I have developed a teachers' assessment identity that I recognize will continue to evolve as I acquire new experiences, collaborate, and conduct research.

As educators navigate the increasing influences of technology and experience shifts in their practice, the opportunity to use educational technology to support assessment practices arises, which can positively influence student learning. Nevertheless, I acknowledge that the access I have to technology is a privilege, and I understand that my digital competence is elevated in comparison to those who didn't grow up with technology or who may not be able to access it easily. This thesis has reinforced my belief in the power of collaboration - when we learn alongside others, we navigate challenges and fill in the knowledge gaps one could not do without the experiences and perspectives of others.

Overview of Thesis

This thesis is comprised of five chapters. The current chapter introduced the statement of the problem, offered an overview of assessment in technology-enriched classrooms, outlined the purpose and research questions, provided the study context by exploring assessment in Ontario, offered the educational significance, and outlined the positionality of the researcher. Since the research context is crucial to the study, it was also introduced in chapter one. Chapter two provides a review of relevant literature to offer insight into the interweaving research conducted on classroom assessment and educational technology. Chapter three outlines the methodology used to address the research questions, including the research design, research context, evaluation context, participants, data collection, data analysis, establishing trustworthiness, and ethical clearance. Chapter four presents the results of the study, while chapter five provides a dialogue on key findings, educational significance, and directions for future research.

Chapter 2: Literature Review

Over the past decade, the increase in scholarly work related to classroom assessment (e.g., Andrade & Brookhart, 2020; Coombs et al., 2018; DeLuca & Johnson, 2017), educational technology (e.g., Bond et al., 2019; Hew et al., 2019; Januszewski & Molenda, 2013) and the intersection of classroom assessment and educational technology (e.g., Danniels et al., 2020; Neumann et al., 2019; Searle et al., 2017, 2018) points to the shifting landscape of teaching and learning. My literature review aims to map this landscape to appraise the current knowledge on assessment and technology by consolidating what is already known and what potential knowledge gaps require further understanding (Winchester & Salji, 2016). First, I explore conceptions of classroom assessment by offering an organizational structure to understand the multiple purposes and methods of assessment. Next, I investigate two pertinent frameworks – assessment literacy and assessment identity – for this study by exploring current research. Finally, I consider educational technology, completing the section with the interweaving of assessment identity and educational technology.

Conceptions of Classroom Assessment

The use of classroom assessment to promote student learning is strongly supported by current educational research (e.g., Black & Harrison, 2001; Coombs et al., 2018). However, there are multiple definitions in the literature to explore what classroom assessment means. According to McMillan et al. (2010), classroom assessment can be defined as the "collection, evaluation, and use of information to help teachers make decisions that improve student learning" (p. 9). More recently, classroom assessment has been conceptualized as:

> a process through which teachers and students gather, interpret, and use evidence of student learning 'for a variety of purposes, including diagnosing student strengths and

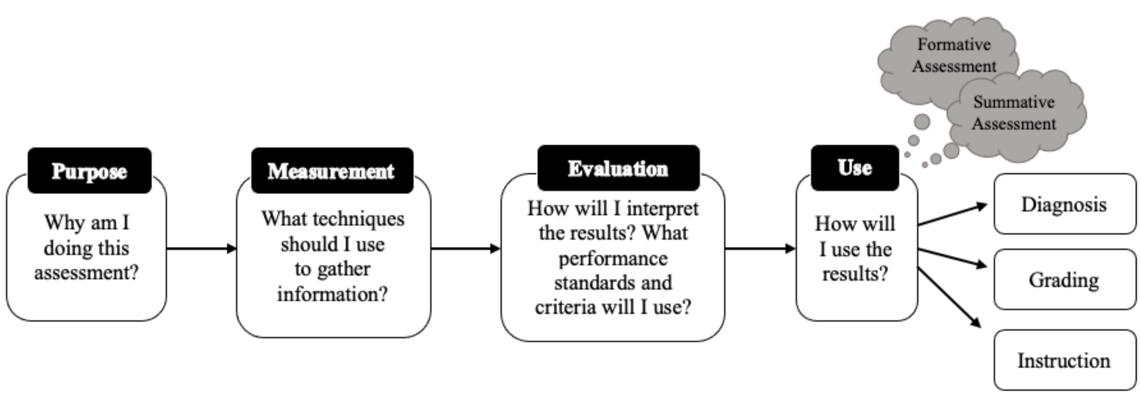
weaknesses, monitoring student progress toward meeting desired levels of proficiency, assigning grades, and providing feedback to parents' (McMillan, 2013, p. 4 cited in Andrade & Brookhart, 2020, p. 354).

Classroom assessment has been found to have profound impacts on student learning (e.g., Coombs et al., 2018; Earl, 2012) and is an essential component of the standards-based, accountability education system (DeLuca, 2012; Stiggins, 2002). I used the McMillan et al. (2010) four components as a heuristic for thinking about assessment. While there are lots of ways to tease out what classroom assessment entails, I was introduced to the McMillan et al. (2010) components during my Bachelor of Education program in the assessment and evaluation concentration and it seemed then, as it does now, a starting point for unpacking some of the complexities associated with assessment.

McMillan et al. (2010) included four major components, which are briefly described below: purpose, measurement, evaluation, and use (see Figure 1). Figure 1 shows that these components are depicted as sequential and essential to implementing classroom assessment. Within Figure 1, I have added formative assessment and summative assessment bubbles to depict how educators nowadays are encouraged to think about the uses of classroom assessment.

Figure 1

Overview of McMillan et al. (2010) Components of Classroom Assessment



Each of these components is explained in the following sections to provide a definition, examples, and overview of what each entail.

Purpose

Regardless of the time at which the assessment is being implemented (e.g., before, during, or after instruction), educators need to identify the *purpose* or purposes of the assessment (McMillan et al., 2010; Newton, 2007). The purpose of assessment has changed significantly as educational goals shifted from large-scale testing and accountability pressure to effective classroom practices to improve student learning (e.g., Marzano et al., 1993). The shift was made evident in the Ontario Ministry of Education's (2010) first edition of assessment, evaluation, and reporting in Ontario schools, stating the primary purpose of assessment and evaluation is to improve student learning. When identifying the purpose of assessment in their classroom, a teacher must consider why the assessment is being undertaken and how the assessment will be used.

Research and policy advocates for assessment-informed instruction that is tailored to the individual needs and abilities of students in the classroom (e.g., Connor et al., 2018; OME, 2013a). It is expected that teachers use the data from student assessments, classroom-based and large-scale, to inform instruction and meet the needs of all learners (DeLuca & Lam, 2014). By intentionally planning varied and ongoing assessments, teachers can gather data about their own teaching that can not only benefit their learners, but inform their future instruction and pedagogy.

Measurement

A key component to classroom assessment is measurement, which is often confused or equated with assessment and evaluation. Although the three terms are defined elsewhere in this thesis, Table 1 offers a clear overview of these terms as defined by three different sources.

Table 1

Conceptualizing Measurement, Assessment, Evaluation

Term	Definition
Measurement	The set of rules for transforming behaviours into categories or numbers. Constructing an instrument to measure a social science variable involves several steps, including conceptualizing the behaviours that operationally define the variable, drafting items that indicate the behaviours, administering draft items to try out samples, referring the instrument based on item analysis, and performing reliability and validity studies (Petrosko, 2005, p. 247).
Assessment	The process of gathering, from a variety of sources, information that accurately reflects how well a student is achieving the curriculum expectations in a subject or course (OME, 2010, p. 143).
Evaluation	An applied inquiry process for collecting and synthesizing evidence that culminates in conclusions about the state of affairs, value, merit, worth, significance, or quality of a program, product, person, policy, proposal, or plan… It is the value feature that distinguishes evaluation from other types of inquiry… (Fournier, 2005, pp. 139-140).

According to McMillan and colleagues (2010), measurement is the "systematic process of assigning number to behaviour or performance" (p. 9). More broadly, measurement determines the characteristics or proportion of an object, skill, or knowledge. In the physical world, objects are used to measure, including rulers, compasses, measuring tapes, and protractors. Similar to measurement in the field of education, these physical measurement tools are held to standards and can be used to acquire results. When used properly, they correctly gather data for educators and administrators. In the context of assessment, *measurement* identifies which techniques should be used to gather information. For example, questionnaires, interviews, and tests are used as measurements in education.

Through the measurement component, differentiated instruction is often advocated for as an approach that allows all learners in the classroom to be reached. To differentiate instruction is to identify students' "varying background knowledge, readiness, language, preferences in learning, interests, and to react responsively" (Hall et al., 2014, p. 3). Using an array of assessment techniques (e.g., tests, observations, interviews) allows an educator to measure a distinct trait or learning target (McMillan et al., 2010).

Evaluation

Once teachers have gathered information through measurement, value is placed, based on specific standards (Airasian et al., 2012). *Evaluation* is a process that "involves an interpretation of what has been gathered through measurement, in which value judgements are made about performance" (McMillan et al., 2020, p. 10). The difference, however, between measurement and evaluation is the judgement about the meaning of a score. Someone looking to interpret a score may ask: what is considered a good, average, or poor score? The classroom assessment community encourages the use of specific determinants that are used to make judgements on students' learning, including performance standards, and the use of criteria (e.g., scoring guidelines, rubrics).

Use

A final component in McMillan et al.'s (2010) conception for classroom assessment is the *use* of the evaluation (the second component discussed above), which can be separated into three major categories: diagnosis, referring to the judgement gathered to allow teachers to diagnose where students are at in their learning, grading, and instruction (McMillan et al., 2010). Included in these three categories are student motivation, feedback, and communication to educational stakeholders. Currently, educators are encouraged to think about classroom assessment use by distinguishing between formative assessments (primarily guiding instruction) and summative assessments (evaluate student learning) (Beatty et al., 2014; Harlen, 2005). Each of these major uses of assessment, formative and summative, are worthy of further exploration.

Formative Assessment. Formative assessment refers to a wide variety of assessment practices used to detect the extent to which "evidence about student achievement is elicited, interpreted, and used by teachers, learners, or their peers, to make decisions about the next steps in instruction" (Black & Wiliam, 2006, p. 9). In Ontario, two approaches to classroom assessment that align with the objectives of formative assessment are encouraged, assessment *for* and *as* learning. Assessment for learning is "a conscious attempt to make assessment a productive part of the learning process" (Stobart, 2008, p. 144) and consists of activities intended to improve and accelerate student learning through diagnostic assessments that reveal where learners are in their thinking (Black & Wiliam, 1998b; Sadler, 1998; Stecker et al., 2008; Searle et. al, 2017). This explicit understanding of growth allows educators to alter and adjust instructional strategies to further student learning (Broadfoot et al., 2002; Black & Wiliam, 2006b). Similarly, assessment *as* learning consists of assessment practices undertaken by the student to determine their next steps (Earl, 2013). The intention of assessment *as* learning is to foster learners who are reflective and capable of self-monitoring (Ontario Ministry of Education, 2010).

In 1998, Black and Wiliam recognized that formative assessment is one of the most effective strategies for promoting student learning (Shuichi, 2016). Since the publication of their reviews (1998ab), formative assessment gained worldwide interest for both researchers and policy makers (Shuichi, 2016). Nevertheless, despite this early innovation, there are tensions between the evidence-based theory and classroom practice of formative assessment (Volante & Beckett, 2011; Torrance, 2012). On one hand, formative assessments still carry the notion of traditional assessments – grades, reporting, accountability. In fact, in an interview published in the Times Educational Supplement, Wiliam stated: “The big mistake that Paul and I made was calling this stuff “assessment”… because when you use the word assessment, people think about tests and exams” (Stewart, 2012, para. 12). This preconceived idea leads to an emerging problem: formative assessments are executed through regular classroom tests, which are used for monitoring student progress or coaching students to improve grade and test results (e.g., Klenowski, 2009; Shuichi, 2016; Torrance, 2012). Nevertheless, many scholars have conducted research demonstrating the benefits of formative assessment (e.g., Boston, 2002; Clark, 2012; Havnes et al., 2012). Benefits include using feedback to help students become aware of learning gaps (Boston, 2002), involving students in the assessment cycle (Irons, 2008), making the assessment process clear and visible to students (Havnes et al., 2012), timely and constructive feedback, ongoing assessments, focus on the learning rather than the outcome (e.g., grade), self-regulation development (Clark, 2012), among others.

Summative Assessment. The act of evaluating student learning is considered a summative assessment. Summative assessments, also known as assessment *of* learning, are the traditional assessments seen in secondary and post-secondary education (e.g., multiple choice midterms and final examinations). Summative assessments are used year after year because they are easier to develop and grade, especially with modern technology (e.g., online test question generators, worldwide web scantrons). Summative assessments seek to monitor educational outcomes and identify the overall achievement of a student, often for the purpose of accountability and gatekeeping (Nagy, 2000; Knight, 2002).

The summative uses of assessment cluster into “internal” and “external” to the school community (Harlen, 2005). Internal uses include grading for recordkeeping, informing decisions about the direction of the student (e.g., grade level and courses to follow), and reporting to parents, students, and other educators. For internal uses, the teacher may develop or locate assessments that are utilized in the classroom to make judgements about student learning, often by way of unit tests, final projects or examinations. External uses of summative assessment include "certification by examination bodies or for vocational qualifications, selection for employment or for further or higher education, monitoring the school's performance and school accountability, often based on the results of externally created tests or examinations" (Harlen, 2005, p. 208).

In Canada, every province and territory, with the exception of Nunavut, administers mandated large-scale assessments to some degree (Volante & Ben Jaafar, 2008). In addition, some provinces also participate in international testing programmes, including the Programme for International Student Assessment, Progress in International Reading and Literacy Study, and the Trends in International Mathematics and Science Study. In Ontario, externally created tests or examinations that are widely discussed and debated include the Education Quality and Accountability Office (EQAO) and Ontario Secondary School Literacy Test (OSSLT).

The EQAO is an agency of the Ontario government, responsible for the creation and reporting of large-scale educational assessments. In 1996, the first EQAO large-scale educational assessment consisted of reading, writing, and mathematics, and distributed to grade 3, grade 6, and grade 9 students (EQAO, 1996; 2012). However, over the years, the EQAO added assessments to develop a yearly administered assessment program, including the OSSLT, which measures whether students are meeting the minimum standard for literacy across all subjects up to the end of grade 9. The OSSLT is administered to students in grade 10 and successful completion of the test is a requirement for graduation (Klinger et al., 2008). Students are eligible to write the test twice, and those who are unsuccessful are eligible to take the Ontario Secondary School Literacy Course. The purpose of these external assessments is to “support and guide student improvement by providing credible information about the quality of the province's publicly funded elementary and secondary education system” (EQAO, 1996; 2012, p. 5). However, there is ongoing debate around the usefulness, quality, and impact of these large-scale assessments (Klinger & Rogers, 2011; Volante, 2006).

Formative and summative assessments are complex and often competing. Although formative and summative assessment practices were described separately, research shows that distinction may not be as clear in practice. In a study conducted by Brookhart (2001), findings suggest that students “do not make neat distinctions between formative and summative assessment, but use assessment in a variety of integrated ways, including some that may be categorized as ‘formative with a hint of summative’ and ‘summative with a bit of formative’” (Brookhart, 2001, p. 168). From the perspective of a teacher, it is not an uncommon practice to use formative quiz grades when developing summative report card grades (DeLuca et al., 2017).

In summary, the four components of assessment – purpose, use, evaluation, and measurement - as conceptualized by McMillan et al. (2010) provide an organizational structure for understanding the foundations underpinning classroom assessment. By unpacking the four components, it is evident that assessment matters; it is complex, involving many actors, processes, and possibilities. Assessment has uses and consequences within and beyond the classroom, therefore it warrants continual attention in the educational research landscape. Furthermore, an understanding of these four components of assessment is merely a cursory look at dense ideas that need to be re-examined with expanding technologies and emergent situations (e.g., COVID). In the next section, I discuss frameworks for assessment, including both assessment literacy and assessment identity, to further examine the nuances of effective classroom assessment practices.

Frameworks for Assessment Literacy

Classroom assessment practices are fundamental to our education system. As the previous section using McMillan et al. (2010) established, assessments are guided by specific purposes, precise measurement, fair evaluation, and executed through formative and summative activities. However, classroom assessment is only a portion of the tasks that comprises a teacher's time. Assessment-related tasks include preparing lessons, grading and feedback, teaching and learning conversations within the school community, instructional time, and communication with parents (Philipp & Kunter, 2013). I recognize that this short list of assessment-related tasks does not capture a complete picture of the complex tasks and demands on educators. In a study conducted by Smith and Bourke (1992), 204 Australian teachers reported that assessment was the most demanding aspect of their job. In Chapter 1, I mentioned four frameworks for assessment prominent in the literature: assessment literacy, assessment competency, assessment capability, and assessment identity. The next section focuses on two of these frameworks, assessment literacy and assessment identity, aimed at increasing a teacher's confidence with classroom assessment practices.

Assessment Literacy

Many educators do not feel they have the required knowledge and skills to be assessment literate (e.g., DeLuca & Klinger, 2010; Popham, 2009). Assessment literacy was first introduced by Stiggins (1991) in the United States in an article featured in Phi Delta Kappen. This piece proved to be seminal for the field of assessment because it was one of the first uses of the term, and has since been cited by renowned scholars (DeLuca & Klinger, 2010; Earl, 2012; Herrera &

Macias, 2015; Plake et al., 1993; Popham, 2004). Assessment literacy was conceptualized as a collection of fixed skills and knowledge related to classroom assessment that all teachers needed to have, including understanding test creation and use, knowledge of statistics, or one's familiarity and technical skills in creating assessments (Bredo, 1994; Popham, 2011).

Initially assessment literacy was constructed on the assumption that assessment is "something that is being done *to* students" (Klenowski, 2009, p. 89). Assessment literacy evolved to include and explicitly recognize the sociocultural conditions that influence teachers' assessment practice and beliefs (DeLuca et al., 2016; Willis et al., 2013). Using a sociocultural view of learning, Willis et al. (2013) offered the following definition:

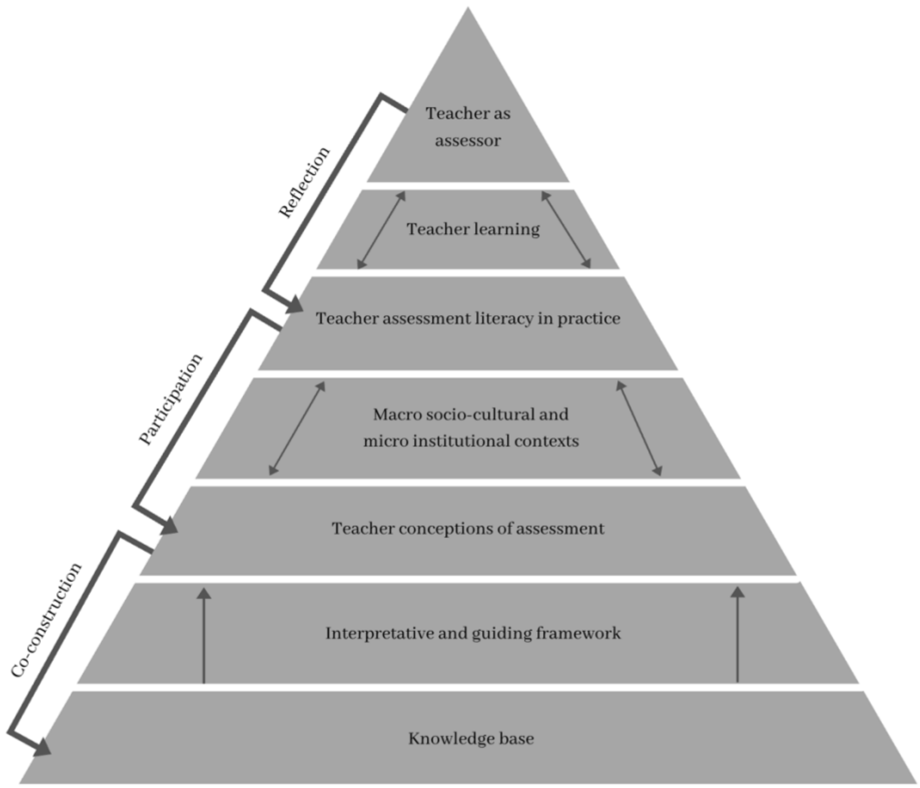
> Assessment literacy is a dynamic context dependent social practice that involves teachers articulating and negotiating classroom and cultural knowledges with one another and with learners, in the initiation, development and practice of assessment to achieve the learning goals of students (p. 242).

By arguing that assessment literacy needs to be understood as a social, dynamic, and layered ethical practice, Willis, Adie, and Klenowski (2013) hoped their reconceptualization would "inform dialogue and decision making for policy and practice to benefit student learning and achievement" (p. 242). This sociocultural view was adopted by a variety of scholars and led to the development of frameworks and further research in the area of assessment literacy (e.g., Adie et al., 2019; Coombs et. al, 2020; Starck et al., 2018; Xu & Brown, 2016). Most recently, Coombs et al. (2020) conducted research into assessment literacy by exploring teacher candidates' approaches to classroom assessment. Findings supported the notion that teacher candidates' approaches to assessment should not be viewed as a stable characteristic, but one shaped by learning experiences, context, and personal dispositions. Similar findings were brought forth by Starck and colleagues (2018), yet when examining assessment literacy in current and experienced teachers, discoveries tend to focus on the need for additional professional development opportunities (e.g., Adie et al., 2019; Popham, 2009).

The Teacher Assessment Literacy in Practice (TALiP) is a conceptual framework developed by Xu and Brown (2016) based on a review of 100 articles (71 empirical and 29 non-empirical studies) related to assessment literacy between 1985 to 2015. An inductively analyzed coding process was used and led to the development of three themes which brought forth four issues of assessment literacy that resonated with me: "AL [assessment literacy] is dependent on a combination of cognitive traits, affective and belief systems, and socio-cultural and institutional influences, all of which are central to teacher education" (p. 155). Demonstrating a need for reconceptualizing teacher assessment literacy through a combination of prior studies and new perspectives, the TALiP was developed to connect the distinctive concerns of teacher education and educational assessment by describing key components and influences in preparing teachers to become assessment literate. The TALiP model is adapted reproduced in Figure 2 to show how the area of assessment literacy was propelled by moving beyond a focus on the knowledge base to the consideration of a situated, dynamic, and evolving system in which teachers constantly make compromises among competing tensions. Figure 2 has adapted the original TALiP by offering the core components and organizing them visually for ease of understanding.

Figure 2

TALiP Components (adapted from Xu & Brown, 2016)



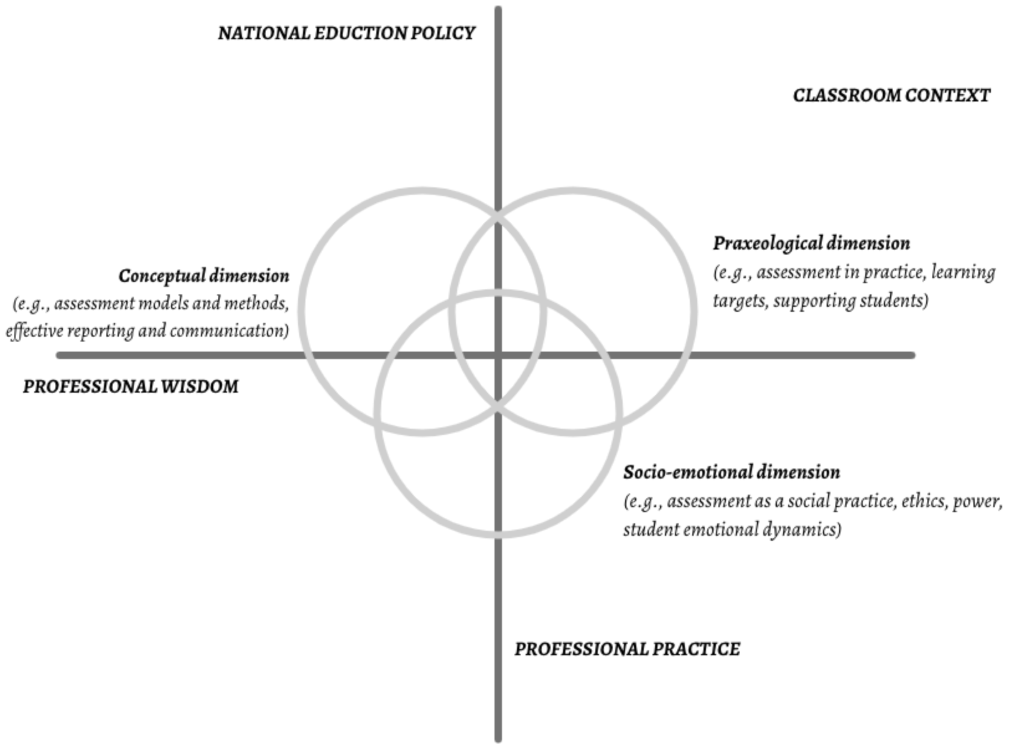
At the base of the pyramid, teachers' fundamental knowledge about assessment purposes, interpretation, ethics, among others informs their formation of assessment. This base acts as an interpretive and guiding framework for future assessment learning, leading to teachers' conceptions of assessment. The conceptions of assessment are continuously negotiated as they encounter tensions within diverse contexts, leading teachers to adopt new assessment practices. Teachers then begin to exemplify their position as an assessor and instructor. Mastery of the peak level, teacher identity (re)construction as assessors, is achieved when a teacher obtains "self-directed awareness of assessment processes and one's own identity as an assessor" (Xu & Brown, 2016, p. 159). Consisting of six components, the TALiP attempted to alter the standardized ideal that teachers are either assessment 'literate' or 'illiterate' and placed it instead on a continuum with different levels of mastery, depending upon the context in which teachers conduct assessment.

