

**A Student-Directed Holistic Assessment Approach
to Help Teachers Support the Diverse Needs of Students
and Develop Self-Regulated Learners in Inclusive Educational Settings**

A DISSERTATION

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in partial fulfillment of the requirements for the degree,
Doctor of Philosophy in Educational Studies

by

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Dedication

This dissertation is dedicated to the memory of Patrick Montgomery and Andrieana Montgomery, two exceptional educators whose commitment, compassion, and belief in the potential of every learner embodied the true spirit of inclusive education. They tragically lost their lives in a sudden and heartbreaking event in the summer of 2024.

Patrick, my nephew, served as a teacher within the Durham Catholic District School Board, supporting diverse learners in inclusive classroom settings. Beyond the classroom, he devoted countless hours to coaching and mentoring young athletes, inspiring them to pursue their full potential. Andrieana, the mother of Patrick's children was also a teacher in Kawartha Pine Ridge District School Board, specializing in Art education and Indigenous studies. Her warmth, creativity, and positive spirit enriched her teaching and empowered students of all identities to learn in ways that reflected their strengths.

Their lives and work stand as a powerful reminder that inclusive education is made possible through dedication, empathy, and unwavering belief in students. This work is offered in their memory and in recognition of the lasting impact they had on their students, families, and communities.

Abstract

In Canada, the number of students requiring educational support has been rising annually (People for Education, 2019). Yet, varying provincial policies and processes of identifying and supporting learning needs has led to inequitable and inaccessible support to meet the diverse needs of all students in inclusive classrooms (Trembley & Belley, 2017). In some provinces or school districts, the level of support has been determined by the identification of a medical diagnosis within a psycho-educational assessment; while in other locations, educational support or adaptations have been provided as soon as a learning need has been informally identified. There have also been some students who might never receive any additional support if their needs have been unrecognized or invisible. Regardless of how the needs were identified, some teachers have found it challenging to implement the required support due to large class sizes, limited training, time, resources, and lack of classroom support. In my research, I identified two fundamental issues; first being able to efficiently identify the learning needs, and second, being able to practically implement effective educational support to meet the diverse needs of all learners.

To address these issues, I explored the development of a student-directed holistic assessment tool to save teachers time in identifying initial student needs and to increase student involvement and accountability in their learning. The purpose of the assessment tool was to enable students to directly communicate their needs to teachers instead of solely relying on teachers to determine student needs through traditional assessment resources. The second objective of my assessment tool was to enable students in collaboration with teachers to select universal instructional strategies that could support individual students' needs as well as the needs of other learners in the classroom. My study was thereby guided by a student-centered theoretical framework based on the humanistic and motivational theories of Dewey, Rogers, Deci, and Ryan.

Dewey and Rogers proposed that teachers should be facilitators who guided students to actively learn and become more accountable for their learning, thereby increasing student motivation (Dewey, 1899; Dewey, 1938; Rogers, 1969). Ryan and Deci's self-determination theory (SDT) further suggested that students could be intrinsically motivated when their psychological needs of competence, autonomy and relatedness were fulfilled in autonomous-supportive environments (Deci et al, 1991; Deci & Ryan, 2000). Therefore, my study examined the impact of student motivation, and identifying student needs when teachers guided active student learning and developed self-regulated learners with a student-directed holistic assessment tool.

The development of the tool was grounded by design-based research (DBR). My design-based research involved three phases: 1) analysis and exploration, 2) design and construction, and 3) evaluation and reflection. The analysis and exploration component consisted of two parts. The first part of analysis and exploration examined the need for my research with a literature review and a commercialization consultation with potential stakeholders. The second part of analysis and exploration included a student survey which informed the design and development of the assessment tool. The assessment tool was tested and refined through three iterative cycles in the design and construction stage. My research questions were answered in the reflection and evaluation phase, and design principles were drafted to support the implementation of the assessment tool.

My research found that completion of the assessment tool increased perceived motivation for students with and without learning challenges in grades 5-10, with the most significant impact on students in the transitional years of grades 7 and 8. Through online interviews, teachers in grades 5-10 also reported that the tool might be effective in helping them identify and support the diverse needs of students in inclusive classrooms. Teachers expressed that the assessment tool was

easy to use and contained meaningful information to build strong student-teacher relationships.

These outcomes suggested that the initial version of the holistic assessment could support both educators and students with and without learning challenges in public, private, and community-based educational settings.

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Chapter 1- Introduction

The number of students in Canada requiring special education support has been rising annually with an estimate of 17% of elementary school students and 27% of secondary school students in Ontario alone (LDAO, 2025; People for Education, 2019). These figures have not included some students with invisible disabilities or learning challenges whose needs have not been recognized (Statistics Canada, 2022). One reason for this disparity might have been because the term ‘special education’ has varied across Canada where education has been provincially regulated, with each province determining its own policies and processes of identifying students who qualify for additional education support (Trembley & Belley, 2017). Hence, it has remained difficult to deduce the actual prevalence of student learning needs across Canada. Therefore, the term ‘special education’ in my study refers to students who might qualify for additional education support within their specific provincial policies.

These varying policies and processes have led to inequitable access to quality education. Some students have been receiving support as soon as a need has been recognized by a teacher, and other students have been requiring a diagnosis of a specific disability before obtaining additional education services. There have also been some students who have not been receiving any additional support if they have an unrecognized invisible disability or learning challenge (Dalkilic & Vadeboncoeur 2016; Guenot, 2020; Slee, 2013; Taylor, 2013; Underwood et al., 2015). In addition to the evidence-based research, I have personally witnessed some of these situations as a mother of children with unique learning needs, a private educator attending to the diverse needs of students outside the traditional classroom setting and a member of several educational based associations. Every student, with or without a formally diagnosed disability, is an individual learner with unique learning needs. Unless those learning needs have been explored,

the student's needs might not be adequately supported. As an inclusive Educational Therapist, I first needed to understand each student's needs before I could attempt to support the students. My approaches have involved strength-based assessments, active student involvement, and helping students understand how they learn, so they want to learn. My practice also involves ongoing collaborative communication with each student and their teachers and parents to ensure everyone is aware of the holistic strengths and needs of the student and can practically guide students in the way that works best for them. In my role as a member and previous Vice Chair of the Special Education Advisory Committee for the largest school board in Canada, I also recognize that limited provincial funding, resources and training might make identifying and supporting the diverse needs of students challenging in a traditional mainstream classroom. Yet, I have also observed the successful implementation of inclusive methods by some teachers in large public-school classrooms and educational settings. Therefore, while my position focuses on moving towards more inclusive classrooms, I would like my research to help me understand and attempt to address the challenges faced by teachers and students through the voice of both student and teacher participants. I reside in Ontario, attend a university in PEI and have been exploring the educational system in New Brunswick, the pioneer province of inclusive education in Canada.

Therefore, in defining the scope of my research, I included students from three provinces: Ontario, New Brunswick and PEI. Each of these three provinces had some distinct differences in their special education processes, with some provinces further ahead in their inclusion models than others. Regardless of the province's processes, the student's trajectory has led to at least one of three outcomes. First, students could experience a delay in receiving educational support if the support was dependent on the diagnosis of a specific disability, and there were lengthy wait times for a psycho-educational assessment (Piccininni et al., 2016; Reid et al., 2020). Second, even when

educational support was provided without a diagnosis, a critical impairment or learning need might have been overlooked or inappropriately addressed, especially if the student was not involved in the decision-making process (Koch, 2017; Metzger & Hamilton, 2021; Reindal, 2008). Third, some students might not receive education support because their learning differences had not qualified for support under the provincial policies, or the student needs were inconspicuous to the teacher, and even the students themselves (Bizier et al., 2015; Clark & Bélanger, 2018; D’Intino, 2017; Disabled World, 2018; McMenemy & Nicholas, 2022; OME, 2017; Whitely & Gooderham, 2016). All outcomes might cause students’ needs to be missed or inadequately supported. Thereby, my research examined underlying issues that may be preventing teachers from both identifying and supporting student needs, specifically in inclusive classrooms.

Due to varying provincial policies, the definition of inclusive education has varied across Canada. However, one objective of inclusive classrooms has been to support the diverse needs of multiple students within the same classroom environment, regardless of each student’s unique identities. Inclusion has been more than just placing students with disabilities in a mainstream classroom; it has been about identifying individual learning needs and teaching to the diverse needs and identities of all students within a classroom (BC Ministry of Education, 2023; Moore, 2016; UNESCO, 2023). According to Shelley Moore (2016), this definition moves away from the traditional perception that inclusion means moving the minority population of students with disabilities into a mainstream classroom with a majority of students with similar needs. The reality is that more students have diverse needs and unique strengths that could benefit all learners in an inclusive classroom, not just those with disabilities. In her book, *One without the Other*, Moore (2016, pg. 4) referred to inclusion as finding unique qualities in all learners instead of trying to make students with disabilities the same as all other students. Her reflection about students in an

inclusive setting was to consider,

What do they bring? What can they contribute to because of their diverse and unique expertise? For decades we have been trying to take this “colour” out of our of students, taking the special out of special education, the autistic out of autism, the language out of cultures, and especially, the indigenous out of First Nations, Metis and Inuit children. This is not teaching to diversity. This is not inclusive. Teaching to diversity and inclusion is where we value the characteristics that ARE diverse, and not try and homogenize them..... the only way to ensure there was no “other” was not to make us all green (or the same), but instead to make as all “an other” (or unique).

Therefore, Dr. Moore considers the intersection of all identities in her definition of inclusion and diversity. I share Dr. Moore’s perspectives of inclusion and diversity; however, the scope of this specific study focuses on the identity of ability, which will expand to include the intersection of all identities in my future research. Despite the desire to consider the diverse needs of learners, current literature has indicated some teachers have been challenged in identifying and accommodating the needs of all students due to a lack of resources, teacher training, limited time and average class sizes of 23-28 students (Alahmari, 2019; Alberta Education, 2019; Allison, 2019; Cowan & Maxwell, 2015; Earl et al, 2015; Fletcher, 2020; Goodrow, 2016). In my earlier research (Montgomery, 2022), I examined practices of teachers who were successful in their transitions to inclusive classrooms. Teachers in my study said that inconsistent assessment approaches in their school boards had been one obstacle they experienced in identifying and supporting the diverse learning needs of students. For example, four of the eight teachers in my study said they had access to comprehensive diagnostic assessments, which they found useful for identifying a wide range of cognitive and academic learning challenges. In contrast, two teachers

reported having only generic screening tools used mainly to determine grade-level placement. Therefore, my research was driven by two key problems: students have unequal access to support, and teachers lack the resources to identify and effectively meet diverse learning needs in inclusive classrooms. Both the identification of a need and the educational support provided to meet that need was influenced by three varying perspectives of disabilities: the medical model, the social model, and the capability approach. Each disability model had varying implications on the timing and effectiveness of educational support provided to students. I started with an exploration of a medical model.

Educational Support based on a Medical Model

A medical model has been the traditional method of identifying students who need special education support. The adoption of a medical model has assumed a biological foundation for students' disabilities and educational limitations. Students without a formal medical diagnosis have also been affected by a medical model, if students were viewed as having the problem that had to be fixed so they could adapt to the system (Allan, 2010; Guenot, 2020). In a medical model, accommodations were made to integrate students into the classroom instead of considering adaptations to the curriculum which could benefit all learners (Guenot, 2020; Slee, 2013). Hence, this view has led to controversy about continuing to provide educational support based primarily on a medical model. Some proponents have also argued about the benefits of maintaining a medical model. Hogan's (2019) review of scholarly perspectives of a medical and social model highlighted varying arguments for a medical model. Proponents of a medical model have been concerned with completely dismissing individuals' medical disorders, especially mental health disorders, which has been a disorder requiring a certain level of awareness to support the disorder (Engel, 1977; Hogen, 2019). One consideration was to increase awareness of

disabilities in a positive light, rather than moving completely away from a medical model. This ongoing controversy about the benefits and challenges of a medical model has continued to affect the decisions of students' access to educational support and the implementation of support in the classrooms. Although students with and without a medical diagnosis have been able to access education support with a medical model, varying provincial policies determined their processes.

The education act in each province has stipulated that all students who have been diagnosed with specific disabilities are entitled to receive special education support; however, provinces have been able to establish their own identification processes (Alberta Teachers' Association, 2014; OME, 2004; PEI Dept of Education, 2005; Saskatchewan Learning, 2004). At the time of my research, some provincial school boards required the completion of a psycho-educational assessment to receive special education services (Alberta Education, 2006; Saskatchewan Learning, 2004). These assessments could have been initiated by the school at no cost to the parent; however, the process sometimes involved lengthy wait times of months or years to obtain an assessment (Clark & Bélanger, 2018; ETFO, 2019; McCrimmon et al., 2019; Ontario Human Rights Commission, 2018; People for Education, 2017; Piccininni et al., 2016). To expedite the process, some parents with financial resources have been seeking out their own private assessments (Jervis & Winton, 2017; Waterfield & Whelan, 2017). Yet delays in obtaining support have continued for students from low-income socioeconomic demographics, if it was financially difficult for them to obtain private assessments or alternative educational aid outside the public school system (James, 2021; Martinez-Zuniga, 2017). In addition to identifying need through formal psycho-educational assessments, some provinces have been utilizing alternative processes.

In Ontario, PEI, and New Brunswick, there have been circumstances where a formal medical diagnosis has not been required, but instead education support has been based on the informal identification of specific disabilities (Aucoin et al., 2020; McCrimmon et al., 2019; New Brunswick, 2015; OME, 2004; PEI Dept of Education, 2005; Ritchie et al., 2021). Most of these methods of identifying students who qualified for educational support correlated with a medical model of disability; when the reason for obtaining the support assumed the students' learning challenges were the cause of their educational limitations. After it was determined that a student qualified for educational support, the next step was to formalize the support through the development of an educational plan.

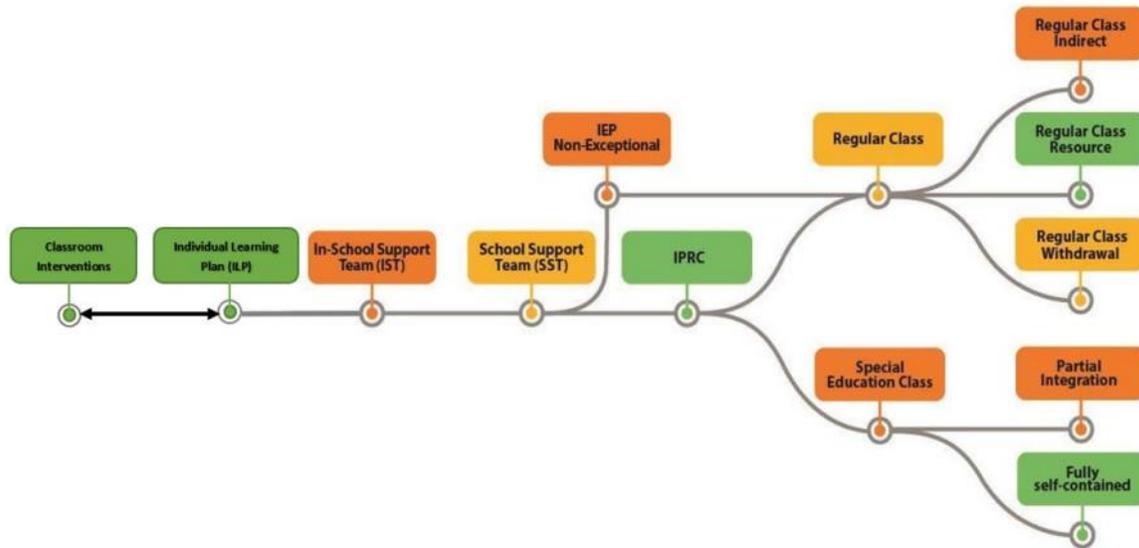
The name of the educational plan varied but the most common name across the provinces was an Individual Education Plan (IEP) which in Ontario was defined as "A written plan describing the special education program and/or services required by a particular student, based on a thorough assessment of the student's strengths and needs that affect the student's ability to learn, and demonstrate learning" (OME, 2004, p. 6). An IEP is a provincially mandated document which requires schools to provide the instructional, environmental and assessment accommodations outlined in a student's IEP. Although, the term IEP has been in effect within Ontario, B.C. and PEI; Alberta has been utilizing the term Individual Program Plans (IPP), and New Brunswick has been referring to the document as a Personalized Learning Plan (PLP) (Alberta Education, 2006; British Columbia Ministry of Education, 2016; New Brunswick, 2015; Ontario, 2004; PEI Dept of Education, 2005). For the purpose of my research, I have referred to this document as an IEP.

Research has found mixed perspectives on using the IEP. An informal IEP might have been beneficial for some students with disabilities who may not have otherwise qualified for

educational support without a formal medical diagnosis (Trembley & Belley, 2017). Depending on the provincial guidelines and schools' processes, the type of involvement by students might have also affected the quality of the educational support they receive. If students were involved in the decision of their accommodations, students might have been more receptive to using the accommodations. However, sometimes IEPs were created primarily by the special education resource teacher, with little if any involvement by the student (Cavendish & Connor, 2018; Cooper, 2019). When students were not involved in the process, students could have been resistant to using the accommodations due to stigmatization, especially if they were the only one in the class receiving the instructional aides (Koch, 2017; McMenemy & Nicholas, 2022; Metzger & Hamilton, 2021). James (2021) study also found stigmatization effects from the implementation of IEP with racialized students, especially Black males. As a result, the Toronto District School Board has moved away from IEPs altogether in primary grades due to the discriminatory barriers that IEPs had on student progress in later years, especially Black males in secondary school (White, 2020). Despite this dilemma, some families have been continuing to advocate for an IEP because the IEP would have ensured the student would be provided with the support they needed (CADDAC, 2021). The implementation process of IEPs has also resulted in positive and negative impacts on the students who received the support and the teachers who implemented the support. Although school districts must follow specific provincial policies in the availability of IEPs, school districts have some flexibility in their processes. An example of the process in one school board in Ontario has been illustrated in Figure 1, although the process will vary across each school board.

Figure 1

IEP process in Toronto District School Board in Ontario



Source: TDSB (2021)

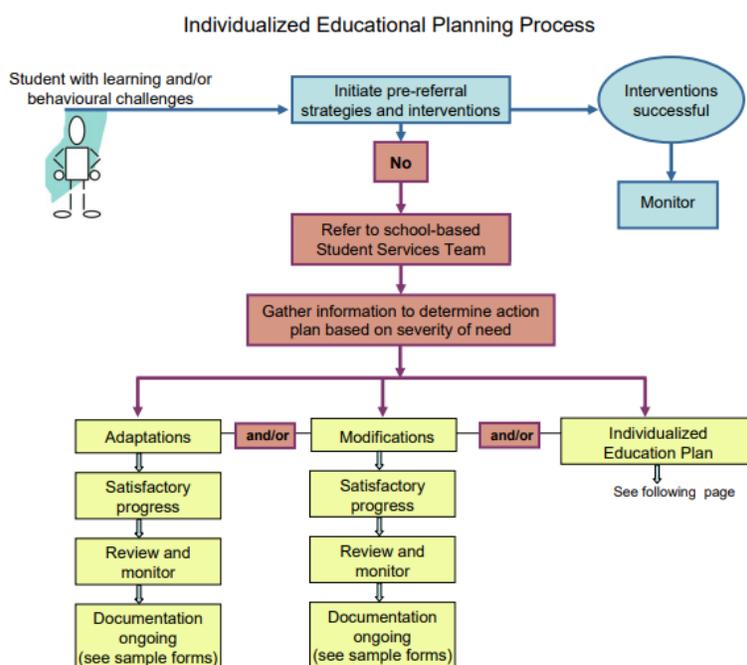
The process usually began with the identification of a learning need within the classroom, with teachers experimenting with random instructional strategies (PEI Dept of Education, 2005; OME, 2005). The strategies were then documented on an individual learning plan (ILP) which included similar information to an IEP, but it was developed solely by the teacher to keep track of the strategies implemented. If the strategies were unsuccessful, the school teams were then approached to offer more guidance to the teacher. At that time, instead of requiring a psycho-educational assessment and diagnosis, an IEP could be created for non-exceptional students or those students without a diagnosed disability. If the student required more intensive support outside the regular classroom, the student would continue through the identification process to an Identification and Placement Review Committee (IPRC) (TDSB, 2021). In this example, some type of educational support could be received without the requirement of a diagnosis, whereas more intensive support required confirmation of the disability with a psycho-educational

assessment (Dalkilic & Vadeboncoeur 2016; Mitra, 2006).

Similar to the TDSB process, teachers in PEI were encouraged to identify and support students who had diverse learning needs with various strategies before requesting the implementation of an IEP (PEI Dept of Education, 2005). When informal strategies were not successful as illustrated in Figure 2, school districts in PEI have been documenting adaptations through a Record of Course Adaptation form.

Figure 2

Individualized Educational Planning Process



Source: PEI Dept of Education (2005)

Adaptations were alternate formats of instructional or assessment strategies that did not affect the curriculum expectations. This is similar to the accommodations proposed in Ontario's IEP processes. However, some students with more intensive needs could also require modifications to the curriculum. Unlike adaptations, modifications changed the curriculum requirements and could affect the student's future academic pathways, so careful consideration was encouraged when

deciding whether a student required adaptations or modifications to successfully participate in the prescribed curriculum. Although both Ontario and PEI teachers were encouraged to initiate strategies upon the onset of an identified need; the accountability of the implementation of strategies had only been possible through the development of an IEP (OME, 2004; PEI Dept of Education, 2005). However, the implementation of an IEP has been challenging for some teachers.

Teachers with limited resources and training have found the implementation of an IEP difficult (Coxwell & Maxwell, 2015; Goodrow, 2016; Henderson, 2018; Leaver, 2012). One participant in Goodrow's (2016) study on inclusion described her experience in creating, implementing and monitoring IEPs as intimidating. She expressed that "IEPs are written by people who know the field... implementing it isn't as easy as it is with someone without a background so it can at times be a little bit intimidating" (p. 66). Other teachers from Cowan and Maxwell's (2015) study on inclusive classroom practices expressed concerns about the time it took to complete the paperwork, implement and monitor interventions from an IEP for individual students in a large classroom. One teacher stated, "What do I do with the other kids while I am doing intervention" (Coxwell & Maxwell, 2015, p. 9)? This formal process of creating and implementing an IEP has been based on a medical model because the proposed accommodations were assumed to fix the student's disability, so the students can be integrated into the system. A medical model in inclusive education has been challenged for disregarding other barriers in the system such as a substandard curriculum design and biases towards individuals' functional capabilities (Dalkilic & Vadeboncoeur 2016). Hence, a social model was considered an alternative.

Identifying Learning Needs with a Social Model

Unlike a medical model, a social model has attempted to address the needs of students as soon as the needs have been identified regardless of a disability diagnosis. A social model has

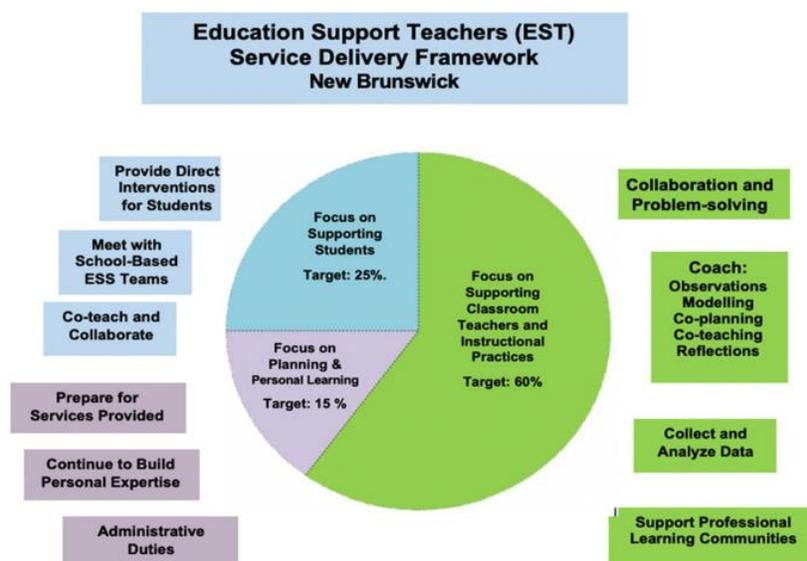
viewed disability based on a social construction instead of characteristics of the individual (Dalkilic & Vadeboncoeur 2016). The focus in a social model has been on the systemic barriers faced by students with disabilities, and it has proposed a structural change to meet the educational needs of the student, instead of the student expected to adapt to the system. A social model started by reviewing the curriculum within the system to ensure it was accessible for all students regardless of a disability. The implementation of universal design for learning (UDL) strategies which considered the needs of all learners in the classroom had been one solution in increasing accessibility. This was specifically evident in UDL Guidelines 3.0, which considered learners multiple and intersecting identities as part of variability, social and emotional learning, student-centered learning, and an emphasis on strength-based approaches (Cast, 2024). When the implementation of universal strategies was successful, inclusion was established because inclusive classrooms meant that “All students actively participate and learn with their peers in the same classroom. Adaptations and accommodations are made for all to succeed” (Canadian Research Center on Inclusive Education, 2021, par. 1). In inclusive classrooms, the environment was adapted to the needs of all students instead of students being expected to adapt to a standardized curriculum (Parekh, 2018).

Even though provincial ministries across the country have been promoting inclusion using universal strategies, the progression has been slow except in New Brunswick (BCME, 2016; OME, 2013; Parekh, 2013, PEI Dept of Education, 2005). New Brunswick had been following an inclusive approach to education for many years but most visible in 2013, with the introduction of Education Support Teachers (EST) who have been directly supporting teachers in inclusive classrooms (Aucoin et al., 2020). In contrast to traditional resource teachers who, in most provinces, worked with a small population of students requiring special education support; the

EST primarily helped the teacher with all students in the classroom. A distribution of the responsibilities of the ESTs was illustrated in Figure 3.

Figure 3

Education Support Teachers (EST) Service Delivery Model



Source: Province of New Brunswick (2014).

In the EST model, the needs of all students were considered not just students who have IEPs; which meant the focus was on all student needs first, with targeted support also available for students who required more intensive support (Aucoin et al., 2020). The EST model was an example of a social model as the needs of all students were the primary goal, not just students with identified disabilities. A social model has also received criticism for ignoring specific restrictions of individuals' impairment or additional capabilities (Reindal, 2008). An alternative to a social model was the capability approach.

Identifying Functional Needs through a Capability Approach

The capability approach, developed by Amartya Sen (1992), addressed some of the criticisms of a medical and social model, and considered well-being and equity based on the

concepts of functioning and capabilities. Functionings were various roles assumed by a person and tasks within these roles (Sen, 1992). Capabilities have been defined as “real opportunities and freedoms people had to achieve valued functionings” (Terzi, 2005, p. 449). Equity was then the extent of freedom provided to individuals to choose functions and develop the capabilities most important to them.

A holistic student-centered view in the capability approach proposed that the identities of students expanded beyond a label of disability as in a medical model (Dalkilic & Vadeboncoeur 2016). Therefore, teachers should not assume that universal practices for a specific disability label would support all students with that specific disability. The capability approach also extended further than a social model, which assumed the social construction of the environment was the primary factor limiting an individual’s capabilities. Instead, the capability approach also proposed that available resources were a third factor that could not be overlooked (Norwich, 2014). In other words, the capability approach proposed that all three factors could affect an individual’s capability to function; 1) individual’s personal characteristic including age and impairment, 2) available resources and their relative costs, and 3) environment including physical and social barriers. In assessing a student’s educational needs to set up practices that could enhance a student’s capabilities, the capability approach stipulated the importance of considering the relationships between the student, teacher and the student’s family, as well as resources available within and outside the classrooms (Dalkilic & Vadeboncoeur 2016). The capability approach has received the least amount of ground in Canada but seemed to be increasingly established in the United States. In addition to the benefits of supporting students with recognizable disabilities, the capability approach might be a suitable approach for students with invisible disabilities.

Due to the varying definitions of disabilities, the provision of educational support was

often overlooked for students with mental health disorders that impacted learning such as mental anxiety, depression, attention deficit hyperactivity disorder (ADHD) and attention deficit disorder (ADD) (Bizier et al., 2015; Clark & Bélanger, 2018; D’Intino, 2017; Disabled World, 2018; McMenemy & Nicholas, 2022; OME, 2017; Whitely & Gooderham, 2016). These types of disorders were sometimes referred to as invisible disabilities because they were not immediately apparent, or as “physical, mental, or neurological conditions that were not visible from the outside yet can limit or challenge a person’s movements, senses with adverse effects to carry out normal day-to-day activities” (Disabled World, 2018, par. 1). In fact, the Canadian Survey of Disabilities (CSD) (2022), reported that among youth aged 15 to 24 with disabilities, invisible disabilities were the most common in 2022, specifically mental health-related (68%), learning (46%) and pain-related (34%). Although not always recognized, students with invisible disabilities had functional needs and capabilities which could be developed to minimize their learning barriers. Therefore, their needs could be addressed using the capability approach (Sen, 1992). The capability approach assumed that individuals had the ability to decide and communicate their own functions, but some argued that this created challenges for younger students or those with disabilities (Underwood et al., 2015). However, these biased perceptions countered a capability-oriented system and student-centered whole child approach which surmised that children could and should be active agents in their learning in collaboration with their educators and families (Taylor, 2013; Underwood et al. 2015). Thereby, the capability approach has assumed an active role for students in identifying and communicating their needs.