TALiP consisted of three levels of mastery (Xu & Brown, 2016). The first level, basic mastery, included the fundamental principles of *what, why*, and *how*. The second level is an internalized set of the understanding and skills of the interconnectedness of assessment, teaching, and learning. Finally, the third level is a self-directed awareness of assessment practices and one's own identity as an assessor. This level allows the educator to accommodate and translate assessment policies and principles into their classroom and institutional settings while reflecting and gaining new insights. It is important to note that achieving a high level of mastery is not simply acquiring more knowledge, rather it occurs through engaging in reflective practice and active participation in a community.

Pastore and Andrade (2019) conducted a Delphi study of Xu and Brown's (2016) model to gather feedback from educational assessment and teacher education experts (n=35) on the clarity, comprehensiveness, and usefulness of this new model. Pastore and Andrade's (2019) results led to a three-dimensional model for assessment literacy that, similar to Xu and Brown (2016), defined assessment literacy through practical, conceptual, and socio-emotional aspects (see Figure 3).

Figure 3

Three-Dimensional Model of Assessment Literacy (summarized from Pastore & Andrade, 2019)



Looking at Figure 3 (centre left), the conceptual dimension includes the models (e.g., theories) and methods (e.g., how to assess) teachers need to know in order to effectively assess student knowledge. The next dimension, praxeological (centre right), involves the integration of "the assessment process with other teaching practices to monitor, judge, and manage the teaching-learning process" (p. 135). Involved in this dimension are the multiple and often competing assessment demands, including defining learning targets and assessment criteria, collecting and interpretating evidence, using data to adjust instruction, and engaging with stakeholders (e.g., parents, administrators) about assessment information. The socio-emotional dimension (bottom right) involves teachers managing "the social and emotional aspects of assessment, especially but not exclusively within the context of the classroom" (p. 136). The socio-emotional dimension includes effective collaboration with stakeholders to enhance assessment systems, attending to ethical aspects (e.g., cheating), being aware of the power one holds as a teacher (e.g., relationships, engagement), and student emotional dynamics of assessment that can influence learning (e.g., test anxiety). The three dimensions of the framework are akin to the purposes, use, measurement, and evaluation of assessment discussed earlier in the thesis (McMillan et al., 2010).

Pastore and Andrade's (2019) model provided insight into the progression of the development of assessment literacy. A notable difference between the two assessment literacy frameworks discussed so far was the shift from measuring or identifying teachers' assessment literacy to forming and developing a teachers' assessment identity, which is the sixth dimension of the TALiP (Xu & Brown, 2016).

As scholarship about assessment continued to expand, it became clear that how teachers perceived themselves as an assessor was interconnected with how they practiced and constructed assessment processes in the learning environment. A conceptualization of assessment literacy that considers the multifaceted and interrelated personal factors influencing assessment learning and practices is needed (Looney et al., 2018; Xu & Brown, 2016). Particularly, there is a need for research to go beyond developing teachers' assessment literacy toward developing and nurturing a teachers' assessment identity (Adie, 2013; Looney et al., 2018; Xu & Brown, 2016).

Assessment Identity

Assessment identity informs how a teacher perceives themselves as an educator, which is shaped by experiences, interactions, and discussions (Adie, 2013). While the Xu and Brown (2016) assessment literacy framework addressed personal and complex dimensions, the expanded conceptualization of teacher assessment identity goes further by proposing a "dynamic and interactive teacher assessment identity constituted by beliefs, feelings, knowledge and skills" (Looney et al., 2018, p. 455). By coupling concepts from assessment literacy with teacher identity, assessment identity captures the personal factors in addition to the skills and knowledge that shape assessment practices in the classroom.

Looney and colleagues (2018) developed an expanded conceptualization of teacher assessment identity comprised of five overlapping dimensions: (a) I know; (b) I feel; (c) I believe; (d) I am confident; and (f) my role (see Table 2). Within the five dimensions, assessment identity is continuously "framed and reframed over a career and mediated by context in which teachers work and live" (Looney et al., 2018, p. 446). While scholars often depict assessment literacy as a hierarchical model with a common base and goal for growth (Xu & Brown, 2016), assessment "identity development is neither simple nor linear: rather it is responsive to events and circumstances" (Looney et al, 2018, p. 446). Teachers develop, select, and effectively use classroom assessments for a variety of purposes in multiple contexts (Kahl et al., 2013), which requires the continuous evolution of a teachers' assessment identity.

Table 2

Expanded Conceptualization of Teacher Assessment Identity (adapted from Looney et al., 2018)

Dimension	Description	Drawing from Foundational Scholars
I know	The knowledge and understanding of assessment practices, theories, analysis, and implementation.	Stiggins (1991,1995) Popham (2009)
I feel	Drawing on sub-identities and emotional dimensions, seeks to capture the affective aspects of assessment identity, including how a teacher feels toward and about assessment.	Beijaard et al. (2004)
I believe	The beliefs a teacher has toward assessment that are informed by personal and professional experiences.	Shulman (1986) Broadfoot (1996) Mockler (2011).

I am confident	The degree to which teachers feel in control of their practice.	Bandura (1977, 1986)
My role	Seeks to capture the complex positions teachers balance when assessing their students.	Ecclestone & Pryor (2003) Pryor & Croussouard (2010)

The interconnectedness of the five dimensions creates a sub-identity referred to as assessment identity. Looney et al. (2018) acknowledged variances caused by describing the situation in which a teacher is knowledgeable about assessment practice, but does not feel confident in their ability to effectively engage those practices could cause tensions. The expanded conceptualization of teacher assessment identity is modeled around an individual's perspective of engaging in assessment identity, which allows for personal reflection, growth, and understanding of what it means to articulate identity.

While there is limited research on the specificity of assessment identity, there is a substantial amount of literature depicting the importance of professional identity as a construct in teacher development (Friesen & Besley, 2012). For example, it is documented that students enrolled in a pre-service education program undergo a shift in identity as they progress through the program requirements and transition from a student to student-teacher role (Beauchamp & Thomas, 2009). However, teachers gaining experience or who are experienced may undergo further identity shifts as they constantly attempt to "reinvent" themselves as an educator. This reinventing could be caused by internal motivations (e.g., a desire to engage differently with learners), a shift in context (e.g., courses taught, new schools, new leadership) or an external factor such as the presence of accessible technology. Nevertheless, by evolving and gaining an understanding of identity, teachers overcome the challenge of resolving a definition of identity, since many issues arise in the attempt to reach a common definition (Beauchamp & Thomas, 2009; Beijaard et al. 2004).

There are several recurring characteristics related to teacher identity: the multiplicity of identity, the discontinuity of identity, and the social nature of identity (Akkerman & Meijer, 2009). The three characteristics are also evident in the research conducted by Looney et al. (2018) when the authors described assessment identity as consistently shifting with time and context, rather than being fixed and stable (Akkerman & Meijer, 2009; Looney et al., 2018). Researchers proposed that the development of a professional identity promotes a teachers' educational philosophy (Mockler, 2011), decision-making (Beijaard et al., 2004), well-being, and effectiveness (Day, 2018). Additional research is needed to understand how teacher assessment identity is constructed over time and influenced by the successes and challenges teachers experience. My study responds to the need for additional research by undertaking an investigation of assessment identity via educational technology.

To develop my study, I examined the specific literature and research conducted on assessment identity. First, Wyatt-Smith and colleagues (2010) explored teacher judgement, standards to inform judgement, and moderation (face-to-face and technologically mediated modes). Both quantitative and qualitative methodologies were used in data collection (surveys, interviews, conversation data) and data was analyzed through a multi-theoretical approach. Researchers based the study upon three sets of understandings, one of which was assessment identity:

> The 'community' in this study is an 'assessment community'; the 'community' of Queensland teachers who through their experiences of moderation negotiate an understanding of standards that underpin their judgement formation of student work. This

> involves the teachers developing an ‘assessment identity’ as a member of this community through moderation ‘practice’ where, through participation, a level of competence that is recognisable is established (Wyatt-Smith et al., 2010, p. 64).

Although the findings do not explicitly mention assessment identity, teacher judgement is influenced by one’s assessment identity. For example, teachers dismissed the marking scheme in favour of the process rather than the final answer: “The connections for another teacher included thinking of the students, a reported move to upgrade from D to C, and the disclosure, ‘I don’t stick with the marking scheme” (p. 71).

In a more recent study, Adie (2013) investigated “social moderation conducted in a synchronous online mode as a specific form of professional conversation” (p. 91). When analysing the data through a sociocultural lens, their findings suggested that “participation in online moderation, while challenging for teachers, can also provide opportunities to construct and to negotiate an identity as an assessor of student work” (p. 91). This conclusion was also noted by Wyatt-Smith and Adie (2019) when they stated, “practice and identity may change, often innovatively and creatively, as the result of exposure to different artefacts or activities, and this may be different for each individual involved in the practice” (p. 6). This continuous and unified idea of assessment identity has been noted by other scholars (e.g., Xu & Brown, 2016).

New research is continuing to emerge in the area of assessment identity. To illustrate, Moqaddam and colleagues (2021) developed and validated a teacher’s assessment identity (TAI) questionnaire using the Looney et al (2018) as a conceptual framework. The research conducted by the authors involved the development and validation of a unique questionnaire used to assess the assessment identity of teachers. The final version of the questionnaire involved Likert 5-point scale questions that included strongly disagree to strongly agree. Although the TAI questionnaire was developed with a sample size limited to Teaching English as a Foreign Language high school educators (n=348) in an Iranian context, an "efficient, eloquent tool [was needed] to measure the underlying elements [of TAI] which possibly make a contribution to teacher professional assessment practice" (p. 42). The authors recognized importance of a teachers' assessment identity in relation to professional judgement, disposition, values, and beliefs; yet noted minimal research conducted on the construct. Developments about assessment identity inspired me to consider how assessment identity might develop in a technology-enriched context.

Introduction to Educational Technology

Educational technology is "the study and ethical practice of facilitating learning and improving performance by creating, using, and managing appropriate technological processes and resources" (Januszewski & Molenda, 2013, p. 1). The role of technology within K-12 classrooms continues to soar as the implementation of educational technology is encouraged to help with classroom activities, instructional strategies, and assessment opportunities. Educational technology is viewed a powerful tool for transforming learning (U.S. Department of Education, 2017), and is a growing area of interest for researchers (e.g., Amiel & Reeves, 2008).

The University of Phoenix College of Education (2017) conducted a survey on teachers' classroom habits with 1,001 full-time K-12 teachers noting that 63% used technology in the classroom daily, with laptops and computers being the most commonly used. Yet, 25% of teachers identified that they were intimidated by the students' knowledge of technology. Intimidation of technology has been noted by other scholars (e.g., Johnson et al., 2016; Levin & Wadmany, 2008) and linked to a lack of technology integration when educators are designing content and class structure (e.g., Hughes, 2005; Rakes & Casey, 2002). In the University of Phoenix College of Education (2017) study, the educational technology was commonly used for student research (71%), online-based games and simulations to aid learning (64%), web-based tools to improve writing and comprehension (49%), and clicker-technology to improve student engagement (20%). For teachers who are not intimidated to use technology, other research has found similar findings noting the most common uses of technology in the classroom for students include research, games, or simulations intended to aid learning (e.g., De Freitas & Oliver, 2006; Qian & Clark, 2016). Yet, involving technology for assessment goes beyond the aforementioned purposes and may pose additional considerations and challenges for teachers and students alike.

Teachers who were born or brought up prior to the widespread use of digital technology are often referred to as a 'digital immigrant' (Kennedy et al., 2008). As a result, these teachers may be teaching using conventional pedagogical and instructional activities that reflect their past experiences. As Levin and Wadmany (2008) state, the incorporation of technology is not simple, "[it] means that teachers must be involved in at least two radical changes; they must learn to use technology and they must fundamentally change how they teach" (p. 235). Changing how they teach also involves considering how they assess and how assessment with technology can unfold.

Adie (2011) recognized knowledge and preparations that are required in order for teachers to incorporate new modes of assessing that utilize technology. Before these knowledge and preparations can occur, teachers need to witness and understand the possibilities as well as the potential impact that the implementation of technology can have on learners. In exploring the possibilities educational technology offers, teachers need to know that "technology alone does not transform learning; rather, technology helps enable transformative learning" (U.S. Department of Education, 2017, p. 42). Further, teachers will need to be supported by school administrators in accessing technology and in learning how to use it effectively (Berrett et al., 2012). When those involved in the education, both teachers and school or district leaders, understand the possibilities of educational technology there is real potential to accelerate, amplify, and expand learning opportunities (U.S. Department of Education, 2017). The foundations of my thesis acknowledge aspects of assessment that come together and are extended in the framework of assessment identity to explore assessment via technology.

Implementing Assessment with Educational Technology

There is a burgeoning body of literature examining the role of educational technology in assessment (e.g., Keppell et al., 2006; Pellegrino & Quellmalz, 2010; Reimer & Moyer, 2005; Searle et al., 2017, 2018). This research makes visible thinking and evidence about how the integration of educational technology into classroom assessment has resulted in benefits and challenges (e.g., Danniels et al., 2020; Hilton & Canciello, 2013; Weston & Bain, 2010). Benefits show technology allows for continuous dialogue between the student and teacher (Williamson-Leadley & Ingram, 2013), permits teachers to execute a quick performance analysis to enable monitoring and prompt feedback (Pellerin, 2012; Williamson-Leadley & Ingram, 2013), improves student scores (Reimer & Moyer, 2005), and allows for the potential of assessments to be easier, faster, more engaging, and more enjoyable (e.g., Attard & Curry, 2012; Clark & Luckin, 2013; Slemrod, 2014). However, a common challenge includes developing the conditions required for properly implementing assessments (e.g., Webb & Jones, 2009). A selection of studies and findings are categorized and described below to further explore literature about assessment and educational technology.

Classroom Assessment Gamified through Technology

Reimer and Moyer (2005) conducted research in a third-grade classroom with 19 students on the impact virtual manipulatives on student learning. The researchers produced handouts to guide formative feedback and summative evaluation of numerous virtual fraction manipulatives.

Findings showed that the technology increased student engagement as it differentiated the task and assessment from more traditional approaches, and enabled students to feel as though they were playing a game. Similar conclusions related to evoking engagement and gamifying assessment have been noted by other scholars who used technology to engage students with assessment (e.g., Clarke-Midura & Dede, 2010; Johns, 2015).

Classroom Assessment through 1:1 Technology

One-to-one (1:1) educational technology is an initiative whereby teachers and students have personal access to their own device (Bebell & O'Dwyer, 2010). Studies in this area show laptops, Chromebooks, and iPads are purchased by schools and sometimes by parents, and then used in a school setting to write and revise papers, conduct internet searches, and engage in personalized instruction and assessment using educational software or online tools (Zheng et al., 2016; Warschauer, 2006). Suhr et al. (2010) studied upper elementary classrooms using 1:1 educational technology and reported that the "most common [student] uses of laptops at school were, in order, writing papers, browsing the Internet, creating presentations (KeyNote), maintaining a personal calendar (iCal), managing photos (iCal), working with movies (iMovie), and taking quizzes" (p. 22). Similarly, Shapley et al. (2010) noted that "students used laptops in their classrooms most often to conduct Internet research, create presentations, write with a word processor, and to complete a test or quiz" (p. 29). Despite similar uses of technology depicted, teachers play an essential role in the effective implementation of the 1:1 initiative so that access is gained, and learning opportunities are furthered, with liability often on the teacher if the enactment is not successful (Bebell & Dwyer, 2010).

Classroom Assessment through Technology during the COVID-19 Pandemic

There is no doubt the bandwidth of educational technology was extended to accommodate for remote learning during the COVID-19 pandemic. The following statistic reveals the central role technology has performed in the education of current students:

> At the height of the COVID-19 outbreak, over 1.5 billion children across the world were taken out of the classroom because of school closures, which, in turn, forced the widespread adoption of remote teaching technologies and the suspension of in-person instruction (The World Bank, 2020 cited in O'Rourke, 2020, para. 2).

Teachers were unable to complete their school curriculum and assessment in traditional ways (Daniel, 2020) and needed to quickly identify where students were at in their learning and how to sustain learning momentum. As students began learning through computers, instructional strategies needed to quickly evolve to effectively capture the attention of the students. In Ontario, large-scale assessments were cancelled, and teachers began to learn the ins and outs of remote learning. In 2021, over one year since the pandemic started, education is at a place where many teachers are expanding upon their original assessment methods by incorporating interactive and engaging formative and summative assessments through technology.

Educational Technology and Assessment Identity

Now that I have identified literature related to assessment identity and educational technology, this section focuses on bridging the two together. The influences educational technology can have on a teachers' assessment identity has been briefly explored (Adie, 2013; Wyatt-Smith et al., 2010). To begin, Wyatt-Smith, Klenowski and Gunn (2010) conducted a study with middle school educators (years 4-9) to explore teacher judgement and moderation (face-to-face and technologically mediated modes). Teachers participated in four one-day meetings where they were grouped into clusters of five and individually tasked with grading student sample work. To aid in their assessments, they were provided with the following materials: (1) five marked student work samples; (2) the Guide to making judgements that consisted of a matrix entitled *Task-Specific Descriptors/Assessable Elements*; (3) annotated student work samples for each question and an information sheet of the reviewing process (Wyatt-Smith et al., 2010).Then, participants compared their judgements and had to collaboratively achieve group consensus regarding the grade. Findings included conclusions about the judgement-making process educators use when assessing, including "the benefit of the doubt" (p. 68), considerations related to the "person" or "identity" (p. 71), and not "sticking with the marking scheme" (p. 72). Conclusions outlined the question of tension between tacit knowledge (experience) and explicit knowledge (supplied resources). While this article stated "technologically-mediated modes" (e.g., p. 61) the extent to which educational technology is used was not defined nor described.

Adie (2013) explored how the social practice of online moderation supported the development of teachers' assessment identity. In this study, assessment identity was used to describe teachers' self-perceptions as assessors. Teachers commonly identified themselves as a particular type of assessor, including a "hard assessor" or "easy assessor" based on prior experiences with assessment (p. 93). In conversations with colleagues to determine standards for student work, teachers drew upon these assessment identities as notions of power. In addition, teachers selected and enacted multiple sub-identities based upon their knowledge of curriculum, prior experience with moderation meetings, teaching practice, assessment practices, among others, to make or justify their assessment decisions. Adie's conceptualization of teacher assessment identity portrayed teacher assessment identity as both self-defined and socially constructed through personal stories, reflections, and continuously changing.

Each of these studies advanced understanding about assessment identity and educational technology and each identified a need for additional research. While Adie (2013) made significant leeway in understanding teacher assessment identity through online moderation, the specific use of educational technology through 1:1 initiative and its relationship to assessment identity has yet to be explored. Research on teacher assessment identity would benefit from a Canadian example since both the studies referenced originated in Queensland, Australia.

Collaboration as a Lever for Learning about Assessment and Educational Technology

Assessment identity informs how a teacher perceives themselves as an educator, which is shaped by experiences, interactions, and discussions (Adie, 2013). However, the factors that shape teacher assessment identity are not necessarily individualistic. Collaboration is an inherent aspect of teaching (e.g., Le et al., 2018), as demonstrated by the plethora of terminology used to describe collaborative efforts the field of education (e.g., professional learning community, teacher teams, learning teams, teacher collaboration) (Vangrieken et al., 2014). All teaching and educational research referenced in this thesis is in some way collaborative, neither is conducted in isolation.

Collaboration is defined as “joint interaction in the group in all activities that are needed to perform a shared task” (Vangrieken et al., 2014, p. 23). Although collaboration is a general construct, it was refined by Little (1990), who distinguished four different types of collaboration: storytelling and scanning for ideas, aid and assistance, sharing, and joint work. Considering the context for my thesis, the Assessment Case Study Community (ACSC), participants were provided with access to all types of collaboration. However, regardless of the type of collaboration, an important characteristic is the need to have a task-related focus, including working and reflecting together for job-related purposes (James et al., 2007).

Results from The Teaching and Learning International Survey showed that teachers involved in collaborative learning reported using more innovative pedagogies (e.g., working in small groups), and displayed more job satisfaction and self-efficacy (Jerrim & Sims, 2019). Similarly, Goddard et al. (2007) used hierarchical linear modeling to identify teacher collaboration for school improvement and student achievement. Results provided preliminary support for efforts to improve student achievement by providing teachers with opportunities to collaborate on issues related to curriculum, instruction, and professional development. In fact, "the authors also discuss the need for more research on the effects of different types of collaborative practices using more representative samples" (Goddard et al., 2007, p. 878). The advantages of collaboration in the field of education should be no shock, because "humans are inherently social" (Young, 2008), our brains and bodies require connection.

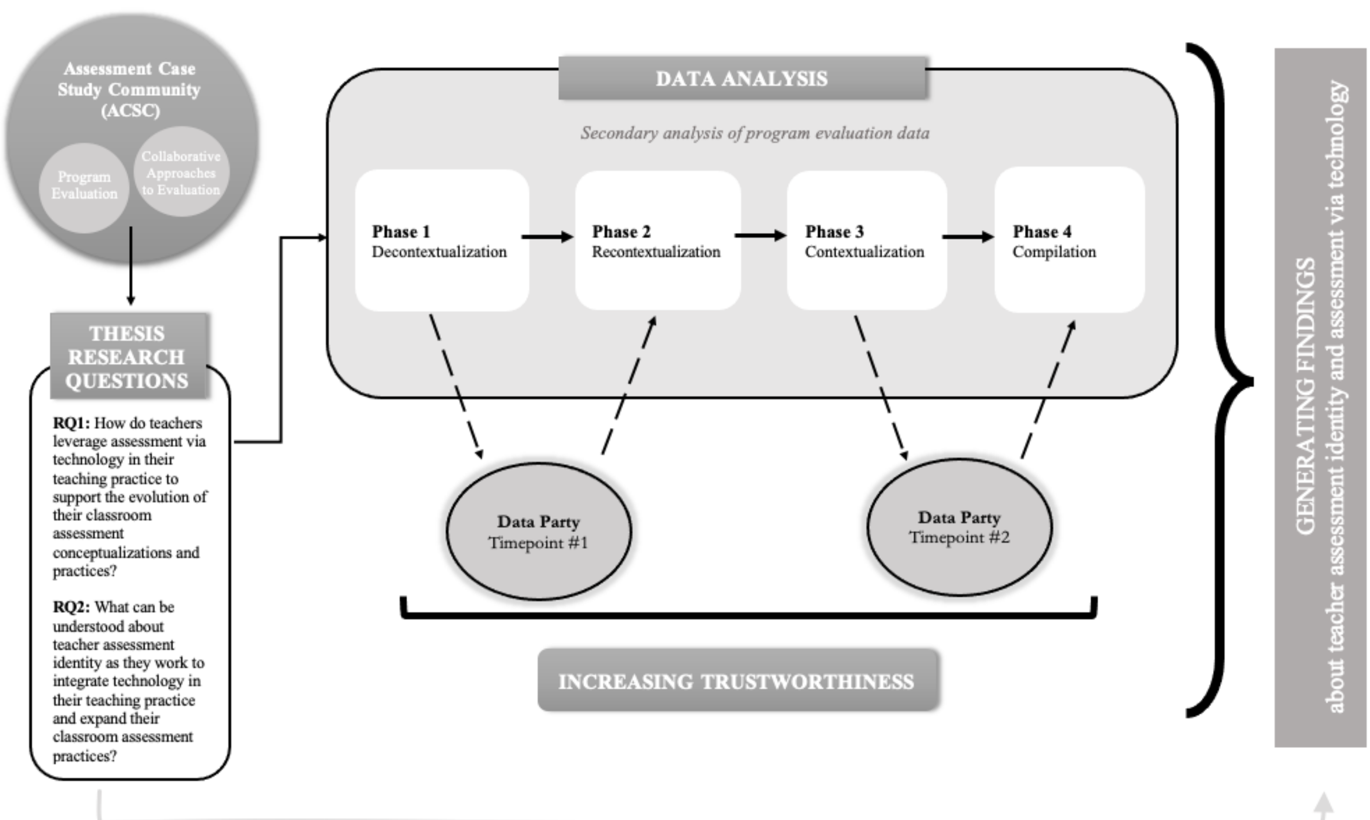
The concept of the "social brain" was introduced by the evolutionary anthropologist Dunbar (1998) and subsequently led to stimulating and imaginative discussion about the relationship between individual mental capacities and social interaction (Mercer, 2013). Embodying the view that human intelligence has an inherently social quality, the social brain believes evolution has equipped humans with brains that enable individuals to operate effectively in complex social networks. However, Mercer (2013) has identified a link between evolutionary, social, developmental, and educational psychology, to identify "our evolution has equipped us with the distinctive human capability for engaging in goal-orientated collective thinking, so that we are able to achieve more together than we each could do alone" (p. 163). Engaging in collaboration has been proven to lead to improved knowledge and skills and benefits for the students (e.g., motivation, engagement), consequently advancing the quality of instruction and assessment in the classroom. In my study, I bring together two dynamic fields, with a focus on assessment identity and educational technology, to explore teachers’ assessment identity as they learn about assessment via technology; and in doing so I acknowledge the important role collaboration can have on a teachers’ assessment practices.

Chapter 3: Methodology

Chapter 3 provides a description of the qualitative methodology of the study and describes the specific procedures and methods used to analyze data. Eight sections are included: (1) research design, (2) research context, (3) evaluation context, (4) participants, (5) data collection, (6) data analysis, (7) establishing trustworthiness, and (8) ethical clearance. Figure 4 unpacks these elements through visuals, depicting the process of how the original Assessment Case Study Community (ACSC) data led to this study and subsequently, the generation of new findings.

Figure 4

An Overview of Study Questions, Methodology, and Analysis



Research Design

The qualitative research design served to address the study's research purpose: to analyze the assessment identity of teachers who were implementing assessment via technology. A secondary case study analysis of the Assessment Case Study Community (ACSC) data was conducted to respond to this purpose.