In consideration of the various disability models, students' involvement in the assessment process varied from minimal involvement with a medical model to complete involvement within a student-centered process of the capability approach. Hence, my research explored concepts of

student-centered approaches to learning. Whether a medical model, social model or capability approach was adopted to assess the educational needs of students, all had implications in determining when, how and what type of educational support was provided to the student. All approaches also affected the teacher's role in identifying and supporting the needs of students with visible and invisible disabilities as well as others who may need education support. Barriers faced by teachers and students were predicted to increase as learning gaps from the COVID-19 pandemic were realized (Bielski, 2020; Braff, 2020; Hargreaves, 2021). However, some provinces found ways to address some of these obstacles. The first solution considered a consistent method for teachers to identify the needs of students with student profiles and class profiles.

Identifying Diverse Needs of Learners with Student and Class Profiles

To support school boards and teachers in effectively identifying and supporting the learning needs of students, Ontario and Alberta have introduced assessment and screening tools to assist teachers in gathering both class and individual student data to better understand and support the needs of all students (AME, 2010; OME, 2013). These resources were called class profiles and student profiles. Class profiles are “an information-gathering tool, a reference and tracking tool, all in one. It helps teachers plan effective assessment and instruction for all the students in the class, monitor student progress, and provide timely interventions when needed” (OME, 2013, p.34). A student profile “provides detailed information about the student to guide the selection of assessment tools, instructional strategies, and where appropriate, individualized supports that are best suited to that student's learning style, preferences, strengths, needs, interests, and readiness” (OME, 2013, p. 42). The student profile in some school boards has also been referred to as an individual learning plan (ILP) as shown in Figure 1 discussed earlier.

Despite the recommendations of class and student profiles, the teachers in my study

(Montgomery, 2022) reported that their school board was not using class profiles which resulted in the teachers creating their own resources for maintaining student assessment data which was cumbersome. The teachers also expressed that guidelines for the development of student profiles or ILPs were unclear, triggering a lack of accountability in the early implementation of effective instructional strategies. The teachers' reflections were corroborated by 8,230 secondary school students in a survey conducted by the Ontario Student Trustees' Association (OSTA) (2018) who expressed their own concerns about the utilization of these student profiles across other boards in Ontario. More than half of the students in the survey perceived that teachers did not understand or accommodate their learning needs and that the teachers created student profiles at their own discretion. However, in Alberta the guidelines about the effective use of class and student profiles were much clearer than the guidelines in Ontario (AME, 2010). The Ministry of Alberta also had a comprehensive library of tools and resources easily accessible to teachers to supplement the completion of the class and student profiles. In addition to identifying needs, student profiles and class profiles might have also been able to support teachers in building holistic relationships with their students. At the time of this writing, I did not find any research to indicate that student or class profiles were being utilized in New Brunswick or PEI.

The teachers in my study (Montgomery, 2022) expressed that building strong relationships with their students was one of the key factors contributing to their success in meeting the needs of all students in inclusive classrooms. The teachers indicated they started with students early by identifying students' strengths, needs, interests, and learning preferences. The teachers then used the student information to design instructional strategies which aligned with the student profiles. The teacher's process paralleled the 'assessment for learning' process which the Ontario Ministry of Education (2013) previously described as the first stage to identify and support the needs of

students:

Assessment for learning is the process of gathering evidence about a student's learning from a variety of sources, using a variety of approaches, or 'assessment tools', and interpreting that evidence to enable both the teacher and learner to determine; where the learner is in their learning; where they need to go; and how best to get there (p. 28). Despite the importance of building relationships, the Health Behaviour in School-Aged Children (HBSC) (2016) study found that students' sense of belongingness and connection with teachers declined with grade progression during the transitional years from grades six to ten. In the HBSC (2016) study, a majority of students in grade six felt their teachers cared about them as a person (77% of boys and 80% of girls) but by grade ten, this number had declined to 59% of boys and 54% of girls reporting that same type of relationship with their teachers. After teachers had identified student needs, the next step was to determine the most effective strategies to meet the students' needs. Involving the students in the selection and decision-making process has led to success for some teachers.

This student-centered approach correlated with the benefits outlined in the capability approach; and inclusive practices which paralleled a social model of supporting diverse learners (Dalkilic & Vadeboncoeur 2016; Taylor, 2013; Underwood et al. 2015). Building upon the importance of developing self-motivated students, humanist Carl Rogers (1980) proposed a holistic approach which considered students' strengths, interests and learning preferences to educate the whole person and guide students to become self-directed learners. Holistic assessments completed in collaboration with students and parents might aid teachers in differentiating instruction based on the characteristics of a learner's readiness, interest and learning profile (OME, 2010; Tomlinson, 2014). This comprehensive assessment approach might

address the criticisms of a social model. It might support consideration of a capability approach; as a holistic approach proposed the importance of understanding the restrictions and limitations as well as the strengths and capabilities of the learner (Reindal, 2008). Varying degrees of holistic assessments currently exist, but these assessments may be developed and utilized for different purposes. For example, an IEP is a comprehensive holistic document developed primarily by a special education teacher for students who have been identified to require additional support and may overlook the needs of students with invisible learning needs (Cavendish & Connor, 2018; Cooper, 2019). Although the information is comprehensive, some teachers have criticized the complexity and time commitment to develop and implement an IEP (Coxwell & Maxwell, 2015; Goodrow, 2016). Therefore, holistic assessments must also consider who is involved in the development and their practical implementation. Hence, I wanted to further explore in my research the collective concepts of student profiles and class profiles, holistic assessments and students' active involvement in their learning.

My Research Objective

My research objective was to develop a practical solution that could address the challenges faced by teachers in Canada in identifying and supporting the diverse learning needs of students in inclusive classrooms. My goal was to determine if the development of a student-directed holistic assessment implemented at the 'assessment for learning' stage could: 1) assist teachers in the early identification of the diverse needs of students in inclusive classrooms, 2) assist teachers in the design of effective instructional strategies aligned to learner and class profiles, and 3) increase student motivation, encouraging students to be accountable for their own learning. My theoretical framework was derived from Deci and Ryan's (2000) self-determination theory which I have discussed in detail in chapter two. The self-determination theory proposed that intrinsic motivation

can be triggered by three psychological needs of relatedness (relationships), autonomy (choice), and competence (perceived ability level). Therefore, the questions guiding my research were:

1. How does the implementation of a student-directed assessment for learning approach impact the motivation of students with and without learning challenges based on the self-determination theory?
 - Impact on relatedness by building holistic student-teacher relationships
 - Impact on choice of learning and student-directed learning
 - Impact on students' perceived competence
2. What are the perceptions of teachers about the usefulness of the student-directed assessment tool in helping teachers trigger student motivation through relatedness, autonomy, and competence?
3. How do the student-directed assessment outcomes impact the teachers' identification of student holistic learning needs and strengths and the design of instructional strategies?

Overview of Dissertation

My dissertation consists of ten chapters. The first chapter provided an outline of my research problem which suggested that the diverse learning needs of K-12 students across Canada had not been consistently identified and supported due to varying provincial policies and each province's adoption of a medical or social model of disability. The second chapter includes a literature review as well as the conceptual and theoretical frameworks that grounded my study based on humanistic and motivational theories. The concepts within the humanistic and motivational theories propounded a student-centered approach which prioritized student needs over medical diagnoses. Specific topics in the literature review integrating my research issue and conceptual framework include: strength-based approaches to assessment, personalized learning

environments, self-regulated and self-directed learning and universal design for learning. In the third chapter, I outline my research design which consists of the methodologies and research approaches I considered, and the reasons for my final decisions. I provide a detailed outline of my research design and how it was implemented. After my research was completed, chapters four through nine included my recruitment strategy, data collection, data analysis, findings, and discussion for each phase of my design-based research process methodology. The final chapter concludes my study with limitations, implications of my research, as well as future research opportunities.

Chapter 2- Literature Review

My literature review started with the development of my conceptual framework which explored my ontological and epistemological views and were grounded by the philosophies of John Dewey, Rogers' humanistic theory and Deci and Ryan's self-determination theory. Building upon these theories, my literature review explored concepts related to active learning through experience, competence, relatedness, and autonomy through choice. These concepts included the impact of strength-based approaches on intrinsic motivation; students' active involvement in the assessment and learning process; self-directed and self-regulated learning and instructional frameworks to sustain autonomy supportive approaches. The literature also addressed my research questions by examining the feasibility and potential effectiveness of student-directed assessment approaches to support teachers in the classroom. I further investigated the barriers to student-centered learning as well as successful approaches that have promoted intrinsic motivation and increased engagement to support the learning needs of all students. Finally, I revealed the gaps in literature that still need to be addressed in my future research. My literature review began with the building of my conceptual framework.

Building a Conceptual Framework

In the development of my conceptual framework, I first reflected on my own ontological and epistemological views and then demonstrated how these views linked to the concepts from four humanist theorists: John Dewey, Carl Rogers, Ed Deci and Richard Ryan.

My Ontological and Epistemological Views

My ontological stance was that multiple realities existed and that each reality was unique depending on how they were perceived by individuals. My perspectives therefore aligned with a relativist ontology which according to Guba and Lincoln (1994) viewed reality as constructed

within the human mind, so reality was relative to how individuals experienced it at any given time. Guba and Lincoln (1994) further depicted that realities in the relativist ontology existed in the form of “multiple and intangible mental constructions that were based on experience, local and specific in nature and dependent on their form and content on the persons or groups holding the constructions” (Guba & Lincoln cited in Shah & Al-Bargi, 2013, p.257). This meant there were multiple realities in which knowledge could be constructed through interactions in natural settings. Consequently, my research relied on interpretations of data from many points of view.

I also believed that knowledge was constructed subjectively through meaningful prior experiences, intrinsically motivated interactions, and through practical actions derived from theory. My epistemological beliefs corresponded with both the interpretivist/constructivist and pragmatic paradigms, making them a multi-paradigmatic view (Taylor & Medina, 2013). Interpretivist/constructivists believed that knowledge was constructed through interaction between humans in specific social contexts (Crotty, 1998). However, since I was also interested in the link from theory to practice, my beliefs have been aligned with the pragmatic paradigm. One of the earliest contributors to pragmatism in the educational field was John Dewey, who believed that the theory of inquiry was the link between understanding our actions and consequences and deliberately controlling our actions rather than acting through trial and error (Kaushik & Walsh, 2019). Hence, Dewey was a proponent of integrating theory with action, and he proposed that “because we live in a world in process, the future, although continuous with the past is not its bare repetition” (Dewey, 1929, p. 40). In addition to Dewey’s views on the theory of inquiry, Dewey also believed that knowledge was socially constructed through experiences initiated by the teacher (Dewey, 1899). Therefore, my conceptual framework was initially influenced by the philosophy of John Dewey.

One of Dewey's followers, Carl Rogers, also shared Dewey's views of the construction of knowledge through experience and student-centered learning, so my research was also derived from Rogers' humanistic theory (Rogers, 1969). I analyzed Dewey's and Rogers shared perspectives of student-centered learning as well as their contrasting stances of the student's and teacher's roles in the learning process. Dewey's and Rogers' theories emphasized the importance of intrinsic motivation in student learning and achievement, which was a natural transition to the concepts of Deci and Ryan's self-determination theory. Therefore, the works of Dewey, Rogers, Deci and Ryan solidified the foundation for my conceptual framework. I started my conceptual framework analysis with an inspection of Dewey's influences on education and then illustrated how all theories addressed my research questions through an integrated theoretical framework.

Dewey's Pragmatic Approaches to Progressive Education

As a pragmatist and leader of progressive education, Dewey (1938) believed human action could not be separated from past experiences and new knowledge was influenced by past experiences and would impact future experiences as well. Dewey's philosophy was sometimes confused by other followers of progressive education who maintained that progressive education was a new approach and was contrary to and should be separated from traditional education. Instead, Dewey proposed we think of education as an experimental continuum where we contemplated about experiences that could be worthwhile or those that were not, or in Dewey's (1938) words, "discriminating between experiences that are educative and those which are mis-educative" (p. 37). Dewey (1938) stated that,

There is some kind of continuity since every experience affects for better or worse the attitudes which will help us decide the quality of further experiences, by setting up certain preferences or aversions, and making it easier or harder to act for this or that end. (p. 37).

Dewey meant that traditional education built the foundation for individuals to learn from their experiences. Traditional education also provided more opportunities for mastery learning and increased perceived competence based on successes of past experiences. Dewey proposed that teaching should begin at the student's readiness level, and prior experiences and interests should be embedded into the curriculum (Feinberg, 2014).

In addition to individuals learning from their own experiences, Dewey believed that teachers also had a responsibility in promoting the experimental continuum in students (who were less mature than teachers) to recognize which experiences were worthwhile and led to positive growth. However, the role of the student in the school community and their own learning should not be minimized. In fact, Dewey (1938) perceived education as a social process since the development of experience was based upon interaction among all members of a group. The members in a progressive school included the students and teachers in a democratic environment where both teachers and students were provided with intellectual freedom and participation in decision making (Knoll, 2016).

Dewey was concerned about the teacher's ability to create experiences for the purposes of students they taught. Some teachers assumed a certain set of conditions were desirable and motivational for all learners, but only those students who found the conditions acceptable managed to learn, and other students attempted to learn the best way they could (Dewey, 1938). Dewey's perspective of integrating students' interest into the content was derived from his balanced stance between traditional and progressive education. He could relate to the views of traditionalist, W. T. Harris, who focused on academic rigor as well as progressive educator Francis Parker, who promoted the natural interest of the child in the curriculum (Feinberg, 2014). One way Dewey (1938) considered the interests of learners was through active learning where students engaged in

their own learning. According to Dewey (1899), active learning involved students participating in the process of learning, making choices in what they learned and setting and being accountable for their goals.

In summary, Dewey's philosophies about education included teachers as facilitators and community builders, and students as active participants by learning through experience, with opportunities provided for choice and interest embedded in their content. Dewey's views promoted mastery learning, autonomy, social development and other factors which met the individual needs of learners. Based on a review of provincial educational policies across Canada, the guidelines set by the ministries also encouraged some form of active learning and student choice by promoting the involvement of the students and families in the IEP consultation process and emphasizing the implementation of UDL practices in inclusive classrooms (Cast, 2024; PEI Dept of Education, 2005, OME, 2005). However, due to the subjectivity of what continuous active learning or student involvement, there may be multiple interpretations of these guidelines and varying degrees in the type of student involvement required to influence student engagement and accountability of learning. As a result, further research may be required to better understand the impact of active learning and autonomy in the current system as it relates to Dewey's philosophy of progressive education. Dewey had many followers, including humanist psychologist Carl Rogers, who shared similar perspectives to Dewey.

Rogers' Humanistic Perspective of Self-Directed Learning

When analyzing the key elements between teacher centered learning and student-centered learning (level of choice, active/passive orientation, role of student/teacher), the major distinction between Rogers and Dewey was their views of the role of teacher and student (O'Neill & McMahon, 2005). Both Rogers and Dewey were proponents of students actively learning through

experience, being involved in their learning and being provided with some choice. In contrast to Dewey who believed teachers had a primary role in guiding students' learning, Rogers believed that students should maintain significant accountability for their own learning as self-directed learners (Whitely & Cohen, 1972). Rogers (1995) encouraged teachers to be facilitators who allowed students to be active learners, giving them the choice of what and how they wanted to learn. Rogers (cited in Grabau, 2017) said that "learning of all kinds goes on best, and lasts best, when it grows out of a real focus of interest in the learner" (par.1). Rogers (1995) believed that intrinsic motivation could also be achieved when students learned through their strengths and interests and were guided to take responsibility for their learning.

Dewey (1938) was concerned that too much reliance on the student minimized the importance of content and the role of the teacher. However, Rogers argued that placing more accountability on students did not absolve teachers of all responsibility either, as teachers still needed to educate students on how to become self-directed learners. One method that proved successful was the use of teacher-student contracts where students negotiated with the teacher what and how they would like to learn, with students responsible for following through on their commitments (Rogers, 1969). The contracts provided a formal avenue for teachers to monitor the progress of students and provide the appropriate guidance as needed while still providing students with choice in their learning. According to Burnard's (1999) interpretation of Rogers' concepts, students' choice of what they learned was based on why and how specific topics aligned with their interests. Rogers' form of educating the whole person by combining cognitive learning with affective-experimental learning was critical for a learner's potential to be fully achieved (Rogers, 1980).

Despite the benefits of student-centered learning, concerns existed about the student-

centered approach. Some critics expressed that student-centered learning focused too much on the individual, making it difficult to implement instruction for the entire class. They also argued many more resources would be required than traditional learning, and the social context of students learning from each other may be limited with student-centered learning (Herold, 2017b). Some critics also proposed that students who were accustomed to teacher-focused approaches might resist student-centered approaches for fear of failure. Hence, these concerns were contradictory to Dewey's and Rogers' concepts of people learning through active experiences with consideration of interests and choice in their learning.

In relation to learning through experiences, similar to Dewey, Rogers' viewpoint was that mastery could be achieved through progressively challenging experiences which met students at their readiness level to learn. In his interview with Dr. Whitely, Rogers shared an example of a student's progression to mastery,

Instead of forcing a student to agonize over writing when they aren't ready then lose interest, Rogers' suggested the teacher encourage the student to tell his story to the teacher or the whole class while the teacher scribes for him. Then when the other students get excited about the story, the student will be motivated to start writing on his own (Whitely & Cohen, 1972, 37min.).

The scenario illustrated the impact that mastery learning could have on a students' perceived competence when the student was able to be successful in a task.

When comparing the philosophies of Dewey and Rogers, there was a significant overlap in their student-centered approaches specifically in relation to students' active involvement in their learning, mastery learning through experiences, and educating the whole person by providing students with choices of learning based on students' interests and strengths. The one variability

was the role of the teacher and student; where Rogers proposed that students could be guided to become self-directed learners, but Dewey argued that teachers needed to play a pronounced role maintaining primary responsibility for students' learning. Therefore, Dewey and Rogers provided a foundation to student-centered approaches of learning which were ultimately related to how students learn and what motivates them to continue learning.

Motivational Theories Influencing Student Centered Learning

Influenced by the works of Dewey and Rogers, several motivational theories were developed to understand students' motivational orientations. Many of these theories explored the concepts of self-efficacy, competence, autonomy, mastery versus achievement learning, belonging/relatedness and self-regulation (Bandura, 1997; Block et al., 2010; Dweck, 2016; Dweck & Yeager, 2019).

Bandura's (1997) self-efficacy theory proposed that the level and direction of a person's self-efficacy were impacted by opportunities for mastery learning, observing vivacious experiences, receiving feedback through verbal persuasion and considering physiological and emotional states (Block et al, 2010). However, the self-efficacy theory was task specific and limited in determining the cause of motivation, meaning that a person's level of self-efficacy could vary between specific tasks without understanding the underlying causes of these variations (Bandura, 1997). Another theory which also explored self-efficacy as well as mastery learning was Carol Dweck's (2016) implicit theories of intelligence, commonly known as growth mindset and fixed mindset. Dweck suggested that motivation was based on students' belief of their self-efficacy; those who believed their abilities were innate and could not be changed were presumed to have a fixed mindset and were generally externally motivated to learn. In contrast, those who believed their development was based on the effort they exerted were said to have a growth

mindset and were generally intrinsically motivated to learn. Based on several research studies (Dweck, 2016; Dweck & Yeager, 2019; Yeager & Dweck, 2020), individuals with a fixed mindset needed to prove themselves and tended to avoid challenging tasks requiring substantial effort. In contrast, those with a growth mindset wanted to improve and master their abilities so exhibited mastery-oriented behaviour when faced with challenges. They believed their abilities could be developed, so they viewed failure as a growth experience and were motivated to try harder on tests and exams (Dweck & Yeager, 2019). Based on the findings of her research, Dweck suggested a growth mindset could be developed by setting learning or mastery goals instead of performance goals which highlighted learning/process-oriented versus performance/ person-oriented practices (Dweck, 2016; Haimovitz & Dweck, 2017). Although Dweck shared similar positions to Bandura of the impact of self-efficacy and mastery learning on a student's motivation, Dweck provided a clearer distinction of the effects of intrinsic and extrinsic motivation in determining which students may exhibit a growth versus a fixed mindset (Dweck, 2016). However, Dweck's model has also received some criticism on impacting achievement of students from varying socio-economic backgrounds as other factors could be impacting achievement levels of those from low-income backgrounds (Brez et al., 2020; King et al., 2021). Another motivational theory which also emphasized the importance of intrinsic motivation instead of extrinsic motivation and decomposed the roots and consequences of different types of motivation on the learner was Richard Ryan and Ed Deci's (Ryan & Deci, 2020) self-determination theory (SDT).

Self-Determination Theory's Influence on Student's Motivation to Learn

Deci and Ryan (2000) maintained that three basic psychological needs were essential to drive motivation: competency through the feeling of mastery and feedback; autonomy through self-initiation and self-regulation of one's own actions; and relatedness through the feeling of

belongingness (Deci et al., 1991; Ryan & Deci, 2020). SDT suggested that social contexts which supported these basic psychological needs promoted intentional action or intrinsic motivation rather than external motivations derived from rewards and avoidance of punishments (Ryan & Deci, 2020). If a person's decision to complete a task was influenced by external factors, the behaviour was no longer self-determined or intrinsically motivated (Deci et al., 1991). Due to the prominence of these three needs in the self-determination theory, I described each separately.

Competence related to a person's self-efficacy, perceived ability or feeling of mastery in achieving a task, activity, experience or goal (Deci et al., 1991; Ryan & Deci, 2020). The perceived competence of students with special education needs could be impacted if they had low self-efficacy due to repeated academic failures or the inability to master experiences (Rhew et al., 2018). According to Deci et al. (1992), encouraging competence in students with disabilities positively impacted their motivation and beliefs that they could achieve their goals. Providing opportunities to master experiences could move behaviours from extrinsically to intrinsically motivated actions. However, motives remained externally regulated or introjected if students were pressured to perform tasks before they were developmentally ready to master them (Ryan & Deci, 2000). Instead, competency could be satisfied by enabling mastery experiences through progressively challenging tasks, praising for efforts rather than intelligence, supplying well-structured environments, and implementing learning instead of performance goals (Deci et al., 1991; Dweck, 2016; Ryan & Deci, 2020).

The second need, relatedness, involved a sense of belongingness, respect and caring. It was satisfied by developing secure and satisfying connections with others (Deci et al., 1991; Ryan & Deci, 2020). Ryan (1991; Ryan & Belmont, 1991; Ryan & Lynch, 1989) proposed that autonomous motivation was found in children who experienced a sense of relatedness or closeness

to significant adults such as parents and teachers. Increased student engagement and energy was also observed by Streb et al. (2015) when autonomy supportive teachers provided learning environments which highlighted social relatedness. Deci and Ryan (2020) also discovered that when teachers' as well as students' basic needs were satisfied, teachers were more intrinsically motivated to autonomously support their students. For example, Klassen, Perry, and Frenzel (2012) studies reported that when teachers were satisfied with relatedness with their students, the teachers were also more engaged in their teaching. Despite the benefits of satisfying teachers' SDT needs, Ryan and Deci (2020) recognized challenges due to administrative pressures to perform specific standards, parental pressures, or lack of support in the classroom. They found that some challenges could be addressed with SDT interventions such as autonomy-supportive teacher training and the establishment of intrinsic goals.

Autonomy's Influence on Intrinsic Motivation

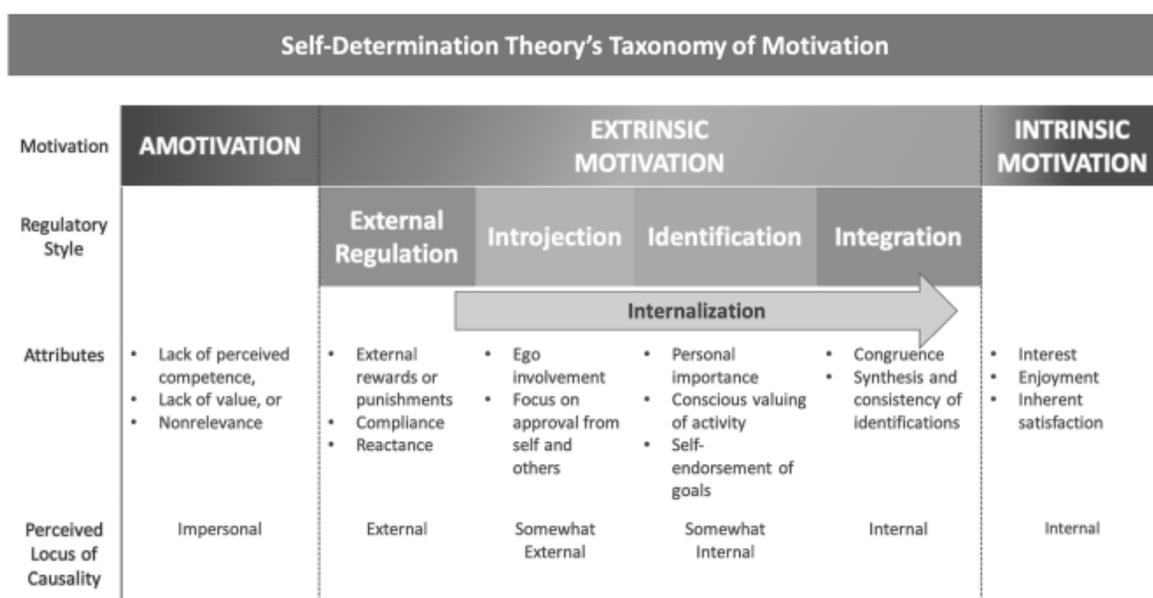
The third need, autonomy, involved self-initiation and self-regulation of a person's own actions and was triggered by intrinsic experiences of interest and value (Deci et al., 1991; Ryan & Deci, 2020). Providing opportunities for choice in learning and self-direction could also induce a greater feeling of autonomy (Ryan & Deci, 2000; Ryan, 1982; Deci & Ryan, 1985).

The Self-Determination Theory proposed that to trigger intrinsic motivation, competence had to be supplemented by autonomy, as people must believe they have both the ability (perceived competence) and internal desire (autonomy) to complete a task (Rodgers et al., 2014; Ryan, 1982). Autonomy was also a critical component in determining the level of intrinsically (autonomous) or extrinsically (controlled) motivated behaviour affected by competence and relatedness (Deci et al., 1991). For example, if feedback provided to increase competence was based on internalized efforts of the student, competence was intrinsically motivated; but if the student completed a task

for another person, competence was extrinsically motivated. The varying levels of autonomous and controlled motivations are illustrated in Figure 4 on the STD continuum ranging from: A-motivation, which was a complete lack of motivation, to four types of controlled or autonomous external motivations to intrinsic motivation where tasks were completed out of pure enjoyment and interest without any expected rewards or reinforcement (Deci & Ryan, 1985; Ryan & Deci, 2020).

Figure 4

Self-Determination Theory's Taxonomy of Motivation



Source: Ryan and Deci (2020)

The four ways extrinsic motivation was enacted were through; external, introjected, identified, and integrated forms of regulation (Ryan & Deci, 2020). The identified and integrated forms of regulation were autonomous motives because the intention was to accomplish for self rather than for others. On the contrary, external and introjected forms of regulation were controlling motives because of the expectation of reward or avoidance of punishment and the need

for approval or validation (Ryan & Deci, 2020). The SDT continuum of motivations also distinguished SDT from other motivational theories because it permitted a deeper analysis of the potential causes of each form of motivation. Autonomous and controlled motivations also impacted students' experiences in schools.

In a study comparing autonomy and controlling supportive teachers, Ryan and Grolnick (1986) indicated that higher levels of intrinsic motivation, perceived competence and self-esteem were reported by elementary students with autonomy supportive teachers than those who perceived their teachers as controlling. According to Ryan and Deci (2020), autonomy support was especially important for supporting the needs of diverse learners as it attempted to respect the unique characteristics, interests, needs, and challenges faced by each learner. Therefore, teachers who supported autonomy adopted a student-centered approach by first understanding, acknowledging, being responsive to student perspectives, and identifying ways to promote engagement (Ryan & Deci, 2020). This was accomplished by creating opportunities for students to be accountable for their schoolwork and learning, offering students meaningful choices based on their interests, minimizing controls, providing rationales for lessons, and providing access to resources needed for decision making (Deci et al., 1991; Ryan & Deci, 2020).

The analysis of Dewey, Rogers, Deci and Ryan illustrated how intrinsic motivation was influenced by active learning through experience, competence, relatedness, and autonomy, through choice and self-directed learning. The theorists suggested these concepts could impact student engagement and achievement for all types of learners, especially those with diverse learning needs, when the focus started with understanding student needs, interests and motivation in an autonomy-supportive or student-centered environment (Rhew et al., 2018; Ryan & Deci, 2020; Streb et al. 2015; Whitely & Cohen, 1972). My key reflection from the analysis of all theorists was

the importance of a positive student-teacher relationship within an autonomy-supportive environment. Although Dewey and Rogers maintained contrasting views of the extent of the student and teacher involvement in the process, they both agreed that the teacher had some type of role. I was able to relate to both stances through my relativist ontology position that multiple realities exist depending on its relativity to how individuals experienced it (Guba & Lincoln, 1994). My own previous educational experiences attending a student-directed alternative secondary school precipitated this revelation. I believe this autonomy-supportive alternative setting influenced my passion for life-long learning and my desire to motivate others through inclusive education practices. The alternative school environment resembled the concepts of Rogers more than Dewey as there was a lot of active learning and choice but very little involvement from the teachers. However, I did recall that a little more structure might have been beneficial at times, especially for some students who had never experienced student-directed learning. Although this alternative environment fulfilled my desire for more autonomy, I wondered if Dewey's progressive education approach might have presented a more pragmatic balance of autonomy and teacher guidance that may have been needed by others. According to SDT, individuals who were externally motivated may still depend on a level of reassurance and feedback from others (or teacher facilitation) to experience a sense of competence which Dewey's philosophy promoted (Deci et al., 1991, Ryan & Deci, 2000). Therefore, when considering the learning needs of all students, I believe an autonomous self-directed learner may be a product of intrinsic motivation. Yet it may also be premature to assume intrinsic motivation with autonomy alone; without some level of teacher guidance (relatedness) if perceived competence was not yet apparent. Therefore, my conceptual framework based on the humanistic and motivational theories transitioned into a holistic student-centered theoretical framework integrating key concepts from

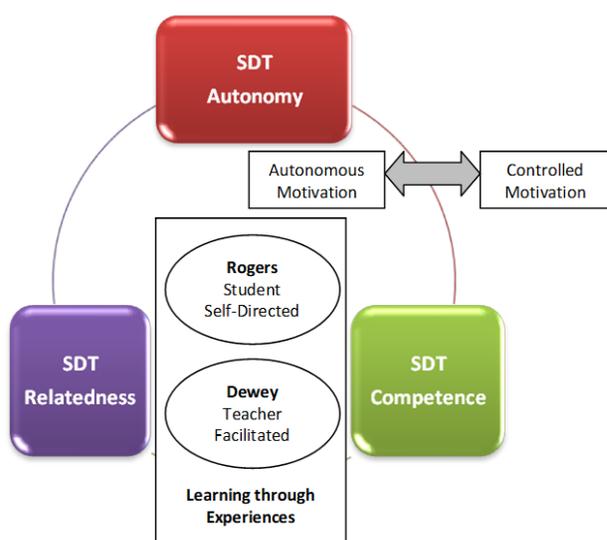
each of the theories.

Transitioning to a Student-Centered Theoretical Framework

My holistic student-centered theoretical framework was derived from the works of Dewey and Rogers' humanistic theory and have been threaded through the self-determination theory (Burnard, 1999; Deci et al., 1991; Dewey, 1899; Dewey, 1938; Rogers, 1969; Ryan & Deci, 2020). Therefore, Dewey's philosophy and Rogers' humanistic theory set the foundation of my theoretical framework which was further expanded by the self-determination theory (SDT) as illustrated in Figure 5. Both Dewey and Rogers believed that knowledge was constructed through active learning experiences; however, Dewey proposed that teachers were facilitators who guided students' learning, but Rogers maintained that students could be self-directed learners. Regardless, both Dewey and Rogers believed the relationships between students and teachers (or relatedness) were essential in sustaining a student-centered environment. They also emphasized the importance of perceived competence in increasing motivation.

Figure 5

Holistic Student-Centered Theoretical Framework



Deci and Ryan's self-determination theory (SDT) further proposed that student achievement and engagement were based on intrinsic rather than extrinsic motivation, which correlated with autonomous instead of controlled motives (Ryan & Deci, 2020). In fact, SDT suggested that both autonomy and competence were required to trigger intrinsic motivation. Intrinsic motivation stemmed from autonomy-supportive teachers and environments which increased students' engagement and aligned with a student-centered approach. Hence, the justification for my holistic student-centered theoretical framework that guided my research. This theoretical framework also corresponded with the research questions I answered in my study.

Addressing my Research Questions with a Student-Centered Theoretical Framework

My study included three research questions which examined the issues affecting both students and teachers in inclusive classrooms. Two questions implicitly focus on the teachers' needs in the classroom and whether or not a holistic student-centered assessment intervention might make it easier for teachers to identify and support the diverse learning needs of students.

- What are the perceptions of teachers about the usefulness of the student-directed assessment tool in helping teachers trigger student motivation through relatedness, autonomy, and competence?
- How do the student-directed assessment outcomes impact the teachers' identification of student holistic learning needs and strengths and the design of instructional strategies?

A student-centered approach assumed that teachers might be able to provide more effective instruction to all learners if teachers first understood the holistic needs, strengths, interests and learning preferences of each student (Rhew et al., 2018; Ryan & Deci, 2020; Streb et al. 2015). These first two questions then highlight the importance of building strong student and teacher

relationships to meet the basic psychological need of relatedness, competence, and autonomy.

The remaining question explored the influences teachers might have on supporting the needs of the students and impacting student motivation.

- How does the implementation of a student-directed assessment for learning approach impact the motivation of students with and without learning challenges based on the self-determination theory?
 - a. Impact on relatedness by building holistic student-teacher relationships
 - b. Impact on choice of learning and student-directed learning
 - c. Impact on students' perceived competence

The questions specifically examined the implications of a holistic student-centered intervention on a student's motivation in autonomy supportive settings. According to humanist theorists, student engagement and achievement may be influenced by intrinsic motivation especially in autonomy supportive environments (Deci et al., 1991; Ryan & Deci, 2020; Ryan & Grolnick, 1986). Autonomy supportive student-centered environments may also increase self-regulation and foster self-directed learning. Therefore, based on the key issues and questions that were answered in my research, the concepts within a holistic student-centered theoretical framework grounded my research.

I next illustrated how these concepts correlated with the current literature on student centered learning specifically; the impact of strength-based approaches on intrinsic motivation; students' active involvement in the assessment and learning process; influences of self-regulated and self-directed learning and instructional frameworks to sustain autonomy supportive approaches.

Increasing Motivation with Strength-Based Approaches of Learning

Strength-based approaches had historical relevance in education since the early 1830s when Froebel's goal was to bring out the strengths of students in the first kindergarten system by considering student achievement as well as human strengths. In fact, the word "to educate" means "to draw out", so strength-based educators focused on drawing out the strengths in students by increasing students' awareness of them (Lopez & Louis, 2009). A strength-based philosophy implied that everyone had strengths and could maximize those strengths to their fullest potential when provided with the opportunity to do so. A strength viewpoint suggested that capitalizing on strengths would lead to greater success than investing an abundance of time on weaknesses (Brownlee et al., 2012; Climie & Henley, 2016; Lopez & Louis, 2009). The capability approach discussed in the introduction chapter has been reflective of a strength-based perspective where the goal has been to substitute the language of needs with that of capabilities (Norwich, 2014). The capability approach has been extending beyond the medical and social models of disability by emphasizing students' capabilities and not only their limitations, thereby considering student's personal characteristics and impairments, as well as barriers within their social environments and resources available to them.

Despite the benefits of a strength perspective to education, deficit approaches in developing a learner profile were still predominant in schools with the focus on needs and remediation (Brownlee et al., 2012; Climie & Henley, 2016). Climie & Henley (2016) stated that although psycho-educational assessments provided balanced data on students' strengths and weaknesses, these assessments were generally used to uncover the deficiencies of a students' behaviour or performance with less emphasis on strengths. As a result, parents were often discouraged when reviewing the comments and recommendations in assessments which portrayed

their children in a negative light (Climie & Henley, 2016). The debate of using strength-based versus deficit-based assessments was also shown to influence students' motivation to learn.

Hiemstra and Van Yperen (2015) conducted a study of first year university students to determine the impact of intrinsic motivation when students had to identify strategies to improve a strength-based or deficit-based professional quality. Separate scales were used to determine the students' intrinsic motivation, perceived competence, and effort intentions to improve the specific qualities. The study found that students working on strengths reported higher levels of intrinsic motivation, competence, and effort intentions than those who focused on deficits. Furthermore, when students were permitted to establish their own developmental activities, students in both groups selected intrinsically motivating activities to capitalize on their existing strengths as well as improve their deficits. As a result, Hiemstra and Van Yperen (2015) concluded students generally could be intrinsically motivated to learn depending on the choices they were provided.

The movement to inclusion in New Brunswick K-12 schools was another example of a strength-based approach to learning (Aucoin et al., 2020). Based on the introduction of policy 322 by New Brunswick's Ministry of Education in 2013, one mandate of each teacher was to focus on student's strengths and needs, and not specifically on their challenges and deficits. One method of achieving this goal was through the introduction of the Educational Support Teacher who worked collaboratively with the classroom teacher to support the needs and promote the strengths of all learners in the classroom, not only students with identified learning challenges (Aucoin et al., 2020).

Regardless of the advantages of identifying students' strengths and motivations, Brownlee et al. (2012), indicated it was uncommon for teachers to utilize interest inventories, multiple intelligence or strength-based assessments in schools making it more difficult for teachers to

uncover students' strengths. Brownlee's et al. (2012) study explored the use of a strength assessment tool that could be used by teachers to create individual profiles for all students. Students initially completed the Strength Assessment Inventory (S.A.I) questionnaire and based on the results, a learner profile was developed which could be applied universally in a full classroom setting or more intensively on an individual basis if needed. The critical component of such a questionnaire was that the students were actively involved in the process from developing awareness of their strengths, to initiating plans which capitalized on their strengths to help them overcome their challenges. Providing students with the opportunity to customize learning activities and create their own goals corresponded with an autonomy supportive environment resulting in increased intrinsic motivation and student engagement (Alamri et al., 2020; Lee et al., 2015). Another strength-based assessment tool was the Multiple Intelligence survey.

The Multiple Intelligence survey derived from Gardner's multiple intelligence (MI) theory could also assist students to recognize their strengths within intra and interpersonal, kinesthetic, musical, naturalistic, linguistic, logical-mathematical and spatial intelligences. Gardner believed that each human being had a unique profile made up of these multiple intellectual capacities which enabled the strengths of students to surface in both academic and non-academic areas (Gardner, n.d). However, critiques of Gardner's MI theory have suggested that when students and teachers focused primarily on a strength domain, there was a risk in the underdevelopment of other domains required for applications outside the classroom (Glazzard, 2015). Waterhouse (2006) also criticized Gardner's theories for the lack of empirical evidence to support each type of intelligence as the various intelligences were described as general rather than specific characteristics. Gardner's theories have also been criticized for the lack of empirical evidence to support each type of intelligence as the various intelligences were described as general rather than

specific characteristics. In addition to formal assessments, informal assessments were also used to identify students' strengths and interests.

Informal methods of identifying students' strengths included classroom activities such as the strengths wall created by a grade four teacher in Brownlee's et al. (2012) study. The strengths wall was created at the beginning of the year when the teacher asked each student to reflect on their strengths and post them on the strengths wall. The teacher noticed that the qualities shared were primarily talents and skills rather than internal or character strengths. To deepen the activity, when the teacher noticed a goodwill action by one of the students, the teacher shared her reflection with the class then posted the character strength on the wall. The teachers' actions resulted in other students modeling the task by recognizing and posting character strengths about their peers on the strengths wall.

Climie and Henley (2016) also emphasized the benefits of using a strength-based assessment (SBA) paradigm with the student's Individual Education Plan (IEP) by proactively identifying the absence of a necessary skill instead of waiting for issues to emerge. In fact, King and Watson's (2010) research on teaching excellence proposed that teachers were accountable for developing a student's own belief in their potential to succeed. The teachers' support was especially important for students with learning disabilities as evidenced by Deci et al. (1992) who found that encouraging competence in these students positively impacted their motivation to learn and achievement levels. Some provinces integrated a formalized process for teachers to proactively identify the needs as well as the strengths and interests of the student prior to the development of an IEP through the creation of individual student profiles, learner profiles or learning plans (OME, 2013). The active involvement of students in the establishment of a learning plan also illustrates promising future outlooks.

Students' Active Involvement in Assessment and Learning Process

My research found that when students were provided the opportunity to identify and communicate their strengths, interests and learning preferences, this set the foundation for them to identify accommodations that worked best for them and become self-directed learners. Self-directed learning could then result in motivated students with increased independence, enabling teachers to directly support more students (Basham et al., 2016; Gross et al., 2018; Katz, 2021). Students' active involvement in learning started by identifying their strengths and needs through the creation of learner profiles.

Katz et al. (2021) study on the Three Block Model (TBM) adopted the Collaborative for Academic, Social, and Emotional Learning (CASEL) program to help students develop their own learning profiles. CASEL (2020) was a widely used program which identified the five competencies of social and emotional learning as: self-awareness, self-management, social awareness, relationship skills, and responsible decision making (Green et al., 2021). Although social and emotional learning was sometimes difficult to measure, a survey was developed by CASEL that measured these key competencies (Owen & Larsen, 2017). The CASEL program enabled students to become aware of their strengths, interests and learning preferences and make choices about academic activities that complement those strengths and interests. Significant improvements were gained by students in Katz's et al. (2021) experimental study of the Three Block Model when social and emotional learning skills were integrated into universal instructional practices.

Despite the benefits of student involvement in their development, provinces have inconsistent approaches of involving students and parents in the development of learner profiles and development plans (Alberta Education, 2006; OME, 2004; PEI Dept of Education, 2005).

Although learner profiles have been available in Ontario and Alberta, and an adaptation form in PEI, for teachers to capture initial instructional strategies attempted; the involvement of students has not been a requirement in the creation of these tools. However, in relation to development plans (IEP, PLP, IPP), ministries in each province have stipulated the importance of involving both students and parents in this process, yet the extent of involvement differed between provinces. In Alberta, Ontario and PEI, the development of an IEP or IPP has normally been initiated by a teacher or school administrator, and the guidelines have been encouraging participation of parents and students; but do not make involvement a requirement to proceed with the development plan (Alberta Education, 2006; OME, 2004; PEI Dept of Education, 2005). Yet, in New Brunswick, a PLP could be requested by parents in addition to teachers, and students and parents have been actively involved in the PLP process including the identification and monitoring of accommodations to be implemented within the school as well as at home and within outside agencies (New Brunswick Department of Education, 2015). Another method of learning which recently emerged to promote autonomy supportive approaches was personalized learning.

Basham et al. (2016) research on personalized learning demonstrated the benefits of active involvement of students in their learning plans. According to Patrick et al. (2013) from the International Association for K-12 online learning (iNACOL), personalized learning was “tailoring learning for each student’s strengths, needs and interests — including enabling student voice and choice in what, how, when and where they learn — to provide flexibility and support to ensure mastery of the highest standards possible” (p. 4). In Basham’s et al. (2016) study of 6,500 students in K-12 in a northern central state in the U.S., a personalized learning environment was designed where each student developed their own learning plan and students with disabilities also had a legally mandated individual education plan (IEP). The teachers then used the learning plans

to personalize instruction considering each student's strengths, interests, needs, and learning preferences. Students primarily worked in small groups, pairs and sometimes independently in classrooms using a blend of technology, peer collaboration, and teacher facilitation. The study found these personalized learning environments beneficial for both students with and without disabilities because the involvement of students from initiating their plans to measuring their progress put students at the center of their learning (Basham et al., 2016). Despite the benefits of the personalized learning environments in Basham's study, personalized learning was dependent on the availability and access to a significant outlay of technology which may be limited in many schools.

Future Outlook of Personalized Learning

Personalized learning has been developing at varying stages across North America with its primary landscapes more notably prevalent in the U.S. than Canada. Although the future outlook was positive for this progressive approach to education, Gross et al. (2018) found mixed perspectives from teachers and students of specific elements of personalized learning when reporting on a collaborative research study in partnership with iNACOL, the Center on Reinventing Public Education (CRPE), LEAP Innovations and nonpartisan and objective research organization (NORC) at the University of Chicago. Based on the responses from the teacher's survey, there was significant progress made in learner focused education where more than 75% of teachers reported they "empowered learners to understand their needs, strengths, interests and approaches to learning" (Gross et al., 2018, p.6). In relation to students' interests and motivations, 65% of middle and high school teachers reported understanding students' learning interests. Also, 65% and 55% of middle and high school teachers, respectively, said they understood students' motivations of more than half the students. Finally, 62% and 58% of middle and high school

teachers respectively indicated they incorporated students' interests into the curriculum more than half of the time. The students' responses were not far from these numbers with 55% and 45% of middle and high school students who believed their interests were incorporated at least half the time.

One element of personalized learning which illustrated slow progression was student-led learning as only 40% of teachers "entrusted learners to take ownership of their learning" (Gross et al., 2018, p. 6). Only 30% and 22% of middle and high school teachers allowed their students to set their own learning goals at least half of the time, which correlated with students' perception of the frequency they believed they set their own learning goals. In relation to learning strategies and activities, only 41% and 36% of teachers enabled students to determine how they will learn. In all cases, high school students received fewer opportunities for personalized and self-directed learning than middle school students. According to Eccles and Roeser (2012), students' need for autonomy increased with age and through the transitional years from elementary to middle to high school. However, teachers might have found it difficult to implement autonomous strategies in the classroom. Kift et al. (2010) developed a pedagogical transition framework to strengthen students' cognitive skills which proposed a first-year high school program that was student-directed, accessible, and inclusive. When using the framework, Uka and Uka's (2020) study on self-regulated learning found a positive relationship between students' transitional experiences, their motivation, and SRL. The use of technology also supported students' SRL skills.

Specific technologies were utilized to identify and link the students' learning attributes with instructional strategies and curriculum content. Regan and Steeve (2019) explored five of the largest organizations and foundations in the United States who developed educational technologies to support personalized learning; namely Bill and Melinda Gates Foundation, Michael and Susan

Dell Foundation, Flora Hewlett Foundation, Google.org, and the Chan Zuckerberg initiative. The aim of the founders of educational technologies was to support disadvantaged, underserved students from low income or marginalized populations, so more students were provided with flexible learning opportunities to enable a high-quality education. Although there were some variations of the definition of personalized learning in each of the five cases; it was generally agreed that personalized learning involved identifying the learners unique strengths, needs, interests and customizing the content, learning strategies and environment to align with those attributes (Bushweller, 2016; Bushweller, 2017; Davis, 2016; Davis, 2017; Molnar, 2016). It was also inferred that these technologies were highly successful based on the billions of dollars that were invested in them (Regan & Steeves, 2019). However, critics challenged the evidence of their effectiveness and suggested that instead of focusing on the technology alone, it was more realistic to consider how the technologies were utilized by both the teachers and students collaboratively in the classrooms (Herold, 2013; Herold, 2017). Some of these critics supported personalized learning in enabling students to be actively involved in their learning but not at the complete absence of the teacher who still maintained expert knowledge in the curriculum content (Davis, 2017; Herold, 2017). A potential solution suggested utilizing the technology to gather the basic student data while enabling teachers to have the final say in the implementation of the learning plans. The student and learner profiles in Ontario and Alberta enabled teachers to gather the data suggested by Regan and Steeve's (2019) research, specifically information on student's strengths, interests and learning preferences (AME, 2010; OME, 2013). However, the processes to complete the provincial profiles were still manual with limited use of technology. Some of these views on personalized learning resembled Dewey's philosophy of focusing on the whole child to understand how students learn, and the roles of student, teacher and educational institution in the process

(Dewey, 1938; Feinberg, 2014; Herold, 2017). However, proponents who believed students could learn independently in a personalized environment more closely aligned with Rogers' theories of self-directed learning (Rogers, 1995). One factor which might have contributed to these contrasting perspectives of students' active involvement in learning might have been the misconception of self-directed learning.

Misconceptions of Self-Directed and Self-Regulated Learning

Self-directed learning (SDL) has often been interchanged with self-regulated learning (SRL); a skill which has been the foundation of self-directed learning (Granberg et al., 2021; Jossberger et al., 2010; Saks & Leijen 2014; Voskamp et al., 2022; Zimmerman, 2002,2015). Students could not be self-directed learners before developing foundational self-regulated learning skills; which often required explicit guidance (Jossberger et al., 2010; Robinson & Persky, 2020; Saks & Leijen 2014). In self-regulated learning, students were involved in the process and strived to work independently on a task, but the tasks were created, assigned, and guided by the teacher (Robinson & Persky, 2020). Vygotsky (1986) also agreed that the development of metacognition and self-regulated skills was a gradual process, not necessarily related to explicit instruction, but through developmental maturity. He believed students had the ability to master these skills at younger ages, but the mastery did not become conscious until students were able to reflect on their own thinking and understand how they learned which usually did not occur until around adolescence. In contrast to self-regulated learners, self-directed learners were expected to take full ownership of their learning; including independently creating goals, selecting and completing tasks, monitoring their progress and reflecting on their achievements. Research had indicated that although teachers understood the impact of SRL skills on students becoming self-directed learners especially in secondary and post-secondary settings, these skills were not being taught in school

(Harding et al, 2017; Zimmerman, 2002). For example, in Harding et al. (2017) survey of teaching practices in Australia, only 32% of teachers had included SRL in their lessons, 45.8% indicated they did not have time to combine SRL skills with curriculum and 24.1% admitted having limited knowledge in applying SRL skills. One reason for the limited teaching of SRL skills could be related to teachers' knowledge of how to teach them. Oates (2019) research on teacher education found that teachers needed explicit instruction on how to teach SRL skills. Oates (2019) questionnaire results also indicated that strong teacher-learner relationships were paramount to initiating the process of developing SRL skills and supporting autonomous learning. Therefore, if SRL and SDL skills were not explicitly taught to teachers or students, they could often be misconstrued.

Voskamp et al's (2022) study examined the self-regulated and self-directed teaching practices of grade seven and eight teachers in four Dutch schools. Although all schools implemented innovative programs to support students' self-regulated and self-directed learning skills, each school had different interpretations and expectations for their students of self-regulated and self-directed learning. The continuum ranged from students working independently on a task created and assigned by a teacher (self-regulated learning) to students managing the entire learning process (self-directed learning). Regardless of the stage of students' progression towards becoming a self-directed learner, teacher and tutor participants in Voskamp et al's (2022) study shared common perspectives about critical elements in the learning process. All participants agreed that initial guidance was required to help students understand the benefits of becoming self-directed learners and understand how students learned. Participants also agreed that students initially (and some students ongoing) needed explicit instruction to develop metacognitive skills such as goal setting, planning, monitoring progress and reflection. Voskamp et al's (2022) study

also explored the impact of self-directed learning on students with differing ability levels. Mixed views were expressed, where some participants assumed self-directed learning was more challenging for students with lower academic abilities due to their cognitive limitations and lack of motivation to learn. In contrast, the majority of participants did not agree that ability level was a factor in self-directed learning but instead was due to the mindsets of teachers and students, and opportunities for students to engage in interesting or challenging tasks. Vosniadou et al. (2020) encountered similar bias about students' ability and concluded that these negative mindsets could be an obstacle in effectively teaching SRL skills because research had found that students' learning improved when they were taught SRL skills. The Australian Science and Mathematics School (ASMS) illustrated an ideal model of a structured program which embedded SRL teaching in the curriculum and focused on increasing students' self-awareness of how they learned (Harding et al., 2017). It involved a small group of students who first created individual learning plans and met regularly to review their successes, challenges, and ongoing action plans. Then, twice a year, students had an opportunity to celebrate their achievements in student-directed student-teacher-parent conversations.

The outcomes of Voskamp et al's (2022) and Vosniadou et al (2020) research aligned with varied theories of self-regulation and self-directed learning. Zimmerman's (2002, 2015) self-regulated learning (SRL) theory proposed that the self-regulated learning process involved three phases; preparatory forethought (before learning), performance or implementation (during learning), and self-reflection (after learning). The forethought phase had been further broken down to self-motivation and task analysis; task analysis included goal setting and strategic planning. The forethought phase resembled the initial stages of formative assessment, also referred to as 'assessment for learning' where students' needs and strengths were first identified and students

understood how they learned before instructional strategies could be implemented (Casel, 2020; OME, 2013; Vosniadou, S., 2020). Forethought involved students first having self-motivation through self-efficacy beliefs about their ability to learn and understand how they learned. Task analysis and strategic planning were also components of forethought which involved students setting goals and developing strategies to achieve those goals. Research found that formative assessment practices could support the development of self-regulated learning if students were actively involved in the process through self-assessment, peer assessment and applying teacher feedback (Black & Wiliam, 2009; Smit et al, 2017; Wang, 2011). However, critics have argued that formative assessments alone might not increase self-regulated learning, and that supplementary feedback on the assessment outcomes and explicit guidance to implement interventions were also critical (Meusen-Beekman et al., 2016). Granberg's et al's (2021) case study illustrated an application of the SRL theory combined with teacher guidance and feedback.

Granberg et al's (2021) study explored the impact of formative assessment to develop student's self-regulation skills (Black and Wiliam, 2009; Meusen-Beekman et al., 2016; Smit et al, 2017; Wang, 2011). The study was conducted with a grade seven mathematics teacher, who implemented formative assessment practices in a classroom over an eight-month period. Granberg et al's (2021) study involved the mathematics grade seven teacher conducting a series of lessons and formative assessments aligned to the SRL phases of forethought, implementation and reflection. Two surveys measured students' perceived autonomy and self-efficacy prior to and after completion of the lessons. Observations and interviews were conducted with the case study teacher and 10 students to explore their experiences throughout the process. The findings indicated that the formative assessment practices in Granberg et al.'s (2021) study had a significant positive impact on both the motivational beliefs and self-regulated behaviors of the student participants.

Voskamp et al (2022) and Granberg et al's (2021) studies demonstrated the value of clarifying the concepts of self-regulated and self-directed learning; while highlighting the roles of the students and teachers in the learning processes of each outcome. These distinctions might have cleared up teachers' misconceptions of the feasibility of students' active involvement in their learning. Despite the clarification of self-regulated and self-directed learning, the practical implementation of these processes was also a concern, especially if the teacher's expectation was to deliver differentiated instruction.

Differentiated instruction was a process of teaching and learning for students of differing abilities in the same class. Based on characteristics of learners' readiness, interest, learning profile, teachers adapted or manipulated various elements of the curriculum (Tomlinson, 2014). In differentiation, the teacher considered the needs of all learners and adjusted instruction to meet the needs of varying groups of learners, and progress was monitored using data and assessments to provide ongoing feedback (Bray & McClaskey, 2014). Therefore, differentiation could be implemented into the initial self-regulated learning process with teacher guidance, before the student continued to develop the independent skills to become a self-directed learner (Bray & McClaskey, 2014). In contrast, self-directed learning would be initiated by the student using instructional strategies aligned to the student's needs and interests, with the student directly involved in monitoring their own progress of learning. The self-regulated and self-directed processes also had implications on different levels of extrinsic and intrinsic motivations. The self-determination theory (SDT) proposed that triggering intrinsic motivation was dependent on fulfilling the needs of autonomy, competence, and relatedness.

Transitioning from Extrinsically to Intrinsically Motivated Learners

SDT recognized that like the transition from self-regulated to self-directed learners; a

continuum approach of increased levels of regulation moved students from extrinsically motivated to fully self-determined, intrinsically motivated learners. The first two levels in the SDT continuum of motivation (external and introjected regulation) were based on externally motivated behaviours. These motivations were satisfied by the expectations of reward, approval from others, or avoidance of punishment. Students who fell into these initial ranges on the continuum required extrinsic rewards or praise; in contrast to those who were internally motivated in the higher levels of identified and integrated regulation, and finally intrinsic motivation. Some researchers have argued that any type of external motivators could stifle the potential of intrinsic motivation (Byrnes, 2021; Deci, et al, 2001; Serin, 2018). These views claimed that rewards could undermine motivation and students' curiosity, interest, and perseverance in completing tasks. According to cognitive evaluation theory, external tangible rewards were a controlling motivator which caused individuals to participate in activities due to persuasion and guilt rather than through their own personal desire (Deci & Ryan, 1985). However, other researchers have claimed that external rewards were not a detrimental factor on intrinsic motivation but only a starting point to motivation; especially for students who were not motivated at all (Bear et al, 2017; Serin, 2018). In a sample of 10,344 students in grades 5-12, Bear et al. (2017) found that despite the potential negative impact of using rewards as motivators, the common use of rewards did not harm intrinsic motivation within the 58 schools in the study. Rather performance was enhanced by a balance of both external and internal motivators. The outcomes of Bear et al's (2017) study illustrated an example of SDT's continuum of levels of motivation from extrinsic to intrinsic motivation. SDT theory proposed that as students transitioned closer to intrinsic motivation, their extrinsic motivation levels declined (Bear et al, 2017; Deci & Ryan, 2008a). Thereby students' transition from extrinsic to intrinsic motivation was based on a variety of factors and perspectives. In

addition to recognizing the varying levels of students' motivation, one instructional framework which supported other diverse needs of students in inclusive classrooms was universal design for learning (UDL).