Secondary analysis is a common approach with quantitative data, but it is not as common using qualitative data (Heaton, 1998 cited in Fielding & Fielding, 2000). The basic purpose is the same regardless of the type of data being used: "to pursue interests distinct from those of the original work or apply alternative perspectives to the original question" (Hinds et al., 1997 cited in Fielding & Fielding, 2000, p. 677). There are five main types of secondary analysis: supra-analysis, supplementary analysis, re-analysis, amplified analysis, and assorted analysis (Heaton, 2008). This research employed the most common type, supplementary analysis, which is the "in-depth investigation of an issue or aspect of the data, that was not addressed, or was only partially covered in the original research" (Heaton, 2008, p. 510). To effectively conduct a secondary analysis, ethical clearance has been obtained, external inquiry team consent received, and data confidentiality was followed. Data was assessed to ensure relevance by looking at, for example, the methodology of data collection, accuracy, purpose for which data was collected and the content of the data (Tripathy, 2013).

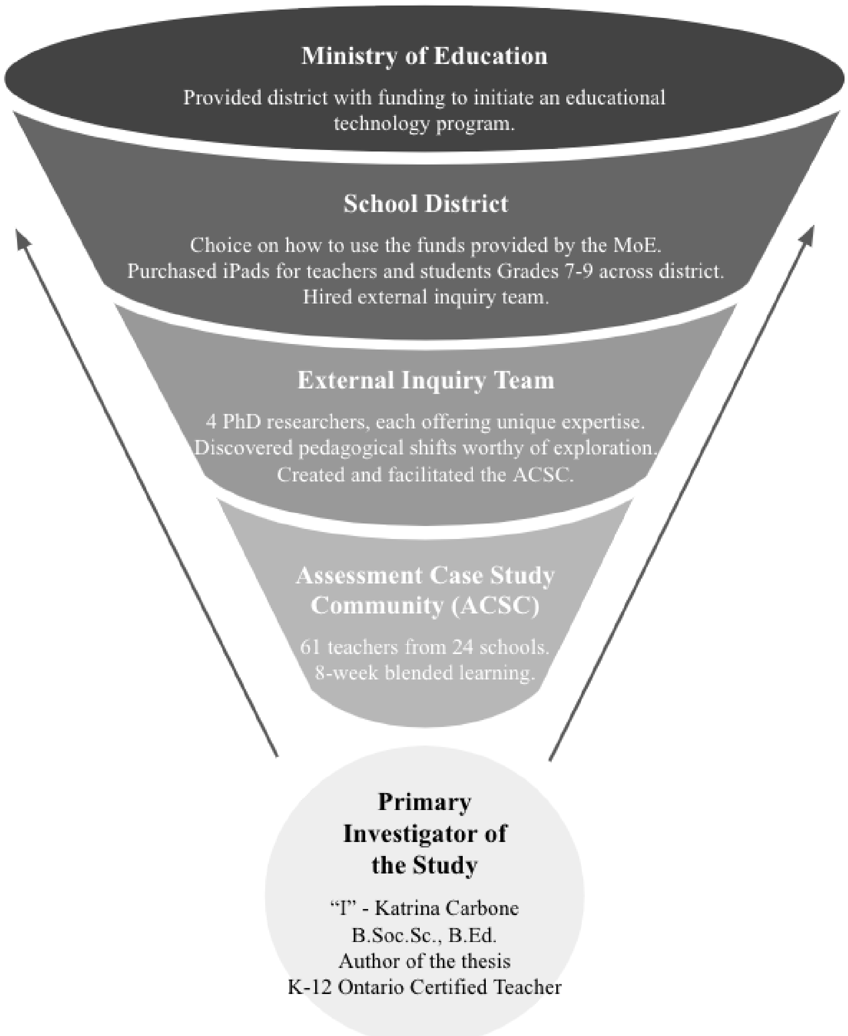
My study utilized case study as a qualitative research design "used to examine in depth one entity such as one individual (e.g., a teacher or student), group (e.g., preservice teachers or students with a learning disability), organization (school or school district), or event…" (Privitera & Ahlgrim-Delzell, 2018, p. 320). According to Stake (2005), a case study is a choice of what is to be studied, defining the approach as "a study of a bounded system, emphasizing the unity and wholeness of that system, but confining the attention to those aspects that were relevant to the research problem at the time (Stake, 1994, p. 258). There are three types of case studies, each of which are selected depending upon the goals of the investigator: illustrative case study (used to investigate rare or unknown phenomena), exploratory case study (used to explore or generate hypothesis for later investigation), and collective case study (used to compare observations of many cases) (Privitera & Ahlgrim-Delzell, 2018). My research used an exploratory case study to discover how the teachers' assessment identity was prevalent and impacted when implementing assessment via technology.

Research Context

The secondary case study analysis data were drawn from a collaborative program evaluation (Shulha et al., 2016) conducted previously between a school district and an external inquiry team (see Figure 2) focused on the use of educational technology in the classroom. My research involved secondary analysis using pre-existing data collected to investigate new research questions (Heaton, 2008). Figure 5 visually integrates the research context to depict the roles and responsibilities of each individual or group involved in the data collection, facilitation, and dissemination. The funnel depicts the stakeholders involved, beginning with the funding body and ending with the ACSC participants. Just beneath the funnel is me, the primary investigator of this research study, making use of everything within the funnel (depicted through the black arrows) as I completed this thesis. Program evaluation and collaborative approaches to evaluation (Shulha et al., 2016) are defined and described further below.

Figure 5

A Visually Integrated Research Context to Communicate Roles and Responsibilities



Program Evaluation

Evaluation research refers to "systematic investigation to determine the success of a specific program" (Barker, 2003, p. 149). However, program evaluation is an applied endeavor (Royse et al., 2010), defined broadly as "the systematic process of gathering information about the merit and worth about something and making a judgement about it in regard to a set of predetermined criteria" (Scriven, 1991 cited in Privitera & Ahlgrim-Delzell, 2018, p. 14). While there are numerous theories and approaches of program evaluation, the data used for this research was generated through a collaborative approach to evaluation (Shulha et al., 2016).

Collaborative Approach to Evaluation

According to Cousins and colleagues (2020), collaborative approaches to evaluation (CAE) is "an umbrella term for the genre of evaluation approaches that meet the basic requirement of evaluators working hand-in-hand with nonevaluators to produce evaluative knowledge" (p. 4). The principles of CAE include (1) clarify motivation for collaboration, (2) foster meaningful relationships, (3) develop a shared understanding of the program, (4) promote appropriate participatory processes, (5) monitoring and respond to the resource availability, (6) monitor evaluation progress and quality, (7) promote evaluative thinking, and (8) follow through to realize use (Shulha et al., 2015). The principles are offered as a way to support the development of professional working knowledge and evaluator expertise in the use of CAE.

In the context of this study CAE was employed through an integrative approach, utilizing aspects of participatory evaluation, developmental evaluation, appreciative and responsive evaluation, and collaborative evaluation (Searle et al., 2015). CAE honoured the unique expertise of the stakeholders involved and allowed for inquiry that was situationally and contextually relevant. Evidence on research from program evaluation is conclusive that stakeholder involvement in systematic processes is essential for increasing the usefulness of evaluation (Johnson et al., 2009). Understanding and aligning with the CAE ethos was important consideration for my study when I was networking with the external inquiry team and planning for the secondary analysis.

Evaluation Context

The program evaluation using the CAE was conducted in a single school district serving two counties in Ontario over a period of three years. The initial program, entitled the Next Generation Learning – School 3.0 (NGL), was a pilot project in the fall of 2013 when the district received funding from the Ministry of Education to initiate an educational technology program. While each district who received the funding had choice about how they invested the funds, this district focused on the purchasing of devices for teachers and students in Grade 7 to 10. After reviewing different options, the district director and senior leaders purchased iPads. The district retained the ownership of the devices, but the educational technology was intended to temporarily become the property of the teacher/student for the school year to use inside and outside the classroom. Over 2000 iPads were distributed, and although they were preloaded with basic district supported software, individual teachers and school communities ultimately decided what applications or software would be used for instructional and assessment purposes.

Before distributing the iPads to students and teachers, senior administration completed a thorough planning and pre-implementation process. The planning process included establishing a vision for the project and the creation of a strategic planning team who was responsible for many of the logical details. In addition, senior administration within the district were committed to a comprehensive implementation and monitoring approach that involved a CAE for engaging the community, addressing the effect of iPads on instructional content and practices, as well as developing a sustainable plan for professional development. These commitments were aligned with the district's Board Improvement Plan for Student Achievement, which sought to improve the educational experiences and outcomes for all students in the district. Since the educators were provided with technology and expected to use it in the classroom, coaches were seconded to work alongside teachers throughout the implementation.

In December 2014, senior administration obtained external expertise in the fields of educational research, assessment, and evaluation. The external inquiry team encompassed diverse backgrounds and worked with the senior administration, teacher technology coaches, and classroom educators and students to study the impact of the NGL initiative. The process took the form of CAE (Shulha et al., 2016), a method involved with assessing changes recognized as caused by an intervention, which unfolded over three phases and involved: co-constructing questions, selecting mixed and multiple methods for data collection, conducting joint analysis, and co-learning through reflection. Together, the activities formed the core of the CAE which allowed for deeper understanding; identifying key strengths and challenges; enabling new capacities, pedagogies and reflective approaches through internal/external partnerships; and sharing discoveries at all stages of the process. Throughout the CAE, the external inquiry team took an integrated iterative approach where the process of understanding, identifying, enabling, and sharing findings continually looped back into the research process to move the research and NGL initiative forward.

Professional Learning Program: The Assessment Case Study Community (ACSC)

Following the first year of the programme implementation, the external inquiry team discovered a few key pedagogical shifts that were worthy of deeper exploration; one of these shifts related to classroom assessment practices. As a result, the district supported the creation of the "Assessment Case Study Community" (ACSC) where participants voluntarily engaged with the external inquiry team and other educators from within the district about assessment. The primary purpose of the ACSC was to provide structure, encouragement, and resources for participating teachers while guiding the group discussion to enable the external inquiry team to gather information about emerging classroom assessment practices with the devices. Participation of the ACSC was voluntary, those who participated were doing so because they had an interest in learning about using the educational technology to enhance their assessment practices. A blended approach was considered the most viable form of participation because the district is geographically distributed, and it aligned with the educational technology goals. The ACSC represents the case study used in this thesis and provided the primary source of data for this secondary case study analysis. While the program evaluation generated a plethora of data, only intentionally selected data from the ACSC was used; the rationale and data used is discussed below.

Participants

Participants for this research project were a subset who participated in the initial programme implementation and ACSC. While a range of stakeholders were involved in the CAE, including superintendents, school leaders, teachers and students, my study focuses on data specifically generated from teachers who were involved in the ACSC.

In total, 61 teachers from 24 schools were involved in the ACSC. All of the teachers in the district who teach grades 7 to 9 and who received an iPad were invited to participate in the ACSC. All participant data considered in this secondary analysis represents those who received letters of information and provided signed consent (see Appendix A) signifying a willingness to contribute to broader scholarly audiences.

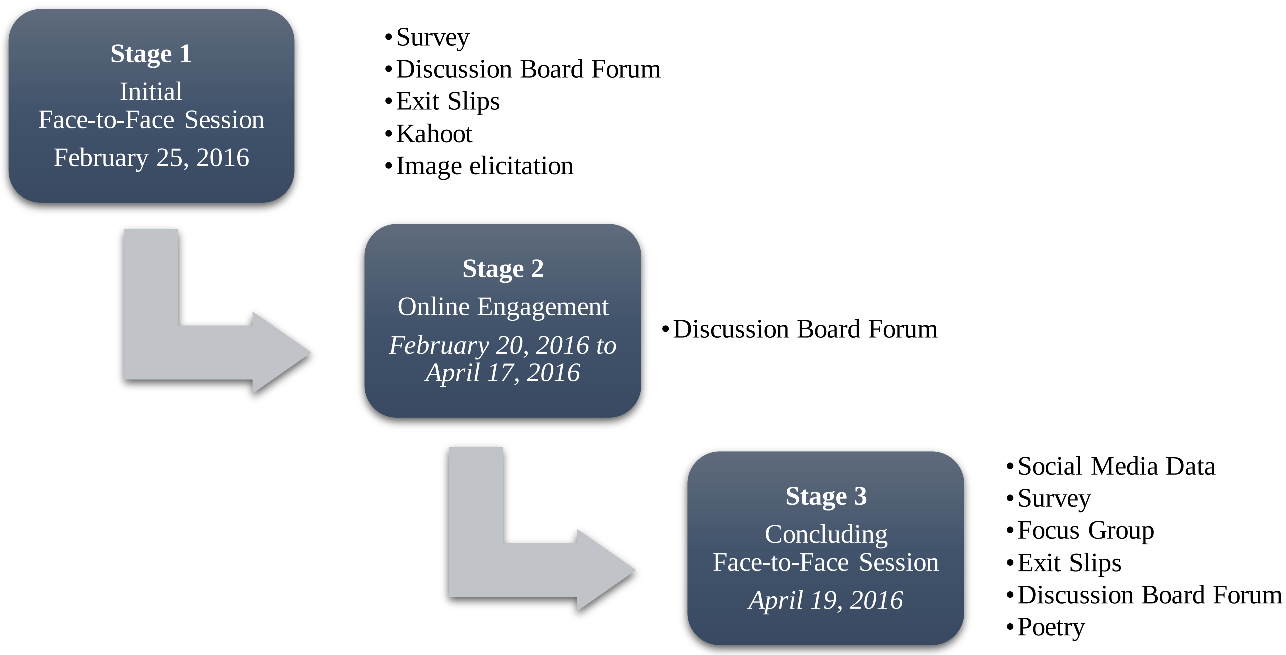
ACSC demographic data extracted from the external inquiry team (Searle et al, 2017; Searle et al, 2018) showed that participants were predominately female (74% [n=44]), and the majority of teachers were experienced, with 85% (n=52) indicting they had between 5 and 25 years of experience. Representation across divisions were fairly even with 43% (n=26) elementary teacher participants and 52% (n=32) secondary teacher participants; 5% (n=3) of participants identified themselves as programme support coaches who were teachers assisting with the programme implementation. Participants represented an array of curriculum areas; however, the three most common subjects were English, Science, and Math. The limited variety in subject areas could be due to the fact classroom teachers retain responsibility for those subject areas in most Ontario elementary schools (Searle et al., 2017; Searle et al., 2018).

Assessment Case Study Community (ACSC) Data Collection

Participants taking part in the ACSC committed to an 8-week blended learning group (Graham, 2013). Based on my conversations with the external inquiry team and a review of the evaluation documents, the blended learning group involved an introductory face-to-face session (stage 1), eight weeks of online engagement (stage 2), and a face-to-face session to conclude the case study (Rooney, 2003; Ward & LaBranche, 2003) (stage 3) (see Figure 6). At the concluding face-to-face session, participants engaged in a focus group to discuss their experiences using educational technology for assessment purposes and learning as part of an online group. Figure 6 summarizes the data collected chronologically through the ACSC.

Figure 6

Blended Learning Overview and Data Available from the ACSC

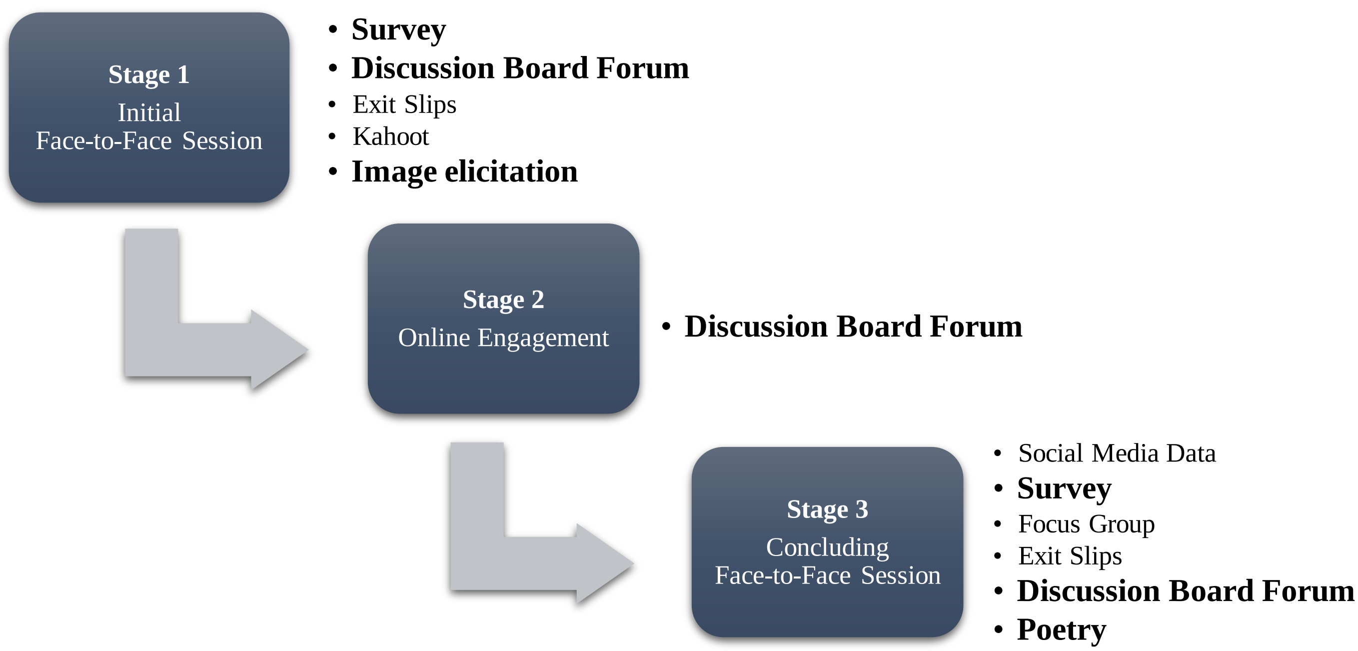


The ACSC was facilitated by the external inquiry team using an outline of weekly themes (e.g., assessment to promote student learning [assessment as/for], assessment of learning, challenges and celebrations) and discussion post content that was co-constructed with district leaders. The weekly thematic plan was flexible as the external inquiry team valued the input of the teachers and wanted to ensure the weekly themes allows for teachers' emergent ideas and experience as well as a judgement-free space for connecting and collaborating.

As I prepared for secondary analysis about the ACSC, I recognized that there was a substantial amount of data generated and available for review. However, not all the data equally contributed to an understanding of the constructs most pertinent to this study. As a researcher looking to understand the assessment identity of a group of teachers implementing assessment via technology, it was important for me to review all of the available data to gather a broad understanding and then selectively work with the data that could help me think about my research questions. I recognized the ACSC provided a glimpse into a moment in time and the data provided a window into how participants thought about assessment and technology only at the time in which the data was collected. Based on my research questions and the available data, I created three broad categories of data to examine further based on chronological clustering focused on usefulness for this study. The bolded text in Figure 7 shows the data included in my study: survey data, exemplars, and arts-informed data.

Figure 7

ACSC Data Included in Secondary Analysis



Next, I describe the data sources, relevant literature, and a rationale for the inclusion of data.

Survey Data

Prior to the launch of the ACSC the external inquiry team co-constructed surveys with the district collaborators for use at the launch and wrap up of the ACSC. The surveys were designed to provide information to answer the overarching inquiry goals. Survey data from both time points use open- and close-ended questions. Open-ended questions allowed the respondent to express an opinion without being influenced by the external inquiry team, while close-ended questions limited the respondent to the set of alternatives offered (Foddy, 1993; Reja et al., 2003). The advantage to offering both questions was to allow the external inquiry team to "discover the responses that individuals give spontaneously…[and] to avoid the bias that may result from suggesting responses to individuals" (Reja et al., 2003, p. 159).

At the introductory face-to-face session (stage 1), participants completed an anonymous survey with a total of 11 questions; 9 closed-ended questions and 2 open-ended questions. Questions included demographic information, as well as teaching-specific questions (e.g., years of experience) and iPad-specific questions (e.g., comfort using the iPads). An online game-based learning platform (Kahoot) was utilized to gather survey-like data and gain a better understanding of the perceived potential influence the educational technology was having on participant assessment practices thus far. In total 5 questions were asked, such as how useful are the iPads for assessment purposes (stage 1)? Utilizing an online-game, during the face-to-face session generated survey-like data and could also have served to motivate engagement, model using technology for assessment purposes, and provide efficient feedback (Dellos, 2015; Gallegos et al., 2017; Licorish et al., 2017).

During the concluding face-to-face session (stage 3), participants completed an anonymous survey (n=28) which included 7 questions; 1 close-ended question and 6 open-ended questions to share their experiences with the ACSC, advice for future participants, and key take a ways or personal and professional shifts. Both surveys were developed by the external inquiry team and were offered using Qualtrics though a university, the online offering was in alignment with the overall ACSC experience.

Discussion Board Postings

The discussion board forum was an online platform that allowed participants to interact. Online technology forums, such as asynchronous discussion modalities, "provide the opportunity for learners to engage in social interaction by reading and responding to peers' and instructors' [external inquiry team] postings" (Gallini & Barron, 2002 cited in Song & McNary, 2011, p. 1). Participants posted an answer to a question (e.g., when thinking about assessment and the devices, what are you celebrating and what is challenging for you?), uploaded resources or exemplars, described their experiences, reflected on their growth, and interacted amongst each other using the comment feature on the forum.

The discussion posts were utilized throughout the entire ACSC, including the face-to-face sessions and online engagement portion of the blended-learning model. There were 167 posts in total (n=55), with 64% of participants posting 10 or more times, and 30% of participants posting 20 or more times. The length of the postings varied, some of which were short comments, while others were in-depth paragraphs. The discussion board was facilitated by the external inquiry team who posted weekly and responded to comments posted by participants.

Arts-Informed Data

Arts-informed inquiry has increased as a contributor within qualitative inquiry (Cole & Knowles, 2008; Wang et al., 2017). Arts-informed inquiry is "a mode and form of qualitative research that is influenced by, but not based in, the arts broadly conceived" (Cole & Knowles, 2008, p. 6). The central purposes of arts-informed inquiry are to "enhance understanding of the human condition through alternative (to conventional) processes and representational forms of inquiry, and to reach multiple audiences by making scholarship more accessible" (Cole & Knowles, 2008, p. 6). Incorporating artful inquiry allows for the external inquiry team to "explore, understand, represent and even challenge human action and experience" (Savin-Baden & Wimpenny, 2014, p. 1). During face-to-face sessions, participates engaged in artful activities that provoked thinking about using educational technology for assessment purposes. These artful activities included image elicitation (stage 1) and creative poetry (stage 3).

Image elicitation is based on the idea of inserting a photograph or image into a research interview (Harper, 2010). In the ACSC context, image elicitation was used with found images to develop community amongst the ACSC members and generate data about participant perceptions of educational technology and assessment. In fact, "images evoke deeper elements of human consciousness that do words; exchanges based on words alone utilize less of the brain's capacity than do exchanges in which the brain is processing images as well as words" (Harper, 2010, p. 13). During the face-to-face sessions, participants were provided with prompts to provoke their selecting and sharing with images. The images were spread out on tables for participants to select from, there was a ratio of 3 images to participant to ensure selection choice, and blank images were alliable for those who were unable to select an image that "spoke" to them.

Creative poetry, known academically as poetic inquiry, is an emergent research methodology that has no fixed definition "because the work undertaken through the methodology is not limited solely to artistic, aesthetic, educational or research-focused spaces" (Vincent, 2018, p. 49). This widespread, transdisciplinary space has been referred to as liminal space in the literature (Sinner et al., 2006; Neilsen, 2008). However, the style of poetry, "the act of writing poems or analyzing through poems, is represented in the literature as a way to expand perspectives on human experience" (Vincent, 2018, p. 51). In the ACSC context, poetic inquiry was used during the concluding face-to-face session to reflect upon their experience in the 8-week blended case group. Participants were individually tasked with writing a creative poem in response to one of the following prompts:

- 3 words that best describe my assessment practices with the iPads are…
- When I first thought of an online assessment community I thought…
- Now that we've travelled the 8 weeks, the most valuable thing for me was…
- The most challenging thing for me was…
- One wish I still have is…

Participants read over their poem silently, gave it a descriptive title, then read their poem aloud to 4-5 people. Without discussing each poem, participants had the opportunity to circle words or phrases that stood out to them while listening to the diversity of poems. Participants then discussed the circled words and phrases with their group.

Data Analysis

The ACSC data was analyzed through a hybrid of inductive and deductive analysis strategies, with sensitizing concepts to ground the work. The hybrid methodological approach for analysis was chosen as it integrates data-driven codes with theory-driven codes (Fereday & Muir-Cochrane, 2006). This approach complimented the research questions by allowing themes to first emerge directly from the data, followed by the use of the teachers' assessment identity framework as sensitizing concepts. Blumer (1954) provided a seminal description of sensitizing concepts, by comparing the idea with definitive concepts, stating:

> A definitive concept refers precisely to what is common to a class of objects, by the aid of a clear definition in terms of attributes or fixed bench marks…A sensitizing concept lacks such specification of attributes or bench marks and consequently it does not enable the user to move directly to the instance and its relevant content. Instead, it gives the user a general sense of reference and guidance in approaching empirical instances. Whereas definitive concepts provide prescriptions of what to see, sensitizing concepts merely suggest directions along which to look (p. 7).

Since qualitative research often does not start with hypotheses or predetermined notions, researcher's attempt to "discover, understand, and interpret" what is happening in the dataset specific to the research context (Bowen, 2006, p. 3). As a result, researchers can view sensitizing concepts as interpretive devices and as a starting point for a qualitative study (Glaser, 1978; Padgett, 2004; see also Patton, 2002). Sensitizing concepts highlight significant features of social interaction and offer guidelines for research in particular settings (Bowen, 2006). In fact, "research usually begins with such concepts, whether researchers state this or not and whether they are aware of them or not" (Gilgun, 2002 as cited in Bowen, 2006, p. 4). Also, when sensitizing concepts are used, they can be tested, improved, and refined (Blumer, 1954).