Universal Design for Learning (UDL) to Sustain Autonomy Support

UDL is an instructional framework based on three basic principles of providing students with: multiple means of representation, multiple means of action and expression, and multiple means of engagement (CAST, 2024). Engagement impacts a student's motivation to learn by enabling learners to engage with the material in a variety of ways. Representation referred to the way learners perceived and understood material using different means of representation to align with different learning preferences. Action and expression enabled learners to express what they knew in alternative ways that worked best for them (CAST, 2024). In short, UDL provided a way to accommodate the needs of all learners by providing students with a choice of how and what they learn. UDL was meant to meet the needs of most learners in an inclusive classroom and eliminate barriers before students encountered them. This could be achieved by first identifying some of the common characteristics of students with disabilities and then considering how these attributes could be integrated into the design stage of the curriculum (Lowrey, 2014). Some cognitive limitations could include slow processing speed, difficulties generalizing and maintaining learned skills, communication challenges, physical or motor impairments, and limitations in self-advocacy or executive functioning skills (Heward, 2012; Lowrey, 2014). When proactive planning was completed, the curriculum included various strategies which increased accessibility to all learners, such as a reduction in text and more emphasis on visual representations, auditory options for reading and comprehension or more linkages to real life applications (Lowrey, 2014). Kelly's (2017) also conducted a literature review to explore how the

opportunity for choice impacted engagement, academic performance, and behaviour on students with disabilities. Kelly (2017) found that all studies within the review reported a positive impact on engagement and academic performance when students were provided with a choice of what and how they learned. In relation to behaviour, 4 out of 5 studies also showed a positive impact on behaviour when varying levels of choice were presented to students. However, the study that did not find a positive impact actually found that students' behaviour declined when provided with more choice. The varying impacts of choice might have been related to the informal practices of applying choice in the curriculum; especially with students with disabilities.

Although some teachers in Canada have been informally practicing universal strategies for many years, formal UDL principles have only been established since 2008 by the Center for Applied Special Technology (CAST) (CAST, 2024). Adopting UDL has been easier for some provinces than others due to the level of training and buy-in from the teachers. The Toronto District School Board, Canada's largest school board, has been challenged in training all teachers on UDL, so they introduced mandatory UDL training to administrators (TDSB, 2022). Whereas schools in New Brunswick have been mandating and training teachers on these critical UDL guidelines since New Brunswick's transition to inclusion in 2013. Regardless of New Brunswick's high inclusion, challenges have also been reported in the lack of resources and funding to support teachers within the classrooms. After seeking feedback from teachers and parents, New Brunswick's education minister Dominic Cardy reported that although progress to inclusion had been positive, current resources in the classroom were still insufficient to address the needs of all learners using UDL, especially those with behavioural disorders (Brown, 2020). Cardy admitted that the lack of support impacted both students with developmental delays as well as all the other students in the classroom when teachers and students had to repeatedly leave classrooms due to

repeated violent outbursts (CBC News, 2020).

Further criticism has been found about the effectiveness of UDL on student's achievement with some studies reporting success (Rappolt-Schlichtmann, 2013; Smith Canter, et al., 2017), and others indicating limited evidence that UDL leads to increased learning (Boysen, 2021; Fornauf et al., 2020; Lowrey, 2014). Some of the criticism was related to the type of research conducted rather than results of the studies, as the complexity within the UDL approaches and multiple measures of learning made it difficult to determine if UDL was effective. Hence, some studies lacked basic research methods such as randomized sampling, comparison groups, and pre- and post- measurements (Fornauf et al., 2020; Ok et al., 2017; Rao et al., 2014). Hollingshead's et al. (2020) study on the comparative views of UDL experts suggested one reason UDL might be difficult to measure was because even the originators and corroborators of UDL purported varying perspectives about elements of UDL. Based on the results of their research, Hollingshead et al. (2020) indicated that although UDL was accepted as a powerful framework in addressing learner variability, UDL should be considered as only one part of other multi-component instructional frameworks.

Another concern about UDL was that matching instruction to diverse ways of learning could be detrimental when students were not aware of the approaches that worked best for them (Bjork et al., 2013; Blasiman et al., 2017). For example, a student who learned best through active engagement with materials might choose an easy passive approach of studying such as rereading materials instead of a more time consuming, yet effective approach such as taking notes and studying out loud. In this case, the choices made by students could lead to a decrease instead of an increase in achievement. One approach suggested by Nelson and Basham (2014, p. 92) to address some of the concerns related to the effectiveness of UDL was to consider the relationship of UDL

as an engineering design and teachers as ‘learning engineers’. When applied together, Nelson and Basham (2014) stated that, “the engineering habits of the teachers minds and UDL drive the design and implementation of curriculum/instructional goals, instructional planning, the use of instructional methods, strategies, and materials, and progress monitoring that support all students” (p. 92). Implementing UDL then involved having clear goals, intentional planning for learner variability, flexible methods and materials, and timely progress monitoring. Nelson and Basham (2014) also expressed that teachers needed training to learn how to effectively apply UDL while dispelling myths about its purpose. Overall, there seemed to be more proponents supporting, than resisting the adoption of UDL because of the increased access to education for students with diverse learning needs (Lowrey, 2014; Nelson & Basham, 2014). Some provinces have also recommended teachers consider learners’ profiles in their UDL and differentiated instructional (DI) strategies (Alberta Ministry of Education, 2010; Ontario Ministry of Education, 2013).

Alignment of Learner Profile to UDL and DI Instruction

Teachers utilized information from learner profiles to develop appropriate UDL and DI instructional strategies that met the needs of the class while considering the unique profiles of each learner. However, the alignment of profiles with learning strategies came with challenges. Roy’s et al. (2013) study on a Differentiated Instruction Scale (DIS) was completed by 125 elementary teachers to report their use of instructional adaptations. The researchers in Roy et al. study reported that only 45% of teachers frequently adapted materials to match student abilities. The teachers generally used instructional strategies that did not require much preparation or adaptations to instruction, and they preferred to adjust the amount of work and provide additional aids rather than vary assignments to match students’ ability levels. The researchers proposed that the teacher’s actions might have been due to teachers’ lack of time, resources, or training to

differentiate instruction. However, teachers in Roy's et al. study also reported that when they did adjust, teachers used student data to inform their curriculum decisions.

Teachers in Lowrey's et al. (2017) study of general education teachers also shared stories of how they effectively aligned the needs and interests of their students to UDL strategies utilized in their inclusive classrooms. One teacher participant addressed barriers of learner variability by actively involving students in the lesson planning process through brainstorming ideas and rich discussions which inevitably increased student engagement. A second teacher reported that all students benefited, including high achievers, as one student told her, "you know, I understand it but I understood it so much better when you presented it this way" (p. 232). The outcomes of Lowrey's et al (2017) study illustrated an example of the first phase of self-regulated learning (SRL); forethought. According to Zimmerman (2002), students could only become self-regulated learners by being actively involved in their learning and developing metacognitive skills required for in the forethought phase of SRL. Although there were benefits in using UDL in conjunction with learner profiles, there was more to uncover about its practicality in inclusive classrooms.

Gaps in Literature

My literature review illustrated the benefits of a student-initiated assessment approach that considered the unique learning profiles of all students in inclusive classrooms (Climie & Henley, 2016; Lowrey et al, 2017; Rogers, 1995). Several studies demonstrated the positive outcomes of implementing a strength-based approach in the classroom to enhance strengths and interests and increase intrinsic motivation (CASEL, 2020; Climie & Henley, 2016; Lopez & Louis, 2009). Teachers had the desire to adapt instruction to align with the learner profiles but also had limited time, resources, training and access to assessment tools to fully identify learner attributes and develop relevant instruction (Brownlee et al., 2012; Roy et al., 2013). Some studies also illustrated

an increase in student engagement when students were involved in assessing their own needs, strengths and interests; developing learner profiles, and collaborating in lesson planning (Basham et al., 2016; Katz et al., 2021; Lowrey, 2017). However, some of these situations depended on the establishment of personalized learning environments which were in emergent stages in the U.S. and even less pronounced in Canada (Basham et al., 2016; Gross et al., 2018; Regan & Steeve, 2019). These student-centered concepts and strategies corresponded with the philosophies of Dewey and Rogers and autonomous supportive approaches of Deci and Ryan's self-determination theory (Deci et al., 1991; Dewey, 1938; Rogers, 1969; Ryan & Deci, 2020). Yet there was little research illustrating the link from theory to practical applications in the classroom to support the needs of students and teachers.

Therefore, my objective was to consider a research design which could respond to my research questions from a theoretical to a practical approach to address the existing barriers of access to educational support for all types of learners.

Chapter 3 – Research Design

My research design started with a series of reflective questions to guide my exploration of potential methodologies. According to Guba and Lincoln (1994, p. 108), “methodology is concerned with why, what, from where, when and how data will be collected and analyzed”. Therefore, before deciding on the most appropriate methodology for my research, I asked myself the following questions (Guba & Lincoln, 1994):

1. Why am I doing this research? What is the problem that needs to be resolved?
2. What type of data will I need to answer my research questions?
3. Where will I get the data and who will be involved in my research?
4. How is the best way to collect and analyze data?

The first question helped me define the purpose of my research and the relationship to specific ontological and epistemological views which aligned to the purpose. The answer to this first question was described in the development of my conceptual framework in the literature review. The second question led me to explore methodologies which corresponded with the purpose of my research. The third question focused on participant selection and the extent of their involvement in my research. The final question guided me to my selection of instruments for data collection and data analysis.

My research design began with a connection of my ontological and epistemological views to my research. I next completed a rigorous analysis of three methodological approaches before justifying the one most suitable for my purposes. The selected approach guided the methods that were adopted for recruitment, data collection, and data analysis. I began with a reminder of my ontological and epistemological beliefs.

Theory to Practice within a Pragmatic Paradigm

Previously, I shared my ontological view that there is no singular reality, and my epistemological stance that knowledge was socially constructed through previous experiences. I also expressed my desire to reveal systemic barriers through a holistic student-centered framework that considered the whole child, and to develop a practical solution to support both teachers and students in inclusive classrooms. My solution was derived from theories, developed through feedback from students and teachers, and deductively tested so that the solution could be applied in multiple settings outside of one specific classroom.

Based on these objectives, the epistemological view I adopted for my research was a pragmatic view. According to Kivunja and Kuyina (2017), “pragmatism employs a relational view which proposes that relationships within the research were best determined by what the researcher deems appropriate to that particular study” (p. 35). Pragmatism then enabled the researcher to communicate with participants who were relevant to the purpose of the study and collect data in the most effective way to answer the research questions. Pragmatists centered on the real world, practical emphasis of research more than a simplistic quantitative or qualitative approach, or a positivist or interpretivist view (Kelly & Cordeiro, 2020). Accordingly, Kelly and Cordeiro’s (2020) derived three principles of pragmatism from the literature, “(1) an emphasis on actionable knowledge, (2) recognition of the interconnectedness between experience, knowing and acting and (3) a view of inquiry as an experiential process” (p. 3).

A pragmatic paradigm focused on the practical understanding of real issues by exploring the meaning of the research data and examining the practical applications of relevant theories, instead of focusing on the nature of truth or reality as in the traditional paradigms of positivism and interpretivism (Morgan, 2014; Patton, 2015). Therefore, instead of considering only one

reality, research conducted within a pragmatic paradigm assumed an ontological position of a non-singular reality which meant that “there is no single reality, and all individuals have their own and unique interpretations of reality” (Kivunja & Kuyina, 2017, p. 35). Hence, the pragmatic paradigm considered research perspectives that may not fall in either the positivist or interpretivist paradigm but a combination of both (Morgan, 2007). For example, quantitative research was associated with the positivist paradigm, and qualitative with the interpretivist paradigms, but the pragmatic paradigms may include both types of data as in a mixed methods design. The methods used in data collection also distinguished the paradigms; quantitative data was derived using a deductive method, qualitative data relied on an inductive method, but a mixed method design combined qualitative and quantitative data. Therefore, mixed-methods design was based on an abductive approach of going back and forth from converting observations into theories to examining theories to apply action (Morgan, 2007). Finally, the inferences of data in a pragmatic paradigm proposed that data could be transferable in different contexts depending on how people used the knowledge that was produced, rather than assuming the possibility or impossibility of generalizability, as in a positivist view (Morgan, 2007).

In summary, research within a pragmatic paradigm considered the collection of both quantitative and qualitative data, was abductive including inductive and deductive approaches, and was action-oriented focusing on solving problems that were transferable between varying contexts. Each of these factors aligned with the purpose of my research but to determine the potential methodologies for my research, I next considered the type of data needed to answer my research questions.

Responding to my Research Questions

A unique feature of each methodology was the type of data utilized to address the research

questions. Data could be quantitative or qualitative or a combination of both. Qualitative data sought to understand the participant's experiences by gathering data in text or image formats, and quantitative data sought to measure observable data that was quantifiable (Creswell, 2008). My research questions could have been either qualitative or quantitative based on the best way I could address my research questions.

Research Question #1

My first research question focused on the student's experience and determining if and how I might be able to measure the impact of assessment on each student's motivation.

1. How does the implementation of a student-directed assessment for learning approach impact the motivation of students with and without learning challenges (quantitative) based on the self-determination theory?
 - a. Impact on relatedness by building holistic student-teacher relationships
 - b. Impact on choice of learning and student-directed learning
 - c. Impact on students' perceived competence

Since my research was based on the self-determination theory, I wanted to measure the student's perceived motivational needs prior to them starting the assessment and upon completion of the assessment. I also wanted to compare the differences between and within students of different ability levels and within varying grade levels. Since my goal was to gather data from a large number of students and I had limited direct access to each participant, I decided a survey was the best way to collect my data. I embedded a pre-study and post-study survey within the assessment which included questions aligned with the three psychological needs of the self-determination theory; relatedness, autonomy, and competence. Therefore, my data for the first question was quantitative.

Research Question #2 and #3

The data for the second research question could also have been quantitative or qualitative. After the students completed the assessment, my objective was for the teachers to review the student data and provide their feedback on how helpful the student data and assessment resources would be to help them keep the students engaged and motivated in their learning. I wanted to obtain rich comprehensive data from the teachers that would help me understand their initial reactions to the resources and data including both benefits and challenges they may have faced. I believed this type of free-flowing dialogue would be best obtained through qualitative interviews. Therefore, I used interviews to collect data on both research question #1 and #2.

2. What are the perceptions of teachers (qualitative) about the usefulness of the student-directed assessment tool in helping teachers trigger student motivation through relatedness, autonomy, and competence?
3. How do the student-directed assessment outcomes impact the teachers' identification of student holistic learning needs and strengths (qualitative) and the design of instructional strategies?

Hence, my research depended on the collection of both quantitative and qualitative data, so my methodology considered the option of gathering both types of data. When observing the questions collectively, the overarching themes revealed: an examination of an existing process and changing the processes with an intervention (student-directed assessment tool). This analysis suggested a methodology with an action-oriented focus involving a change process that could be measured both objectively and subjectively. Subsequent to the type of data, methodological analysis included the role of researcher and participant and where the data will come from.

My Engagement with Participants

As previously mentioned, the purpose of my research was to develop practical solutions to eliminate systemic barriers of students' inequitable access to educational support. The goal was also to provide teachers with resources they needed to support all students in inclusive classrooms. Although an existing 'assessment for learning' process already existed in Ontario, there were limited guidelines, training and access to relevant resources to implement the changes required for an equitable process (Montgomery, 2022; Ontario, 2013). Therefore, through my research, I developed a student-directed assessment tool to guide teachers in designing instructional strategies that aligned with the learning needs, strengths, interests and motivational tendencies of all learners in inclusive classrooms. Data was drawn from teachers who may or may not have engaged in the existing 'assessment for learning' process, and students who may or may not have been supported by the outcomes of the process.

In addition to identifying the source of data, the extent to which participants were involved in the research was pertinent to the methodology selection. In quantitative methodologies such as surveys and some experiments, participants assumed a passive role where the research was completed 'on them' instead of 'with them'. The participants did not make a direct contribution to the study, and the researcher controlled the entirety of the study (Bryman, 2001). In contrast, qualitative methodologies encouraged participants to be involved to some degree through input or feedback on specific aspects of the study (as in case study, phenomenology, ethnography) or to be completely involved in the development and implementation of the research (as in action research) (Creswell, 2008; Merriam & Tisdell, 2016; Shank & Brown, 2007). A pragmatic approach which combined qualitative and quantitative methodologies could involve participants in different phases of the study depending on the type of data being collected and the importance of participant

involvement in the collection of that data. For example, a quasi-experimental design centered on problem solving of student behaviour with a specific intervention may be more enhanced with direct researcher-participant involvement than if the student was strictly observed without any contribution to the research (Bryman, 2008). Since my research depended on a combination of quantitative and qualitative approaches, it also meant different degrees of involvement of the participants and I through varying parts of my research process.

After analyzing the purpose of my research, data required to respond to my research questions, and how my role as researcher would interact with the participants, I proceeded to evaluate potential methodologies based on Guba and Lincoln's (1994) guidelines before deciding on my final selected methodology.

Evaluation of Potential Methodologies

Based on my objectives, research questions and researcher/participant roles, I considered methodologies that were action-oriented, involved change processes, integrated quantitative and qualitative data, and were aligned within the pragmatic paradigm. Therefore, the three specific research methodologies I explored were mixed methods, action research and design-based research (a type of experiment) (Kaushik & Walsh, 2019; Kelly & Cordeiro, 2020; Kivunja & Kuyina, 2017; Lee & Nickerson, 2010). I next provided an analysis of each methodology, including my justification for accepting or rejecting each to achieve my research objectives. I also indicated how each methodology related to my research objective, research questions, and my (researcher) level of involvement with the participants, starting with an exploration of mixed methods, followed by action research and concluding with design-based research.

Evaluation of Mixed Methods Design

Mixed methods design was based on a combination of qualitative and quantitative data

brought together to produce expanded results (Hesse-Biber & Johnson, 2015). According to Creswell (2008), mixed methods design involved the “mixing of both qualitative and quantitative research and methods in a single study to understand a research problem” rather than simply collecting two independent strands of qualitative and quantitative data (p. 552).

Quantitative research typically sought to understand findings which generated numeric and measurable outcomes through survey, correlation, or experimental research designs. Quantitative research provided the opportunity to conduct large studies in laboratory settings leading to objective, empirical findings that could be generalized to increase validity and reliability (Creswell, 2008). In purely quantitative designs, experimental research between groups included true experiments and quasi-experiments, and research within groups or between individuals included time series experiments, repeated measure experiments, and single subject experiments. Surveys and true experiments tended to focus on larger samples for organizational purposes, and true experiments required randomized samples, making them the costliest and time-consuming type of quantitative research. Quasi experiments were like true experiments but could be conducted with smaller groups that were purposefully assigned. Time series, repeated measures, and single subject experiments were the most conducive experiments to local context as they could be conducted with smaller groups and individuals within a group (Bryman, 2008; Creswell, 2008). In contrast, qualitative research sought understanding through rich verbatim quotes, textual and graphic data from numerous qualitative approaches such as case study, phenomenology, ethnography, grounded study and action research to name a few (Creswell, 2008). During most of the 20th century, educational research had been guided by quantitative research to inform educational innovation and improvement; however, according to Guba and Lincoln (1982), the scientific method of controlling variables, fostered results had no longer been transferable in

educational environments. Guba and Lincoln (1982) claimed that qualitative research in natural humanistic surroundings could be just as convincing as mounds of quantitative data generated in elaborate artificial settings. Although quantitative research utilized non-human instruments for data collection because of their objectivity, qualitative researchers preferred humans because of their responsiveness and insightfulness (Hameed, 2020). Therefore, mixed methods research provided an alternative of using both qualitative and quantitative research if the mixing of both expands the study. However, a mixed method design must present the need for quantitative and qualitative data, and a rationale should be apparent for utilizing both types of data in the research (Creswell, 2008).

Types of Mixed Methods Designs. The four types of mixed methods design were: explanatory, exploratory, embedded design and triangulation design. An explanatory design was used when quantitative data was first collected, and then qualitative data was collected subsequently to elaborate on the quantitative data. On the contrary, an exploratory design was utilized when qualitative data was first collected, and then quantitative data was collected to explain the relationships found in the qualitative data. In a triangulation design, both quantitative and qualitative data were collected at the same time, and both data were merged to understand a research question. The strengths of one data set could offset the weaknesses of the other data set. Finally, the embedded design was like the triangulation design where quantitative and qualitative data were collected simultaneously, but one type of data (qualitative or quantitative) played a supportive role to the other (Creswell, 2008).

Objective of Mixed Methods Design. The objective of mixed methods was to enhance the quality of research by building on the strengths of both qualitative and quantitative data. For example, the integration of large quantities of statistically analyzed data with rich actual words

encapsulated through qualitative open-ended interviews could lead to a powerful study (Creswell, 2008). Mixed methods were also used when either quantitative or qualitative research alone were insufficient to address the research problem or answer the research questions. In that case, the research involved a core qualitative or quantitative component followed by a supplementary component or additional research question (Hesse-Biber & Johnson, 2015). The analysis of each research question was a critical element in the evaluation of mixed methods of research.

Type of Research Questions. An analysis of the research questions was one indication of whether a mixed methods design was best suited for the study as there was a distinction in the way quantitative and qualitative research questions were formulated. A quantitative research question included a “variable or an attribute of an individual or organization that could be measured and that varied among individuals and organizations” (Creswell, 2008, p. 123). A variable could be measured as a category resulting in a nominal score, such as the number of males or females. A variable could also be measured on a continuous score with an interval scale, such as an age range (25 years to 65 years old) or dollar range (\$1000 to \$10,000). In quantitative research, hypotheses were also used, and researchers often sought to test theories and predict results of differences in variables. However, qualitative research questions were “intended to explore or understand a central phenomenon with specific individuals at a certain research site” (Creswell, 2008, p. 142). Qualitative questions were generally open-ended, and the researcher sought to understand the perspectives of participants and build themes based on collected data. Instead of comparing variables or groups, qualitative researchers aimed to gather rich viewpoints from individuals or groups. A mixed methods study then included a combination of qualitative and quantitative research questions, or one research question included criteria related to both qualitative and quantitative research. Mixed method questions were typically used in conjunction with the

different types of mixed method designs: exploratory, explanatory, embedded, and triangulation described earlier (Creswell, 2008). The role of the participant and researcher in a mixed method design depended on their involvement in both quantitative and qualitative approaches.

Role of Participant and Researcher. In quantitative research, participants were generally observed and were not directly involved in the research while in qualitative research, participants were more involved. Since mixed methods included both qualitative and quantitative approaches, participants could be more involved in some portions of the research than in others (Bryman, 2001; Bryman, 2008; Creswell, 2008; Merriam & Tisdell, 2016; Shank & Brown, 2007).

Participant Involvement in Quantitative Approaches. Some of the quantitative approaches that could be adopted in a mixed study design were survey or experimental research. In the case of a survey or large-scale experiment which involved large samples of participants, participants generally did not make direct contributions to the research process and abided by directives from the researcher (Bryman, 2001). However, a smaller quasi-experiment or single subject experiment could require more direct involvement with the researcher and participants. An example could be measuring the effectiveness of an intervention with students with disabilities in a classroom when there was wide diversity within the larger classroom. In experimental studies, the researcher was generally responsible for the research and deciding how the research was conducted and how much or little the participants were involved (Creswell, 2008).

Participant Involvement in Qualitative Approaches. Some of the qualitative approaches in mixed method designs included case study, phenomenology, ethnography, and grounded study. These approaches solicited input and feedback from participants, but the researcher still assumed the primary role of the research (Creswell, 2008; Merriam & Tisdell, 2016; Shank & Brown, 2007). Qualitative approaches in mixed methods designs contrasted more participatory approaches

such as action research and design-based research which depended on participants playing an active role in the research (Bryman, 2008).

Therefore, one benefit of a mixed study design in relation to participant involvement was that the researcher could decide to what degree participants should be involved in the project.

Opportunities for Mixed Methods Design in my Research. The main advantage of mixed methods was the option of combining quantitative and qualitative data to produce a broader, richer study (using qualitative data through interviews, observations, and document analysis); with increased validity and generalizability (using quantitative empirical measurements) (Hesse-Biber & Johnson, 2015). According to Creswell (2008), quantitative research could provide more opportunities to transfer the outcomes of my research outside the local classroom. It could also make it possible to quantitatively measure the effectiveness of the intervention, possibly increasing validity based on the outcome. The objective of my research was to change an existing process through the development of an intervention, a new student-directed assessment tool. I also wanted to measure the effectiveness of the new process so that if successful, the student-directed assessment tool could be adopted in multiple classroom settings.

Qualitative research also had the advantage of gathering rich data from human participants in the field who experienced the intervention through interviews, observations, and focus groups. According to Guba and Lincoln (1982), these close connections in a natural setting enabled rich, responsive, and insightful conversations that could not be obtained through surveys or large controlled experiments. Therefore, a mixed methods design could provide the opportunity to collect both quantitative and qualitative data that I needed to answer my research questions.

According to Creswell (2008), qualitative data sought to understand the participant's experiences and quantitative data sought to measure observable quantifiable data. The qualitative

questions in my research were presented as broad open-ended questions intended to explore the perspectives of students and teachers about their experiences with the intervention (assessment tool). The data was to be gathered using interviews with a qualitative approach such as a case study, phenomenology, ethnography or grounded study (Merriam & Tisdell, 2016).

The quantitative questions included ordinal variables and continuous scales to measure the perceived impact of motivation upon completion of the intervention. For example, one statement in the pre-study survey that participants responded to was, 'I feel my teachers understand and care about me a person' which aligned with the motivational need for relatedness. Then upon completion of the assessment, the pre-study statement was, I think the information from my learning plan (in the assessment) will help my teachers understand and care about me as a person. A quantitative score was assigned to each response for these statements and the change in score could determine the difference in the student's perceived motivation (impact on motivation) in relation to this variable upon completion of the assessment. An experimental study could be used to measure these quantitative variables, but the experiment needed to match the type of groups within my study. Since the objective of my research was to initially impact a specific group of people (students with diverse learning needs); I initially focused on a smaller group of individuals within individual classrooms. According to Creswell (2008), when the number of participants was limited; within group and individual experiments might be the most appropriate experiments to answer the quantitative research questions. More specifically, a quasi-experiment or single subject study could be most suited when there was a lot of diversity within a group; as the variables were measured separately for one or more single subjects (Creswell, 2008). Since my research centered on the impact of an intervention on diverse learners who were not in the same classroom (or group); both a quasi-experiment and a single subject experiment were considered to obtain a

pretest score before the intervention and post-test score upon completion of the intervention.

In mixed method, the involvement of the participant was determined by the researcher with more involvement occurring when the core component of the research was qualitative instead of quantitative (Bryman, 2001; Bryman, 2008; Creswell, 2008; Merriam & Tisdell, 2016; Shank & Brown, 2007). Therefore, mixed methods would enable me to determine how involved the participants would be in my research.

Therefore, based on an examination of the objectives of my study, the benefits of combining qualitative and quantitative research in a mixed methods design and the flexibility of participant involvement in varying stages of the study could align with my objectives. I now move to the limitations of a mixed methods design.

Limitations of Mixed Methods Design in my Research. Although it might be convenient to include both qualitative and quantitative research, Creswell (2008) suggested there must be a rationale for utilizing both types of data in the research as mixed methods were not simply collecting two types of data. Hesse-Biber and Johnson (2015) proposed that mixed methods were only used when either quantitative or qualitative research alone were insufficient to address the research problem or answer the research questions. Hence, when I re-examined the quantitatively structured research questions, I determined that the effectiveness of the intervention could only be measured with qualitative questions. If the research questions could not be answered with the quantitative variables or the quantitative questions were not essential, then a mixed method design might not be the most appropriate methodology. The second methodology I explored was action research.

Evaluation of Action Research

Karl Lewin developed action research in the 1940s as a response to social challenges he

believed could be resolved through democratic decision-making processes. He believed action research required group decision making and commitment to improvement, and a collaborative approach could result in theory building with practical application (Dickens & Watkins, 1999). The main objective of action research was to solve a practical problem with an intervention in practice and to produce knowledge generated from the solution of the problem (Collatto et al, 2018). Lewin's original perception of action research included, "analysis, fact-finding, conceptualization, planning, execution, more fact-finding or evaluation; and then a repetition of this whole circle of activities; indeed a spiral of such circles" (Dickens & Watkins, 1999, p. 128). The action research process was extended later by other action researchers (Coughlan & Coughlan, 2002; Järvinen, 2007; Collatto et al, 2018) who believed action research involved four major steps: 1) a preliminary phase to understand the purpose of the research, 2) a conduction cycle which included repetitive cycles of data collection, feedback of data, data analysis, action planning, implementation, and evaluation, 3) a metaphase to evaluate research and improve future conductive cycles and, 4) communication of the study findings (Collatto et al, 2018). Sanford (cited in Reason and Rowan, 1981) did not adequately address Lewin's intent for change through the conduction cycle when he assumed change was implemented upon the participant rather than the participant being an active member of the process.

Other researchers who continued to expand the work of action research after Lewin's death included, Chein, Cook, and Harding (1948) who were students of Lewin. The works of Collier, Kippitt and Radke have also been mentioned by many scholars (Jacobs, 2018). In relation to the field of education, Stephen Corey (1954) proposed that action research could be used as an alternative to traditional research methodologies. Corey had similar views to Lewin's approach to action research and followed similar cyclical steps to Lewin in the process of action research.

Corey believed that teachers should be equal partners in the research process and the design, data collection, and analysis of classroom research (Corey, 1954). Hence, action research has now played a predominant role in education.

Based on Habermas's theory of knowledge, Kemmis et al. (2014) specified three types of action research falling under different epistemological paradigms including technical action research (positivist paradigm), practical action research (interpretivist paradigm), and emancipatory or critical action research (critical paradigm). I expanded each of these and illustrated how they were related or unrelated to my research objectives, research questions, and participant/researcher involvement.

Technical Action Research. Technical action research was guided by an interest to impact control over the outcome (Masters, 1995). It focused on solving problems through generalizations and empirical facts.