Nevertheless, there are drawbacks with sensitizing concepts as they could direct attention away from other important aspects of the data (Gilgun, 2002); however, by utilizing a hybrid between an inductive and deductive approach, I can expand on the original sensitizing concepts with new emerging themes and ideas. The sensitizing concepts for this study include the dimensions provided by the model of teacher assessment identity developed Looney and colleagues (2018) (Table 3).

Table 3

Sensitizing Looney et al.'s (2018) Model of Teacher Assessment Identity

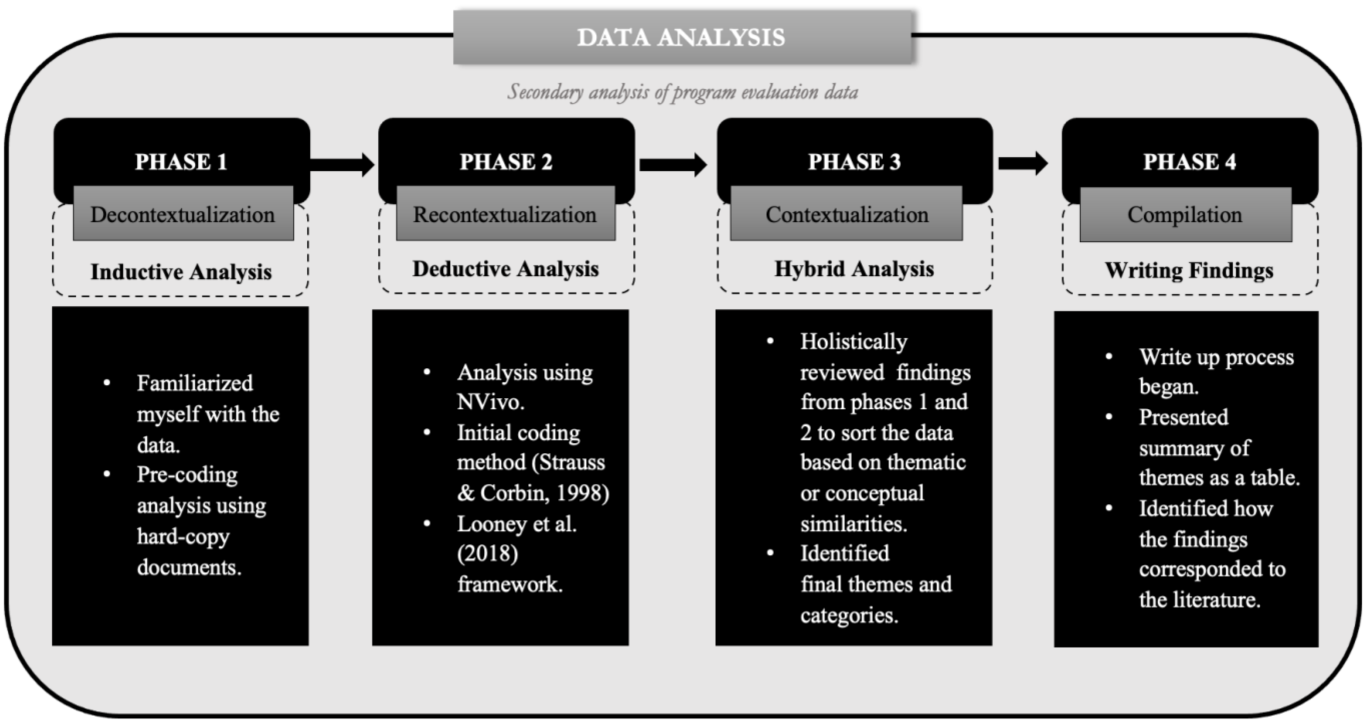
Code	Description
I know	Knowledge/skills
I feel	Feelings; emotional dimensions
I believe	Informed and shaped by teachers' assessment dispositions
I am confident	Self-efficacy
My role	Degree to which they feel in control of their practice

In order to identify themes and explore new ideas from the data, content analysis was conducted in four phases (see figure 7). According to Krippendorff (2018), "content analysis is a research technique for making replicable and valid inferences from texts (or other meaningful matter) to the contexts of their use" (p. 24). In this definition, other meaningful matter includes art-informed data, which is present in the data used in this thesis. Through content analysis, researchers organize and obtain meaning from data collected and elicit realistic conclusions from the findings (Bengtsson, 2016). Content analysis provides novel insights, increases researcher's understanding of particular phenomena, or informs practical actions (Krippendorff, 2018) – each of which are objectives of this research. Although content analysis shares similarities to thematic analysis, content analysis was strategically chosen due to the significance of context as a foundational feature. In fact, Downe-Wamboldt (1992) explained the importance of context, stating: "to describe the occurrences of words, phrases, or sentences without consideration of the contextual environment of the data is inappropriate and inadequate" (p. 314). Context is important for gaining a deepening understanding of participant experiences and identifying how the results relate to existing and future research.

The four phases of data analysis include decontextualization, recontextualization, categorization, and compilation (Bengtsson, 2016). The inductive, deductive, and hybrid methodologies were strategically arranged within the four phases of data analysis to ensure a blind (i.e., generating new insight) and applicable (i.e., theory-driven) coding procedure (see Figure 4). The data was analyzed by data collection stage with the ACSC viewed as a collective group of teachers. Figure 8 below is extrapolated from Figure 4 to provide more detail about the four-phase data analysis procedure used in my study.

Figure 8

My Data Analysis Overview by Phase



Phase 1: Decontextualization. During this phase, I familiarized myself with the data, and read through the text to obtain general, preliminary information (Bengtsson, 2016). To successfully achieve this, an inductive pre-coding analysis was completed manually using hard-copy print outs. Pre-coding involves circling, highlighting, bolding, underlining, or coloring rich

or significant participant quotes or passages (Boyatzis, 1998; Layder, 1998). According to Bengtsson (2016), pre-coding is equivalent to the process of developing meaning units, “the smallest unit that contains some of the insights the researcher needs, and it is the constellation of sentences or paragraphs containing aspects related to each other, answering the question set out in the aim” (p. 11). A manual coding method was chosen because handling the data turns abstract information into concrete data (Graue et al., 1998). Manual inductive data analysis may be tedious and frustrating (Basit, 2003), but seemed valuable to me as it allowed me to become familiar with the specificities of the data and key assessment identity ideas, especially when conducting a secondary analysis. Using an inductive approach allowed for new insight, discovery, or ideas to emerge related to teachers’ assessment identity.

Phase 2: Recontextualization. The pre-coding and meaningful unit development allowed the researcher to check whether all aspects of the content have been covered in relation to the research objectives (Burnard, 1991). During phase 2, the data was formatted and loaded into NVIVO, and a deductive analysis was completed using the initial coding method with Looney et al.’s (2018) model as sensitizing concepts (Charmaz, 2014; Saldana, 2009) (see Table 3). The initial coding method is an open-ended approach that involves breaking down the data into discrete parts and comparing them for similarities and differences (Strauss & Corbin, 1998). The purpose of this cycle was a starting point to provide analytic indications for future exploration (Glaser, 1978). The line-by-line initial coding approach was used as it is the most suitable approach qualitive data with a wide variety of data forms (Saldana, 2009). Once the coding was completed, I read through the data to review unmarked text to identify whether or not the unmarked text should be included in the data. When the researcher is deeply involved with the data, everything seems to be of importance; however, a process of distancing is necessary in the recontextualization phase, and “the researcher must allow him or herself to let go of the unimportant information that does not correspond to the aim of the study” (Bengtsson, 2016, p. 12).

Phase 3: Categorization. Phase three involved holistically reviewing the findings from phase 1 (inductive) and phase 2 (deductive) to sort the data based on thematic or conceptual similarities. This approach provided the ideal opportunity to merge the different lenses used to date. As categories and sub-categories emerged, they were coupled with core ideas from the assessment identity framework so that themes and codes could be summarized, supported, and connected to the research questions to develop findings. However, an important component of the categorization phase was to identify themes and categories that are internally homogeneous and externally heterogeneous, meaning no data would fall between two groups nor fit into more than one group (Krippendorff, 2004; Patton, 2002).

Phase 4: Compilation. Once the categories were established, the analysis and writing up process began. When performing a qualitative content analysis, the investigator must consider the data collected from a neutral perspective and consider their objectivity (Bengtsson, 2016). An important aspect of the compilation phase is the final check, considering how the new findings correspond to the literature and whether or not the result is reasonable and logical (Burnard, 1991; Morse & Richards, 2002). To validate the outcome and strengthen the validity of the study, member checking was completed by presenting the results to the external inquiry team in order to achieve agreement (Burnard, 1991; Catanzaro, 1988).

Establishing Trustworthiness

Unlike quantitative research, qualitative researchers do not typically use instruments with established benchmarks or standards about validity and reliability; thus, it is pertinent to address if the study's findings can be trusted (Korstjens & Moser, 2018). To identify trust or truth value (Connelly, 2016) within qualitative findings, researchers use the word *trustworthiness* to refer to the degree of confidence in data, interpretation, and methodology (Polit & Beck, 2013). Typically, this means that researchers establish the protocols and procedures necessary for a study to be considered worthy or consideration by readers (Amankwaa, 2016). Lincoln and Guba (1985) identified and defined the best-known criteria for trustworthiness, which include credibility, transferability, dependability, and confirmability (Connelly, 2016; Shenton, 2004). Table 4 offers an overview of the four criteria of trustworthiness, in addition to references to the literature for more information. The secondary data was collected by the external inquiry team comprised of four PhD researchers, each with specialized expertise in a unique area of education, positively affecting the trustworthiness of the study.

Table 4

An Overview of Trustworthiness in Qualitative Research

<table>
<tr><th>Trustworthiness Criteria</th><th>Overview</th><th>Links to the Literature</th></tr>
<tr><td>Credibility</td><td>How confident the researcher is in the findings of the research study.</td><td rowspan="4">Connelly (2016)
Elo et al. (2014)
Guba (1981)
Korstjens & Moser (2018)
Lincoln and Guba (1985)
Shenton (2004)</td></tr>
<tr><td>Transferability</td><td>The extent to which the researcher demonstrates that the findings are applicable to other contexts (e.g., similar situations, similar populations).</td></tr>
<tr><td>Confirmability</td><td>The objectivity and neutrality of the research's findings. The findings are based on participants' responses rather than potential researcher bias or personal motivations.</td></tr>
<tr><td>Dependability</td><td>The extent to which the study could be repeated and yields consistent findings.</td></tr>
</table>

In my research, I endeavoured to establish credibility through the use of triangulation. Triangulation refers to the use of multiple methods or data sources in qualitative research to develop a comprehensive understanding of phenomena (Patton, 1999). Triangulation through researcher reflexivity, multiple data sources (e.g., discussion posts, arts-informed data, survey results), and the interweaving of data analysis strategies (e.g., sensitizing concepts, hybrid approach) increased the rigor and transparency of the research (Creswell & Miller, 2000). Trustworthiness was further established through confirmability by providing an audit trail, highlighting every step of data analysis that was made in order to provide a rationale for the decisions made (Nowell et al., 2017). I have tried to do this by providing tables, graphs, narrative details, and artifacts of my process. These efforts help establish that the research study's findings accurately portray participants' responses. The components of trustworthiness were extended through intercoder reliability (ICR), investigator triangulation, and analytic memos.

Intercoder Reliability

ICR is a numerical measure of the agreement between different coders regarding how the same data should be coded (O'Connor & Joffe, 2020). ICR is sometimes blended with interrater reliability (IRR), and the two terms are frequently used interchangeably. However, IRR refers to cases where the data are rated on an ordinal or interval scale, while ICR is suitable when categorizing data at a nominal level. ICR is the most common analytic approach for qualitative research; in fact, many qualitative researchers have proposed different steps to substantiate the credibility of the coding process (e.g., Bauer et al., 2000; Popay et al., 1998), one of which is ICR. By increasing the consistency and transparency of the coding process, ICR can help provide confidence that specific efforts were made to ensure the finding represents a credible account of the data (O'Connor & Joffe, 2020). This secondary research study utilized intercoder reliability through a data party at two timepoints, which is discussed and examined below.

Investigator Triangulation

Investigator triangulation is a collaborative strategy (Archibald, 2015) involving the participation of two or more researchers to provide multiple observations and conclusions (Carter et al., 2014). Investigator triangulation can bring both confirmation of findings and different perspectives, adding breadth to the phenomenon of interest (Denzin, 1978). My secondary study utilized investigator triangulation through a data party, which is discussed and examined below.

Data Party. In evaluation, a data party is a time-limited event where diverse stakeholders, researchers, or members of the community come together to collectively analyze data that have been collected (Roger & Newhouse, 2020). The data party is intended to provide additional perspectives and explanations of what the data mean and the implications for action, the process can improve the quality of the interpretation. In my study, a data party was organized at two timepoints to incorporate input from graduate researchers to increase the trustworthiness of the study's findings. The data party timepoints align with the CAE with which the data was collected. Ethical clearance was obtained to conduct the data party with graduate students (see Appendix B).

After I completed the first phase of coding, the data party participants were recruited and completed the Letter of Information and Consent (see Appendix C). The first timepoint of the data party involved a 2-hour session with graduate participant researchers (n=4) blind coding a subset of the secondary data through an inductive, exploratory approach.

Drawing on Gardner's (1983) theory of multiple intelligences, the data party timepoint one agenda was developed based on the Accelerated Learning Cycle (ALC; Smith, 1996). The

ALC builds a learning environment that acknowledges diverse prior knowledge and work habits. The model includes the subsequent seven stages: (1) create a safe and welcoming learning environment, (2) build on the background knowledge of the learners, (3) describe intended learning outcomes, (4) provide new information or content, (5) facilitate a student activity, (6) enables discussion or interactive demonstration based on the findings of the activity, and (7) reviews and reinforces presented information (Yale University, 2021). The seventh step is not pertinent to the session and was not taken into consideration when developing the agenda. Although the ALC is based on effective teaching pedagogy, it is also a research-informed learning framework that can be used for course design to assist instructors align learning goals with activities. The ALC offered a structure that ensured an organized and purposeful session for the graduate students and me which could contribute to increasing the consistency and transparency of the data analysis, specifically the coding process. Table 5 provides an overview of the data party timepoint one agenda to make the ICR process apparent.

Table 5

Data Party Timepoint #1 Agenda

Purpose	Explanation	Rationale
Welcome Purpose	Shared the purpose of the data party with the graduate students, including an overview of the research objectives and questions.	Graduate students were recruited based on diverse research interests and methodology expertise. Although all graduate students are researchers in the Faculty of Education, they did not already know each other. I also introduced myself to the graduate students and shared the reason for the session. Developing a sense of community and getting to know one another offers a brave space (Arao & Clemens, 2013) for open-dialogue and enables team members to unleash creativity (Nirenberg, 2007).
Overview & Collaborative Coding	Presented a brief introduction to qualitative data analysis and coding. Presentation followed by a group activity coding one sample arts-informed entry using the principles discussed.	Qualitative coding is different for each research study, so this portion oriented the graduate students to the data analysis method. Qualitative analysis was also new to some graduate students participating.

Independent Coding	Graduate students were given the same document comprised of 10% of the data used in the thesis. Graduate students instructed to inductively code the data. During this process, a Padlet was developed for graduate students to offer insight, questions, or reflections based on their coding experience.	Graduate students coded the data through an inductive approach to allow exploration and new insights to emerge, aiming to minimize bias or preconceived notions. Data was the same for all coders to develop an intercoder reliability agreement rate.
ICR	As a group, we read through the data sentence-by-sentence to discuss codes and identified agreements and disagreements.	ICR is the most common analytic approach for qualitative research; in fact, many qualitative researchers have proposed different steps to substantiate the credibility of the coding process (e.g., Bauer et al., 2000; Popay et al., 1998).

During data party timepoint one, the graduate participants cumulatively coded 10% (n=17) of the discussion post data to reach an intercoder reliability agreement percentage. To ensure random discussion posts were chosen for the 10%, an online random number generator was used. Since each discussion post week included a different topic related to assessment, it was important to have an even distribution of discussion post weeks and topics. The maximum number for the generator was selected based on the number of discussion posts, conducted week-by-week. There were five weeks of discussion post data, three discussion posts for each week were chosen, with the remaining two randomly generated from the two weeks containing the most discussion posts.

While there is no standard or base percentage of agreement among qualitative researchers, 85%-90% agreement is a minimal benchmark (Saldana, 2016). To reduce bias and influence, graduate student participants did not have access to a code list while engaging in the collaborative work session. Following the coding session, the researcher and participants discussed codes sentence-by-sentence to identify ICR. During the discussion, I kept a detailed record of the codes by participants, agreements, and disagreements (see Figure 9). If multiple graduate students had the same nature of code (e.g., reflection, reflective practice), it was only recorded once. While discussing, if the codes were different, we engaged in a conversation about why with the goal of understanding and resolving. If an agreement was made, it was counted toward an agreement. If there was no agreement, it was counted toward a disagreement. The number of agreements was be divided by the number of total codes, and we conversed until an agreement rate of 85%- 90% was achieved. The ICR of the data party was 93.6% (320 codes, 309 agreements, 21 disagreements). As mentioned above, Figure 9 provides a snapshot of the detailed record used to track agreements and disagreements during the first data party timepoint. The purpose of the image is not to read the details closely, but rather to make the analysis and ICR process transparent.

Figure 9

Record of ICR Agreements and Disagreements during Data Party Timepoint 1

CODE	Discussion Post	DPY1	Agree/ Disagree	DPY2	Agree/ Disagree	DPY3	Agree/ Disagree	DPY4	Agree/ Disagree	DPY5	Agree/ Disagree
E15 1	"My confidence has improved with using technology and I have seen the students engagement and skills improve immensely…	Accessability	D	Engagement		Teacher confidence		Success in tech-integrated practice			
		Comfort		Learning		Student skills					
	Looking to the future I am finding that I know which apps work for me to make my teaching easier and to get the knowledge from my students.	Accessibility		Specific Technology		Teacher skill building		Technological self-awareness			
						Teacher self awareness					
	When planning, I try to offer variety for the students and choice	Multiple methods		Student voice		Teacher Planning		Accessible			
				Student agency		Student choice		Engaging			
	This is what has allowed students to be engaged and as a result, the output is much greater.	Engagement		Academic Achivement		Student output					
		Student meaning									
	Finding deep, rich tasks is the area of need for me, so this is where I want to go next with my teaching.	Professional learning		Teacher self-reflection		Teacher goal setting		Next steps: deeper use of tech			
		Meaning				Teacher gaps	D				
S7 0	"I think it is fantastic that I can offer feedback to students on their work and track the improvements they make through things like revision history.	Evaluation of iPad accessibility	D	Specifc technology		Student self correction		Value-added by tech			
				Monitoring Learning							
				Feedback							
	One struggle is to get them to reflect on work more. I request a lot of it but need to more.	Engagement				Barrier – increase student reflection		Tech facilitating metacognitve learning	D		
	I request a lot of it but need to more.	Connection to practice		Teacher self-reflection		Teacher goal					
	Comments I put in margins of assignments are "resolved" and then go missing.	Tech difficulties		Challenge		Teacher learning curve					
	It is not a major problem, just an adjustment for me to write comments at the end of assignments so I can see my words later when I see improvements are made."			Teacher self-reflection		Teacher learning curve					
				Feedback							
				Next steps							

Following timepoint one, I ensured the coded data and findings matched the preliminary findings and adjusted accordingly. A preliminary code list was generated (see Table 6). Then, I completed phase two of the data analysis (recontextualization), deductive coding. The same graduate student participants were then invited back for the second timepoint, a virtual gallery and discussion session.

Table 6

Preliminary Code List

Theme	Code	Subcodes
	Feedback	
Student Relevance	21^{st} Century Learning	
	Learning Processes	Engagement Self-Monitoring
	Specific Tool or Resource	
Connecting to Practice	Connection to Practice (general)	
	Theory	Types of Assessment
	Technology Benefits	
Evaluating	Tensions	Technology Challenges
	Accessibility	Differentiated Instruction
	Reflective Practice	Self-Efficacy
Professional Identity	Commitment to Professional Learning	Collaboration
	Feelings	

The virtual gallery and discussion session involved the study findings visually presented on slides created digitally through Google Slides, an online presentation program platform. See Appendix D for a sample overview of the slides developed. I created questions prior to timepoint two that were used to prompt discussion among the participants. Examples of the questions included: does anything stand out for you that may be surprising? Do the results to the research questions? Several slides were developed depicting research findings through tables providing an overview of the codes, description, and sample quotes, and participants viewed the "gallery" to review and discuss each slide. After giving participants time to look at the slides, we discussed overall thoughts, and participants had the opportunity to ask any questions or mention concerns. Due to the pandemic, the data party (timepoints 1 and 2) were held virtually on Zoom.

Analytic Memos

Analytic memos, also known as reflective commentary, are comparable to journals, lab notebooks, and blogs by allowing researchers to reflect and record on "coding processes and code choices; how the process of inquiry is taking shape; and the emergent patterns, categories and subcategories, themes, and concepts in your data…possibly leading toward theory" (Saldaña, 2016, p. 44). When reflecting and writing about data analysis and thinking with the coding process, it increases critical thinking and challenges personal assumptions (Rogers, 2018). Analytic memos are informal and are typically absent of academic jargon, rather they "should read like personal letters to a friend" (Rogers, 2018, p. 890). Through memos, researchers have the opportunity to record the research process and allow future readers the opportunity to understand thoughts throughout the coding journey.

In my research, analytic memos were used during phases one, two, and three of the data analyses, including data party timepoint one and two. During data analysis, I kept a detailed log of my thoughts and reflections as I was exploring and coding the data. Figure 10 depicts a snapshot of the analytic memo process used during phase one. The purpose of this figure is to show how I organized the analytic memos and to make my process transparent. Since the spreadsheet was completed during the data analysis, I took the time to complete journal entries that allowed me to narratively capture my thought processes and potential discussion points.

Figure 10

Analytic Memo Exemplar

DATA SOURCE	CODE (THEME)	TRANSCRIPT	TECHNOLOGY	INTERESTING IDEAS, NOTES, AND/OR QUESTIONS
		Week 02 Challenges & Questions (I)		
DP Week 02 Elementary I	Meaningful Feedback	"what is the best way to have students check the feedback that I individually send them?"..."they check if they have any notes from me"	Showbie	Is the purpose of checking the feedback to improve student learning?
DP Week 02 Elementary I	Meaningful Feedback	"not only use the feedback provided but to also just plain read it!"		Similar comment to above. Are techers struggling to get students to use the feedback they're providing?
DP Week 02 Elementary I	Convenience	"students can submit work...its so much easier to track and organize who has completed work"	Showbie Schoology	The language of the code matters... Convenience = easier
DP Week 02 Elementary I	Tedious	"I find writing on the iPad very tedious, especially for something like math where you are trying to be very specific with correctors to their form...		Does the technology better suit specific subjects for assessment?
DP Week 02 Elementary I	Tedious	"when I give feedback on that sort of thing [math], I find myself going back to paper"		
DP Week 02 Elementary I	The power of assessing with technology goes beyond substitution	"I find technology less effective when it replaces a strategy that is already working."		This reminds me of the SAMR Model... SAMR categorizes four different degrees of classroom technology integration: Substitution, Augmentation, Modification, and Redefinition. Technology is more effective when it transforms, rather than substitues
		Week 02 Assessment Practices in your Classroom (II)		
DP Week 02 Secondary II	Meaningful feedback	"feedback provided enabled students to revise work and submit"	N/A	
DP Week 02 Secondary II	Dual value of feedback	"amalgamate feedback comments into a single stream so that a trajectory of learning can be seen by both sudents and teachers"	N/A	Feedback is not just for the student, but for teachers and students
DP Week 02 Secondary II	Meaningful feedback	"students need time to reflect on their returned assignments with feedback"	N/A	
DP Week 02 Secondary II	Reflection			
DP Week 02 Secondary II	Feedback loop	"extra time is required to digest the feedback and work on next steps	N/A	Not only providing students with feedback, but allowing students to use the feedback to improve their work and reflect on next steps
DP Week 02 Secondary II	Student voice	"generate a list of skills and practices as a class to be used as a self-evaluation tool"	N/A	
DP Week 02 Secondary II	Triangulation	See S4 1	N/A	Students are included in the assessment process - co-creation and student voice, self-assessment using co-created rating scale, teacher eval, comparison, conversation on similarities and differences between how the student assessed themselves and how the teacher assessed the student... is triangulation the right term?
DP Week 02 Secondary II	practical example of going beyond substitution	"video assessments of a specific type of lay-up in physed"	N/A	Again, I keep thinking of the SAMR model... this example goes BEYOND substitution. This assessment wouldn't be possible without the technology
DP Week 02 Secondary II	Assessment Shift	"shift from assessing only specific expectations towards assessing overall expectations. Benefits include a big picture of a student's learning"		**A shift in how teachers assess without the tech vs. with tech**
DP Week 02 Secondary II	Feedback loop	"students will do a self-assessment, and prioritize components they need to work on for next steps"	N/A	
DP Week 02 Secondary II	Self-refelction	"this helps students to learn how to self-assess and become more self-aware"	N/A	Remember.. WHY Assessment IDENTITY; HELPING STUDENTS BECOME STRONGER - using assessment to develop 21st century learning skills
DP Week 02 Secondary II	Feedback to advance assessment pedagogy	"individual reflections from students showed it was a more valuable learning experience than a test would have been"	N/A	Okay, thinking about assessment identity... how does this FEEDBACK on an ASSESSMENT impact assessment identity. It would influence their future assessment pedagogy and choices they make when deciding culminating assessments
DP Week 02 Secondary II	Assessment documentation	"self-assessment chart at the end of each unit in English. This is available in an individual student specific Google Doc that becomes the basis for teacher-student conferences"	N/A	

Ethical Approval

Data was originally collected by the external inquiry team for the purpose of answering district focused questions and later undertaking research on the process and findings. All ethical requirements for the collection, analysis and later dissemination of knowledge from this data set have been met. Ethical permissions for the evaluation and research on evaluation were initially granted from the University of Alberta (see Appendix E) and Brock University (see Appendix F). Studies related to the external inquiry team's research have been published (e.g., Searle et al., 2017; Searle et al., 2018), but to date no one has looked at the data to discover more information about the intersections between assessment identity and educational technology. Examining this intersection is the contribution my study makes. Ethical permission for secondary analysis was sought from Queen's University EREB (Education Research Ethics Board) and GREB (General Research Ethics Board) (Appendix G).