Objective of Technical Action Research. The researcher first identified a problem; then developed and tested an artifact to solve the problem (Masters, 1995). The outcome in technical research was the validation of the effectiveness of the artifact in the laboratory before it was scaled up and implemented in the field. Technical action research differed from other forms of action research which centered on helping clients solve a problem without the goal of testing a particular artifact (Wieringa, 2014). Consequently, the goal in technical action research was not just to create a solution but also to ensure the intervention could help the client. Technical action research was the least common type of action research used in education (Kemmis et al., 2014; Wieringa, 2014).

Type of Research Questions. Technical action was considered an experiment, so it was a quantitative approach within the positivist paradigm (Kemmis et al., 2014). Hence, research

questions in a technical action research study aimed to elicit measurable results. One example might be seeking a variance in standardized achievement scores (Merriam & Tisdell, 2016). Success in technical action research was measured by how well a project achieved its goals (Kemmis, 2001).

Role of Participant and Researcher. In technical action research, the researcher's bias was eliminated or minimized (McCutcheon & Jung, 1990). The researcher was considered the expert in the process and facilitated different stages of planning, implementation, and reflection. However, there was no active involvement from the participants, as participants were treated as instruments rather than change agents (Grundy, 1982). The second type of action research was practical action research where participants were more involved in the process.

Practical Action Research. Practical action research was utilized most in classroom environments and focused on educating practitioners so they could improve their practices (Merriam & Tisdell, 2016).

Objective of Practical Action Research. In practical action research, the aim of the teacher was to utilize the findings uncovered in the research to improve their practices and evaluate the effectiveness of the change process within a single classroom setting. The teacher-researcher then became a reflective practitioner while building knowledge about themselves and their students (Merriam & Tisdell, 2016). In practical action research, participants usually reflected on questions related to their experiences before, during and after the change process (Jacobs, 2018).

Type of Research Questions. In practical action research, any type of data collection was appropriate provided it was able to answer the research questions. However, some researchers have indicated that the best alignment was a mixed methods approach combining qualitative and quantitative data (Creswell, 2005; Mertler, 2020). Mixed methods combining qualitative and

quantitative data enabled teachers to collect rich data of students' and teachers' perspectives through qualitative interviews and observations while also measuring the impact of a specific change using quantifiable data, such as an increase in student performance.

Role of Participant and Researcher. Practical action research was usually conducted by a teacher leading the research within their own classroom, or by a teacher engaging with the assistance of academic scholars (Merriam & Tisdell, 2016). A collaborative process was assumed between researcher and the participants, but a teacher might not have time to conduct all the steps involved in the research process. In that case, a co-researcher outside the classroom setting could take the role of the primary researcher and engage more actively with the teacher and students at selective stages throughout the process (Merriam & Tisdell, 2016). However, Corey (1954) argued that an outsider researcher may not be able to relate to the unique situations faced by a teacher within the classroom and may not have the same interest and motivation to implement the change as the teacher. At the same time, Corey (1954) stated that teachers also struggled with actual practice of the application. Therefore, one disadvantage of practical action research was that outcomes or solutions tended to be short lived or ceased when a teacher left the classroom where the research was conducted (Jacobs, 2018).

The third type of action research was critical action research which also depended on the involvement of the participants.

Critical Action Research. The difference between practical and critical action research was found in the interest of the research, and the extent to which participants were involved.

Objective of Critical Action Research. Critical action research, also referred to as participatory action research, focused on emancipating people from marginalized groups on injustices. It aimed to combine critical theory and practice, so people became aware of the

disparities in their social practices and beliefs. Therefore, identifying the problem was just as important as understanding the cause of the issue in relation to its social, economic, cultural or political contexts and acting upon the conditions that one faced to change the circumstances (Jacobs, 2018; Kemmis et al, 2014).

Type of Research Questions. In critical action research, the research process was a collaborative effort, therefore after identifying the problem, research questions were developed collectively by the researcher and participants (Dickens & Watkins, 1999). Stringer (1999) contended that critical research was a spiral process where researchers and participants were continually moving through the phases of looking, thinking and acting so the research was continually evolving in conjunction with the research questions. The ‘look’ phase consists of building a picture which leads to understanding, clarity, and insight by gathering and analyzing the data. The ‘think’ phase encouraged participants to ask interpretive questions, such as why, what, how, who, where, and when to better understand the issues and identify priorities for action. The research questions were embedded in the ‘think’ phase. Finally, the ‘act’ phase was where practical solutions were formulated to solve the issues and address the critical questions that were raised throughout the process (Stringer, 1999). The active involvement of the researcher and participant was then significant to the successes of a critical research study.

Role of Participant and Researcher. The full active engagement of the researcher and participants was an essential component of critical action research as the generation of knowledge and implementation of action were influenced by both groups (Jacobs, 2018; Kemmis et al, 2014). Participatory action (PAR) was one form of critical action research in which participants were co-researchers, but other forms had limitations on participant involvement such as student contributions in the design of a curriculum. However, teachers in critical action research usually

tried to involve students in the process as much as possible so students could have more say in their learning (Merriam & Tisdell, 2016). I next reviewed the opportunities and limitations of action research in relation to my research.

Opportunities for Action Research in my Research. There were several opportunities for action research in relation to the objectives of my study, the level of participant/researcher involvement, and the alignment with my research questions.

The primary objective of technical research was to solve a problem by developing an artifact and testing the effectiveness of that artifact which was similar to my objective of also developing an intervention to address challenges of participants and teachers in the assessment for learning process. Although a solution may also be created in practical action research and critical action research, according to Wieringa (2014), these approaches did not necessarily test the effectiveness of the solution. Since the aim of my research was to apply the intervention in multiple settings outside the local context, both the development and testing of the intervention similar to technical action research was crucial.

Another objective of my research was to deconstruct systemic injustices that might exist with marginalized populations which paralleled the objectives of critical action research (Jacobs, 2018; Kemmis et al, 2014). My research assumed that students with diverse needs were disadvantaged in receiving the support they needed to be successful learners when assessments were primarily focused on a deficit based instead of a strength-based approach. The reasons for the existing system may be related to a social or economic institutional barrier which could be uncovered through critical action research. The type of participant involvement required in critical research to eliminate these barriers was distinct to the role of the participants in technical and practical action research.

Technical action research involved the least amount of participant involvement and critical action research the most involvement. There would be benefits and challenges of engaging participants within every stage of my research. Full collaboration in critical action research might elevate the voices of marginalized populations leading to justice and change for the better (Jacobs, 2018; Kemmis et al, 2014). However, in practical action research, the time commitment to the research was more limited when teachers assumed a dual role of teacher and researcher (Merriam & Tisdell, 2016). In consideration of the limited data collection period in my research, a balanced approach of actively involving participants only at critical junctures of the research was the most appropriate solution. Practical action research presented the opportunity for balance. In addition to opportunities, there were also limitations in each type of action research.

Limitations of Action Research in my Research. Some of the limitations related to action research occurred in the evaluation and reflection process. As previously mentioned, the requirement of testing an intervention was not compulsory in practical action research and critical action research, which limited the opportunity for transferability outside the classroom. However, the responses to each of my research questions depended on testing the effectiveness of the intervention, as a successful intervention might increase reliability and sustainability. Limitations of action research were also apparent in the role of participant/researcher.

Although Corey (1954) contended that active involvement from teachers correlated with the teachers' interest and motivation to implement a change resulting from the research, he also recognized the challenges in practicing the application. Jacobs (2018) proposed that one challenge related to sustainability of solutions, as the regular turnover of a classroom teacher could lead to short lived solutions. For these reasons, practical action research in a local context was not compatible with my research objective of provoking systemic change outside the classroom.

Limitations in critical action research were also related to the role of the participants. Due to time constraints of the participants, the repetitive cyclical process, and the short timeline of a dissertation study, it was difficult to rely on the full active involvement of participants that was crucial in critical research.

Based on my evaluation of action research, all three types of action research presented opportunities and limitations in relation to my research. Technical action research provided the opportunity to develop and test an intervention but limited the involvement of participants, which was crucial to emancipating people from marginalized groups. Practical action research enabled the collection of rich data in a natural setting from the key stakeholders who were most familiar with the issues that needed to be resolved; however, the level of involvement may be limited due to the time constraints in a dual teacher-researcher role. Practical action research and critical action research also limited the opportunities to test the intervention in the local context, but critical action research provided more opportunities for collaboration with the participants in every stage of the process. The final methodology I evaluated was design-based research.

Evaluation of Design Based Research

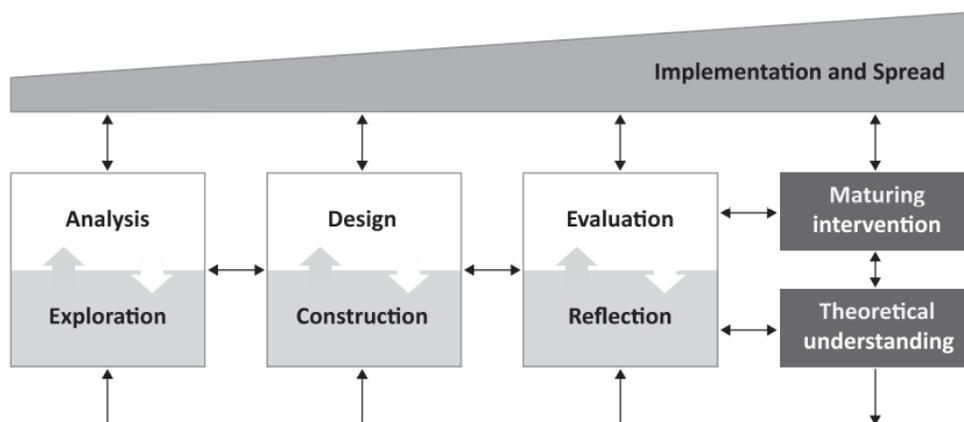
Design based research (DBR) was introduced by Allan Collins and Ann Brown as a design-experiment methodology for educational research with an objective of increasing the impact on educational research through rigorous research leading to the development of design principles (Stemberger & Cencic, 2016). According to Stemberger & Cencic (2016), Brown (1992) indicated the importance of design-based research was, “to determine how various learning environments impact learning and teaching, to build a more systematic methodology for implementing the design experiment, and to upgrade laboratory research into lessons with interventions” (p. 182-183). Barab and Squire (2004) further defined design-based research as “not

so much an approach as it is a series of approaches, with the intent of producing new theories, artifacts, and practices that account for and potentially impact learning and teaching in naturalistic settings” (p.2). Design based research and action research designs have several similarities, but differences were found in the objectives, the role of the researcher, and the type of research questions.

Objective of DBR. The main objective of design-based research was to generate theory and design a new solution and corresponding principles to solve a problem; unlike action research which was based on resolving a problem in a specific setting. In fact, Collins (2012) indicated that the success of the solution in DBR was dependent upon the underpinning theories that guided the development, testing, and evaluation of the solution. DBR was also intended to increase the impact of educational research into improved practice through; analysis of the problem, development of a solution, iterative cycles of testing, and reflection to produce design principles (Reeves, 2006). Since the inception of DBR in 1990, several frameworks of the DBR process have been proposed, initially starting with four phases and then moving to the three phases illustrated by McKenney and Reeves (2012) in Figure 6. McKenney and Reeves’ framework is a generic framework used to conduct DBR in education and is based on the three core phases of DBR; 1) analysis and exploration, 2) design and construction, and 3) evaluation and reflection.

Figure 6

Generic framework for conducting design-based research (DBR) in education



Source: McKenney and Reeves (2012)

In the initial analysis and exploration stage, the issue was identified and a theoretical understanding of the problem and its context was developed. The design and construction phase involved the development of a solution to the problem. A variety of options were considered before deciding on the most feasible solution for the intervention. The solution was informed by a theoretical understanding of the type of intervention that was required. Finally, a prototype of the solution was examined in the evaluation and reflection phase with the objective of finding out if, how and why features of the intervention work from a theoretical lens and reflecting further refinements required. A focus on theory and practice was embedded throughout all phases within the process, where the theory framed the scientific inquiry which was advanced by findings revealed in the empirical testing of the intervention. As a result, the researcher could produce design principles derived from the underpinning theories and application of intervention. After iterative cycles of evaluation and reflection, the final product was then implemented with the opportunity for future enhancements through maturation of the intervention and further theoretical

understanding (McKenney & Reeves, 2012; McKenney & Reeves, 2020).

Role of Participant and Researcher. In DBR, the researcher's primary role was to lead the research and design of the intervention. DBR differed from action research, where the teacher had a dual role as a researcher and a teacher which sometimes created challenges because of the teacher's busy workload (Anderson & Shattuck, 2012; Waters-Adams, 2006). Researchers in DBR were also not alone in the research and could negotiate participant involvement at any stage throughout the research process. In fact, they usually involved participants and stakeholders from the onset in the initial analysis and exploration stage illustrated in Figure 6. Collaboration was also generally conducted in the creation of the intervention (Anderson & Shattuck, 2012; Collatto et al., 2018). In DBR, it was important to understand the core elements related to iteration; when DBR teams should iterate, the importance of early and frequent iteration and the focus of the iteration (Dede, 2004). A well-defined plan ensured the DBR team considered the goals of the stakeholders, designs that can work, and the learning process of the team, so they could identify the designs and theory the teams need to create (Jonassen & Hung, 2015).

Type of Research Questions. DBR usually involved mixed methods using a variety of data collection and analysis tools, so the research questions could reflect both qualitative and quantitative elements (Anderson & Shattuck, 2012). The research questions were formulated in the analysis and exploration stage (stage 1 in Figure 6) after the problem was identified. According to Anderson and Shattuck, (2012), it was beneficial to collaborate with the participants and stakeholders at that time to ensure a good understanding of the problem and further refine the research questions if needed. The research questions were answered in the evaluation and reflection stages of the process (stage 3 in Figure 6) before the design principles were developed. In relation to evaluation, Collins (2012) believed that educational research was more than

examining learning outcomes based solely on content. He stated educational research should also consider metacognitive components and disposition of learners which could be achieved through design-based research when proper funding and training was also in place.

Opportunities for Design Based Research in my Research. Some opportunities for DBR were similar to those found in mixed methods and action research. A distinguishing factor of DBR was the emphasis of transforming theory into practice by identifying an issue, creating a solution and developing design principles that were transferable in varying contexts. According to Collins (2012), the success of DBR was dependent upon the underpinning theories that guided the development, testing, and evaluation of the solution. The theoretical framework for my research was also based on the integration and application of Dewey's and Rogers' philosophies and Ryan and Deci's self-determination theory. The assumption derived from these theories was that students were motivated to learn through their strengths and interests, so a student-directed assessment and learning intervention could provide equitable learning opportunities for all. The rigorous process of DBR ensured that issues were appropriately identified, and all stakeholders and participants who may be impacted by the intervention were involved in relevant phases of the process.

In DBR, the researcher assumed the lead role in the research but negotiated with a team of other researchers and participants at varying phases of the study (Anderson & Shattuck, 2012; Waters-Adams, 2006). The researcher-participant structure set the foundation of a well evidenced study, while enabling the flexibility to collaboratively design, construct, evaluate and reflect through multiple iterations. Since the number of participants in my research and their level of involvement were limited, it was beneficial to have the flexibility of determining how and when the participants would be involved. There were also varying opportunities available to answer the

research questions in DBR studies.

DBR was a type of experiment making it like technical action research as well as a quantitative core mixed methods study. The experimental approach provided the opportunity to conduct empirical research within a natural setting depending on the research questions. When seeking quantitative data, a survey or experiment was conducted. Experimental research included between group, within group and individual designs. As discussed previously in the mixed methods section; if an experiment was selected, a quasi-experiment or a single subject experiment was likely most suited for my research when dealing with smaller groups of individuals or a diverse group of students within individual classroom settings.

Limitations of Design Based Research in my Study. Although the rigor of DBR presented various opportunities, it also created limitations to time and involvement of research participants in the process (Goff & Getenet, 2017). The purpose of my research was the completion of a dissertation which entailed a time limit from proposal to dissertation defense of approximately one year. Due to the number of iterative cycles that were usually required through each phase of DBR, there has been a debate of whether or not doctoral students with limited research timelines should engage in DBR. However, Herrington et al. (2007) suggested that DBR studies enabled doctoral students to obtain a better understanding of the study's strengths and weaknesses of the techniques used for data collection and data analysis. Herrington et al. (2007) and others (Abdallah & Wegerif, 2014; Goff & Getenet, 2017; Kennedy-Clark, 2013; Pool & Laubscher, 2016) also proposed specific methods in conducting a doctoral DBR study based on the research objective.

After gaining an understanding of mixed methods, action research and DBR, and the opportunities and limitations within each, I considered which of the three methodologies would be

the most suitable for my dissertation. Hence, I next engaged in an analysis of each methodology in comparison to one another.

Comparison of Methodologies and Justification of my Decision

My initial analysis of each methodology was based on three components: 1) the objective of my research, 2) the research questions, and 3) the role of the researcher and participants. Therefore, I determined which methodology best complemented each of these components with a justification for my decisions.

Objective of Research in my Decision of Methodology. Based on a pragmatic view, the purpose of my research was to combine theory and practice to identify and eliminate systemic barriers preventing all students from receiving the educational support they need to succeed. My views aligned with Dewey who believed in the theory of inquiry which linked the understanding and deliberate controlling of our actions (Kaushik & Walsh, 2019). The theory of inquiry involved a comprehensive investigation of the underlying issues and practical applications of theories (Morgan, 2014; Patton, 2015). Therefore, I first needed to understand the causes that could be impacting the inequitable opportunities for all students to succeed before developing solutions or practical actions to link the theories with practices. My exploratory analysis was undertaken differently with each of the three methodologies.

Mixed methods design was most appropriate when a combination of qualitative and quantitative research was required to address the research problem, and neither quantitative nor qualitative alone was sufficient. When I evaluated the opportunities of mixed methods in relation to DBR, one benefit was that quantitative and qualitative research could be employed in both methodologies (Anderson & Shattuck, 2012). Therefore, instead of considering mixed methods as a singular methodology, DBR enabled the integration of both mixed methods and DBR.

A mixed methods design also focused on the outcome of the research rather than examining the underlying cause of the research problem. It differed from action research and DBR which prioritized underpinning theories of the issue. For example, in DBR, the identification of a theoretical framework was a critical link to the development of design principles in DBR (Morgan, 2014; Patton, 2015). A pragmatic approach depended on a powerful link between theory and practice which aligned with my research objectives of understanding and eliminating systemic barriers through practical action. Hence, DBR and action research seemed more aligned to my research objectives than mixed methods.

One of the core distinctions between action research and DBR was the extent to which outcomes could be transferred outside the research environment. The outcomes of action research were usually limited to the local context in which the study is undertaken, whereas DBR paralleled a pragmatic perspective where data could be transferable in different contexts (Jacobs, 2018; Morgan, 2007). Since one of my objectives was to develop solutions that could be adopted within multiple classrooms, DBR was more suitable than action research. The second factor considered in validating my choice of methodology was the role of participant and researcher.

Role of Researcher and Participant in Decision of Methodology. All three methodologies involved the participant to some degree, but the extent of involvement differed with the least involvement in technical action research and mixed methods with a quantitative core component. Technical action research fostered a positivist view which discouraged active involvement and was led by the researcher (Kemmis et al., 2014). Quantitative studies were also led by the researcher and usually involved an experimental component of a large sample of participants making full active participation impractical (Bryman, 2001). However, if quantitative was combined with qualitative research, as in a mixed methods design, the opportunity for

participant involvement increased depending on the mix of quantitative and qualitative data and the decisions of the researcher. Since participant involvement could be beneficial to my research, mixed methods were only appropriate with a qualitative core component. When mixed methods design was employed in DBR, the researcher determined the extent of participant involvement. The researcher decided the most suitable points for collaboration through DBRs three formal phases: exploration and analysis, design and construction, and reflection and evaluation (McKenney & Reeves, 2012). Collaboration was essential in action research, as Kurt Lewin, the creator of action research, believed that a collaborative approach resulted in theory building with practical application (Dickens & Watkins, 1999). Unlike DBR, the researcher and participant in action research shared the collective roles from the inception to the conclusion of the research. For example, in practical action research and critical action research, the researcher and participants were actively involved in every stage of the process. In my research, the role of the participant depended on the time and availability of participants as well as the importance of participant involvement at various points of the study. If too much involvement was required from the participants, their busy schedules could present a barrier (Anderson & Shattuck, 2012; Waters-Adams, 2006). Therefore, in relation to my research, DBR was a more flexible choice than action research in recruiting participants and engaging them in different phases of my research (Anderson & Shattuck, 2012; Collatto et al., 2018). The final factor in my evaluation of methodologies was the type of research questions.

Type of Research Questions in my Decision of Methodology. The formulation, analysis, and responses to research questions were tackled differently within each methodology. In mixed methods, the formulation of research questions determined the extent of quantitative or qualitative data that was necessary to answer the research questions and whether the core of the study was

quantitative or qualitative (Creswell, 2008). Mixed methods questions could also appear in practical action research and DBR, whereas questions in technical action research tended to be quantitative in nature (Creswell, 2005; Kemmis et al., 2014; Mertler, 2020). It meant that other than technical action research, my study might be able to capitalize on the use of observable, measurable quantitative data, and rich, broad qualitative data to respond to my research questions in any of the other methodologies.

The researcher and participants also played distinctive roles in the formulation of the research questions in each methodology. Research questions in mixed methods and technical action research were usually formulated by the researcher, but in practical action research, critical action research and DBR, a collaborative approach was undertaken in the formulation or refinement of the original questions. In practical action research and critical action research, collaboration started at the initial onset of the research but in DBR, the researcher determined the specific point in the preliminary stage to involve the participants in the development or refinement of the research questions (Anderson & Shattuck, 2012; Dickens & Watkins, 1999).

The responses to research questions could provide broad exploratory explanations of participants' perspectives on an issue as in practical, critical action research and a core qualitative mixed methods study. Responses could also measure the effectiveness of an intervention or change in process as is common in technical research, DBR, and core quantitative mixed methods (Anderson & Shattuck, 2012; Kemmis, 2001). The responses to my research questions required the perspectives of participants as well as the measurement of the effectiveness of the intervention, so a mixed methods /DBR combination was able to achieve these results.

Although my comparative analysis illustrated general correlations between each methodology in relation to my research, DBR was the only methodology that succinctly paralleled

all the essential components to achieve my research objectives, respond to my research questions and enable meaningful interactions with my participants. Therefore, I was able to justify that DBR was the most suitable methodology to conduct my dissertation research.

Decision of a DBR Methodology

DBR provided the opportunity to employ both quantitative and qualitative research in my study capitalizing on the integration of mixed methods within a DBR design. It provided a structured, yet flexible approach during the three core phases which could be constructed in a variety of ways based on the objective of the study. The flexibility was beneficial in addressing the limitations of conducting a traditionally lengthy DBR study with multiple iterative cycles. DBR's primary aim of linking theory to practice enabled me to address the underlying issues of the existing inequities in educational support and collaboratively develop interventions that could be tested and refined resulting in concrete design principles. The effectiveness of the interventions determined whether ongoing refinement was required through future iterative cycles or if the evidence-based results could be transferred to multiple settings outside of the classroom. The credibility of my study depended on some involvement of teacher and student participants while recognizing the schedules and time commitments of these participants may be limited. Hence, a DBR design provided the flexibility to determine the most relevant times for involvement throughout each phase of my research process. Finally, DBR enabled a comprehensive analysis and refinement of my research questions from the formulation in the exploratory phase to the responses to the questions in the evaluation and reflection phase.

A major concern of using DBR was that the process involved multiple iterations of a cycle before an intervention was satisfactorily tested to generate a set of design principles. However, several scholars proposed that an adapted framework of DBR could still provide the rigor and

validity required in a doctorate dissertation (Abdallah & Wegerif, 2014; Goff & Getenet, 2017; Herrington et al., 2007; Kennedy-Clark, 2013; Pool & Laubscher, 2016). Therefore, I considered an adjusted approach based on the works of these scholars who successfully utilized DBR for their PhD dissertations.

One method conveyed by Herrington et al. (2007) was the adoption of four instead of three phases of DBR by splitting the initial phase into two separate phases to include components of traditional research as illustrated in Figure 7.

Figure 7

Design Based Research and Elements of a Research Proposal

PHASE OF DESIGN-BASED RESEARCH (REEVES, 2006)	THE TOPICS/ELEMENTS THAT NEED DESCRIPTION	POSITION IN A RESEARCH PROPOSAL
PHASE 1: Analysis of practical problems by researchers and practitioners in collaboration	Statement of problem	Statement of problem or Introduction or Rationale or Background
	Consultation with researchers and practitioners	
	Research questions	Research questions
	Literature review	Literature review
PHASE 2: Development of solutions informed by existing design principles and technological innovations	Theoretical framework	Theoretical framework
	Development of draft principles to guide the design of the intervention	
	Description of proposed intervention	Methodology
PHASE 3: Iterative cycles of testing and refinement of solutions in practice	Implementation of intervention (First iteration)	Methodology
	Participants	
	Data collection	
	Data analysis	
	Implementation of intervention	
	Second and further iterations	
	Participants	
	Data collection	
	Data analysis	
PHASE 4: Reflection to produce "design principles" and enhance solution implementation	Design principles Designed artefact(s) Professional development	Methodology

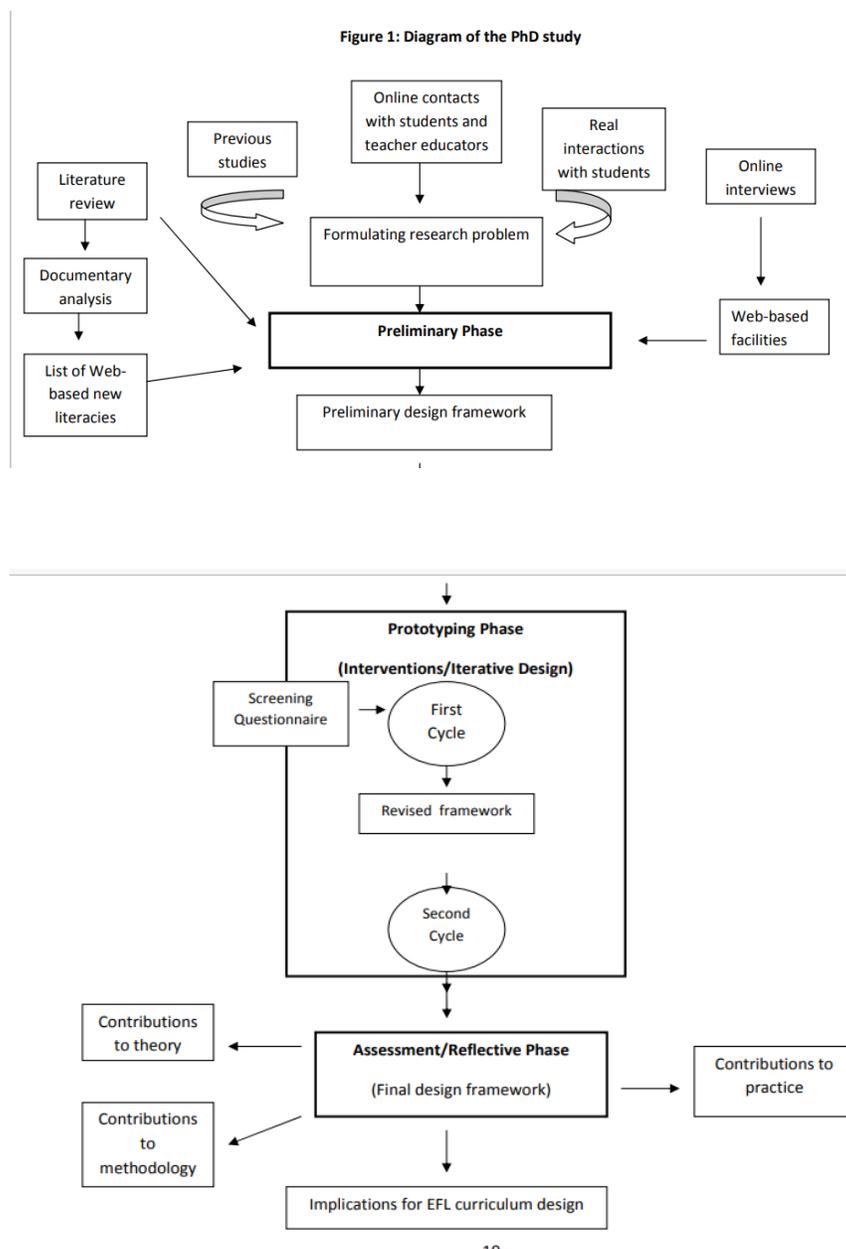
Source: Herrington et al., 2007

Another option was utilized in Abdallah's (2011) PhD dissertation (Abdallah & Wegerif, 2014). Abdallah's framework included a preliminary, prototype, and assessment stage but employed a more flexible approach than Herrington's et al. (2007) framework. Abdallah developed a preliminary framework in stage one after integrating a literature review and document analysis. In contrast to Herrington et al. (2007), Abdallah did not suggest a specific order of

completing each component, but instead proposed methods and procedures be applied in context to the objective of the research as illustrated in Figure 8. The second phase only utilized two iterative cycles, but traditional DBR studies could encompass several more iterative cycles.