Chapter 4: Results

The purpose of the study was to analyze teachers' assessment identity as they were implementing assessment via technology into their technology-enriched classrooms. Specifically, this research explored if the technology-enriched classroom assessment practices impacted the evolving assessment identity of the teachers who engaged in the case study by experimenting with educational technology. As the teachers implemented and explored assessment via technology, they documented their learning by reflecting and sharing with fellow educators also engaging in the professional learning community. Guiding this study were the following research questions: (1) How do teachers leverage assessment via technology in their teaching practice to support the evolution of their classroom assessment conceptualizations and practices? (2) What can be understood about teacher assessment identity as they work to integrate technology in their teaching practice and expand their classroom assessment practices? In this Chapter, I sequence the results identified from the inductive and deductive data analysis phases. There was overlap in the inductive and deductive analysis and writing of the results to offer more in-depth learning opportunities. I first present the inductive results in response to research question one, then I present the deductive results to respond to research question two. Selected literature is woven throughout the results to create, situate, and connect the findings within broader conversations about teaching, learning, assessment, and technology.

Research Question 1: Leveraging Classroom Assessment via Educational Technology

In my research, I identified and built on the following themes: expanded assessment practices, seeking professional development, and developing core competencies for 21st century learners. Table 7 provides an overview of these themes, as well as the frequency count, a description, and an exemplary quote. All frequency counts are provided in parenthesis beside each code. Exemplary quotes are offered to illuminate the meaning of each theme.

Table 7

Overview of Themes Related to Leveraging Educational Technology for Assessment

Theme	Codes	Description	Exemplary Quotes
Expanded Assessment Practices	Student choice (37) Meaningful feedback (136) Differentiated instruction (31) Culture of learning (12)	Teachers used educational technology to provide students with ongoing and diverse assessment practices that go beyond traditional assessment possibilities.	*"You are now able to integrate formative assessments directly into a lesson and provide students with immediate feedback. This serves as a great progress check for students to make sure that they are on track."* *"Celebrations include that the iPads are used on a regular basis and that I was able to differentiate, add variety and overall enhance the learning in the classroom."* *"Rethinking my assessment practices, making them more authentic to real problems that would engage the students. Trying to get away from pen and paper test."*
Seeking Professional Development	Teacher self-reflection (41) Learning curve (15) Extensions beyond current practice (27) Future PD engagement (34) Motivation (8)	Teachers used educational technology to explore new ways of incorporating the devices into the classroom for assessment purposes.	*"As part of this inquiry I decided to pose a questions to a wonderful Twitter group that I belong to."* *"Reaching out to other teachers who are using similar tools"* *"Yes... [I] would enjoy being part of a follow up project as I implement my learning over the next year."*

Developing Core Competencies for 21st Century Learners	Critical thinking (12) Creativity (17) Collaboration (29) Communication (21) Information literacy (4) Technology literacy (9) Leadership (15) Social skills (11)	Teachers used educational technology to develop competencies of learners that ultimately enhanced assessment practices and learning.	*"This particular skill has transferred into all learning subject via critical thinking, problem-solving, perseverance and collaboration."* *"Using this app [Explain Everything] allowed students to be creative, show their learning visually and orally."* *"We have to teach them how to use apps frequently which we need time and opportunity to learn ourselves. There is no time given for us to learn and do this, so it becomes difficult to become well-versed enough in apps to really understand how to apply them to perceived learning needs and summatives. We need people who are experts or knowledgeable about certain apps to come in and show us the possibilities and concrete uses, and then let us play around and discuss potential uses."*

Expanded Assessment Practices

The first theme identified was the expanded assessment practices ACSC teachers. Expanded assessment practices was coded 216 times, including the potential for multiple codes per person, with the following codes: student choice (37), meaningful feedback (136), differentiated instruction (31), and culture of learning (12). In comparison to the other two themes in research question one (seeking professional development and developing core competencies for 21st century learners), expanding assessment practices was the most saliant theme. While there were differences and nuances in the individual assessment practices within the ACSC, most participants identified expanded assessment practices by incorporating the technology to enhance their teaching methods. Teachers noted the educational technology allowed their assessment practices to move beyond traditional assessments methods but serve the same purposes. Some teachers used self-described “old school” formative assessment methods, but reflected on how their teaching style can be improved upon by locating “potential apps [they] can use to achieve the same tasks (i.e., students read aloud and record their understanding using summaries, visuals, etc.).” The data related to expanded assessment practices is best characterized as a responsive, adaptive, student-centered approach that teachers were embracing because of ubiquitous access to technology. The data showed that most teachers valued and believed in student choice, meaningful feedback, differentiated instruction, and a culture of learning. Next, these values will be discussed in detail.

Student Choice. Analysis of data revealed that use of educational technology furthered the importance of offering choice when it comes to assessment practice. Teachers offered assessment criteria, expectations, or a problem, and students had the opportunity to choose the application or website they wanted to use to demonstrate their understanding, learning, or process. By incorporating choice, teachers noted higher levels of student engagement, motivation, comfort, and creativity. For example, when comparing a pencil and paper formative assessment, one teacher described: “I find that the students are more engaged in daily writing and responding through this method versus traditional writing prompts and journaling. Another participant wrote that “student engagement is up and there is daily and consistent access to a customized tool [e.g., students verbally recording their thinking using the Explain Everything application] that fits the needs of all diverse learners and learning styles. Students feel more confident and independent when using the iPads.” Furthermore, in the creation of a grade nine business assignment, a teacher explained that student choice “provided information around the student’s comfort and ability level based on the programs they choose degree of customization and creativeness.” Although student choice is a frequently touted construct in education broadly (e.g., Jopp & Cohen, 2020; Patall et al., 2010) and emerged as significant in the collective data, one teacher felt student choice was not always beneficial:

> Overcoming the myth that students are proficient at all these neat apps/formats and are itching to use a variety of them if we give them choice. I find that is true for very small number of them. Most are either overwhelmed by the choice, and/or revert back to what they know. So mandating certain formats, and instructing them on the effective use of each, is still a focus in my junior classes.

The quote above serves to remind us of the importance of noting the occasional dissonant and outlier voice within the ACSC experience as they offer a nuanced perspective. However, in a previous comment, the same teacher mentioned they were having “difficulty helping students develop the skills to navigate the functions of the iPad for educational purposes.” While data was not examined for change over time, due to the short length of the ACSC, data showed that assessment choice was related to ensuring students were familiar with how to use the applications before sharing the plethora of tools they could use to complete a task or assignment. Teacher comments demonstrate student choice as an important value, that could be leveraged as teachers and students explored new forms of assessment with technology.

Meaningful Feedback. Throughout the ACSC, teachers identified meaningful feedback as a core value to improve student learning. This value aligns with research exploring the importance of feedback (e.g., Alique & Linares, 2019). In the English department of one school, a teacher described separate due dates “in an attempt to provide more formative feedback that promotes self-assessment. The first due date is to receive feedback, not editing but comments that will require students to reflect, self-assess and make changes.” Similarly, when explaining the use of formative assessment in the classroom, one participant noted “assessing with descriptive feedback allows a greater focus on what learning needs improvement." To highlight the importance of feedback and combat the feedback challenges teachers were facing, some ACSC teachers offered students time for incorporating feedback. For example, one teacher noted that "students need time to reflect on their returned assignments with feedback. Rather than requiring student to correct and resubmit the same day, extra time is required to digest the feedback and work on their next steps." Examples of teacher feedback signal an overall desire to provide meaningful feedback to promote learning and a recognition that this process requires an investment of time, both for educators to generate and students to process.

Providing meaningful feedback through educational technology presented a challenge for many teachers. Examples included:

- "I still have work to do with regards to kids using feedback provided though."
- "Writing feedback on a screen is difficult and can be hard to read."
- "I don't use my iPad to assess and offer feedback on student work."

Reasons for these challenges included "screen fatigue" and educational technology as "tedious", "especially for something like math where you are trying to be very specific with corrections to their form." These challenges denote attitudes related to the frustration of learning a new approach of offering feedback as well as questioning the usefulness and effectiveness of this new approach to leverage student learning.

Despite these challenges, teachers in the ACSC worked together to share ideas and problem solve. One teacher expressed the following concern: "… sometimes I take the time to make comments on student papers on line, but then they don't take the time to go back into the document to actually read the comments that I have written." Another teacher responded by explaining how they transition across various technology platforms ("Explain Everything" and

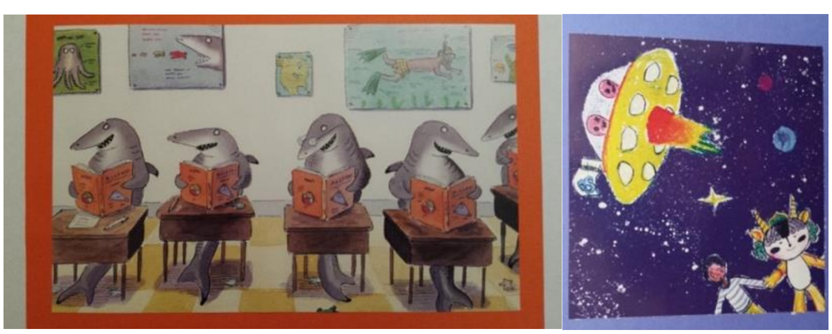
“Google Classroom”) to streamline the assessment process. In doing so, the teachers had time to generate detailed feedback in a more efficient process that is then quickly accessible to students.

Differentiated Instruction. Participants engaged in image elicitation to identify their beliefs of the past, present, and future of assessment via technology. The most common image to describe the past depicted sharks sitting in a row reading a book (see Figure 11) with one teacher who described their selection by asking, “could we be doing things differently?” When thinking about the future, the most common image represented space (see Figure 11). The future of assessment via technology was often depicted as having various opportunities to engage students, with new and emerging technologies becoming available as innovation soars. One ACSC teacher’s quote is highlighted below as an accurate portrayal of how ACSC teachers viewed the future of assessment via technology:

> Going into a black hole. Uncertain future for assessment. Endless possibilities + tech advancing. A whole new world x2. Students won't be afraid to explore. Sky is the limit. Geography does not limit learning. Finding what works and building a relationship. Propel learning to new heights. Connecting to other worlds. Inquiry-based learning: go your own way. Tech makes thinking more endless, helping kids be the best they can be rather than teaching to an assessment.

Figure 11

Image Elicitation Exemplars



In both the scenarios depicted by the images , teachers recognized assessment via technology as an enabler to meet the needs of all students in their classroom through differentiated instruction. The importance and ease of differentiated instruction was highlighted throughout the ACSC experience.

Differentiated instruction is defined as an approach to identify students' "varying background knowledge, readiness, language, preferences in learning, interests, and to react responsively" (Hall et al., 2014, p. 3). Differentiated instruction aims to maximize each student's growth through an individualized approach (Landrum & McDuffie, 2010; Levy, 2008). In the ACSC, one teacher indicated:

> Having several students in one class with modified IEPs I'm taking this opportunity to really make a concentrated effort to track their progress on the iPad. I have also had the opportunity to redesign curriculum, performance tasks and A&E [assessment and evaluation] strategies to reflect each of their unique learning needs.

Differentiation is an expected part of instruction in Ontario classrooms (Ontario Ministry of Education, 2013) with educators looking for strategies to better understanding the trajectory of learners. Teachers in the ACSC described how technology could support all leaders, one teacher stated, "this assessment […] allows me to know my [students] as readers and to individualize my instruction for each student. [Many students] are excited because they have never read so much on their own." These quotes reveal teachers celebrating success with differentiation as they see learners progressing.

Learner progression resulting from using assessment with technology for differentiation was also connected to student engagement. One teacher said, "student engagement is up and there is daily and consistent access to a customized tool [e.g., Book Creator, Google Read and

Write] that fits the needs of all diverse learners and learning styles" and another participant wrote "differentiation is still key and it is important that students know they have options on how to represent their knowledge and understanding." Student engagement often influenced learner progress by aligning instructional and assessment strategies with student needs, strengths, and goals. Differentiated instruction was an important approach for most teachers in the ACSC and was commonly discussed in conjunction with learning culture, the next sub-theme for expanded assessment practices.

Learning Culture. The use of educational technology altered the relationship between assessment and the learning culture within the classroom. According to Shepard (2019), practices need to change so that students and teachers view assessment, formative and summative practices, as a source of insight and support instead of the opportunity to reward or punish. A shift towards assessment as a lever for learning was evident when teachers described movement away from an emphasis on grading towards a culture of learning. To illustrate, one teacher explained how they promoted learning dialogues:

> No grades are used except at midterm and final in Gr 9 and 10. Conferencing enabled a shift that eliminated the faster student being 'done'. Instead of those students being done, they now get another book etc. and improve work based on feedback even if it was a level 4. Typically 3 conferences are done daily.

Similarly, another teacher identified: "No marks are provided or recorded, instead students receive feedback that identifies areas that need improvement and asks reflective questions… Previously if students were satisfied with the mark there was no incentive to improve." A realization that that learning culture and feedback work cooperatively was also noted by other teachers in the ACSC. For example, when describing an assessment practice, another teacher linked culture and feedback:

> Descriptive feedback on class work submitted, as opposed to a grade, became an important learning tool. Nearpod is a useful tool to discuss student work, especially in science. As a result of this culture of feedback and improvement, the student performed better on summative tasks.

This quote highlights the profound impact assessment practices can have on classroom culture. By offering descriptive feedback in an efficient and online manner, students were aware of the next steps in their learning and were able to make adjustments for their next assignment.

Learning culture extended beyond the inclusion or exclusion of grades, teachers were also articulating how assessing with educational technology altered their view of assessment. One teacher described a ‘eureka’ moment:

> While my focus on posting on this site has come and gone, my reflection on assessment has been at an all-time high in the past few months…Ultimately, I am realizing that assessment in everything. 16 years ago when I started teaching, I thought I was doing a good job because I had fun lessons. Kids liked school. They were having fun learning. When I reflect, however, I had no evidence that they were actually learning. And, more importantly, the students who struggled the most and needed my most support in assessment probably didn’t actually learn as much as I would have liked. My view points on what is ENGAGEMENT have changed.

The learning culture is not simply directed at the students; everyone in education can be included, and this idea is highlighted in this ‘eureka’ moment. This teacher, and others, noted that the ACSC community heightened their awareness about assessment practices with educational technology specifically, but also made references to their growing awareness of the profundity of assessment more generally.

The inclusion of technology challenged teachers to change the way in which they perceived and applied assessment via technology in their classroom which altered the learning culture. Teachers were challenged to incorporate assessments that merged higher-order thinking questions with critical thinking opportunities; they expanded their assessment practices to include questions that couldn't, as one teacher explained, "just be googled." As a result, an increase in tasks that involved real-world and authentic applications were being integrated. One teacher noted they were "rethinking [their] assessment practices, making them more authentic to real problems that would engage the students" and another expressed the desire to "create rich assessment tasks" because they "know where to start and who to ask for help." Teachers also began to realize that technology was an educational tool that went beyond merely a "flashy" reward for students, technology could be used to make "assessments meaningful, relatable, and authentic." Improving the way in which teachers approached classroom assessment via technology benefited students by increasing their motivation to learn, engagement with curricular content, and agency within the classroom.

The influence of learning was noted throughout the comments of ACSC teachers who developed goals focused on areas of personal growth and desire to improve student learning. For instance, at the end of the ACSC experience, teachers developed poems based on prompts (e.g., three words that best describe my assessment practices with the iPads are…, now that we've travelled the 8 weeks, the most valuable thing for me was…, one wish I still have is) and provide their creation with a descriptive title. The teachers recognized a continuum of ongoing learning through the names their poems, including "Always Learning," "Work in Progress," and "Still

Learning + Growing." In addition, teachers developed goals with the desire to improve student learning by expanding their assessment practices within the classroom. For example, one teacher described a "shift from assessing only specific expectations towards assessing overall expectations" and another reflected on the experience by stating: "We [the staff in the department] were happy with the results and this [ACSC] has provided us with the confidence to move forward in finding other ways to change our assessment practices." The shift ACSC teachers described provides insight into how their assessment practices have been expanded upon by using technology. Next, I discuss next how professional development was influenced through assessment via technology.

Seeking Professional Development

Teachers used educational technology to support the evolution of their classroom assessment conceptualizations and practices by joining the ACSC as a professional development opportunity. In this data, seeking professional development was coded 125 times and included the following codes: teacher self-reflection (41), learning curve (15), extensions beyond current practice (27), future PD engagement (34), and motivation (8). In the ACSC, teachers were asked to develop a goal related to their desired professional development in assessment with technology. Goals teachers established included wanting to learn "more about student conferencing", "strategies for effective feedback," "piloting transformative practices," increasing the use of "student self-assessment" and increasing "confidence" as an educator. Across all ACSC participant responses, teachers most often alluded to promoting and empowering student learning, and improving one's own teaching practice to build confidence.

Later, when asked to reflect on their goal and consider how their assessment thinking has grown, one teacher described a thirst for knowledge, desire for community, and accessible forms of professional learning which typifies comments.

> As part of this inquiry I decided to pose a questions to a wonderful Twitter group that I belong to. Every morning starting at 530 AM a group uses #BFC530 to answer a different question. Mine finally came up in the rotation. I had asked what digital assessment methods did other educators use? The answers were very helpful and span using Google to Kahoot to Padlet and PingPong…etc. Lots of good advice was shared. I highly recommend joining a Twitter group and following a hashtag – I can't believe the amount of incredible and free PD I have opened myself up to!

The ACSC teacher above was first sharing their excitement for learning, and how inquiry in the form of questioning can nourish passion. In addition, engaging in professional learning and sharing that learning validated the tools teachers in the group were already experimenting with. By connecting professional learning to prior knowledge of the ACSC group, the post demonstrates a cycle of professional development that can be ongoing and support pedagogical shifts.

There were intentional efforts by the external inquiry team to build a community by using a blended model where participants first met in-person to develop relationships before shifting to an online space. The efforts were well received by participants because they "felt a real sense of community with everyone" and explained "it was REALLY important to see and talk with colleagues at the beginning and end of the project." In an online survey, ACSC teachers were asked if the community was a useful space for professional collaboration and 91% of respondents indicated they agreed (n=23) or strongly agreed (n=7) with the statement. The online environment provided teachers with the opportunity to join the discussion and offer input at flexible timepoints throughout the experience in alignment with their schedule. In addition, teachers were asked if they would engage in a similar online community in the future to promote professional learning, and 88% (n=30) responded yes. Technology can be seen as a mode for learning and while online learning may not be the preference for some, it opens the possibility for everyone to engage in ongoing professional learning opportunities. Participants offered the following reflections on the ACSC experience:

- "The online aspect presented discussion points and the meetings allowed us to elaborate on discussion points."
- "I would jump at the chance to continue my learning and I would encourage colleagues to join."
- I believe that all professional development opportunities are valuable, as we can always learn something new from other teachers!"

The three quotes highlight the enthusiasm teachers in the ACSC had for professional development opportunities. It is evident learning arose from the ACSC and as a result, teachers are motivated and willing to engage in a similar opportunity whilst expressing the desire to invite their colleagues to join as well.

For those who responded no to engaging in a similar community (n=4), reasons included preferring "face to face" experiences and others felt it was "difficult to keep up with the rigours of teaching everyday." The vast demands in teaching are well documented (Loewenberg & Forzani, 2009), but most teachers used the ACSC space to complement these demands by collaboratively engaging and deepening their understanding of assessment purposes, practices, and strategies. For example, participants shared their effective and ineffective approaches integrating assessment, and often completed their posts by inviting suggestions from other teachers. Examples of questions posed included, “what have you tried that works?” and “has anyone else faced this dilemma?” The suggestions, questions, and resource exchange showed a lively group where teachers could connect and develop their professional understandings. The ACSC formed a network for these participants where sharing and seeking out additional resources and links enhanced one another’s assessment via educational technology.

Developing Core Competencies for 21st Century Learners

The final theme related to the first research question about reconceptualizing classroom assessment via technology is the development of students’ core competencies. One of the initial aims of the implementation of educational technology into the district was a way to further 21st century competencies. In fact, the program statement said: “Schools of today are beginning to recognize the need for innovation, change, and the incorporation of technology into pedagogical practices, in order to best meet the needs of 21st century students” (Searle et al., 2015). In the strategic plan, the district outlined a direct focus on five of the student competencies:

> The…plan focuses on ensuring that students gain competency in the following areas: collaboration, communication, creativity, critical thinking, and problem solving. These competencies have been identified as critical when preparing students for life after school. They are competencies that have been identified as required for participation in a global economy. Further, AMDSB recognizes that student learning and engagement is fostered when teacher knowledge and pedagogy is integrated with meaningful forms of technology (Searle et al., 2015, p. 2).

The development of student competencies was not a motivator or specific goal of the ACSC, but based on the strategic plan and program statement, it is not surprising competencies were highlighted in the data. Developing core competencies for 21st century learners was coded 118 times, with the following codes: critical thinking (12), creativity (17), collaboration (29), communication (21), information literacy (4), technology literacy (9), leadership (15), and social skills (11). Although there are twelve core competencies established in some of the 21st century literature (e.g., Stauffer, 2020), eight competencies were explicitly described by teachers in the ACSC. Teachers in this study referenced these competencies while describing assessment practices or strategies they used in the classroom via technology, although one teacher explicitly mentioned the need to "embrace change and teaching towards the new literacies of 21century" more generally. These competencies which were identified in the data and are selectively portrayed in Table 8 are garnering increasing attention in the classroom (Child & Saw, 2015) because they can be purposefully integrated within core content areas to allow students to find relevancy in their work and offer benefits for students upon entering the workforce (Ananiadou & Claro, 2009).

Table 8

Stauffer's (2020) Core Competencies Reflected in the ACSC Data

Core Competency	Description	Exemplary Quote
Critical thinking	Finding solutions to problems.	*"One celebration would be having the student's code on the iPads using Lego Mindstorms. This particular skill has transferred into all learning subject via critical thinking, problem-solving, perseverance and collaboration."*
Creativity	Thinking outside the box.	*"Using this app allowed students to be creative, show their learning visually and orally. So that is a celebration!"*
Collaboration	Working with others.	*"Students use the app Explain everything to collaborate and create short tutorials of assigned or chosen topics. The best way to learn is to teach someone, in this scenario students teach their classmates."*

Communication	Talking to others.	*“Schoology App used to promote student accountability (with teacher and parents), responsibility, and communication…”*
Information literacy	Understanding facts, figures, statistics, and data.	*“There is a need to teach students how to appropriately decipher and critically analyze information from the internet.”*
Technology literacy	Understanding the machines that make the Information Age possible.	*“Teaching kids how to use accessibility features [of the devices] has been a real game changer for many students.”*
Leadership	Motivating a team to accomplish a goal.	*“They are also becoming great leaders both with each other in class and with other classes.”*
Social skills	Meeting and networking with others for mutual benefit.	*“The iPad does not help students learn important social skills such as face to face conversation and social cues.”*

The information in Table 8 was developed based on the findings of the data analysis which highlighted the core competencies as one-way teachers supported their reconceptualization of assessment through expanded assessment practices. Findings from the ACSC data show that teachers often incorporated assessment tasks that allowed students to develop many of these core competencies. By developing the core competencies, teachers noted an increase in student motivation and student engagement, and enhanced student learning were enhanced.

Teachers frequently mentioned the purpose of the assessment or task related to these skills, including “critical thinking, problem-solving, perseverance…collaboration,” and “creativity.” Data showed that teachers were focusing on internet safety and used the technology to teach information literacy and digital literacy skills. One teacher noted “a need to teach students how to appropriately decipher and critically analyze information from the internet and encourage them to do more than cut and paste.” Due to the accessibility of the internet and how easy false information can spread, before teachers could use the devices for assessment purposes, it was important to teach students how to identify misinformation and summarize good sources.

However, once teachers taught these key competencies, students could explore content with a sensible and knowledable attitude and the activity and assignment options were nearly endless.

Teachers also used the devices as a way for students to "becom[e] great leaders both with each other in class and with other classes." By providing leadership opportunities to students, many of the other core competencies were highlighted, including collaboration, social skills, and communication. The student leadership opportunities also allowed students to develop skills that they could carry throughout their post-secondary educational experiences and beyond into adulthood. By promoting the development of 21st century competencies through assessment with technology, teachers created opportunities for students to develop skills to engage in meaningful tasks.

Summary of Research Question One

In summation, the first research question examined leveraging classroom assessment via educational technology. Teachers supported their reconceptualization of assessment through expanded assessment practices by providing students with choice, meaningful feedback, opportunities for differentiated instruction, and emphasizing a culture of learning. By integrating assessment via technology, devices were no longer seen as free time activities, rather they were perceived as powerful educational tools by both teachers and students. ACSC teachers were able to become more efficient in their assessment processes and students could explore and demonstrate their learning process through products. The devices were also used to seek out professional development opportunities based on their personal reflection for future areas of growth and interest. Finally, teachers used the devices to develop student core competencies for 21^{st} century learners demonstrating how assessment can be enriched via technology. In sum, my findings show that assessment via technology has the power to enrich classroom assessment practices and pedagogy.

Research Question Two: Teachers' Assessment Identity

The second research question asked what can be understood about teacher assessment identity as teachers engage in a professional community to implement assessment via technology. To respond to this question, I share insights gained from my deductive analysis using the five dimensions of the teachers' assessment identity framework (Looney et al., 2018) while also allowing for emergent codes to arise. The five dimensions include *I know, I feel, I believe, I am confident,* and *my role.* The findings bring to life dimensions of assessment identity in the ACSC teachers, and an emerging code surfaced to encompass the influence learning can have on a teachers' continuously evolving assessment identity. Although the teachers were analyzed as one case, most ACSC participants had some representation across all the dimensions. Each of the dimensions is explored following the overview offered in Table 9. All frequency counts are provided in parenthesis beside each code.

Table 9

Overview of Teachers' Assessment Identity Framework (Looney et al., 2018)

Deductive Codes	Codes	Description/Applied When:	Illustrative Quotes from ACSC Members
I know	Purposes of assessment (28) Assessment strategies (19) Triangulation of data (12) Impact of assessment (3)	Described their knowledge and understanding of assessment, the impact of assessment, and the use of assessment. Explained a reason for using technology to assess students based on concepts of assessment.	*"Assessing with descriptive feedback allows a greater focus on what learning needs improvement."*

I feel	Overwhelmed (15) Frustrated (8) Courage (19) Challenges (34) Successful integration (28) Struggle (5)	Described their feelings toward assessment through the use of educational technology, positive and negative feedings.	*"It can be so overwhelming with all the apps mentioned in the education world and not knowing where to start."*
I believe	Style of assessment (e.g., individualized, traditional) (7) Learning culture (12) Student involvement (15) Purposeful (9)	Described their beliefs toward assessments that are informed by personal and professional experiences.	*"As science teachers we are accustomed to assessing in very traditional ways, as we were in our own schooling."*
I am confident	Confident (17) Comfortable (10) Efficient (10) Validation (5)	Described a confidence with assessment via educational technology. Described a situation in which they felt in control of their practice.	*"I take great pride in my conferences and individualized approach."*
My role	Digital literacy (5) Technological literacy (9) Student relevance (13) Facilitator (32) Teacher-as-student (14)	Described a role in which the teacher performed aside from being an assessor.	*"Be more open to trying and maybe not having things work out exactly as planned......to let the students teach me."*
*I learn**	Reflection (47) Collaboration (62) Ongoing professional learning (59) Connection to future practice (30)	Described an interest to improve an aspect of their assessment pedagogy. Reflected on successful and unsuccessful ways of using assessment via technology. Explained how collaboration led to an improvement of assessment practice related to technology. Described the way in which assessment was being altered in the classroom because of something they learned.	*"I have been introduced to new app and new ways of thinking about the iPads that I will take with me as I move forward."* *"I love connecting all over the world with others and think it is valuable to share and learn from other educators best practice."*

**I learn is an emerging code that resulted from the deductive analysis.*

I know

The *I know* dimension of Looney et al. (2018) described the knowledge and understanding of assessment practices, theories, analysis, and implementation. *I know* was coded 62 times using the following sub-codes: purposes of assessment (e.g., formative, summative), assessment strategies (e.g., test, quiz), triangulation of data, impact of assessment, use of assessment, and classroom assessment strategies (e.g., feedback, scaffolding). In the data, *I know* was coded when teachers used assessment terminology to describe their assessment practice with educational technology. For example, the purposes of assessment, formative and summative, were referenced by some teachers and these references depict their knowledge around current assessment practices advocated in our provincial assessment guidelines (Ontario Ministry of Education [OME], 2010). One teacher noted the advantages of using Nearpod for math because it is "a resource for formatively assessing student comprehension and holding students accountable…" Another teacher described providing "due dates for all summative work in an attempt to provide more formative feedback that promotes self-assessment." The terms formative and summative did not appear often, but teachers did portray their knowledge and understanding of classroom assessment purposes while describing the impact or use of technology for assessment or when explaining a reason for using the tool or resource chosen.

The specific strategies of assessments teachers were incorporating into the classroom were frequently described. Examples include quizzes, tests, videos, essays, drama presentation, musical performances, creation of books, and interviews. One teacher not only described the type of assessment being used (a test), but a process for classroom assessment strategies (e.g., feedback, self-assessment, correction) to enhance the learning outcome for their students.

> Today I gave my grade 9's a practice test. They were given 20 multiple choice questions as part of the practice test. They completed the multiple choice using pen and paper (a bubble grid from the app zipgrade), and when they were finished I scanned their bubble grid. In the app you make an answer key and then you scan the bubble grid handout and it automatically shows the student what questions they got incorrect. So I highlighted on their paper copy which questions they got wrong and they went back to work to figure out the corrections. This app saves me time as well as giving immediate formative feedback. I will use this app again tomorrow when they have their real test, so it will be summative feedback. They will complete 20 multiple choice questions on their bubble grid, bring it up to see how they have done, I will tell them what they have wrong and then they get one chance to fix their mistakes. My students liked the fact that they get immediate results and that I am giving them multiple chances to be successful.

This example illustrates the role of feedback and utilization of iterative assessment practices with technology. Further, this example aligns with other feedback from the ACSC where feedback was prioritized by participants as a meaningful facilitator of student learning.

In addition, teachers were describing their knowledge and understanding of assessment with direct alignment to the fundamental principles of Growing Success, Ontario’s guide to classroom assessment (OME, 2010). These principles are based on the Principles for Fair Student Assessment Practices for Education in Canada (Joint Advisory Committee, Centre for Research in Applied Measurement and Evaluation) and depict practices central to assessment, evaluation, and reporting policies and practices (OME, 2010). Teachers described “accessible” assessment for all students, offered “many opportunities” for students to “represent their knowledge and understanding,” “focused on the overall expectations versus the specific expectations," met the "needs of all diverse learners and learning styles," offered "ongoing" and "written feedback," and provided "self-assessment" opportunities to enable students to "work on their next steps." Many teachers described the knowledge and understanding of these principles which demonstrates a level of assessment literacy.

I feel

I feel was coded 109 times using the following sub-codes: overwhelmed, frustrated, courage, challenges, successful integration, patience, and honesty. *I feel* related to affective aspects of assessment identity, including how a teacher feels toward and about assessment. In the data, *I feel* was coded when teachers described their feelings toward assessment, positive and negative, while using educational technology. The successful and challenging experiences of using the technology for assessment purposes were evident through *I feel* because teachers often described situations in which the inclusion of technology for assessment purposes went well or could have been improved upon. Teachers often felt a wide range of emotions; teachers were excited, overwhelmed, frustrated, patient, attentive, defeated, energized, and disconnected, many of which occurring alongside one another.

Participants in the ACSC recognized the value of using technology to enhance and evolve classroom assessment practices. The technology enabled teachers to "differentiate," "enhance the learning in the classroom," students "collaborating on tasks," fostering independent learners by enabling the option to "google knowledge," "blogging weekly updates" to share classroom activities, and incorporating "current and relevant resources" for students to explore and utilize. In other words, there were many assessment possibilities that provided opportunities for expanding teacher practice and enriching student learning.

Many teachers enter the field because they enjoy learning and have a desire to share this passion (e.g., Serin, 2017). When engaging in inquiry, having the opportunity connect with other professionals and try new pedagogical practices may be essential for some teachers to nourish or sustain positive feelings about teaching. When examining the role of technology in the classroom, a teacher acknowledged that while “the iPads increase engagement, good teaching practices and variety are necessary to avoid boredom or a lack of interest.” Many teachers identified similar requirements for successful integration of technology for classroom assessment practices but recognized that they feel there is “never enough time” to effectively learn how to use technology. For example, when describing a challenge experienced one teacher “found it more time-consuming to download student work to mark than opening a folder of papers."

A different perspective of the joy related to engaging in inquiry and learning new things can be seen in darker feelings articulated in the ACSC. These darker feelings can be a barrier to teachers’ willingness to take on learning new processes and practices. Teachers expressed their frustration and feelings of being overwhelmed and exhausted from the time needed to explore and learn the new technology. One participant noted: “it can be so overwhelming with all the apps mentioned in the education world and not knowing where to start.” You may want to connect here to the fact that choices are awesome but can overwhelm both student and teachers when it comes to learning.

The plethora of choices was also posed a challenge because the technology enabled open access to information for students and made summative assessment more difficult. One ACSC participant described this challenge when explaining the implementation of an online exam: “I’m having difficulty coming up with questions that are rich enough that they can’t simply be ‘Googled.’” Nevertheless, by the end of the ACSC, participants felt a “boost in confidence” and were excited to continue learning about how to expand their assessment practices through other professional development opportunities.

I feel also referred to struggles teachers identified with the functionality of the technology. Although this aspect is not related directly to assessment, the challenges teachers faced with technology functionality directly impacted their ability to use the technology to expand their assessment practices. In response to a request part way through the ACSC, teachers were asked to upload an assessment instrument or description of an assessment practice to evaluate student learning. The response made by one participant offered a description of how the majority of ACSC teachers felt throughout the experience, "summative assessment takes enormous patience." This patience stems from the technology challenges they were facing:

> Anytime using the iPads, there is at least one student who runs into problems no matter what (ex. Can't login, forgets password, wife intermittent, wifi not strong enough, iPad is not charges, iPad is in for repair, app is glitchy, file is too large, printer not working, iPad not here at school, didn't receive work from student since they used incorrect email to share it. I have also had moments where I have held back the opportunity of summative assessments on the iPad due to connection problems…

These technological glitches, happening in the classroom during teaching and assessment led to frustrated teachers and students, and resulted in the necessity to be "very flexible very quickly." Despite the technological challenges, teachers and students worked together to discover solutions.

I believe

This dimension of Looney et al. (2018) described the beliefs a teacher has toward assessment that are informed by personal and professional experiences. In the data, *I believe* was coded when teachers described a personal or professional experience that influenced their attitudes and beliefs about classroom assessment. *I believe* was coded 43 times with the following sub-codes: style of assessment (e.g., individualized, traditional), learning culture, student involvement, and purposeful.

In comparison to the other dimensions, *I believe* was not as prominent, but some teachers described how their previous educational experience influenced their current assessment practices. One teacher described: "We struggled to think of ways to assess knowledge of science facts, terms and concepts using iPads and an open network. As science teachers we are accustomed to assessing in very traditional ways, as we were in our own schooling." However, the technology prompted the space for teachers to work beyond usual processes by collaborating on a new activity that integrated emerging forms of assessment. The same teacher exemplified this evolution by explaining:

> We took advantage of this opportunity to discuss what skills were really important for our students and how could we assess these skills in an open-network environment. I think the staff in our department did a great job of creating a final assessment that involved solving a major environmental problem and using their skills and knowledge of the content from one of the units studied. The task forced us to be more creative and to produce more authentic, real-world problems for our students to solve.

Additional teachers also described "old school formative assessment method[s]" and reflected upon their classroom assessment practices. Some teachers specifically described their current assessment and teaching philosophy as "personalized," "ongoing," and "purposeful" to promote and encourage student success. These beliefs were also evident in the ACSC stage three assessment survey where 90% of respondents strongly agreed (n=12) or agreed (n=23) with a statement that indicated the encouragement of students to use multi-modal means of demonstrating their learning. However, during the concluding face-to-face session (also stage 3), one table group noted “in some areas the iPads are used more in formative assessment and teachers are falling back to traditional ways for summative assessment.” These differed beliefs are to be expected in a group of teachers and the variability of professional feeling and experiences highlights the importance of ongoing professional learning.

I am confident

I am confident, the fourth dimension described in Looney et al.’s (2018) framework refers to the degree to which teachers feel in control of their practice. *I am confident* was coded the 39 times with the following sub-codes: confident, comfortable, efficient, and validation. This was coded when teachers described confidence with assessment via educational technology or described a situation in which they were validated by efficient or successful assessment practices. *I am confident* was coded the least out of all the remaining dimensions, likely because the purpose of the ACSC was to engage in a collaborative learning environment to learn about how to integrate assessment with technology, a new context for many educators.

In the stage 1 survey, teachers expressed a lack of confidence with technology, identifying the need to “go slow,” “be patient with me,” and requesting the external inquiry team to “be available for support or questions.” However, during the online discussion forum engagement, teachers also learned from one another, adopted strategies, borrowed activities, and shared their successful technological assessments. By the final week, teachers were “loving it,” found the integration “easier,” were taking “great pride in” their assessment practices, and no longer felt overwhelmed because they knew “where to start and who to ask for help.” Confidence as an educator can be influenced by professional experiences (e.g., Baxter et al., 2014); engaging in the ACSC allowed educators to develop comfort and confidence with using technology for assessment purposes.

My role

My role seeks to capture the complex positions teachers balance when assessing their students (Looney et al., 2018). These complex positions stem from research on formative assessment by Pryor and Croussourd (2010) and Eccelstone and Pryor (2003). Conclusions depict that students construct a learner identity through interactions with teachers and each other, which can lead to teacher identity tensions, increased demands, and a recognition of students engaging with the dimensions of learning (Eccelstone & Pryor, 2003; Looney et al., 2018; Pryor & Croussouard, 2010). *My role* was coded the 73 times with the following sub-codes: digital literacy, technological literacy, student relevance, facilitator, teacher-as-student. This code was applied when participants described a role in which they were portraying or engaging in aside from being an assessor. *My role* will be discussed using two broad themes: facilitator of student learning and technology coach.

The primary role and purpose of any teacher in the classroom, is to help learners learn, inquire, problem-solve, and self-regulate their emotions and behaviours (Withall, 1975). The role of teachers has shifted from a lecturer to a facilitator who encompasses someone who provides resources, monitors progress, and encourages students to use problem solving and critical thinking skills (Corey, 2019). In order to do so, teachers provide the necessary scaffolding and teaching of skills while offering support and advice when needed.

The role of a facilitator of student learning emerged frequently when analyzing the data. Teachers were facilitating when they were modelling a new concept, approach, or process for students to observe and engage with before beginning self-directed learning. Teacher modelling was mentioned when participants were describing an assessment instrument or a description of an assessment practice that has been used or will be used to promote student learning. One teacher mentioned they "model the process with the Plains of Abraham (research, jot notes, organizing, summarizing, finding big ideas, etc.)" and another "model[s] for everyone and then they [students] use what they need." In addition to modelling, teachers provided students with resources to facilitate independent learning and problem-solving skills. During a student-inquiry assessment, students "travelled from station to station" where the teacher "prepared videos [and] provided verbal instructions" for students to use as a model when developing their own video. Students "filmed their products and recorded audio to explain their thinking at each station."

To facilitate learning, teachers also used the scaffolding method (Wood et., 1976). Scaffolding assignments is a method in which a teacher breaks the learning into chunks to offer explicit support and guidance to assist a learner with a difficult or large task (Alber, 2011; Kazak et al., 2015). One teacher described their use of the bingo card to scaffold a reading activity: "This assessment […] allows me to know my [students] as readers and to individualize my instruction for each student. [Many students are] excited because they have never read so much on their own." The most popular way of scaffolding, however, was providing opportunities for students to self-monitor, self-correct, and self-assess. Teachers achieved this by asking students to record themselves when completing an activity or assignment for the purpose of revisiting later. For example, as explained in the quote below, one teacher used video as a way for students to self-identify growth.

> As part of a final organic chemistry unit test an Explain Everything component was added. Every student was given a different organic molecule and told they had to teach this to someone else including various aspects. This outline is easy to transfer to other

subjects and assignments. Hearing the students thought process through the problem enables the teacher to better understand why a student did what they did. As students work through the problem, they often catch their own mistakes when listening to themselves explain and correct their mistake. Students are encouraged to keep the full footage and not edit out errors.

Other teachers noted similar techniques to help students learn how to “self-assess and become more self-aware.” This was evident when a teacher used “video assessments of a specific type of layup in phys-ed.” Students reviewed the videos to self-assess and “prioritize components they need to work on for next steps.” Another teacher used video assessments to “record instrumental performances for self-assessment and self-evaluation.” Videoing offered a record of student learning that could be repurposed for self and teacher-assessment practices.

During the initial distribution of devices to the teachers in the school district (see Research Context), teachers received assistance from teacher technology coaches. The teacher technology coaches were available to teachers during specific periods of the day on selected days in each school to offer assistance, support, and witness the devices in action. While the district, coaches and many teachers identified that the use of technology in education was new for many teachers; using technology related to teaching and learning was also new for many students. Teachers had to “overcome the myth that students are proficient at all these neat apps/formats and are itching to use a variety of them if we give them choice.” Teachers themselves were becoming a technology coach to provide troubleshooting and internet safety to students in the classroom.

When using the devices for classroom activities and assessments, teachers frequently came across challenges with the technology that required them to assume the role of technical support and motivators. In some circumstances, students were not eager to use the technology and there was a spectrum of ability, as well as skill, where some students “required more coaching than others in the use of the app[s].” These technology implementation challenges led to deviating beyond specified content curriculum because of the need to first instruct in the “effective use of each [application]” and disruptions during class due to the technology mishaps. Despite these challenges, “in many cases, [students] exceeded…expectations” and teachers felt more confident in their ability to assume the role of a technology coach.

Internet safety was frequently mentioned as an aspect that required participants to teach their students on the effective use of technology. Teachers noted frustrations with “students who need to be reminded about appropriate use of the iPAd and/or their phone” and the need to educate students on the life-long impacts of social media. For example, one teacher explained that “internet safety is an important skill that students need to be taught, a post takes a few second to send but lasts a lifetime on the internet.” Another teacher described that there was also “a need to teach students how to appropriately decipher and critically analyze information from the internet and encourage them to do more than cut and paste.” Participants noted that using the internet for learning purposes is novel to students, specifically in junior and intermediate classrooms. Participants were obligated to share the consequences of the internet while facilitating learning about identifying appropriate resources to use for gathering content information and world-wide news.

I learn

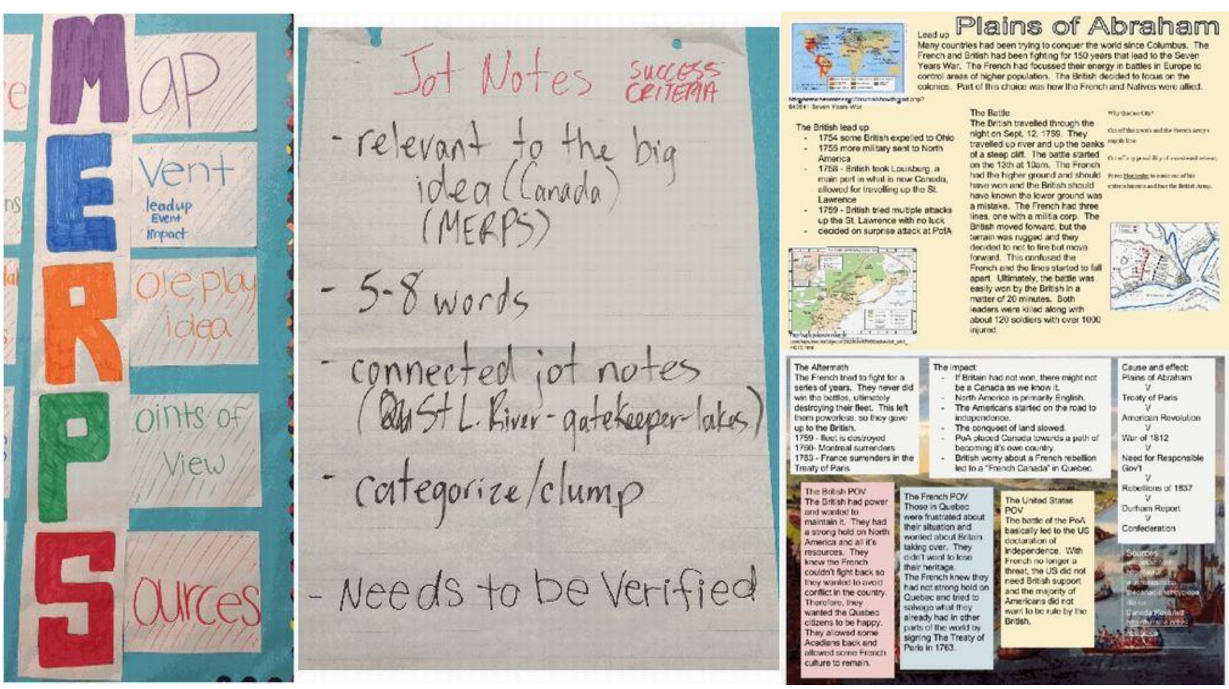
I learn is an emergent code that arose as a result of the deductive analysis. *I learn* was coded 198 times with the following sub-codes: reflection, collaboration, ongoing professional learning, and connection to future practice. The *I learn* emergent code was applied when teachers described an interest to improve an aspect of their assessment pedagogy through reflective practice, collaboration, or ongoing professional learning.

Participants reflected upon their successful and unsuccessful ways of enacting assessment via technology during the duration of the ACSC. Teachers in the ACSC expressed reflection at an “all-time high” while engaging in the collaborative learning community related to assessment and technology. Participants had “time to reflect on practices, consider where to go next and how to do it [next]” while “going with the flow” and taking the opportunity to “sit back and reflect.”

The ACSC teachers were also learning through community and collaboration with one another. In response to discussion posts and final reflections at the end of the ACSC, participants expressed gratitude for the opportunity to collaborate and articulate growth in their assessment knowledge and practice. For example, one teacher offered an example of a MERPS history assessment they use and model to promote student inquiry (Figure 12).

Figure 12

Elementary Summative Assessment Exemplars



In response, a teacher wrote: “Wow! This is exactly what I was looking for my history classes. As I teach these classes on rotary, I find it limits my ability to integrate other subjects, so I plan to modify the template and use parts of it.” Another response noted: “Thanks for sharing this. I find I try to have some balance between full-inquiry and other methods of accessing curriculum so as to attempt to engage everyone.” The process of sharing and gathering assessment practices provided teachers with a toolkit of resources to implement and assess with in their future classroom.

The opportunity to collaborate and engage in collective professional learning was beneficial, especially for those who felt secluded from colleagues. When teachers were sharing successes and challenges of incorporating assessment via educational technology, one teacher expressed gratitude: “This has been a good thread to read to know that many others see exactly the same or similar things. I think it helps to take away some of the isolation, guilt and frustrations that I sometimes feel.” During the final wrap-up session, ACSC teachers were asked to write down the most valuable part of the experience – one quote was selective that highlights the majority of responses: “chatting, engaging, and sharing with other educators.” Collaboration is an important aspect of education, but it ceases to exist without a supportive and trusting learning environment.

I learn also identified ongoing professional learning commitments the ACSC participants articulated in their instructional and assessment practices. In addition to the desire to “take part in another PD opportunity like this,” participants described new goals for learning “moving forward” and explained assessment strategies they want to investigate “next” with the technology. Another teacher joined a Twitter group for “free PD”, and one described how they were going to make use of the “targeted PD articles posted by the [external inquiry] team.”

Engaging in professional learning, reflection, and collaboration was mentioned on its own, but also in conjunction with other dimensions of the Looney et al. (2018) teachers' assessment identity framework. To determine the magnitude and frequency of the new dimension, a co-occurrence analysis was conducted.

Co-Occurrence Analysis

A co-occurrence analysis involves counting the paired data within a collection unit (Buzydlowski et al., 2002). To identify the relationship between the dimensions of teacher assessment identity, a co-occurrence analysis was completed to determine the frequency of codes commonly coded together. Although the co-occurrence analysis highlights the connection among many of the dimensions, I focus on the emergent *I learn* code in relation to the five dimensions proposed by Looney et al. (2018). The co-occurrence analysis highlights the interrelationship *I learn* has on the original five dimensions proposed by Looney et al. (2018) (see Table 10). The frequencies do not match the original *I learn* frequency number (198) because certain pieces of the data were coded by multiple dimensions.

Table 10

Co-Occurrence Frequency Count

	I know	I feel	I believe	I am confident	My role	*I learn**
I know	18	2	19	21	8	24
I feel		27	15	34	11	82
I believe			6	27	19	39
I am confident				10	15	24
My role					31	17
*I learn**						46

**Code that emerged because of the deductive analysis.*

As seen in Table 10, *I learn* was most frequently coded with *I feel* (82). Participants expressed desire to learn about assessment while expressing their feelings towards assessment in the classroom. An example of learning and feeling was depicted during the concluding face-to-face session when teachers described their feelings toward assessment and the transformation they encountered through a poetic activity:

There is an early stage
to take a leap of faith
which creates tension
We develop an evolving
view
by deconstructing old notions
back and forth
go at assessment with more intentionality
growing, changing, evolving
is turbulent, rocky,
and inconsistent.

The poetic rendering offers an overview of how teachers felt at the beginning of the ACSC and throughout the experience. Teachers demonstrated their readiness to learn about new assessment practices, recognized the tensions that arose, but also acknowledged the complex feelings associated with making these changes.

In the discussion forum, towards the end of the ACSC teachers reflected on their initial goal; one participant noted the technological applications:

> All have features that [they] like for different purposes…Baiboard because [students] can collaborate and have more than one page to share on…Quizziz because it allows students to work at their own pace verses Kahoot, and Showbie is a nice way to collect and organize student work.

The teacher continued to discuss the influence these applications had on student engagement in the assessment process and expressed a desire to continue learning: "Next, I plan on investigating student portfolios using sesame hq." The teacher initially described their feelings toward the use of assessment via technology, but followed-up with a new technological tool they heard about and hoped to explore in the future. In addition to *I feel, I learn* was also frequently coded with *I believe.*

I learn and *I believe* were represented together 39 times. When *I learn* and *I believe* were coded together, teachers were expressing the ways in which their beliefs shifted because of the learning in the ACSC. One group wrote the following poetic expert that expressed the shift in beliefs toward assessment via technology:

A move towards a
strong core
practice.
out of the chaos
emerges an
assessment practice
that is
reciprocal
co-created
accessible
inclusive
and open.