Figure 8

Diagram of Abdallah's PhD Study

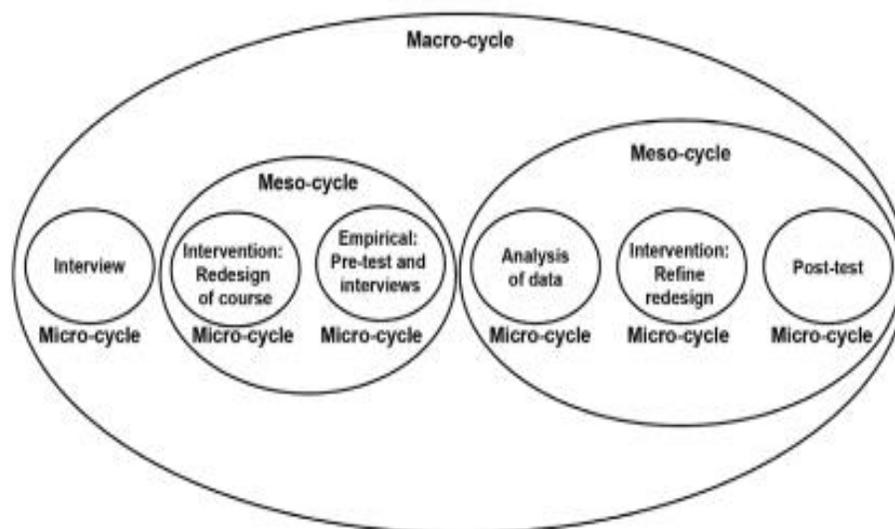


Source: Abdallah & Wegerif, 2014

A third approach adopted by Pool (2014) was the concept of micro-meso-macro cycles (subcomponents of the DBR process) in Figure 9, to illustrate how DBR could achieve the desired research objectives in a short-term project. A micro-cycle occurred when one of the three main phases of the McKenney and Reeves (2012) DBR framework was completed: 1) analysis and exploration, 2) design and construction, and 3) evaluation and reflection. A meso-cycle was established with the combination of several micro-cycles, and a macro-cycle was the integration of one or more meso-cycles and represented the entire DBR process (Pool & Laubscher, 2016). Long term DBR projects usually consisted of numerous meso-cycles, but the illustration of Pool's (2014) dissertation research in Figure 9 and Table 1 demonstrated how the objectives were achieved using only two meso-cycles or iterative cycles.

Figure 9

DBR research based on a process of cycles within cycles within a short-term project



Source: Pool, 2014

Table 1

Micro-meso-macro cycle concept of Poole (2014) PhD dissertation

Macro-cycle					
	Meso-cycle 1		Meso-cycle 2		
Micro-cycle 1	Micro-cycle 2	Micro-cycle 3	Micro-cycle 4	Micro-cycle 5	Micro-cycle 6
Analyze and Exploration	Design and Construction	Evaluation and Reflection	Analyze and Exploration	Design and Construction	Evaluation and Reflection
Gain Understanding , Baseline for development of intervention	Development of Intervention	Pre-test and Interviews	Analyze data and clarify findings of pretest to refine intervention	Refinement of intervention	Posttest

Adapted from Poole and Laubscher (2016)

Therefore, Pool and Laubscher (2016) argued that DBR could be a suitable methodology for a short-term PhD dissertation if the three core DBR phases were executed, and the outcomes of the research were achieved with a refined intervention and the development of appropriate design principles.

Each of the three frameworks proposed for a PhD dissertation were derived from Reeve's (2006) original DBR framework, but they differed in the number of phases, specific elements included within each phase and the structure and flow of the methods and procedures. Hence, my research was adopted from one of these frameworks while considering elements from the others. I expanded the specific details of my approach in the methods section of my paper. The methods addressed Guba and Lincoln's (1994, p. 108) last question in the methodology process of "how is the best way to collect and analyze the data" or what methods will be used?

Methods

The methods section included an outline of my adapted DBR framework and how each of the methods components were integrated into that framework.

Adapted DBR Framework for my Dissertation

The DBR framework I used for my research was adapted from McKenney & Reeves (2012) framework described previously in Figure 6, but I also considered elements of alternative methods suggested by Abdallah and Wegerif (2014), Herrington et al. (2007), and Pool and Laubscher (2016). The adapted model was illustrated in Table 2, so I next justified the reason for these adaptations as they related to my research.

Table 2*Adapted Design Based Research (DBR) Model*

		Research Process
Phase 1 (part 1) Chapter 4	Analysis and Exploration Jan - Dec. 2023	<ul style="list-style-type: none"> ● Identify problem, literature review ● Identify theoretical framework ● Confirm need for research ● Finalize research questions
Phase 1 (part 2)		<ul style="list-style-type: none"> ● Design intervention (assessment tool) ● Development of assessment tool ● Alpha testing of assessment tool
Phase 2 Chapter 5 Chapter 6 Chapter 7 Chapter 8	Design and Construction First Testing Cycle Mar- June 2024	Objective - Test functionality of the intervention (assessment tool)- ch. 5 - Explore impact of motivation with a universal design for learning framework- chapter 6 <ul style="list-style-type: none"> ● Implement intervention ● Participant formative feedback (post-study survey; teacher interviews) ● Analyze feedback ● Refine intervention
	Second Testing Cycle Oct-Dec 2024	Objective -Test refined intervention -Explore impact of motivation on students with and without learning challenges – chapter 7 <ul style="list-style-type: none"> ● Implement refined intervention ● Participant formative feedback (pre and post study survey; teacher interviews) ● Analyze feedback ● Refine intervention
	Third Testing Cycle Mar-May 2025	Objective -Test refined intervention - Exploring impact of motivation on student with and without learning challenges in three transitional grade ranges in relation to research questions- chapter 8 <ul style="list-style-type: none"> ● Implement refined intervention ● Participant formative feedback (Pre and post study survey) ● Analyze feedback ● Refine intervention
Phase 3 Chapter 9	Evaluation and Reflection	<ul style="list-style-type: none"> ● Draft framework of intervention ● Design principles ● Design final tool

All frameworks were derived from three core phases where the problem was identified, a solution was developed and tested through multiple iterations and design principles were created based on the successful implementation of the intervention. Although the names of these phases differed among scholars, their steps aligned with the phases of McKenney and Reeves (2012) framework of: 1) analysis and exploration, 2) design and construction, 3) evaluation and reflection (Abdallah and Wegerif, 2014; Herrington et al., 2007; McKenney & Reeves, 2012; Pool & Laubscher, 2016). Therefore, I also utilized these titles for my framework and described the elements I adapted from other scholars' frameworks within each phase.

Phase One (Part 1)

I used Herrington et al's. (2007) framework (Figure 7) of dividing the first phase into two components to better reflect the traditional requirements of a PhD dissertation. Dividing the first phase into two components made it easier to initiate the DBR process in advance of the formal proposal approval as I could identify the problem and determine the need for my research through a literature review in the first section prior to designing my intervention in the second section. I also included the theoretical framework in the first section as the underlying theories of the framework were required to guide my literature review and development of the intervention.

Abdallah and Wegerif (2014) suggested a formal preliminary exploration of the issue with the participants in phase one (Figure 8). Due to the structure of my PhD program, I was unable to connect with new participants until after approval of my research proposal and approval from the ethics research board. However, since my proposal stemmed from a gap in my Master's thesis, I referred to my previous study to review some of the critical issues that required further research. I also identified my research problem through a supplementary Mitacs/Lab2Market funded research project; an initiative to help graduate students determine the desirability, feasibility and viability of

commercializing their research. The results from this consultation guided the design and development of the intervention in the second part of phase one.

Phase One (Part 2)

In alignment with Herrington's framework, the second part of phase one introduced the intervention. Abdallah also designed the intervention in the preliminary phase before the testing cycles began. Before designing the intervention, I conducted a student survey of student's current school experiences to further guide the content within the intervention. The intervention was developed into a holistic assessment tool which was implemented in phase two.

Phase Two

The assessment tool was implemented and refined in phase two. All scholars proposed only two iterative cycles for a PhD study, which was my initial intention, but a third cycle was needed to finish my research as I needed to do more testing to answer all my research questions. Herrington and Abdallah conducted their iterative cycles in the design and construction phase, but Pool and Laubscher used a micro-meso-macro approach instead as illustrated in Table 1. The only adaptation I extracted from Pool and Laubscher (2016) was the procedures completed within each cycle, namely: pretest, analyze findings of feedback, refinement of intervention, and posttest as shown in Table 1.

Phase Three

Abdallah and Wegerif (2014) and Herrington et al. (2007) frameworks specified the design principles were created in the final phase. Since the development of design principles was the final element that links theory to practice, I also included the design principles in the final phase of my adapted framework.

Conclusion

The next six chapters provided the details within each of the three phases of my DBR framework. Chapter 4 introduced the framework with phase one (analysis and exploration). The planning of the iterative testing cycles was conducted in Chapter 5 with a general overview of the recruitment strategy, data collection, and data analysis processes. However, specific methods related to each testing cycle as well as their findings were included in Chapter 6 (first testing cycle), Chapter 7 (second testing cycle), and Chapter 8 (third testing cycle). Chapter 9 included the details for phase four of the DBR framework (evaluation and reflection). I finished my study with chapter ten outlining my limitations, implications, and future research perspectives.

Chapter 4- Phase 1: Analysis and Exploration

Analysis and Exploration (Part 1)

The first phase of my DBR study was analysis and exploration, which was divided into two parts. This chapter covers the first part which includes identifying the problem, conducting a literature review, identifying the theoretical framework, confirming the need for research, and finalizing my research question as illustrated in Table 3.

Table 3

Phase 1- Analysis and Exploration (part 1)

Phase 1	Analysis and Exploration	<ul style="list-style-type: none"> ● Identify problem, literature review ● Identify theoretical framework ● Finalize research questions ● Confirm need for solution- customer discovery
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Identifying the Problem, Literature Review, Theoretical Framework

The first step in the process was to identify the problem, conduct a literature review, and identify a theoretical framework. I conducted a comprehensive review of literature and identified a theoretical framework previously in chapter 2. Through this process, I identified a problem; inequitable access to educational support to meet the diverse learning needs of K-12 students in inclusive classrooms. The literature review led to the identification of a motivational theoretical framework based on the self-determination theory and instructional framework derived from the principles of universal design for learning. The following research questions were also previously identified to guide my research.

- How does the implementation of a student-directed assessment for learning approach impact the motivation of students with and without learning challenges based on the self-determination theory?

- Impact on relatedness by building holistic student-teacher relationships
- Impact on choice of learning and student-directed learning
- Impact on students' perceived competence
- What are the perceptions of teachers about the usefulness of the student-directed assessment tool in helping teachers trigger student motivation through relatedness, autonomy, and competence?
- How do the student-directed assessment outcomes impact the teachers' identification of student holistic learning needs and strengths and the design of instructional strategies?

The final step in the first part of phase one was to determine the need for a solution.

Determining the Need for a Solution

I explored the need for research and the demand and receptiveness of the assessment tool through a commercialization consultation.

Commercialization Consultation

The commercialization consultation, funded by Mitacs research, was part of an internship to determine if my research could be commercialized into a product for future sale to customers. The internship commenced with a customer discovery process. Customer discovery has been a process used in business to determine the interest and need of a product to solve a customer issue through consultations with potential customers (Blank & Dorf, 2020). The individuals in my customer discovery process were potential users of the product and decision makers who could purchase the product. It included consultations with 102 students, parents, teachers, principals and superintendents in the provinces of PEI, New Brunswick, Ontario, and Alberta. These individuals shared existing issues and needs, assisted in identifying potential solutions, and expressed interest in testing the solution. The common theme from all consultations revealed that strong student-

teacher relationships were critical to motivating and supporting the diverse needs of students in inclusive classrooms. Building relationships could start with the teachers first identifying students' needs, strengths, interests, and learning preferences utilizing a holistic assessment tool. Based on the outcome of this consultation, I was able to identify the need for my research and that a holistic assessment tool might be a potential solution to support this need.

Ethics Approval

After identifying the need for my research and potential demand for the commercialization of an assessment, I obtained ethics approval to conduct a multi-phased DBR study in Table 4.

Table 4

Summary of Multi-Phase Study

Student Survey January 2023	First Testing Cycle September 2023	Second Testing Cycle May 2024	Third Testing Cycle March 2025
UPEI research board	UPEI research board Application to 7 school boards – approval from 3 school boards in Ontario, PEI and New Brunswick	UPEI research board Application to 3 school boards- approval from 3 school boards in Ontario, PEI and New Brunswick	UPEI research board

The first ethics application was approved in January 2023 (Appendix A) to conduct an online student survey which helped to inform the development of the online assessment tool. This study included an invitation to students via parents with an online consent from parents and assent from students. The next three ethic approvals were related to the three iterative testing cycles. Since each application was dependent upon the results of the previous cycle, the applications were completed only after completion of each cycle. The second ethics application was approved in September 2023 (Appendix B), and this application precipitated the first set of applications to school boards in Ontario, PEI, and New Brunswick. Seven applications were made to 7 school

boards and approval was received from 3 school boards to conduct my research. Since the participants involved teacher and student participants, extensive recruitment was completed. After approval was received from the school boards, principals were invited to the study; then principals invited and approved voluntary participation of teachers within their schools. The teachers invited students in their classrooms through the parents since students were minors in grades 5-9. Due to delays in recruitment, revisions were made to the process of the first testing cycle which resulted in an amended ethics application (Appendix C) and a request for an extended renewal of the application (Appendix D). The next application was approved by the UPEI research board in May 2024 (Appendix E) to conduct the second iterative cycle of testing. This application for the second testing cycle also precipitated subsequent applications to the three previous school boards that participated in the first cycle of testing. After approval was received from the three school boards, a similar recruitment process was completed as in the first testing cycle. Revisions were made to this testing cycle to include a broader criteria of participants which resulted in an amended ethics application (Appendix F) for the second testing cycle. The final ethics application was completed March 2025 (Appendix G) to complete the third testing cycle. This third testing cycle was only conducted in community organizations, so further school board approval was not required. Instead, after community organizations accepted the invitation to participate in my research, the organizations invited students through their parents like the previous testing cycles. Once I received approval for the first ethics application, I continued to the second part of phase one to conduct the student survey.

Analysis and Exploration (Part 2)

The second part of phase one involved conducting the student survey which informed the design, development, and alpha testing of the assessment tool before it was implemented in the study as illustrated in Table 5.

Table 5

Phase 1- Analysis and Exploration (part 1)

Phase 1	Analysis and Exploration (part 2)	<ul style="list-style-type: none"> ● Student Survey ● Designing the intervention (assessment tool) ● Developing the assessment tool ● Alpha testing of the assessment tool
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Student Survey

Prior to designing the assessment tool, I needed to determine the initial content to be included in the assessment tool. Since one objective of the assessment was to increase motivation, I wanted to obtain students' perceptions of their current experiences at school, relationships with teachers, and how students were motivated. I collected this information through a student survey.

Survey Design

The student survey included 25 questions about the students' existing experiences in school (Appendix H). The survey questions focused on students' educational experiences and perceived levels of motivation. Questions included how frequently students' interests and learning preferences were considered in instructional strategies, how frequently students' teachers taught students the way they learned best, and how students were motivated to learn. The questions in the survey were grouped into six categories aligned with student-directed learning; interests and talents, learning skills strengths and challenges; learning supports; learning preferences; student involvement and choice of learning; and engagement and motivation. Some questions included

multiple choice options with a free format option for responses not on the list. Descriptive analysis was completed for the free format questions. The remaining questions were based on a four- or five-point likert scale which included a combination of descriptive and inferential analysis. Mann Whitney U tests were used to compare the differences between students with and without learning challenges. In this survey, students who reported having Individual Education Plans (IEPs) were considered those with learning challenges and students who reported not having an IEP were categorized in the group of students without learning challenges. I used four constructs to design and analyze the survey questions. The first three constructs aligned with the three psychological needs of the self-determination theory; relatedness, competence, and autonomy. The fourth construct aligned with overall engagement and motivation. Upon completion of the survey design, I continued to recruit the participants.

Recruitment for Student Survey

The student survey involved the recruitment of students across Canada. The inclusion criteria were students:

- Currently attending grade 6-12 at a public, private, or separate school
- Residing in one of the Canadian provinces

The recruitment was completed by posting an advertisement (Appendix I) on social media in a variety of parent support groups. An information letter (Appendix J) was provided to parents/students, and online parental consent, and student assent (Appendix K) was obtained in conjunction with the completed surveys. Only parent names and emails were requested without the names of students to ensure confidentiality of data collected.

Data Collection

A total of 115 students from grades 6-12 completed the survey. Eighty-four percent ($n=$

97) of students who completed the survey were in grades 6-9. These were the transitional years which affected student motivation as social and emotional skills started to impact students' academic performance in varying ways (Jones & Kahn, 2017; Steinberg, 2017). The number of students in each province who completed the survey aligned with the relative population of each province with the largest numbers in Ontario (50%), Quebec (13%), British Columbia (12%), and Alberta (11%) respectively. Most students attended public district schools (79%) with the remaining in public separate and private schools. Sixty-six percent ($n= 76$) of students indicated they had an Individual Education Plan (IEP) which meant they had some type of learning challenge. Since the term IEP varied across Canada, a definition was also provided and the opportunity for students to indicate "they don't know" if they didn't understand the question. This meant a large number of students indicated they had some type of learning challenge that would require special education support. This large percentage of students with learning challenges was not surprising since invitations were posted on social media parent groups or organizations supporting students with diverse learning needs. Data analysis was completed next.

Data Analysis

The data from these surveys were analyzed with SPSS software using descriptive and independent between-group tests to compare the differences between students with and without learning challenges. The outcome of the student survey helped to inform how the assessment might strengthen student-teacher relationships and increase students' motivation. It resulted in the development of a holistic assessment tool which included a student learning plan, learning strategies, and a class profile.

Findings

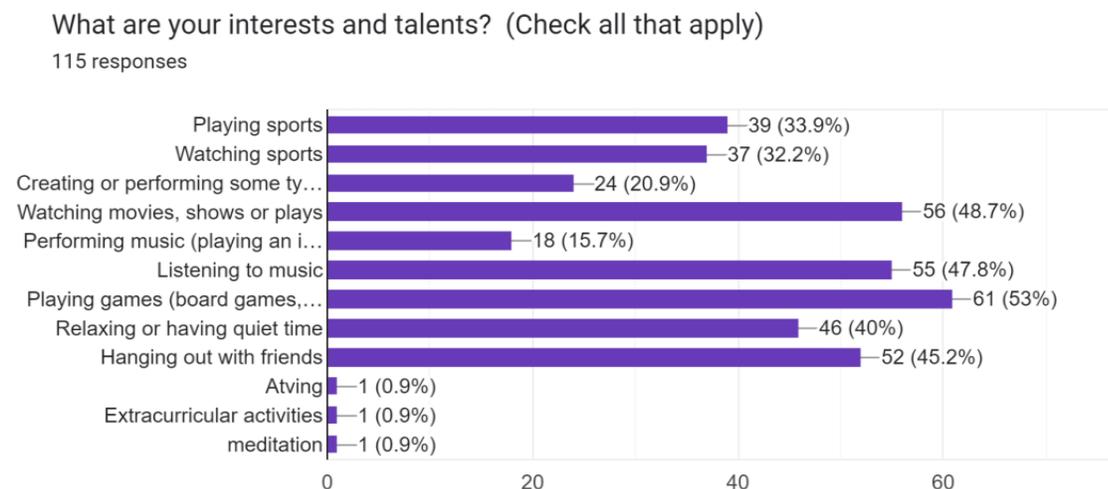
The findings have been outlined within the four constructs aligned to relatedness,

competence, autonomy, and overall engagement and motivation. I used a Pearson correlation test to identify items that could be combined into each construct. Pearson was used instead of Cronbach because Pearson was more appropriate for two-items constructs, whereas Cronbach was generally used for constructs of more than three items (Eisinga et al., 2013). Since most of the constructs in my study included only two items, I continued to use Pearson correlation throughout my remaining research. The first three questions focused on relatedness.

Relatedness: Interest and Talent Questions. According to the self-determination theory, relatedness was one of three psychological needs which impacted intrinsic motivation (Deci et al., 1991; Ryan & Deci, 2020). Relatedness signified the need for belongingness or relationships. This need could be satisfied through the development of strong teacher-student relationships when teachers recognized and emphasized students' interests, talents, and strengths. Students were asked three questions in relation to their interests and talents.

- *What are your interests and talents?*
- *How often does your teacher include your interests or talents in your Math lessons?*
- *How often does your teacher include your interests or talents in your English/ Language Arts lessons?*

Students selected from a list of common interests and talents (Figure 10) and had an option to include other interests not on the list. The students reported having a variety of interests and 2.7% ($n= 3$) also reported a few other interests that were not on the list.

Figure 10*Interests and Talents Questions*

The students were also asked to report the frequency that their interests and talents were included in their Math and English/ Language Arts (Table 6) lessons using a four-point likert scale “frequently, often, sometimes, not at all”. Only 32.8% ($n= 38$) and 35.3% ($n= 41$) of students indicated their interests or talents were respectively considered frequently or often in their Math and English/Language Arts lessons.

Table 6*Frequency of Students Interests Included in Math and English*

Frequency	Math	English
Not at all	21.6%	20.7%
Sometimes	45.7%	44.0%
Often	12.1%	12.1%
Frequently	20.7%	23.3%
Total Frequently or Often	32.8%	35.3%

A positive correlation was found between Interests included in Math and Interests included in English, $r(113) = .91, p < .001$. Therefore, these variables were combined into one construct to compare the responses between students with IEPs and students without IEP in relation to how often the students perceived their interests were included in Math and English lessons.

Since the data was not normally distributed, a Mann-Whitney U test (Table 7) was performed.

Table 7

Mann Whitney U Test- Interests in Math and English

Mann-Whitney U	718.50
Wilcoxon W	3958.500
Z	-4.492
Asymp. Sig. (2-tailed)	<.001

The results indicated a significant difference between the two groups for Math, $U = 718.5, z = -4.492, p < .001$. To assess the practical significance (the effect size), rankings were compared. The mean rank for students with IEPs was lower ($R1 = 54.44$) than the mean rank of students without IEPs ($R2 = 67.53$) and the effect size was medium to large; $r = .417$. Therefore, students' perception of the frequency their interests were included in their Math and English lessons found a practically significant difference for students with and without IEPs or learning challenges.

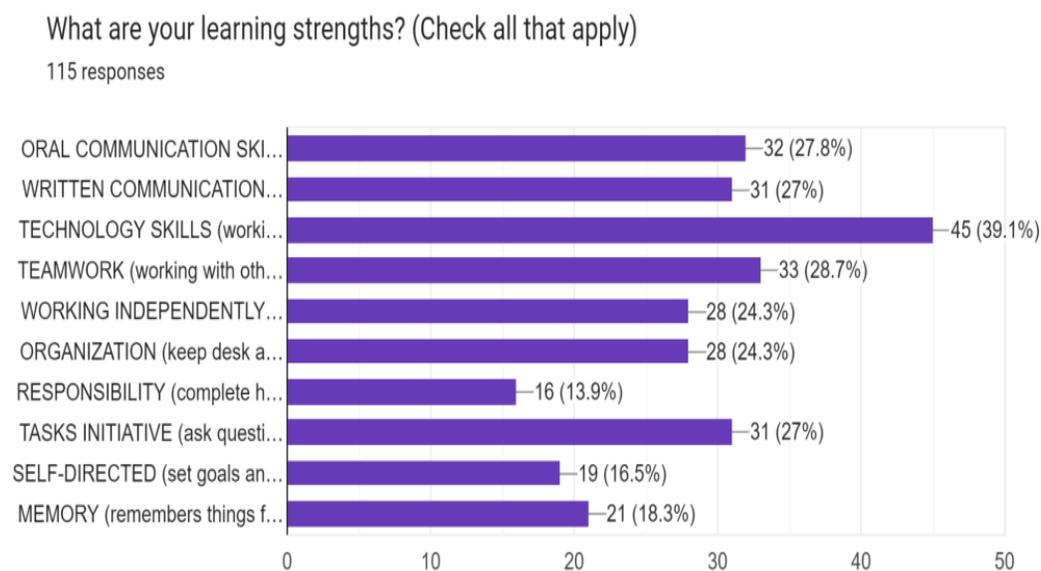
Competence: Learning Skill Strengths and Challenges Questions. Competence was the next psychological need which impacted motivation. This was based on how students perceived their academic and learning strengths and needs, and the support they received to make them successful learners (Deci et al., 1991; Ryan & Deci, 2020). Therefore, the next two categories of questions were aligned with competence and focused on learning skill strengths and challenges, and learning supports. The first two questions related to learning skills strengths and challenges were:

- *What are your learning skills strengths?*
- *What are your learning skills challenges?*

The learning skills strengths and challenges questions included 10 multiple choice categories related to how students learn, some of which were included in provincial progress report cards (Deluca et al., 2017; Ministry of Ontario, 2010). Initially, students were asked (in Figure 11) if they had learning skill strengths in teamwork, working independently, organization, responsibility, task initiation, self-directed learning, memory, oral communication, written communication, and technology. The students who completed the survey reported learning strengths from all 10 learning skill areas. Technology, teamwork, oral communication and written communication ranked the highest of all other categories with 39.1%, 28.7%, 27.8%, and 27% of students respectively reporting strengths in these areas. The skills that were less often reported as strengths were related to the executive function skills of responsibility (13.9%), self-direction (16.5%) and memory (18.3%).

Figure 11

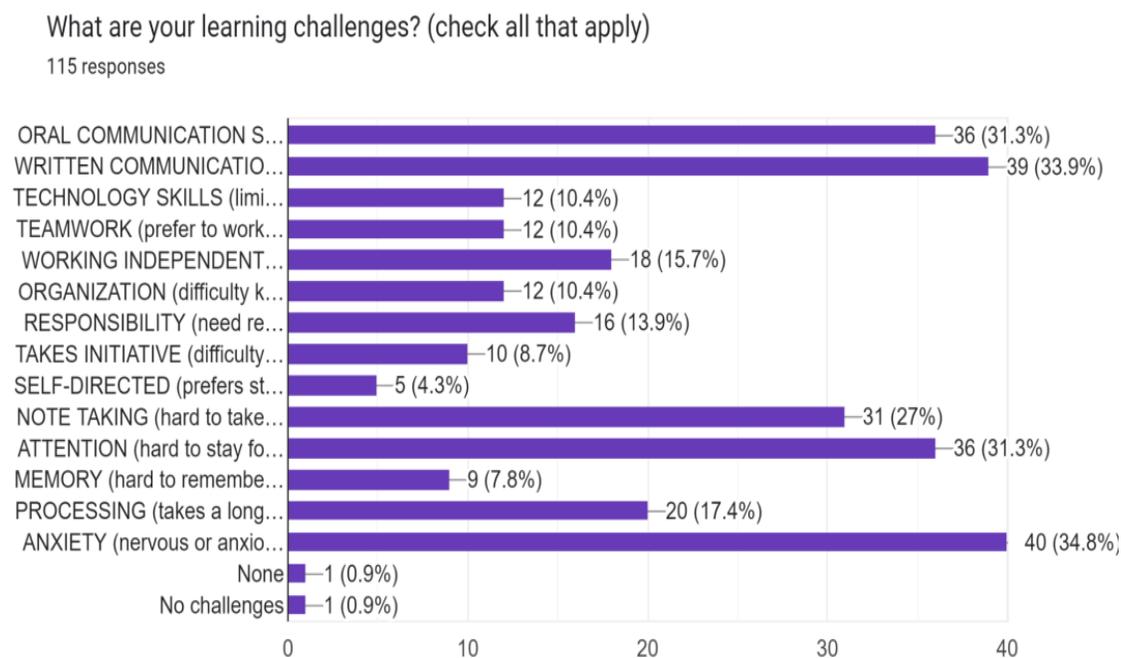
Learning Skill Strengths Questions



A second list was presented to the students in (Figure 12) to identify learning skill challenges. This list included the same items from the list of learning strengths in addition to four more skills which might have impacted learning challenges: note taking, anxiety, attention, processing. When asked about their learning skills challenges (in Figure 12), participants expressed learning challenges in all areas with only 2% indicating they didn't have any learning skill challenges. The learning challenges ranked by more students included anxiety (34.8%), written communication (33.9%), oral communication (31.3%), and attention (31.3%) while the areas selected less often as challenges were self-direction (4.3%) and memory (7.8%).

Figure 12

Learning Skill Challenges Questions



The students were next asked to select the frequency of being able to use their strengths in Math and English/Language Arts (Table 8) using a likert scale of “frequently, often, sometimes and not at all”. The questions were:

- *How often does your teacher allow you to use your strengths in Math class?*
- *How often does your teacher allow you to use your strengths in English/
Language Arts class?*

Table 8*Frequency Learning Skill Strengths Included in Class*

Frequency	Math	English
Not at all	10.3%	10.3%
Sometimes	28.4%	24.1%
Often	24.1%	29.3%
Frequently	37.1%	36.2%
Frequently and Often	61.2%	65.5%

Sixty-one percent ($n=70$) of students indicated their learning skills strengths were used in Math “often or frequently” and 65.5% ($n=75$) indicated these strengths were also “often or frequently” used in English/Language Arts. There were just as many students who perceived oral communication, written communication, self-direction, and memory as both strengths and challenges. A positive correlation was found between ‘Strengths included in Math’ and ‘Strengths included in English’, $r(113) = .843, p < .001$. Therefore, these variables were combined into one construct to compare the responses between students with IEPs and students without IEP in relation to how often the students perceived their strengths were included in the Math and English lessons. Since the data was not normally distributed, a Mann-Whitney U test (Table 9) was performed.