As the ACSC unfolded, teachers described a change in their assessment practice due to learning about a new topic through collaboration, integration of new assessments within the classroom, and reflection. Participants described the rethinking of assessment practices to make "them more authentic to real problems that would engage the students." Educators began to use the technology to "try to get away from pen and paper test[s]" and "try… new things to enhance…teaching and assessment practices." Beliefs frequently mentioned revolved around a shift in traditional education to progressive education, which was also a theme noticed in research question one.

Another visible overlap occurred when *I learn* was coded separately with *I know* and *I am confident* 24 times each. For instance, *I learn* and *I know* were coded together when teachers expressed new knowledge gained from the ACSC learning experience. For example, one teacher highlighted the impact assessment via technology had on student accountability in their classroom and the importance of gathering frequent assessment data because of the learning that occurred in the ACSC:

> Student accountability on a day-to-day basis is much higher, because I'm frequently gathering data from everyone - and this is the key change that is enabled by the iPads - before I could only gather data from everyone once or twice, or gather it frequently, but from a small group -the iPads streamline the process of gathering, examining, and responding to the information I get about what students know, and what they need.

As teaching pedagogy shifts, for example, through the incorporation of technology, it is important for educators to engage in meaningful learning experiences to expand upon their knowledge of assessment practices.

I learn and *I am confident* were coded when the learning, knowledge, and experiences teachers gained from the ACSC impacted their confidence using assessment via technology. Teachers demonstrated confidence with “using [devices] for learning” and incorporated an increased “use of technology [that] is more efficient." While confidence increased throughout the ACSC for most teachers, they still craved additional learning opportunities to continue their exploration:

> My confidence has improved with using technology and I have seen the students engagement and skills improve immensely…Looking to the future I am finding that I know which apps work for me to make my teaching easier and to get the knowledge from

> my students. When planning, I try to offer variety for the students and choice. This is what has allowed students to be engaged and as a result, the output is much greater. Finding deep, rich tasks is the area of need for me, so this is where I want to go next with my teaching.

There is a clear connection between increased confidence because of a professional development experience that resulted in recognized areas of growth and additional learning opportunities.

Finally, *I learn* was coded with *my role* 17 times, which is the fewest co-occurrences in comparison to the remaining dimensions. *My role* was coded with *I learn* when ACSC teachers were engaging in dialogue with other participants, expressing a role other than being an assessor while also reflecting, collaborating, or questioning their practice. Teachers were very aware with the time they spent “developing resources” and expressed the desire to improve their practice by becoming more efficient and effective. For example, one participant stated, “I want them [the assessments] to be somewhat generic so I can use them in multiple courses and grade levels.” Participants asked questions that expressed the spirit of *I learn* while also exemplifying their role as a facilitator of student learning and occupying space as a learner themselves. Teachers often wondered how they could continue the collaboration “to investigate and share” and noted they wanted additional time to “figure it out.” Teachers were focused on their role as an assessor with assessment via technology which may be why this co-occurrence was infrequent.

The co-occurrence analysis also highlighted *I learn* as an independent dimension that was sometimes coded by itself. In these instances, teachers were explaining the desire to continue learning or improving an aspect of their assessment practices. Teachers mentioned they “still had work to do with regards to…using feedback” and expressed an interest to “check out [the assessment] resources” at a later date. Participants recognized change in their classroom, but was not certain about the way in which to approach the changes: “I know that I will structure things differently next year but need to figure out how.” *I learn* influences the feelings, beliefs, confidence, role, and knowledge an educator has toward assessment.

Summary of Research Question 2

In summation, the second research question examined assessment identity as teachers in the ACSC worked to integrate assessment via technology and expand their classroom assessment practices. The findings from the deductive analysis highlight the interconnected nature of the five dimensions of the teachers’ assessment identity framework (Looney et al., 2018). The knowledge, feelings, beliefs, confidence, and role of the teacher were all evident based on previous experiences, but were informed and influenced by learning, catalyzed through reflection, collaboration, and a commitment to professional development. Teacher assessment identity is not fixed, it is continuously influenced by previous experiences, current engagement, and professional development opportunities.

Chapter 5: Discussion

The purpose of this study was to analyze teachers' assessment identity as they implemented assessment via technology. Using assessment identity (Looney et al., 2018) as a conceptual framework, this study responded to the following research questions:

1. How do teachers leverage assessment via technology in their teaching practice to support the evolution of their classroom assessment conceptualizations and practices?
2. What can be understood about teacher assessment identity as they work to integrate technology in their teaching practice and expand their classroom assessment practices?

In this chapter, I discuss implications related to three core ideas: (1) linking assessment and learning as purposeful processes, (2) using educational technology for multiple purposes, and (3) assessment via technology. Rather than addressing each research question, these three core ideas are extracted as a holistic response to the questions. Each idea is detailed with sub headed sections to interweave discoveries from my study and theory. I conclude by outlining the significant contributions, addressing the benefits and limitations of this research, suggesting directions for future research, and offering final remarks.

Linking Assessment and Learning as Purposeful Processes

From the outset of this research, I recognized assessment as an integral component of instruction, curriculum, and a critical step in the learning process (Mertler, 2003). My research drew from a voluntary, blended community that enabled educators to explore assessment via technology. The findings from this study support past research showing that classroom teachers' attitudes vary toward assessment (Katz, 2012), and their beliefs and practices are strongly influenced by personal and social factors (Brown et al., 2011; DeLuca & Klinger, 2010; Smith & Galvin, 2014). When considering assessment, there are many angles worth exploring, the concepts of a teachers' knowledge of assessment, termed assessment literacy, as well as a teachers' attitudes and beliefs toward assessment, which encompass the assessment identity construct. Assessment literacy is also a construct included in assessment identity, but since assessment identity is an under-studied area with few empirical studies investigating the construct (e.g., Looney et al., 2018; Xu & Brown, 2016), I utilized the ACSC data set for deeper exploration focused on assessment identity. I first describe a glimpse of the shifts related to classroom assessment that were visible in my study and then the influence of these shifts on teaching and learning follows.

A Trajectory of Assessment

As mentioned earlier in this thesis, assessment is not a static concept, as the field of education has evolved, so too has our thinking about assessment purposes and practices. It is important to note that data collection took place at a time when Growing Success was only beginning to be implemented into teaching pedagogy (OME, 2010). Although teachers were just considering the balance of formative and summative assessment practices, data revealed that the ACSC participants believed in and incorporated the principles of Growing Success, including fairness, inclusion, transparency, which were strengthened by the learning opportunities they encountered. Assessment for, as, and of learning were fairly novel constructs to some educators at the time, but most educators now understand the influence each has on teaching and learning. Specifically, assessment as learning (AaL), now understood as an approach to teaching and learning that "is designed to give teachers information that will allow them to modify the teaching and learning activities in which students are engaged, in order to differentiate and understand how individual students approach their learning" (Earl, 2006, p. 7). AaL traditionally focuses on the student, emphasizing assessment as a process of developing and supporting their metacognition, monitoring their learning, and using the feedback from this monitoring to adjust, adapt, and change what they understand (Earl, 2006; 2012). However, the ACSC data helped me think about the AaL construct from the perspective of teachers as learners. I discovered that AaL permeates the way in which teachers understand their role as an assessor, question their assessment identity, and draw upon a variety of tools and resources, such as technology, to expand their assessment practices and contribute to their trajectory of identity.

Assessment Identity

The purpose of the teachers' assessment identity framework is to demonstrate the evolving and connected nature of an educators' identity (Looney et al., 2018). The evolving concept of assessment identity was noted in the findings of this study through recognition of the importance of self-reflection and the AaL mindset ACSC participants exuded. AaL is a recognized assessment construct that offers a foundation to understanding the link between assessment and learning. Using this same basis, I extend the linkage to the way we think about the connection between how teachers understand assessment, learning, and technology. The dimensions of the teacher assessment identity (Looney et al., 2018) framework were present in the ACSC teachers, and an additional code emerged that encompassed the influence learning can have on a teachers' continuously evolving assessment identity.

The emerging code identified through this research, *I learn, is* connected to and influences the original five dimensions: *I know, I feel, I believe, I am confident,* and *my role* (Looney et al., 2018). It is important to acknowledge that through the identity discourse, learning may already be implied as contributing to a teachers' assessment identity. For example, since a teachers' assessment identity is continuously evolving and mediated by context (Looney et al., 2018), learning is required to gain knowledge, feelings, or values of assessment. Thus, the aim of the co-occurrence analysis was to make the connection between learning and teacher assessment identity more explicit. Based on my literature review, I identified that several frameworks related to assessment offer an explicit learning component (e.g., Pastore & Andrade, 2019; Xu & Brown, 2016). For instance, the Xu and Brown (2016) Teacher Assessment Literacy in Practice (TALiP) framework explored in Chapter 2 states “teacher learning as the impetus for advancing TALiP” (p. 157). Teacher learning is a major source of input for how assessment literacy is constructed because it is “both a process of active individual construction and a process of enculturation into the … practices of wider society” (Cobb, 1994, p. 13 cited in Xu & Brown, 2016). This research confirms that learning can transpire within the classroom and other workplace communities if teachers are aware of the shared interactions among many processes, mechanisms, and actions arising from assessment activities (Koh, 2011). Xu and Brown (2016) continued this notion of learning and identified two specific ways for teacher learning to occur: reflective practice and participation in community activities, both of which are features of this secondary case study analysis research and highlighted by the proposed *I learn* dimension. It is important to note that *I learn* does not denote AaL, rather the foundational understanding of AaL provides a basis to comprehend the *I learn* emerging code in relation to the teacher perspective.

To make learning more explicit in the teacher assessment identity framework by Looney et al. (2018), *I learn* is proposed as the centre of the figure (see Figure 13). The centre is envisioned as influential to the knowledge, feelings, beliefs, confidence, and role of an educator. The position of *I learn* also aims to strengthen the importance of learning as an educator (Dinham & Scott, 2003; Hunzicker, 2011), particularly learning that is focused on aspects related to reflection, collaboration, and professional learning communities (e.g., Crockett, 2002; Dooner et al., 2008; Riveros et al., 2012). Since our knowledge-based society embraces lifelong learning

(Laal & Salamati, 2012), *I learn* may have emerged as a result of the context in which the framework was applied – professional development. This study demonstrated one of the ways in which teacher assessment identity was influenced through participation in a professional learning community designed to enriched assessment practices via technology. I recognize the intellect of Looney and colleagues (2018) in their expanded conceptualization of teachers' assessment identity framework, and suggest that additional research can explore the influence of *I learn.*

Figure 13

Positioning I learn within Teacher Assessment Identity (adapted from Looney et al., 2018)

Ongoing Professional Learning

ACSC teachers noted the challenges they were facing with the increased use of technology, the requirement to implement technology into the classroom, and the learning curve associated with this advancement. Continuously revising professional knowledge, meeting new standards, and experimenting with innovative pedagogy are part of a teachers' professional routine (Ng, 2010). Teacher professional knowledge requires continuous professional learning that involves change and the development of new practices (Kwakman, 2003). Mizell (2010) noted "for teachers and school and district leaders to be as effective as possible, they continually expand their knowledge and skills to implement the best educational practices" (p. 3). Additional evidence-based research has also linked professional development and ongoing professional learning effective teaching practices and an improved quality of education for students (e.g., Bayar, 2014; Blandford, 2012; Tournaki et al., 2011). My study demonstrates a response to this need to adapt one's practice by engaging in professional learning opportunities and highlights the potential for ongoing professional learning when there is a focus on collaboration and reflection.

The ACSC data provides further evidence that professional learning is a critical means for teachers to engage in advancing their practice (Darling-Hammond et al., 2020). Many teachers expressed delight with the knowledge they gained as a result of the ACSC and articulated the desire to continue this learning beyond the community. This willingness to engage in ongoing learning demonstrated by those engaged in the ACSC aligns with research from McMillan et al. (2016) when they highlighted the key role the teacher must embrace to continue professional development. Participants who volunteered for the learning opportunity were committed to consistent participation over the 8-week blended learning opportunity (Graham, 2013). Technology, the focus of the ACSC community, was also the means of generating new opportunities for educators to explore emerging assessment practices. Exploring assessment via technology highlights the learning disposition of teachers who are willing to embrace shifts in assessment, expand their pedagogy, and make their educational practice visible by connecting with others. In other words, the ACSC featured teachers whose assessment identity linked assessment and learning as a purposeful process.

Using Educational Technology for Multiple Purposes

Educational technology is viewed an influential tool for transforming learning (e.g., Bush & Mott, 2019; Singh, 2021) and due to rapid technological innovation, is a growing area of interest for researchers, teachers, and educational stakeholders (Amiel & Reeves, 2008). At the time of the ACSC, technology in the K-12 classroom was emerging; however, the incorporation of educational technology continued to increase as the implementation of devices was encouraged to aid with classroom activities, instructional strategies, and assessment opportunities. To explore the rise in interest, I first describe a shift related to educational technology in the classroom and then examine some of these effects on teaching and learning by drawing on the ACSC data.

Situating Shifts in Educational Technology

Similar to the shifts in assessment, the use of educational technology has developed since it was introduced. The data was originally collected in 2016, so it is important to recognize the rapid ability for technology to change, yet to also understand how the past can influence the future. In Canada and the USA, the history of technology in schools reveals a ground-breaking past, present and future (Bates, 2019). During the beginning of the 20th century, pencils started to replace chalkboards, overhead projectors were then introduced, educational broadcasting through the radio surfaced, as did the photocopier allowing the quick distribution of materials (Purnava, 2020). As modern technology began to advance in the 1940s, audiovisual learning started to be introduced into classrooms as televisions became more mainstream. In 1972, the Scantron was introduced as a mechanism that allowed educators to grade tests quickly and efficiently (Moncaleano & Russell, 2018), to this day Scantrons are still being used for summative assessments.

The pace of the unfurling pathway of technology has elicited mixed reactions by many people. While there is some unwavering support and enthusiasm for educational technology (e.g., Danniels et al., 2020; Hilton & Canciello, 2013), as expected, there are frequent questions and criticisms about the inclusion of technology in classrooms (Hooper & Rieber, 1995). For example, some educational stakeholders believe technology has the capacity to be distracting, misguiding, increases opportunities for cheating, and leads to the decline of competencies in reading, writing, and mathematics (e.g., Alhumaid, 2019; Bennet et al., 2008; Deubel, 2007). In the ACSC, teachers initially raised similar concerns with assessment via technology and the use of devices in the classroom in general. However, through the exploration and integration, teachers began to recognize the power of technology to enrich their assessment practices.

Technology to Support Student Learning

Initially, ACSC teachers were describing disapproval with the integration of technology in the classroom due to the potential for cheating, misuse of the devices, technical issues (e.g., battery depletion), and a lack of knowledge and confidence. Nevertheless, as the ACSC experience unfolded, teachers began to recognize the ways in which the technology could enhance student learning and how the devices offered opportunities traditional resources and practices of teaching could not achieve (also noted in Dede, 2014). Many stakeholders agree that technology in classrooms can “enable, expand, and accelerate learning in ways previously unimaginable” (Fullan & Langworthy, 2014 cited in People for Education, 2019, p. 1). Some of the ways that technology accelerates learning are through interactive whiteboards, applications, robotic toys, or gamification, each of which positively impact student engagement and participation. Similarly, ACSC teachers cited many ways to integrate assessment via technology (e.g., formative and summative purposes, feedback, documentation organization, specific websites and applications) and demonstrated a willingness to engage in learning beyond the scope of their current knowledge. The learning in this case entailed collaborating amongst one another to offer solutions while they developed an emergent understanding of the benefits of assessment via technology.

This study makes clear that technology influences not only student learning, but it also influences the ways in which teachers teach, assess, and learn. Teachers who are willing to explore technologies and embrace the near constant state of change facilitated through technology are able to see and identify how technological tools can be integrated into the classroom for educational purposes. To do so, teachers have to be included in the shift by educational stakeholders (e.g., policy makers, administrators) and be willing and committed to experimenting with new ideas, sharing knowledge around practices, and making technology visible in their classrooms. According to Bill Gates (1997), “technology is just a tool. In terms of getting the kids working together and motivating them, the teacher is the most important” (Ratcliffe, 2016, para. 3). Teachers have the capacity to act as change agents for the increased demand for technology in the classroom, supporting the progression of technology for learning and growth. As devices and application evolve, “teachers need to be prepared to constantly learn-and relearn” (Hubbard, 2018, p. 2). Data showed that the teachers in the ACSC were enthusiastic to discover the possibilities of the devices for their instructional and assessment practices by exploring assessment via technology, an evolution in education. The interest of ACSC participants led to the increased use of technology in the classroom.

Technology as an Enabler for Professional Development

When designing the ACSC, notes from the external inquiry team revealed that the large geographical region made the costs of bringing together groups for professional learning quite prohibitive. Furthermore, they wanted to use the technology as a means for professional development by enabling a greater level of connectivity for educators. Professional development can offer a variety of interactive activities intended to improve teachers' professional knowledge, skills, and teaching practices, and contribute to their personal, social, and emotional growth (Wasserman & Migdal, 2019). In this case, the ACSC teachers not only used the devices to improve student learning, but the technology actually enabled professional development by offering access to learning, reflection, and collaboration in an online space. Teachers had the opportunity to work at their own pace and join from a place that best suited their needs. In fact, a commonly cited advantage of the ACSC was the flexibility the learning opportunity allowed (e.g., requirements, frequency of interactions).

Participants experienced and confronted uncertainties while engaging in the ACSC, but formed an online community of support, exploration, and conversation that contributed to new ideas and understandings of how to assess via technology. Although the effectiveness of the online component of the ACSC was not a purpose of this thesis, many participants did express an interest in continuing professional development in an online space because of the flexibility, accessibility, and bandwidth the technology enabled. Technology as an enabler for professional development is an area of future research that directly relates to assessment via technology.

Assessment via Technology

Due to the significance of classroom assessment (Stiggins, 1998) and the rising integration of technology (Leneway, 2018) in education, it is important to understand how assessment via technology can be leveraged in the classroom. Looking over the ideas in this thesis, I begin to see assessment via technology as an extension of the philosophical movement and values of progressive education. Progressive education, a response to the traditional methods of teaching, was “a movement that started in the early 19th century as a reaction to the socially-stratified teaching methods that focussed almost entirely on university preparation” (Holz, 2017, para. 4). Since the First World War and intensifying following the Great Depression, there have been at least three major waves of progressive education in Ontario (Christou, 2019). These waves began in 1937 with the inclusion of health and social studies subjects, continued in 1960s and 1970s with the focus on self-discovery, exploration, and new technologies, and most recently with the inclusion and importance of 21st century learning. Progressive education focuses on student-centered, experience-based learning that is co-developed by both students and teachers (Christou, 2017; Reese, 2001). Characteristics of progressive education include, but are not limited to (Hayes, 2007; Matusov; 2021): learning by doing, collaborative learning, emphasis on lifelong learning and social skills, and diverse methods of assessment throughout the entire learning process. Assessment via technology incorporates characteristics of progressive education that were identified by ACSC teachers as valuable ways to leverage technology to improve student learning (e.g., student choice; meaningful feedback), influence instructional strategies (e.g., differentiated instruction), and contribute to an evolving assessment identity (e.g., reflection, collaboration; future professional development).

Significant Contributions

Through a secondary case study analysis, three core contributions emerged from my research findings. First, that the teacher assessment identity framework (Looney et al., 2018) is interconnected and highlights the evolving nature of identity. Evident in the data and co-occurrence analysis, I discovered that the knowledge, feelings, beliefs, confidence, and role of the teacher are not only all linked based on previous experiences, but are informed and influenced by professional learning, catalyzed through reflection, collaboration, and a teacher's commitment to professional development.

The second contribution of this research demonstrated that as technology becomes more widely available, some educators are interested to learn about how to incorporate it into their professional practice and looking for guidance to do so. After the completion of the ACSC, participants were still craving opportunities to extend their learning related to assessment via technology. As evident in the literature, "technology cannot be effective in the classroom without teachers who are knowledgeable about both the technology itself and its implementation to meet educational goals" (DeCoito & Richardson, 2018, p. 362). Interweaving the two concepts, assessment and educational technology, denotes the possibilities inherent in the ongoing learning about technology in the field of education, coupled under a term that leverages and positions the concepts as one, assessment via technology. It is recognized that assessment and technology are discrete, but the merging of the terms is pivotal as it allows for a conscious intertwine of the aspects of assessment and technology to enhance learning.

Finally, online learning required throughout the pandemic enhanced the relevance and significance of my research. Although the data were collected pre-pandemic, this thesis provides insight into educators' thoughts about assessment via technology without the psychological strain many may have felt throughout the past months. Teachers and students pivoted into a new learning environment that included variable implementation of fully online education across Grade K-12 as well as hybrid (online and in-person classes). The influence of the recent events in education have been described as what was probably the biggest challenge of many educators' careers (Kraft & Simon, 2020). From recent research we have learned that teachers were struggling with how to transition to online teaching (e.g., Cutri et al., 2020; Kaden, 2020), and conducting assessments posed additional challenges (e.g., Guangul et al., 2020). My research offers worthwhile insights because going back to the ACSC data provided evidence for understanding how teachers negotiated shifts in assessment via technology and the potential power, momentum, and trajectory of assessment via technology which can be leveraged in a transformative way to support professional learning.

Balancing the Successes and Limitations of this Study

Although core findings have emerged from this research study, it is important to acknowledge the successes and limitations of the study. To begin, the secondary analysis offered the opportunity to intertwine two personal and professional interests, assessment and technology. While the secondary nature of this study meant that I was not able to identify an inquiry focus or data collection methods, the research and program evaluation conducted over a three-year timespan offered a plethora of data sources that I would not have been able collect as a graduate student researcher. The desire and potential for launching in-person data collection was also limited during a pandemic. Working with the secondary data provided insight into the collaborative approach to data collection. Data sources were selectively chosen in alignment with my study's research purpose and the questions I constructed for this thesis. While secondary analysis can sometimes seem like a limitation because of the lack of control over the data, I off-set this with the depth of the analysis and the cycles of analytic processes, including the involvement of the data party to increase trustworthiness and gather perspectives of graduate students to deepen my understanding of the data.

Another limitation of the study is that the data was collected under specific contexts (e.g., blended learning, majority engagement conducted online), a challenge most educational research is faced with. However, a strength of the secondary analysis is that the data was collected by a credible, credentialed, and knowledgeable external inquiry team who were well-informed about the community and context, and carefully thought through the context, facilitation, and process of the ACSC. The CAE allowed the external inquiry team to work with district leadership who supported the inquiry and were willing to engage and invest in district, school, and individual learning.

Finally, using the secondary data allowed the opportunity to focus on a topic of interest, assessment at time when our world was moving through a precarious state. The global pandemic was announced by the World Health Organization (WHO) on March 11, 2020 (WHO, 2020). The pandemic created a state of emergency – almost all regions implemented lockdowns, shutting down activities that require human gathering and interactions (e.g., colleges, schools, malls, temples, offices, airports, railway stations) (De et al., 2020). While the lingering pressures may have implications for researcher access for years to come, researchers needed to find creative and compelling ways to make contributions to the field of education and to address pressing questions brought to light by the pandemic. For example, the precarious nature of schooling led to transitioning from in-person to remote learning, back to in-person learning with the option to join online, eventually back to fully remote learning as the pandemic worsened. These transitions raised questions such as *how can we best use technology to support student learning in a remote environment? How do should students be assessed in remote delivery?* Education may be data rich, but information poor (Slotnick & Orland, 2010), so it is critical to make the most out of every data gathering and analysis opportunity – to learn, share, and disseminate findings to improve the field of education. Furthermore, students and teachers made a swift and necessary transition to remote and online learning, which has bolstered the need for continued educational research on assessment via technology (e.g., Rivera-Mata, 2020; Vargo et al., 2020). By exploring assessment via technology, the assessment identity construct was investigated at a time when teachers worldwide were navigating learning about technology.

Implications for Future Practice

The implications for future practice are discussed in three subheadings: research, practice, and policy. While research, practice, and policy are discussed as distinct, the relationship amongst them are increasing, demonstrating the urge for various stakeholders to share, use, and contribute to each other's knowledge development and products (de Haas & van der Kwaak, 2017). For each subheading I outline areas for future consideration to explore a construct or idea.

Research

Assessment is an essential component to the teaching-learning process (Neumann et al., 2019; Xu & Brown, 2016) and can enhance student achievement, motivation, and learning (Broadfoot & Black, 2004; Cauley et al., 2010). Nevertheless, effective assessment is complex:

> Teachers need to plan and implement high-quality assessment tasks, interpret evidence, develop outcomes appropriate to assessment purposes and types, generate feedback, report, and engage students as active participants in their assessment and learning (Looney et al., 2018 cited in Neumann et al., 2019, p. 116).

Through the complexities of assessment, teachers develop an assessment identity that supports in the understanding of their role, their confidence as an educator and assessor, and the choices they make about future assessment practices. Although the ACSC data demonstrated the interconnectedness of the teacher assessment identity framework and proposed a new dimension, additional research could apply the framework to a larger sample size to explore the impact of learning on assessment identity. Future research on the construct of teacher assessment identity might consider: *how does the assessment identity of in-service educators expand or adapt over time? Does learning influence teacher assessment identity and could it be added to the framework?* In addition, professional development in an online space was heralded by the ACSC participants, but not a specific aim of this study. One might wonder: *how effective are online professional development opportunities for teachers?*

Practice

Even without the present pandemic context, technology has affected many aspects of our lives; it is not surprising that technology is increasingly integrated into learning and school experiences. In fact, educational technology has been heralded by some as having the potential to transform schooling (e.g., Kozma, 2003; Papert, 1993). The ACSC demonstrated the profound impact technology can have on enriched assessment practices. In fact, Gonski (2018) urges educators to "use new technology not for its own sake, but to adopt ways of working that are more efficient and effective" (p. 99). Technology provides the opportunity to enhance the facilitation of the learning process and summarization of student knowledge. Practical examples are included in Table 11 to demonstrate how classroom assessment strategies can be enriched through technology.

Table 11

Practical Examples to Integrate Enriched Assessment Via Technology

Key Learning	Rationale	Connection to the ACSC
Offer students choice in how they complete a summative assessment.	Providing choice aligns with the Ontario Ministry of Education document Learning for All: A Guide to Effective Assessment and Instruction for All Students, Kindergarten to Grade 12 (2013) and should be a standard of practice in education.	Teachers in the ACSC offered choice and often cited students using Book Creator, Piktochart, and Explain Everything.

Provide students with the opportunity to re-submit work. Included in the opportunity to re-submit is the importance of ongoing, prompt, detailed feedback.	Feedback provides students with next steps and the opportunity to reflect on their learning. By allowing resubmissions, emphasis is on the learning process, not the grade.	Teachers in the ACSC often referenced using the comment function in the Google Suite to provide feedback in-real-time or Schoology and Showbie.
Develop formative assessments that make learning and assessment fun	Formative assessments were developed through websites that offered friendly competition among students, which increased engagement, motivation, and reduced the stress students typically feel when engaging in a traditional assessment.	Teachers most frequently cited the use of Kahoot, Quizziz, and Nearpod.

While assessment via technology may be new to some educators, school districts can continue to support assessment learning for everyone by offering professional development and collaborative learning opportunities for educators to explore, take risks, and build their confidence.

Policy

Ontario's assessment policy, Growing Success (OME, 2010), may be ready to be updated to amplify the presence of educational technology. In the current text, technology is mentioned 18 times in the document. These mentions occur either in relation to the science and technology curriculum strand, the safe use of equipment and technology, or the use of technology as a learning resource for student accommodations. However, the policy document would benefit from a section specifically related to assessment via technology. This section could follow a similar organization and structure to the current ten chapters of Growing Success. The first section would offer current policy related to assessing, evaluating, and reporting student achievement as they pertain to technology. The second section would offer the context for the policy, including theories of educational technology, the ways in which assessment via technology could benefit student learning and support professional learning, and considerations for implementation. Included in this section would be examples of incorporating assessment via technology through concrete lesson plans and a comprehensive list of technology tools and resources available for classroom use.

Final Thoughts

According to Perreault (2017), "today's research is tomorrow's practice…" (p. 167) and the findings from the ACSC data represent promising research in the areas of assessment via technology and teacher assessment identity. This thesis is also the beginning of an ongoing professional learning journey inspired by the participants' commitment to learning and the graduate students and faculty with whom I collaborated. My learning is on its way – through the development of this thesis, in the enrollment of the PhD program, and the ongoing mentorship my committee and other faculty at Queen's University provided. In addition, I have already shared this work through conference presentations (e.g., Canadian Society for the Study of Education) and I hope to share it at future conferences. I also aim to publish findings from this study in academic journals (e.g. Assessment in Education Principles Policy and Practice, Teaching and Teaching Education) and practical publications (e.g., Ontario College of Teachers). My work may also make a contributing when I reach out to the district in which data collection took place to share the secondary analysis I have completed. Despite all the learning and growth I have experienced, I recognize that I am at the beginning of my academic career and have much more to learn as I deepen my understanding about classroom assessment, educational technology, assessment via technology, and teacher's assessment identity.

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Appendices

Appendix A: ACSC Letter of Information and Consent Form

iAM education

LETTER OF INVITATION

UNIVERSITY OF ALBERTA
QUAECUMQUE VERA

Study Title: Assessment Practices and Online Professional Networking as part of the Next Generation Learning: iPads in the Classroom

Principal Investigator Heather Brown University of Alberta Edmonton, AB T6G 2R3 heather2@ualberta.ca 780-492-5363	**Co-Investigator** Michelle Searle Queens University 151 Union Ave Kingston, ON K7L3N6 michellesearle@yahoo.com 519-495-6942
Co-Investigator Lori Kirkpatrick Brock University 500 Glenridge Ave Saint Catharines, ON L2S3A1 lkirkpatrick2@brocku.ca 519-645-2455	**Co-Investigator** Adrienne Sauder Western University 1151 Richmond St, London, ON N6A 3K7 asauder4@uwo.ca 519-619-0995

Introduction

You are receiving this letter because your students have an iPad as part of AMDSB's Next Generation Learning initiative and you have agreed to participate in a case study about assessment practices with technology. In addition to the case study being conducted for AMDSB, as researchers we are interested in sharing what we learn with broader audiences. We invite you to allow your data from the case study to also be used for research purposes about classroom assessment practices with technology. In addition, we are asking you to participate in a focus group at the conclusion of the case study so that we can better understand assessment with technology and the role of online networking as a form of professional learning.

Purpose of the study

The purpose of the this study is to investigate how the iPads are being used to promote different forms or purposes of assessment in classrooms across AMDSB. We are also wondering how an online space can be used to facilitate professional learning within AMDSB. We would like to share what we learn with other people interested in innovative educational initiatives.

If you agree to participate
You will take part in the assessment case study – this case study involves an introductory face-to-face session, eight weeks of online engagement, and a face-to-face session to conclude the case study. At the concluding face-to-face session you will participate in a focus group to discuss your experiences using technology for assessment purposes and learning as part of an online-networked community. You agree to allow data from the case study to be analysed for AMDSB as well as for research purposes. This means that in addition to sharing with AMDSB, we might also share what we learn with others, such as educational researchers or the broader educational communities.

Risks & Benefits
There are no known risks associated with participation in this study. A potential benefit is reflective learning from your participation in the case study and sharing the role of iPads in assessment with others.

Voluntary Participation
Participation in this study is voluntary. You may refuse to participate or withdraw from the study at any time with no effect on your employment status.

Confidentiality
Neither your name nor the name of your school would be included in research presentations or publications. That is, we might write about how you used the iPad, but we wouldn't use your name. Please note that there is an *option* to allow us (or not allow us) to use images of you in presentations or publications; your name would not be included, but it is possible that someone might recognize you.

Ethical Clearance
Please note that this research project has been reviewed and received ethics clearance through the University of Alberta Research Ethics Board.

Questions
If you have any questions about this study, please contact one of the researchers, Michelle Searle at michellesearle@yahoo.com or 519-645-2455. If you have concerns about this study, you may contact the Research Ethics Office at (780) 492-2615. This office has no direct involvement with this project. This letter is yours to keep for future reference.

Sincerely,
Michelle Searle, Heather Brown, Adrienne Sauder, and Lori Kirkpatrick
Next Generation Learning Project – Program Evaluation Team

Consent Statement

I have read this form and the research study has been explained to me. I have been given the opportunity to ask questions and my questions have been answered. If I have additional questions, I have been told whom to contact. I agree to participate in the research study described above and will receive a copy of this consent form. I will receive a copy of this consent form after I sign it.

__________Initial here if **you agree** to have your image used as part of the research

__________Initial here if **you do NOT agree** to have your image used as part of this research

Participant's Name (printed) ______________________ Date ____________

Participant's Signature ______________________

Name (printed) of Person Obtaining Consent ______________________ Date ____________

Signature of Person Obtaining Consent ______________________

Appendix B: Graduate Research Ethics Board Amendment Approval Letter

December 16, 2020

Miss Katrina Carbone
Master's Student
Faculty of Education
Queen's University
Duncan McArthur Hall
511 Union Street West
Kingston, ON, K7M 5R7

Dear Miss Carbone:

RE: Amendment for your study entitled**: "GEDUC-1009-20 Exploring Teachers' Assessment Identity Through Educational Technology; TRAQ 6030319"**

Thank you for submitting your amendment requesting the following changes:

1) To host a data party with graduate students (N=2-4);

2) Letter of Information/Consent Form (v. 2020/12/04).

By this letter, you have ethics approval for these changes.

Good luck with your research.

Sincerely,

Chair, General Research Ethics Board (GREB)
Professor Dean A. Tripp, PhD
Departments of Psychology, Anesthesiology & Urology Queen's University

c. Dr. Michelle Searle, Supervisor

Appendix C: Amendment Letter of Information and Consent Form

EXPLORING TEACHERS' ASSESSMENT IDENTITY THROUGH EDUCATIONAL TECHNOLOGY.

Letter of Information

Title: Exploring teachers' assessment identity through educational technology.

What is the study about?
This study investigates insights that emerge from exploring how teachers' assessment identity is constructed and evolved through the use of educational technology. This study aims to understand how teachers articulate the successes and challenges of their experiences assessing with educational technology.

What is involved if you participate?
If you read through the letter of information and decide to participate, you will be invited to a 2-day collaborative working session and data party. You will first engage in a blind coding process, the opportunity to explore the data without being influenced by the primary investigator's preliminary findings. After you have coded 10% (maximum) of the data (the percentage may vary depending on the number of graduate students involved), all the researchers engaging in the data party will join together to discuss the agreements or disagreements between the codes. All disagreements will be discussed until an inter-rater reliability of at least 80% is reached.

Following the blind coding activity, the primary investigator will ensure the coded data and findings match the preliminary findings, and adjust accordingly. The primary investigator will then complete the second, deductive coding cycle. Participants will be invited back for a second day gallery walk event. The gallery walk involves findings from a particular question or set of questions presented on a large poster with questions to prompt discussion among the participants (Lewis, n.d.). Several posters will be developed depicting research findings, and participants will view the "gallery" to review and discuss each poster. After giving participants time to look at the posters, the large group will join back together to discuss their overall thoughts, and any questions or concerns. The posters will be emailed at the beginning of Day 02, to allow students to view the posters virtually.

Day 01 (blind coding process) and Day 02 (gallery walk) will both be conducted virtually, on Zoom.

Is participation voluntary?
Yes, participation is voluntary. If you choose to participate, while it would be greatly appreciated if you would attend both evets, you should not feel obligated to attend or engage in discussion that makes you feel uncomfortable. If you choose not to participate or to leave the study at any time it will have no consequences.

What will be done with information that is collected?
The results of this study will be used to satisfy the requirements of the Master of Education, and potentially published in journals and presented at conferences. Only researchers affiliated with this study will have access to the data. All data collected from this study will remain confidential and names will remain anonymous in any written or oral documentation of the research. In line with Queen's University policy, all data will be stored for five years, after this time, the data will be destroyed.

More questions or concerns?
If you have questions or concerns about the study, please contact the principal investigator: Katrina Carbone, at 289-208-1543 or at 17kmc11@queensu.ca. Any ethical concerns about the study can be directed to the General Research Ethics Board (GREB) at 1-844-535-2988 (Toll free in North America) or chair.GREB@queensu.ca.

CONSENT

Title: Exploring teachers' assessment identity through educational technology.

I have read (or someone has read to me) the letter of information. Someone from this study gave me the chance to ask questions. I agree to my data being used for research purposes. I have retained a copy of this letter of information and consent form. I agree to participate.

SIGNATURE OF PARTICIPANT

PARTICIPANT	
Name (Print)	
Date (month/day/year)	
Signature	
Email Address	

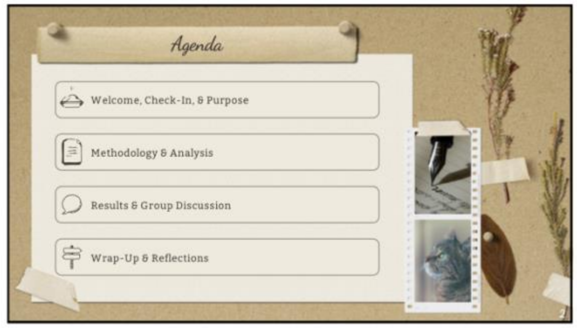
SIGNATURE OF INVESTIGATOR

My signature means that I have explained the study to the participant named above. I have answered all questions.

INVESTIGATOR	
Name (Print)	
Date (month/day/year)	
Signature	
Email Address	

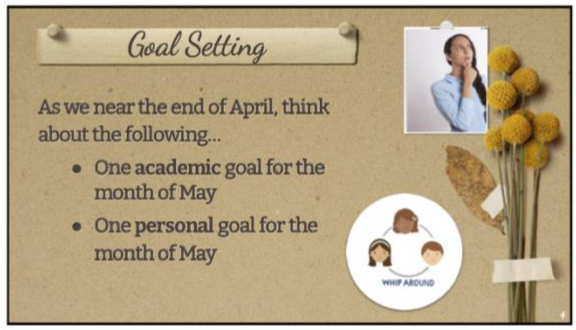
Appendix D: Data Party Timepoint 2 Google Slides Overview

1



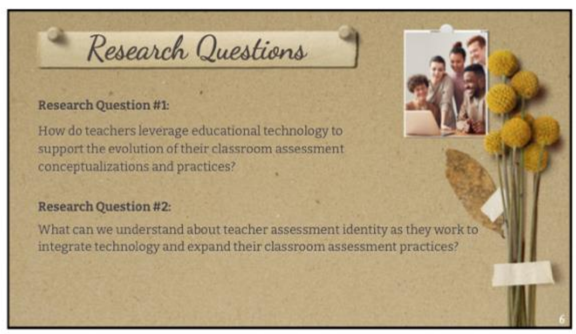
2

3



4

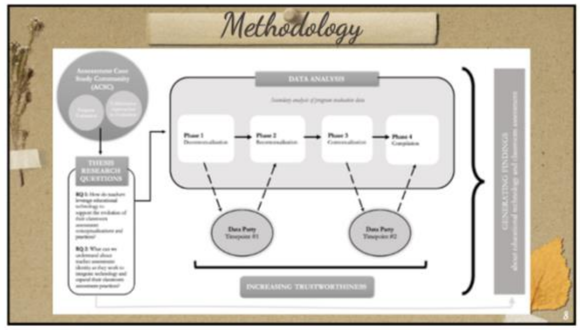
5



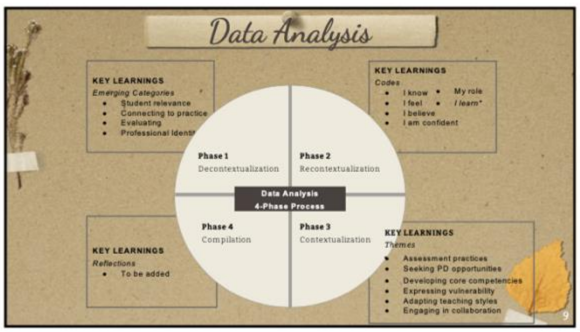
6


2.
METHODOLOGY
& ANALYSIS

7


Methodology
Assessment Case Study Community (ACSC)
THESIS RESEARCH QUESTIONS
DATA ANALYSIS
Phase 1
Phase 2
Phase 3
Phase 4
Compilation
Data Party
Timepoint #1
Data Party
Timepoint #2
INCREASING TRUSTWORTHINESS
GENERATING FINDINGS
8

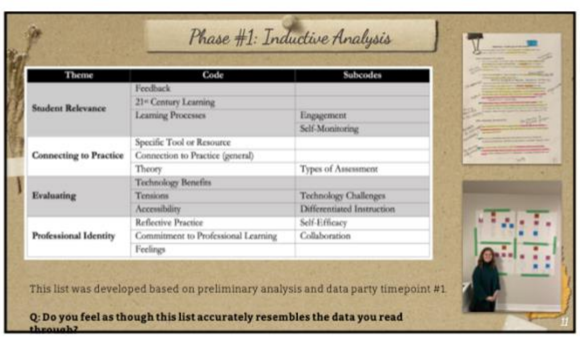
8


Data Analysis
KEY LEARNINGS
Emerging Categories
Student relevance
Connecting to practice
Evaluating
Professional Identity
KEY LEARNINGS
Codes
I know
I feel
I believe
I am confident
My role
I learn*
Phase 1
Decontextualization
Phase 2
Recontextualization
Data Analysis
4-Phase Process
Phase 4
Compilation
Phase 3
Contextualization
KEY LEARNINGS
Reflections
To be added
KEY LEARNINGS
Themes
Assessment practices
Seeking PD opportunities
Developing core competencies
Expressing vulnerability
Adapting teaching styles
Engaging in collaboration
9

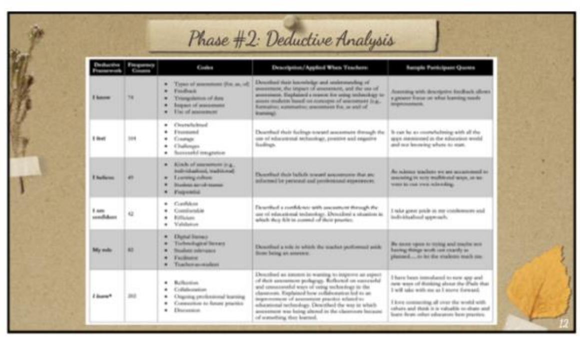
9


3.
RESULTS &
GROUP
DISCUSSION

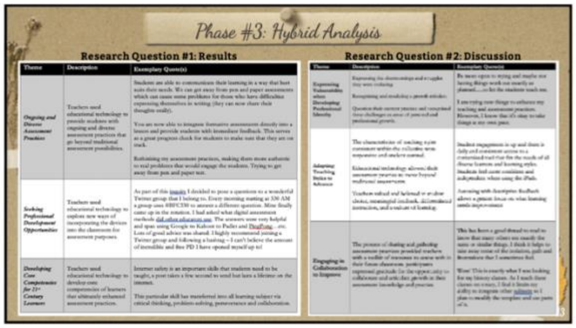
10


Phase #1: Inductive Analysis
Theme | Code | Subcodes
Student Relevance | Feedback
21st Century Learning
Learning Processes | Engagement
Self-Monitoring
Connecting to Practice | Specific Tool or Resource
Connection to Practice (general)
Theory | Types of Assessment
Evaluating | Technology Benefits
Tensions | Technology Challenges
Accessibility | Differentiated Instruction
Professional Identity | Reflective Practice | Self-Efficacy
Commitment to Professional Learning | Collaboration
Feelings
This list was developed based on preliminary analysis and data party timepoint #1
Q: Do you feel as though this list accurately resembles the data you read through?
11

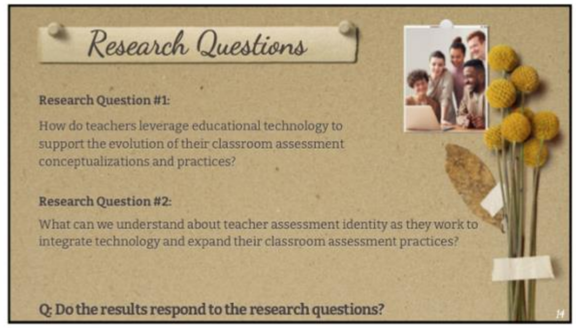
11


Phase #2: Deductive Analysis
12

12


Phase #3: Hybrid Analysis
Research Question #1: Results
Research Question #2: Discussion

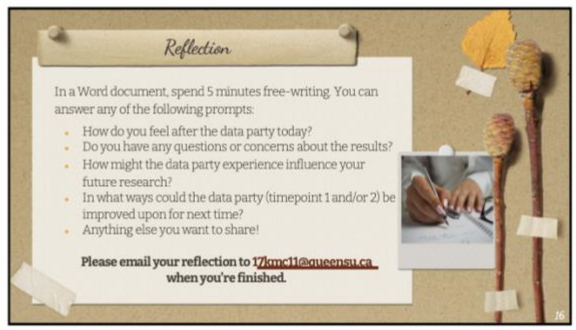
13


Research Questions
Research Question #1:
How do teachers leverage educational technology to support the evolution of their classroom assessment conceptualizations and practices?
Research Question #2:
What can we understand about teacher assessment identity as they work to integrate technology and expand their classroom assessment practices?
Q: Do the results respond to the research questions?

14


4.
WRAP UP &
REFLECTION

15


Reflection
In a Word document, spend 5 minutes free-writing. You can answer any of the following prompts:
How do you feel after the data party today?
Do you have any questions or concerns about the results?
How might the data party experience influence your future research?
In what ways could the data party (timepoint 1 and/or 2) be improved upon for next time?
Anything else you want to share!
Please email your reflection to 17jkmc11@queensu.ca when you're finished.

16


Thank you
for your time, knowledge, patience, and reflections.

17

Appendix E: University of Alberta Ethical Clearance

From: hero@ualberta.ca
Date: February 16, 2016 at 4:02:58 PM MST
To: heather2@ualberta.ca
Subject: HERO: Ethics Application has been Approved Pro00062179
Reply-To: hero@ualberta.ca

UNIVERSITY OF ALBERTA

Ethics Application has been Approved

ID:	Pro00062179
Title:	Assessment Case Study
Study Investigator:	Heather Brown
	This is to inform you that the above study has been approved.
	Click on the link(s) above to navigate to the HERO workspace.
Description:	**Note**: Please be reminded that the REMO system works best with Internet Explorer or Firefox.
	Please do not reply to this message. This is a system-generated email that cannot receive replies.

University of Alberta
Edmonton Alberta
Canada T6G 2E1

Appendix F: Brock University Ethical Clearance

Brock University
Research Ethics Office
Tel: 905-688-5550 ext. 3035
Email: reb@brocku.ca

Social Science Research Ethics Board

Certificate of Ethics Clearance for Human Participant Research

DATE:	2/19/2016
PRINCIPAL INVESTIGATOR:	BROWN, Heather - Child & Youth Studies
CO-INVESTIGATOR(S):	Michelle Searle, Adrienne Sauder, and Lori Kirkpatrick
FILE:	15-230 - BROWN
TYPE:	Faculty Research STUDENT: SUPERVISOR:

TITLE: Assessment Case Study

ETHICS CLEARANCE GRANTED

Type of Clearance: NEW Expiry Date: 2/28/2017

The Brock University Social Science Research Ethics Board has reviewed the above named research proposal and considers the procedures, as described by the applicant, to conform to the University's ethical standards and the Tri-Council Policy Statement. Clearance granted from **2/19/2016 to 2/28/2017**.

The Tri-Council Policy Statement requires that ongoing research be monitored by, at a minimum, an annual report. Should your project extend beyond the expiry date, you are required to submit a Renewal form before **2/28/2017**. Continued clearance is contingent on timely submission of reports.

To comply with the Tri-Council Policy Statement, you must also submit a final report upon completion of your project. All report forms can be found on the Research Ethics web page at http://www.brocku.ca/research/policies-and-forms/research-forms.

In addition, throughout your research, you must report promptly to the REB:

a) Changes increasing the risk to the participant(s) and/or affecting significantly the conduct of the study;
b) All adverse and/or unanticipated experiences or events that may have real or potential unfavourable implications for participants;
c) New information that may adversely affect the safety of the participants or the conduct of the study;
d) Any changes in your source of funding or new funding to a previously unfunded project.

We wish you success with your research.

Approved: K Maich

Kimberly Maich, Chair
Social Science Research Ethics Board

Note: Brock University is accountable for the research carried out in its own jurisdiction or under its auspices and may refuse certain research even though the REB has found it ethically acceptable.

If research participants are in the care of a health facility, at a school, or other institution or community organization, it is the responsibility of the Principal Investigator to ensure that the ethical guidelines and clearance of those facilities or institutions are obtained and filed with the REB prior to the initiation of research at that site.

Appendix G: Graduate Research Ethics Board Approval Letter

July 24, 2020

Miss Katrina Carbone
Master's Student
Faculty of Education
Queen's University
Duncan McArthur Hall
511 Union Street West
Kingston, ON, K7M 5R7

GREB Ref #: GEDUC-1009-20; TRAQ # 6030319
Title: "GEDUC-1009-20 Exploring Teachers' Assessment Identity Through Educational Technology"

Dear Miss Carbone:

The General Research Ethics Board (GREB), by means of a delegated board review, has cleared your proposal entitled **"GEDUC-1009-20 Exploring Teachers' Assessment Identity Through Educational Technology"** for ethical compliance with the Tri-Council Guidelines (TCPS 2) and Queen's ethics policies. In accordance with the Tri-Council Guidelines (Article 6.14) and Standard Operating Procedures (405), your project has been cleared for one year.

You are reminded of your obligation to submit an annual renewal form prior to the annual renewal due date (access this form at http://www.queensu.ca/traq/signon.html/; click on "Events;" under "Create New Event" click on "General Research Ethics Board Annual Renewal/Closure Form for Cleared Studies"). Please note that when your research project is completed, you need to submit an Annual Renewal/Closure Form in Romeo/traq indicating that the project is 'completed' so that the file can be closed. This should be submitted at the time of completion; there is no need to wait until the annual renewal due date.

You are reminded of your obligation to advise the GREB of any adverse event(s) that occur during this one-year period (access this form at http://www.queensu.ca/traq/signon.html/; click on "Events;" under "Create New Event" click on "General Research Ethics Board Adverse Event Form"). An adverse event includes, but is not limited to, a complaint, a change or unexpected event that alters the level of risk for the researcher or participants or situation that requires a substantial change in approach to a participant(s). You are also advised that all adverse events must be reported to the GREB within 48 hours.

You are also reminded that all changes that might affect human participants must be cleared by the GREB. For example, you must report changes to the level of risk, applicant characteristics, and implementation of new procedures. To submit an amendment form, access the application by at http://www.queensu.ca/traq/signon.html; click on "Events;" under "Create New Event" click on "General Research Ethics Board Request for the Amendment of Approved Studies." Once submitted, these changes will automatically be sent to the Ethics Coordinator, GREB, at University Research Services for further review and clearance by GREB or the Chair, GREB.

On behalf of the General Research Ethics Board, I wish you continued success in your research.

Sincerely,

Chair, General Research Ethics Board (GREB)
Professor Dean A. Tripp, PhD
Departments of Psychology, Anesthesiology & Urology Queen's University

c: Dr. Michelle Searle, Supervisor
Dr. Saad Chahine, Chair, Unit REB
Kyle Cummings-Bentley, Dept. Admin.