Table 9*Mann Whitney Test- Learning Strengths Applied in Math and English*

Mann-Whitney U	1100.5
Wilcoxon W	4340.500
Z	-2.091
Asymp. Sig. (2-tailed)	.037

The results indicated a significant difference between the two groups, $U= 1100.5$, $z= -2.091$, $p =.037$. To assess the practical significance (the effect size), rankings were compared. The mean rank for students with IEPs was lower than ($R1= 54.44$) the mean rank of students without IEPs ($R2= 67.53$) and a small effect size was found; $r=.194$. These findings illustrated a statistical but not a practical significance difference between the students with and without IEPs or learning challenges who reported being able to use their learning strengths in class.

Competence: Learning Support Questions. Learning support included two questions and a list of supports and accommodations that students reported made learning (Figure 13) and testing (Figure 14) easier for them in Math and English/Language Arts as follows:

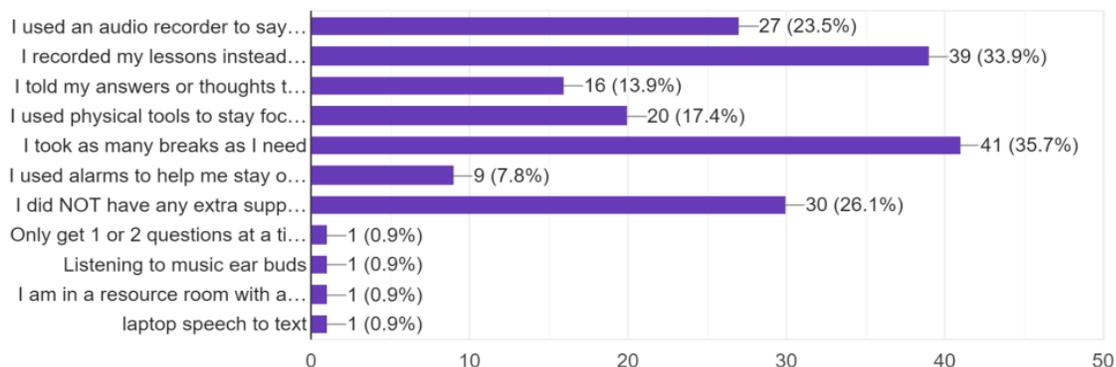
- *Which of the following supports have you received that has made LEARNING IN CLASS easier for you?*
- *Which of the following supports have you received that has made TESTING easier for you?*

There was also an option for students to include supports that was not on the list. 73.9% ($n= 85$) reported they received support for learning from all the listed items and added four additional options. Eighty-two percent ($n= 95$) of students reported they received support for testing from all the listed items and added two additional options.

Figure 13*Learning Support Questions for Learning in Class*

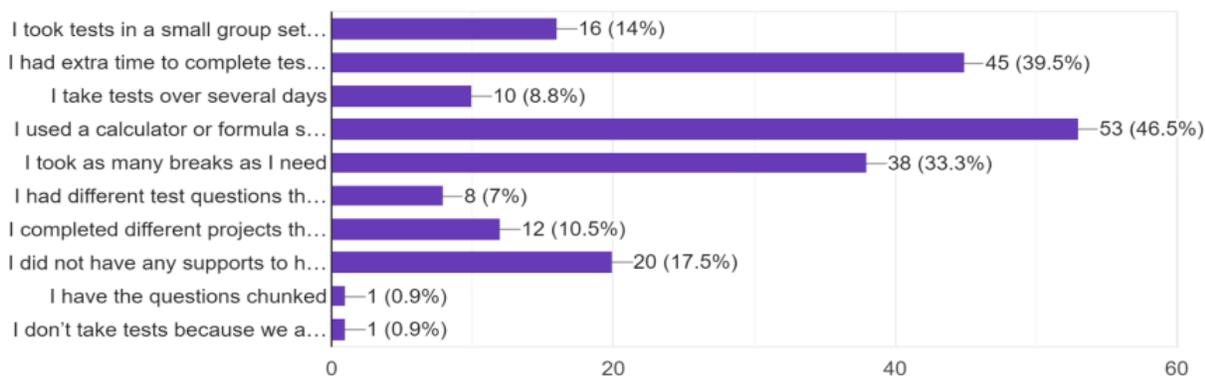
Which of the following supports have you received that has made LEARNING IN CLASS easier for you? (check all that apply)

115 responses

**Figure 14***Learning Support Questions for Testing*

Which of the following supports have you received that has made TESTING easier for you? (check all that apply)

114 responses



Autonomy: Learning Preferences Questions. Autonomy was the third SDT need which triggered intrinsic motivation by supporting students' self-initiation and self-regulation of their own actions through choice of learning. Therefore, the first set of questions aligned with autonomy were about students' learning preferences. Students were asked to select how they perceived they

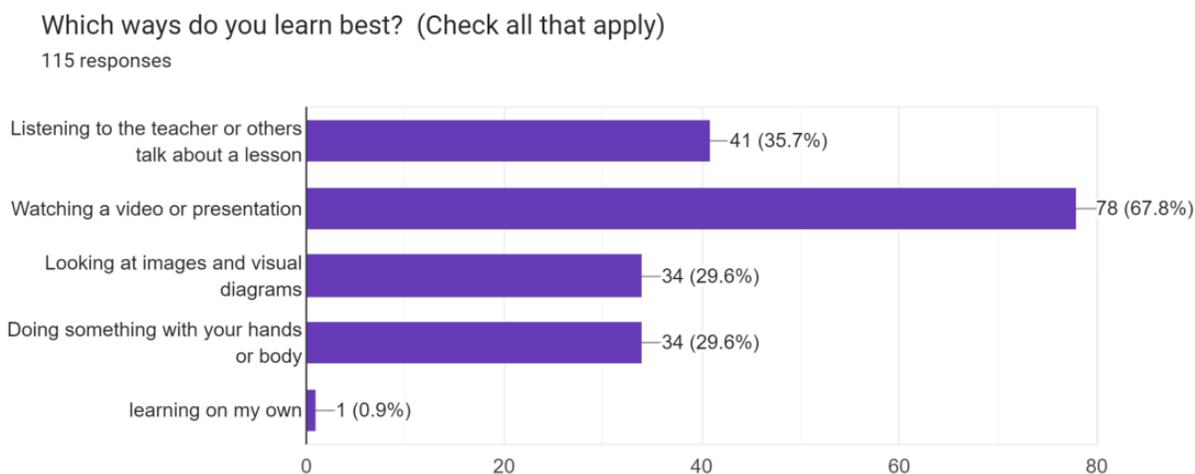
learned best from a list of traditional instructional methods (Figure 15): listening to the teacher or others; watching videos or a presentation; looking at images or visual diagrams; doing something with hands or body.

- *Which ways do you learn best?*

The most favoured learning preference was “watching a video or presentation “(68% and $n= 78$) with an even distribution of the remaining options.

Figure 15

Learning Preference Questions- Ways Learning Best



Students were also asked how often they perceived they were taught the way they learned best in Math and English/Language Arts, using a four-point likert scale of “frequently, often, sometimes, not at all” (Table 10).

- *How often does your teacher teach you the way you learn best in Math?*
- *How often does your teacher teach you the way you learn best in English/ Language Arts?*

Table 10*How Students Learn Best*

Frequency	Math	English
Not at all	4.3%	4.3%
Sometimes	44.8%	44.8%
Often	17.2%	17.2%
Frequently	33.6%	33.6%
Often or Frequently	50.9%	50.9%

Only 50.9% ($n= 59$) of students reported that their teacher “frequently or often” taught them the way they learn best in Math and 50.9% ($n= 59$) of students reported their teacher “frequently or often” taught them the way they learn best in English/ Language Arts. A positive correlation was found between ‘Learn Best in Math and Learn Best in English’, $r(113) = .854$, so these variables were combined into one construct. To determine the impact between students with and without IEPs or learning challenges on students’ perception of being taught the way they learn best in Math and English class, a Mann-Whitney U test was performed (Table 11).

Table 11*Mann Whitney Test- How Students Learn Best*

Mann-Whitney U	1016.000
Wilcoxon W	4256.000
Z	-2.636
Asymp. Sig. (2-tailed)	.008

The results indicated a significant difference between the two groups, $U=1016$, $z= -2.636$, $p = .008$. To assess the practical significance (the effect size), rankings were compared. The mean rank for students with IEPs was lower ($R1= 53.20$) than the mean rank of students without IEPs ($R2= 70.28$) and a small effect size was found; $r(113) = .2447$. The findings for students who reported being taught the way they learned best in class illustrated a statistical but not a practical significant difference between the students with and without IEPs or learning challenges.

The last three questions students were asked in relation to learning preferences were the preferred ways of demonstrating the students' knowledge.

- *Which ways do you prefer to be tested or show your knowledge?*
- *What testing methods have you experienced in your Math class?*
- *What testing methods have you experienced in your English/Language Arts class?*

The students were asked how they preferred to be tested from a selection of 10 different assessment methods (Figure 16). At least 15% of students preferred 8 out of the 10 assessment methods. However, when students were asked how they were primarily tested in Math (Figure 17), only 3 out of the 10 methods were selected by at least 15% of the students. In English/Language Arts (Figure 18), only 4 out of the 10 assessment methods were selected by at least 15% of the students.

Figure 16
Assessment Preferences Questions

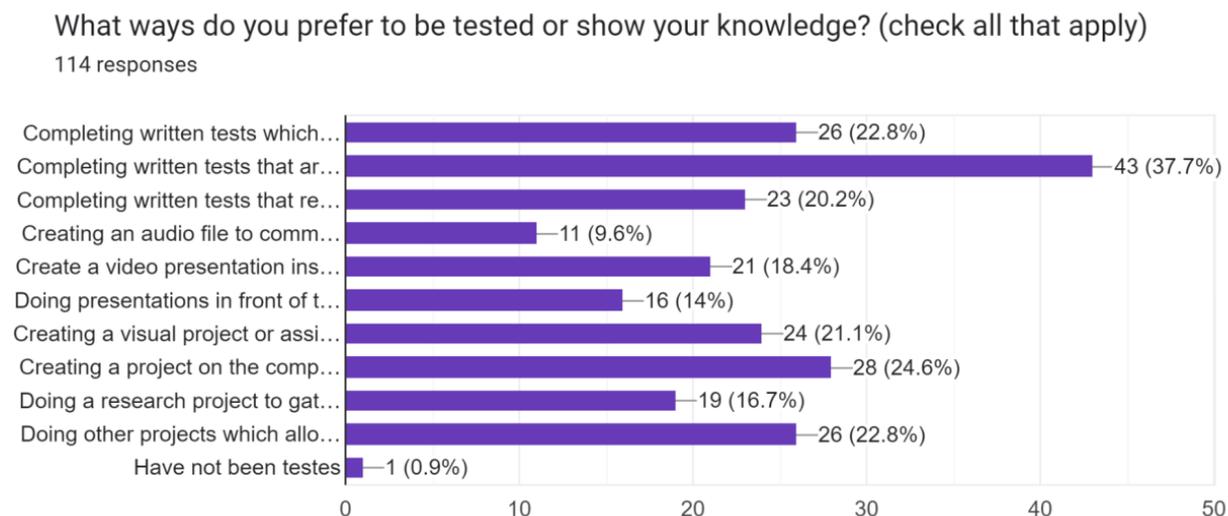


Figure 17

Assessment Preferences Questions- Math

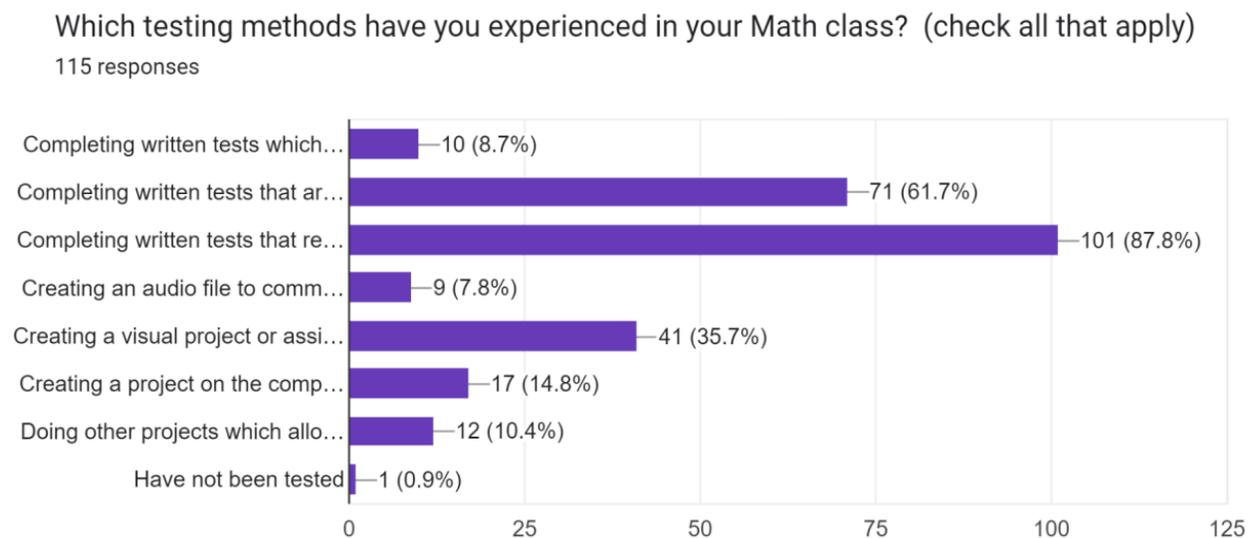
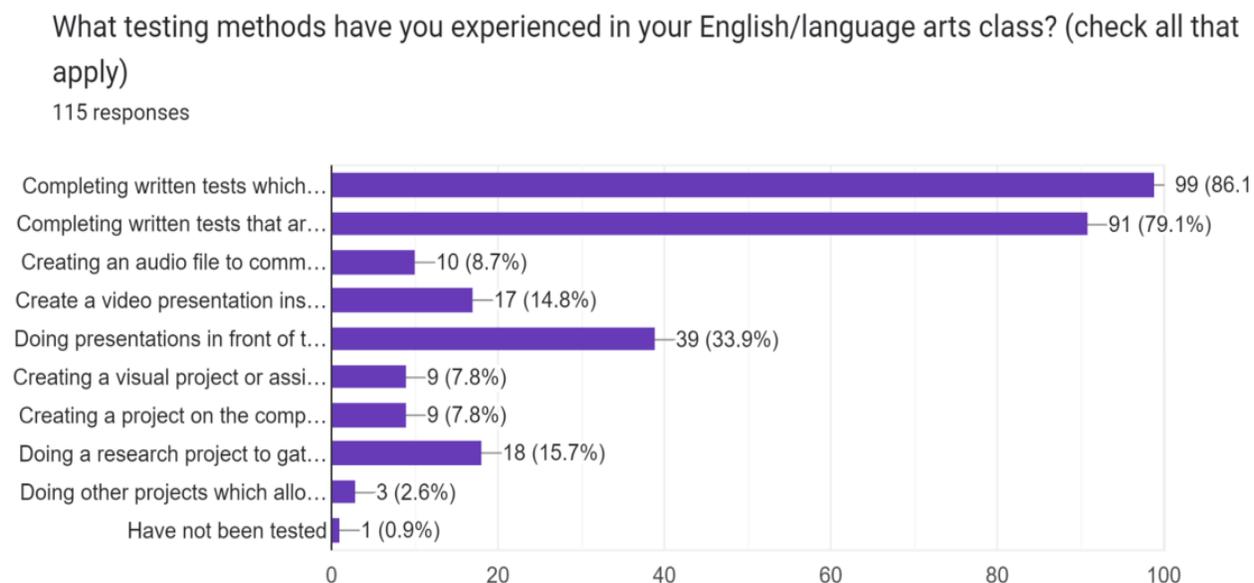


Figure 18*Assessment Preferences Questions- English/ Language Arts*

Autonomy: Choice of Learning Questions. Choice of learning was another factor aligned with the need for autonomy. Four questions were posed to students relating to the frequency (Table 12) and importance of students' choice of learning (Table 13) in Math and English/Language Arts. A four-point likert scale was used to measure frequency (frequently, often, sometimes, not at all) and importance (extremely important, very important, somewhat important, and not important at all).

- *How often have you been able to choose how and what you want to learn in Math class?*
- *How often have you been able to choose how and what you want to learn in English/Language Arts class?*
- *How important is it to have choices of how and what you want to learn in Math class?*

- *How important is it to have choices of how and what you want to learn in English/Language Arts class?*

A frequency test (Table 12) indicated that only 12.1% ($n= 14$) of students reported they had a choice of how and what they wanted to learn in Math “often or frequently”. Despite this outcome, 81.9% ($n= 94$) reported that it was “very or extremely important” to have a choice of how and what they learned in Math (Table 13). In relation to English, only 18.1% ($n= 21$) of students reported they had a choice of how and what they wanted to learn in English/ Language Arts “often or frequently”. This contrasted the 83.6% ($n= 96$) who reported that it was “very or extremely important” to have a choice of how and what they learned in English/Language Arts.

Table 12

Frequency of Choice

Frequency	Math	English
Never	44.0%	40.5%
Sometimes	44.0%	41.4%
Often	7.8%	14.7%
Frequently	4.3%	3.4%
Frequently or Often	12.1%	18.1%

Table 13*Importance of Choice*

Frequency	Math	English
Not important at all	3.4%	5.2%
Somewhat important	14.7%	11.2%
Very important	17.2%	17.2%
Extremely important	64.7%	66.4%
Extremely or Very Important	81.9%	83.6%

There was a positive correlation ($r(113) = .857$) between ‘choice of learning in Math’ and ‘choice of learning in English’. Therefore, the first two questions were combined into one construct. There was also a positive correlation ($r(113) = .876$) between ‘importance of choice in math’ and ‘importance of choice in English’ so these two questions were also combined into one construct. This data was not normally distributed for any of the variables, so Mann-Whitney U tests were also performed to determine the impact between having a choice in learning (Table 14) and the importance of having a choice (Table 15) for students with and without IEPs or learning challenges.

Table 14*Mann-Whitney U Test – Have Choice of Learning*

Mann-Whitney U	1248.000
Wilcoxon W	4488.000
Z	-1.215
Asymp. Sig. (2-tailed)	0.224

The first test (Table 14) indicated there was not a significant difference between students with learning challenges and students without learning challenges in their perception of having a choice of learning; $U= 1248$, $z= -1.215$, $p = .224$. The mean rank for students with IEPs was lower ($R1= 56.10$) than the mean rank of students without IEPs ($R2= 63.83$). A Mann-Whitney U was also conducted to determine the significance of the importance of having choice in learning for students with and without IEPs (Table 15).

Table 15*Mann-Whitney U Test - Importance of Choice in Learning*

Mann-Whitney U	1083.000
Wilcoxon W	1749.000
Z	-2.404
Asymp. Sig. (2-tailed)	0.016

In this second test, a significant difference was reported between the two groups: $U= 1083$, $z= -2.404$, $p= 0.016$. To assess the practical significance (the effect size) rankings were compared. The mean rank of students with IEPs ($R1= 62.96$) was this time higher than the mean rank of students without IEPs ($R2= 48.58$) and a small effect size was found; $r (113) = .223$. These findings of the importance of having choice in learning illustrated a statistical but not a practical significant

difference between students with IEP and students without IEPs. The final question related to autonomy was:

- *If teachers allowed you to have some choices about how and what you learned, how interested would you be in having these choices?*

A four-point likert scale was used to measure students' interest in having choice in learning (very interested, a little interested, not interested, not sure). In response to this question, 75% of students ($n= 86$) indicated they would be very interested in having more choice in learning if the opportunity was presented. The final section of the survey focused on students' overall level of engagement and motivation in Math and English class.

Engagement and motivation questions. Students were asked general questions about how engaged and motivated they were in Math and English/ Language Arts and what would make them more engaged and motivated in these classes (Table 16). The first two questions were:

- *How engaged and motivated are you to learn in your Math class?*
- *How engaged and motivated are you to learn in your English/ Language Arts class?*

Table 16

Level of Engagement and Motivation

	Math	English
Not Engaged at all	21.6%	22.4%
Somewhat engaged	49.1%	42.2%
Very engaged	12.1%	17.2%
Extremely engaged	17.2%	18.1%
Extremely or Very Engaged	29.3%	35.3%

Only 29.3% ($n= 34$) of students indicated they were “very engaged or extremely engaged” in Math

and 35.3% ($n= 41$) indicated they were “very engaged or extremely engaged” in English/Language Arts. There was also a positive correlation ($r(113) = .885$) between ‘engagement in Math’ and ‘engagement in English’ so these two questions were combined into one construct. This data was not normally distributed, so a Mann-Whitney U test (Table 17) was performed to determine the difference in level of engagement in Math and English class between students with and without IEPs or learning challenges.

Table17

Mann-Whitney U Test-Level of Engagement and Motivation

Mann-Whitney U	634.500
Wilcoxon W	3874.500
Z	-4.954
Asymp. Sig. (2-tailed)	0.000

The results indicated a significant difference between the two groups, $U= 634.5$, $z= -4.954$, $p =0.00$. To assess the practical significance (the effect size), rankings were compared. The mean rank for students with IEPs was lower ($R1= 48.43$) than the mean rank of students without IEPs ($R2= 80.88$) and a medium to large effect size was found; $r(113)= .46$. These findings illustrated a practically significant difference in students' level of engagement and motivation in Math and English between the students with and without IEPs or learning challenges. The information related to students' engagement and motivation prompted the final questions of the survey which were:

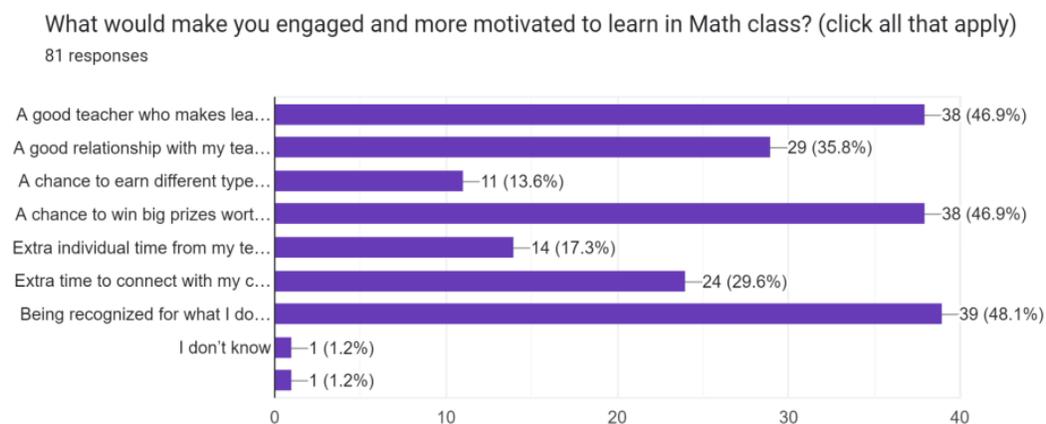
- *What would make you more motivated to learn in Math class?*
- *What would make you more motivated to learn in English/ Language Arts class?*

The most common ways students reported engagement, and motivation could be increased in Math

were illustrated in Figure 19. These ways were: being recognized for what I do (48%), a good teacher who makes learning interesting (47%), a good teacher who makes learning interesting (47%), a chance to win big prizes over \$100 (47%).

Figure 19

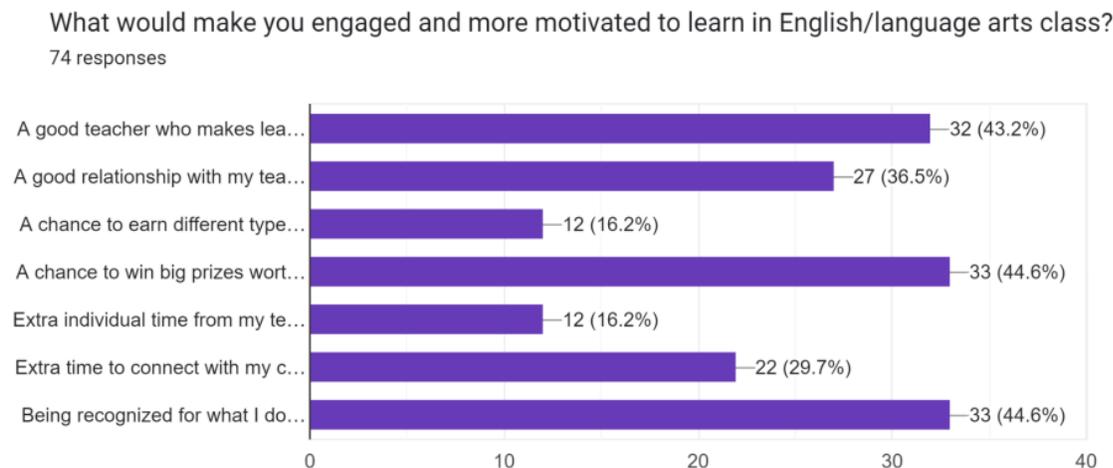
Increasing Engagement and Motivation in Math



The same items were reported for increasing motivation in English/ Language Arts (Figure 20) with very similar outcomes of being recognized for what I do (45%), a chance to win big prizes over \$100 (45%), a good teacher who makes learning interesting (43%).

Figure 20

Increasing Engagement and Motivation in English/ Language Arts



Phase One Discussion- Student School Experiences Impacting Motivation

The findings from the student survey revealed a variety of themes about the students' current learning experiences as well as potential areas of opportunities that may increase students' motivation. Four themes identified were; 1) learning skills and support impact perceived competence; 2) autonomy based on choice and ranges of motivation; 3) building relationships by identifying interests and talents; 4) balancing extrinsic and intrinsic motivation

Learning Skills and Support Impact Perceived Competence. To fulfill students' need for competence, I aimed to understand students' learning strengths and challenges and the support that may help students overcome their challenges. I wanted to determine if teachers could help students overcome their challenges if they were able to identify the students' challenging skills earlier. Therefore, the assessment included a section for learning skill strengths, learning skill challenges, and supports to make learning easier.

When comparing the learning skills strengths between students with and without learning challenges, the mean rank was lower for students with learning challenges or IEPs ($R1 = 54.44$) than students without learning challenges ($R2 = 67.53$). A Mann-Whitney U test also illustrated a statistical significant difference in learning skills strengths between these two groups of students in Math and English. Executive functioning skills including anxiety and attention were often reported as challenges which could be a barrier impacting students' learning. Therefore, I decided to consider a wide range of executive functioning skills in the holistic assessment, so students and teachers could obtain a better understanding of the root causes of students' learning and how to address these obstacles.

In addition to identifying students' strengths and challenges, students reported how often they were taught the way they learned best. The mean rank for students with learning challenges

was lower than the mean rank for students without challenges. Students also selected a variety of options that could make learning and testing easier for them. These results indicated there were more ways that students preferred to be assessed than were offered to them. The results implied that students with learning challenges might have limited opportunities in making decisions about accommodations in their Individual Education Plans (IEP). Although students in some provinces were involved in consultations about their IEP (PEI Dept of Education, 2005; OME, 2005), Cavendish and Connor (2018) and Cooper (2019) noted that consultations do not necessarily equate to students' decisions about their assessment and learning options. Therefore, I also included this list of learning supports in the holistic assessment to enable students to make more choice in communicating the educational support that worked best for them. The second psychological need to be addressed in the self-determination theory was the need for autonomy.

Autonomy Based on Choice of Learning. Autonomy was explored through students' learning preferences and choice of learning. Students reported there were more ways they preferred to learn than were being provided to them. They also stated they were only taught the way they learned best in Math and English/ Language Arts 51% and 52.2% respectively. Similar results were revealed when students were asked how they preferred to demonstrate their knowledge. Most students indicated they preferred to be tested using the 10 multiple ways that were listed in the question, yet only three or four of these methods were offered to (more than 15%) of the students. Although the students identified several learning and assessment methods that helped them process and demonstrate their understanding of knowledge, they experienced a limited number of these methods in their Math and English/Language Arts classes. According to CAST (2024), limiting the preferences of learning and assessment contrasted the concept of neuro-variability which stated that learners depended on many parts of the brains working together to

perform specific functions. The recognition and strategic networks of the brain were particularly relevant for students to acquire and demonstrate their understanding of knowledge.

Although it might be difficult for teachers to implement instructional strategies for individual students, a selection of instructional strategies aligned with the principles of universal design for learning (UDL) could benefit individual students as well as the entire class when teachers provided students with multiple means of engagement, representation and actions of expression. This was illustrated in Katz's (2021) study on the Three Block Model where students made significant improvements in learning when social and emotional learning strategies were also integrated into universal instructional practices. Therefore, the holistic assessment also contained multiple ways of learning and assessment including watching videos and completing multiple choice assessments since they were the most preferred ways of learning and assessment.

In addition to providing students with multiple ways of instruction, autonomy also included students having a choice of how and what they learned. When students were asked how often they were provided with a choice of learning and how important it was for them to have these choices, there was a large gap in the responses to these questions. Although 82% of students stated that it was extremely or very important to have a choice in learning, only 12-19% were frequently or often offered this choice. Further, when a Mann-Whitney U test was conducted, the importance of having choice found a statistically significant difference between students with and without learning challenges ($p = .016$). However, there was not a significant difference in frequency of choice between students with and without learning challenges ($p = .224$). The significant difference reported between students with and without an IEP or learning challenges in relation to importance of choice could mean that providing choices of learning options might have a larger impact on students with learning challenges than students without learning challenges

when they complete the assessment. Kelly's (2017) review of 10 studies on the impact of choice on students with disabilities supported this perspective. In 9 out of 10 of the studies reviewed by Kelly, providing students with disabilities with choice in learning positively impacted their engagement, academic performance, and behavior. Also important to note in the findings was that the importance of choice was the only category where the mean rank for students with IEPs ($R1=62.96$) was greater than the mean rank of students without IEPs ($R2=48.58$). Given that students with IEPs reported a low frequency of having choice and being taught the way they learn, yet a large number of students with IEPs expressed the importance of choice, it was critical to consider if and how these responses could be related to students' perceived level of motivation. The final need that was addressed based on the self-determination theory was relatedness.

Building Relationships by Identifying Interests and Talents. Relatedness was explored by understanding students' interests and talents and the frequency they were included in their Math or English/Language Arts lessons. The students expressed they had a variety of interests and talents, but only 33-36% of students indicated their interests and talents were included in their Math or English/Language Arts lessons. When a Mann-Whitney U test was conducted to compare the differences between students with and without learning challenges, a practically significant difference was found between the two groups. The mean ranks of students with learning challenges or IEPs were also lower ($R1=54.44$) than students without learning challenges ($R2=67.53$). Since relatedness was aligned with a sense of belongingness, the low score in this category could have indicated a lack of belongingness or relatedness with the students' teachers, especially students with learning challenges if their teachers were unaware of their interests and talents.

Teachers may find it challenging to obtain this information, but if students directly provide their interests and talents through the holistic assessment, teachers might be able to identify

common interests that could be included in lessons. This information may also be used to trigger informal conversations with individual students to solidify authentic student relationships and promote a sense of belongingness. The final theme considered the balance of extrinsic and intrinsic motivation.

Balancing Extrinsic and Intrinsic Motivation. The overall level of motivation was quite low for all students with only 29.3% of students indicating they were “very engaged or extremely engaged” in Math and 35.3% indicating they were “very engaged or extremely engaged” in English/Language Arts. When comparing students of differing ability levels, a practically significant difference in perceived engagement and motivation was found between students with IEPs and students without IEPs. These outcomes may be related to the way students were motivated; extrinsically or intrinsically. When all students were asked how they were motivated, the results were mixed with a combination of external tangible rewards and internal motivators such as recognition or choice of learning. This suggested that the students may have required a balance of external and internal sources to become motivated, placing them between the continuum of amotivation to intrinsic motivation. Based on the self-determination theory, motivation was regulated through a continuum of external and internal regulation from amotivation to intrinsic motivation (Deci & Ryan, 1985; Ryan & Deci, 2020). In between amotivation and intrinsic motivation were four types of extrinsic motivation: external (external), introjected (external), identified (internal), and integrated (internal) regulation. For example, students who were offered a choice of learning through external rewards would be extrinsically motivated in contrast to those who were intrinsically motivated to make choices on their own. Therefore, it was important that the assessment offered students a choice of learning as well as considered extrinsic and intrinsic sources of motivation. The integration of UDL strategies and

internally regulated choice may not only satisfy students' autonomous needs but may also transition students from extrinsically motivated to intrinsically motivated self-directed learners.

Based on the results of the student survey, I was able to identify the need for a solution to potentially increase student motivation. The outcomes helped to inform how the development of a holistic assessment might strengthen student-teacher relationships and increase students' motivation. The survey resulted in the development of a holistic assessment tool.

Development of Intervention (Assessment Tool)

The development of the assessment tool included three steps: 1) designing the assessment tool, 2) developing the assessment tool, and 3) conducting alpha testing on the tool. I first considered the design of the tool by reviewing the outcomes from the literature review, commercialized consultation, and student survey.

Designing the Assessment

Literature Review. The key findings from the literature review suggested consideration of the following elements within the assessment tool.

- Opportunities for active student involvement in their learning (Basham et al., 2016; Gross et al., 2018; Katz, 2021)
- Strength-based approaches which included a balance of strengths and deficits (Brownlee et al., 2012; Climie & Henley, 2016; Lopez & Louis, 2009).
- Student-directed learning which required minimal guidance from educators (Bushweller, 2016; Bushweller, 2017; Davis, 2016; Davis, 2017; Molnar, 2016)
- Strategies based on the principles of universal design for learning (Cast, 2024)
- Student-directed learning plans providing students with choice and voice (Basham et al., 2016; Katz et al., 2021)

Commercialization Consultations. The main theme that was revealed through the commercialization consultations was the importance of strong student-teacher relationships. This could be promoted through the following information teachers receive from the students in the assessment process.

- Recognition of students' strengths, needs, interests, learning preferences and motivational tendencies through informal conversations
- Inclusion of strengths, interests and learning preferences in curriculum
- Direct voice from student on their needs and areas of support
- A holistic profile of students' academic, cognitive and social emotional needs
- An easy format to simultaneously view the profiles of multiple students

Student Survey. A variety of themes unfolded in the student survey with the following primary areas for consideration.

- Opportunities for more choice and voice in student learning
- Recognition through a balance of external and internal motivational sources
- Inclusion of executive functioning skills and learning supports that could strengthen challenging skills
- Teachers increased awareness of students' strengths, needs, skills and learning preferences
- A variety of methods to engage in assessment content including videos, audio, written text, multiple choice, games, puzzles, text to speech, speech to text.

In addition to the above sources, I also needed to consider which academic components would be included. Through my background as an Educational Therapist, I have administered a variety of academic and cognitive based psychological assessments to students in grades K-12. This

provided me with a deep understanding of the type and format of academic and cognitive based content normally included in holistic assessments. I started by reviewing curriculum standards for the Ontario curriculum, recognizing the curriculum varied by province. My goal was to conduct skill-based assessments with more focus on skills achieved within a specific strand of Math or Language Arts, than a focus on grade level alignment. However, grade levels were taken into consideration to ensure students were directed to an appropriate starting grade level. I also reviewed a variety of other related sources prior to designing the individual quizzes within the assessment. The full list of academic and cognitive skills sources I used as a base for the content is listed below.

Affective/ Cognitive Topics

Affective and cognitive topics focused on how individuals learned; their learning skills, learning preferences, motivational tendencies, and executive functioning skills. There were a variety of existing screening tests and surveys related to these areas but the specific ones I referenced to create my assessments were adapted from:

- The Intrinsic Motivation Inventory (IMI)- Ryan & Deci, 1982
- Executive Skills Questionnaire for Students- Dawson & Guare, 2010
- Multiple Intelligences Profiling Questionnaire- Based on Gardner's Multiple Intelligence Theory, adapted by Tirri, Nokelainen & Komulainen, 2013.
- Student Engagement in Schools Questionnaire (SESQ)- Hart, Stewart & Jimerson, 2011

Academic Skills

The academic skills assessed were: reading fluency, written expression, reading comprehension, listening comprehension, oral expression, and math operations. Academic topics were based on core subjects aligned with Math and English/Language Arts curriculum standards.

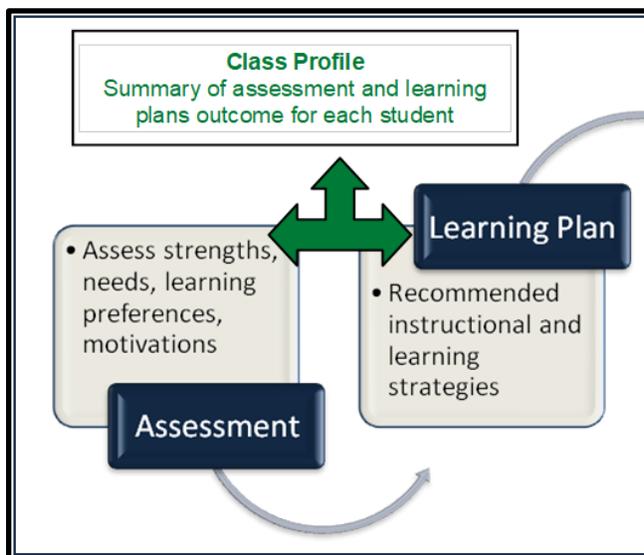
The intent of these assessments was to understand the strong and deficient skills in each subject as opposed to the specific grade level equivalent as curriculum standards varied between provinces. However, to increase validity, multiple sources were used to design each of the specific questions within the academic assessments. These sources included:

- The Kaufman Test of Educational Achievement, 3rd Edition (KTEA-3), Kaufman & Kaufman, 2014
- Wechsler Individual Achievement Test, 4th Edition (WIAT-4), Wechsler, 2014
- Brigance Comprehensive Inventory of Basic Skills II, Brigance, 2010
- Ontario Curriculum Resources, OME, 2020
- Atlantic Canada English Language Arts Curriculum: Grades 7-9, NBDE, 2011
- New Brunswick Curriculum Development (Anglophone sector)- relevant to all Atlantic provinces, NBDE, (2011, 2015, 2023)
- IXL.com assessment and learning platform aligned with Ontario Math and Language Arts Curriculum
- Netmath- Math learning platform aligned to provincial curriculums, Scolab, 2004

Based on all the design considerations, the next step was to finalize the design and develop the assessment tool.

Development of Assessment Tool

The final assessment tool consisted of: 1) a holistic assessment, 2) a learning plan, 3) the recommendation of instructional and learning strategies, and 3) a class profile with the process illustrated in Figure 21.

Figure 21*Illustration of Draft Prototype*

Student-Directed Holistic Assessment. The tool was designed as a holistic assessment to consider students' academic and learning strengths and needs, interests, learning preferences, and motivational tendencies. The academic strengths and needs were determined by the student's performance on the curriculum-based content. The learning strengths and needs, learning preferences, motivational tendencies were based on the student's individual responses to a variety of quizzes, but the final outcomes in each category were determined by specific formulas embedded within the assessment. The assessment included nine short assessments covering six academic and three affective and cognitive areas. The academic areas included, 1) reading fluency, 2) reading comprehension, 3) written expression, 4) oral expression, 5) math operations, and 6) listening comprehension. The cognitive areas included, 1) visual and auditory memory, 2) executive functioning skills, and 3) learning preferences. The total estimated time to complete the assessment was 75-90 minutes depending on the pace of each student. However, each segment was short (5-10 minutes) and could be completed over several sessions depending on the student.

To keep students engaged, the assessment was gamified with a storyline and a variety of videos, puzzles, and other interactive tasks.

Holistic Assessment Process

The design of each mini assessment within the larger holistic assessment was derived from the principles of academic and cognitive diagnostic assessments which considered factors such as the number and order of questions, grade level equivalency and alignment with provincial curriculums (Rathvon, 2004). Table 18 provided an outline of the full assessment demonstrating how each segment was linked to the motivational theoretical and UDL instructional frameworks.

Table 18

Holistic Assessment Outline based on UDL and STD motivational needs

Topics	Task	Purpose
Who are you? (8 minutes)	Starting and ending video	Means of representation
	Interests, academic preferences assessment	Affective (relatedness) needs
How do you read? (7 minutes)	Starting and ending video	Means of representation
	Reading fluency assessment	Academic strength/need
	Calculation Puzzle	Means of engagement
What are your strengths and needs? (12 minutes)	Starting and ending video	Means of representation
	Executive functioning skills assessment	Cognitive (autonomy) needs
	Brain training activity	Means of engagement
	Learning support quiz	Affective (competence) need
How do you	Starting and ending video	Means of representation

remember? (14 minutes)	Auditory and visual assessment	Cognitive (competence) need
	Math operations assessment	Academic strength/need
	Sliding puzzle	Means of engagement
How do you learn best? (10 minutes)	Starting and ending video	Means of representation
	Learning preferences assessment	Cognitive (autonomy) need
	Motivational type assessment	Affective (relatedness) need
	Scavenger hunt puzzle	Means of engagement
How do you listen? (7 minutes)	Starting and ending video	Means of representation
	Listening comprehension assessment	Academic strength/need
	Word scramble puzzle	Means of engagement
How do you express yourself? (8 minutes)	Starting and ending video	Means of representation
	Written expression assessment	Academic strength/need
	Oral expression assessment	Academic strength/need
Learning Plan (7 minutes)	Setting smart goals activity	Intrinsic motivation
	Learning plan	Intrinsic motivation
	Smart shop	Extrinsic motivation

Student and Teacher Reports. After the holistic assessment was completed, a learning plan was generated for each student with a list of recommended UDL strategies to align with each student's learner profile. These strategies could also be used with the entire class or a small group of students. A class profile was then automatically created so each teacher could have a snapshot

of the holistic profile of each student in the class. From the class profile, the teacher was able to access each student's individual learning plans and recommended UDL strategies. The last step in the development of the assessment tool was the testing of the tool before it was implemented in the study. This was referred to as alpha testing.

Alpha Testing of Assessment Tool. Prior to the implementation of the tool in the first cycle of testing, three students were hired (with parental permission) to complete a comprehensive alpha testing of the tool. I completed two individual online zoom sessions with each student as they worked through the assessment and provided immediate detailed feedback of their experiences every step of the way.

Conclusion

The details of the first and second parts of phase one were outlined in Chapter 4. I identified the need for my research through my literature review, theoretical framework, and commercialization consultations. I also conducted a student survey which informed the design and development of my holistic assessment tool. During the alpha testing process, I was able to identify and fix any technical or user experience issues in preparation for the iterative cycles of testing in phase two: design and construction.

Chapter 5- Phase 2: Design and Construction

After the assessment tool was developed in phase one, it was ready for three iterative testing cycles in phase two. Each testing cycle consisted of; 1) implementation of assessment, 2) participant feedback, 3) analysis of feedback, and 4) refinement of assessment based on feedback, as illustrated in Table 19.

Table 19

Phase 2- Design and Construction

		Research Process
Phase 2	Design and Construction (3 testing cycles)	<ul style="list-style-type: none"> ● Implement assessment ● Participant formative feedback (pre and post study survey; teacher interview) ● Analyze feedback ● Refine intervention

Recruitment

Prior to starting the testing cycles, I created a recruitment plan to identify the participant sample and participant criteria for each of the three testing cycles. The assessment process consisted of two components: students' completion of an online holistic assessment and the teacher's review of a class profile and each student's learning plan. Therefore, participants consisted of students and teachers.

Teacher and Student Participant Criteria

I explored the learning experiences of students in grades 5-10 and their respective teachers. This grade range was selected as social and emotional skills during the transitional years between elementary and middle school, and middle and high school impact students' academic performance in varying ways so more educational support may be required (Jones & Kahn, 2017; Steinberg, 2017). The purpose of my study was to identify and remove systemic barriers for all students to

receive the educational support they needed to be successful learners. Therefore, I attempted to recruit a diverse sample of students with varying educational needs within each test cycle. The diversity included students from a variety of socio-economic backgrounds, especially those who may not have the financial means to obtain support outside the public school system. My study also included students with and without learning challenges since some students may have invisible learning differences which were not easily recognized or supported. The term ‘students with learning challenges’ referred to students who indicated they had a formal education plan or reported that learning was difficult. The term ‘students without learning challenges’ referred to students who reported that learning was easy or was not difficult.

Sampling of Participants

Since my objective was to learn from a very specific population of students with diverse needs, I wanted to ensure my sample reflected this population. Therefore, I used purposeful sampling to recruit my participants because “Purposeful sampling is based on the assumption that researchers want to understand and gain insight so they must select a sample from which the most can be learned” (Merriam & Tisdell, p.96). My initial objective was to obtain a sample of at least 30 students and their respective teachers to ensure a normal distribution of the target population based on the central limit theorem (Ghasemi & Zahediasl, 2012) while still obtaining rich meaningful data which could reach saturation for the qualitative data (Merriam & Tisdell, 2016). Saturation was a common term in design-based research to determine the number of iterative cycles required before no further information was needed to complement the new innovation (Štemberger & Cencič, 2016). Although there was limited research specifying a minimum number of participants required for qualitative studies, it was generally agreed that less participants were required when the purpose of a study was narrow, interview discussion was rich and the study was supported by a theory expediting

saturation of the data (Malterud et al., 2016). The number of students and teachers who were invited and participated in study varied within each of the three testing cycles as illustrated in Table 20.

Table 20 provided a summary of the recruitment process for each cycle, but more details have been included in the chapters of the relevant cycles. After participants were recruited, data was collected and analyzed from both teachers and students.

Table 20

Summary of Recruitment Steps and Participants

1st Testing Cycle	2nd Testing Cycle	3rd Testing Cycle
	New Brunswick Teachers conference Inclusive Action Network conference	
3 school boards 1 private school	3 school boards 1 community organization	3 community organizations
Invited 10 teachers from previous consultations in phase 1 who expressed interest via principals Teachers invited students via invitation letter to parents	Invited 18 teachers via school principals or educational organization Teachers invited students via invitation letter to parents	Invited 32 students via community or educational organization via parent invitation letter
5 teachers participated 17 students participants completed assessment Learning challenges; $n= 14$ Without learning challenges; $n= 3$	7 teachers participated 53 student participants started, 50 finished assessment Learning challenges; $n= 21$ Without learning challenges; $n= 29$	35 student participants started, 32 finished Learning challenges; $n= 7$ Without learning challenges; $n= 25$

Data Collection and Analysis

I collected both quantitative and qualitative data using a variety of instruments, so I described the data analysis method for each separately starting with the quantitative then the qualitative data.

Student Data Collection. Students completed a post-study survey in the first testing cycle and a pre- and post-study survey in the second and third cycles. According to Creswell (2008), when the number of participants was limited and there was a lot of diversity within a group; quasi-experiments could be used to measure variables separately for one or more single subjects. Since my research centered on the impact of an intervention on diverse learners who were not in the same classroom (or group); a quasi-experiment was used to obtain pre-study and post-study scores before and after the student's completion of the assessment (intervention).

Quantitative Data Analysis. The data from the student surveys were analyzed with *SPSS* software. Independent tests were used in the first two cycles to compare dependent variables within two groups of students; students with learning challenges and students without learning challenges. The third cycle included within-group testing among three grade ranges; junior elementary (grade 5 and 6), senior elementary (grade 7 and 8), and high school (grade 9 and 10). Finally, paired t-tests were conducted to compare dependent variables before and after the students completed the intervention (assessment).

Teachers Data Collection. My study also included the teacher's review of the student's assessment, learning plan, and class profile. Therefore, teachers participated in an online interview to share their perspectives on the effectiveness of the assessment resources.

Qualitative Data. After the interviews were recorded and transcribed through zoom, I used manual coding to analyze the data into descriptive codes and themes and to consider further

refinements to the assessment. After the data was analyzed, further refinements were completed on the assessment before it was subsequently implemented in each testing cycle. I have outlined the recruitment, methods, and findings for each testing cycle in the subsequent three chapters.

Conclusion

Phase three of the Design Based Research process (Design and Construction) was introduced in chapter 5. The iterative testing cycles were conducted in the design and construction phase. This chapter set the foundation for the testing cycles with a recruitment strategy and the general data collection and data analysis processes. The next three chapters (chapter, 6, 7, 8) included outcomes of each of the three testing cycles.

Chapter 6 - First Testing Cycle

I had two objectives for the first testing cycle; 1) to test the functionality of the assessment tool, 2) to explore the impact of student motivation and teachers' perceptions of the effectiveness of the tool in supporting motivation as illustrated in Table 21. The process for each testing cycle started with recruitment of participants and implementation of the assessment. Feedback was then gathered from the participants and analyzed to inform the next cycle of testing. Prior to starting the first testing cycle, I recruited the teacher and student participants.

Table 21

Phase 3- Testing Functionality of Assessment

		Research Process
Phase 3	Design and Construction 1st Testing Cycle	<p>Objective of first iterative testing cycle</p> <ul style="list-style-type: none"> ● Testing Functionality of Assessment with a small targeted sample; ($n=17$ students; $n=5$ teachers) ● Testing impact of student motivation and teachers' perception of the effectiveness of the assessment <p>Process</p> <ul style="list-style-type: none"> ● Implement assessment ● Participant formative feedback (pre and post study survey; teacher interview) ● Analyze feedback ● Refine intervention

Recruitment

Teacher Participant Recruitment. I emailed an invitation (Appendix L) to all participants from my Mitacs funded project who agreed to be contacted about future research studies. These individuals were asked if they would like to be considered as a participant for the DBR research. I next sought approval through each teacher's school board for the teacher's participation in the study. After ethics approval (Appendix B) was received from each teacher's school boards, an email invitation (Appendix L) and information letter (Appendix M) about the

study was also sent to each teacher's principal to obtain their permission for the teacher to participate in the study. Then consent forms (appendix N) were signed by the teachers. Five teachers ($n=5$) in grades 6-9 participated in the study. The teacher criteria and tasks have been outlined in the teacher information letter (Appendix M).

Student Participant Recruitment. Teachers invited the students in their class via parents by emailing parents an invitation (Appendix O). Each teacher had the opportunity to invite up to 5 students from their classroom for the first testing cycle. An information letter (Appendix P), consent form (Appendix Q) and assent form (Appendix R) were reviewed and signed by students/parents/guardians of students who participated in the study. The assessment was completed by 17 students ($n=17$) in grades 6-9; grade 6 ($n=2$), grade 7 ($n=2$), grade 8 ($n=7$), grade 9 ($n=6$). In relation to learning challenges, 81.2% ($n=14$) of students reported they had an Individual Education Plan (IEP) or received special education support. The student criteria and tasks have been outlined in the teacher information letters (Appendix M). Following recruitment, data was collected from the students and teachers.

Data Collection

The data collection for the first testing cycle included: 1) a post-study survey after completion of the assessment (Appendix S) and 2) a teacher interview to share views on the effectiveness of the assessment resources (Appendix T). Pseudonyms were used to ensure confidentiality of data collected. In addition, students had the option to use Avatar or first names only when completing the assessment. Students completed the assessment over a two-week period within 2-3 sittings ($n=10$) and 4-6 sittings ($n=7$). The average time to complete the entire assessment was 90 minutes. After the assessment was completed, a learning plan with recommended learning strategies was generated for each student. The results of the students'

learning plans were shared with their teachers. Teachers then participated in an interview to provide feedback on their review of the learning plans, UDL strategies, and class profile. My analysis of the findings started with the post-study student survey.

Findings

Post-Study Student Survey

The survey questions were categorized into four areas: quality of content, quality of learning plan, achievement and rewards, and overall experience. Based on the feedback from students and teachers, refinements were made to the tool to enable its use in a larger sample of all students within each classroom.

Quality of the Content. The first set of questions in the quality of content section focused on the difficulty and clarity of the assessments and the videos which guided the experience.

Difficulty of Assessment Questions. The difficulty of the questions was related to perceived competence, one of the psychological needs in the self-determination theory. Students' perceived competence was measured by how difficult or easy students perceived a task might be compared to how students actually performed a task. Therefore, the first two questions about the difficulty of the questions and clarity of the content were based on a four-point likert scale of, "very easy, somewhat easy, a little difficult, very difficult. The third question was about the student's experience with the videos, and it was also based on a four-point likert scale, with the options of "very helpful, somewhat helpful, a little helpful or not helpful at all". The questions were:

- *How easy or difficult were the questions to complete?*
- *How easy or difficult was it to understand the rest of the material in the experience?*

- *How helpful were the videos in guiding the experience?*

How easy or difficult were the questions to complete?

Only one general question was asked about the difficulty of all assessments instead of a question for each subject. Fifty-eight percent of the students reported the questions on the assessment were “very easy or somewhat easy” while 42% reported questions were “a little difficult or very difficult” to complete. In relation to the actual outcome of the assessments, challenges were identified in:

- Math for 50% of students
- Reading comprehension for 59% of students
- Listening comprehension for 50% of students

In the math and listening comprehension questions, students were initially directed to questions at their current grade level and then redirected to questions at a lower grade level when unsuccessful after a specified number of attempts. This redirection continued to lower levels until students were able to successfully respond to questions at a specific grade level. In the Math assessment, all, except three students were directed to more than one level below their current grade level with some being redirected downwards as many as five grade levels. In the reading comprehension questions, students were initially asked how difficult or easy “understanding reading” was before they were directed to a starting grade level based on their response. For example, if a student in grade 7 reported that reading was very difficult, they would have been initially directed to grade 5 or if the student reported reading was very easy, they would be directed to a reading level at grade 9.

How easy or difficult was it to understand the rest of the material in the experience?

The content of the assessment was developed at the grade five reading level. Eighty-eight percent

of students reported that it was “somewhat easy or very easy” to understand the material in the assessment.

How helpful were the videos in guiding the experience?

Videos were embedded throughout the assessment to keep students engaged and guided the flow of the experience, however only 59% of students indicated the videos were “very helpful or somewhat helpful” in guiding the experience compared to 41% who indicated they were “a little helpful or not helpful at all”.

Quality of Learning Plan Questions. After the assessment was completed, a learning plan was generated with a summarized outcome of the student responses. This information included the students’ interests and talents, assessment preferences, academic challenges, learning skills strength and challenges, motivational types, effective learning supports and goals. It also included a list of UDL strategies aligned with each student’s profile, but these strategies could also be used with the entire class. The questions related to the learning plan determined the student’s perception of the accuracy and effectiveness of the plan:

- *How well did the information in the learning plan match who you are?*
- *How many of the strategies in the learning plan could support you in your learning?*

How well did the information in the learning plan match who you are?

Seventy-six percent of the students reported that the information on the learning plan was “extremely or very well matched” with the individual profile of the student. However, two students stated that their learning plans did not provide them with any learning skill strengths and only challenges.

How many of the strategies in the learning plan could support you in your learning?

In this testing cycle, each student was provided with 10 UDL strategies aligned with their profile and the students were required to select as many of these strategies as they wished that they perceived could support their learning. Twenty-nine percent of students indicated that 1-3 strategies may be helpful, and 59% of students indicated that 4 or more strategies may be helpful in supporting their learning.

Achievement and Rewards Questions. I attempted to engage students in the assessment with a gamified experience of completing puzzles and earning coins and gems for completing specific portions of the assessment. Upon completion of the entire assessment, the students then had the opportunity to select from a variety of tangible rewards with the coins and gems they earned. To determine the impact of these puzzles, coins and gems, and rewards on students' extrinsic motivation, I included four explicit questions in a post-study survey. The first three questions were based on a four-point likert scale with responses, "enjoyed it a lot, somewhat enjoyed it, enjoyed it a little, did not enjoy it at all".

How much or little did you enjoy the gamified puzzles in this experience?

The puzzles were designed to increase engagement while providing a break for the students in between completing the more intensive assessment questions. Eighty-eight percent of the students stated they "enjoyed a lot or somewhat enjoyed" the gamified puzzles.

How much or little did you enjoy receiving coins and gems to guide your experience?

The students were also incentivized with extrinsic rewards (coins and gems) for completing the assessments and puzzles. Seventy-seven percent of students stated they "enjoyed a lot or somewhat enjoyed" this experience.

How much or little did you enjoy shopping for incentives in the Smart Shop?

The students were able to purchase awards at a virtual shop (called the Smart Shop) with the coins

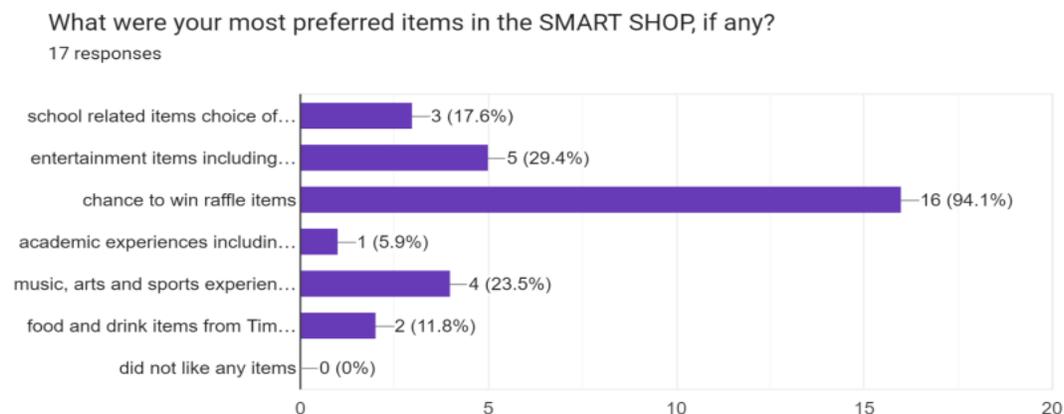
they earned. Eighty-two percent of students also reported they enjoyed shopping for incentives at the virtual Smart Shop.

What were your most preferred items in the Smart Shop?

The types of rewards that were important to students could also provide an indication of the way students were motivated. Students were provided with a chance to win one of three larger prizes in the virtual shop Smart Shop. There were also a variety of other rewards in the Smart Shop including music, art, or sports experiences; items to make learning easier in the class; entertainment gift cards, and other experiences as illustrated in Figure 22. Most students (94.1%) indicated they preferred a chance to win big physical items with a smaller percentage of students (23.5%) selecting a preference of music, art or sports experiences, and items to make learning easier in the classroom (17.6%).

Figure 22

Preferred Items in Smart Shop



In addition to these specific questions related to external rewards, students were asked two open-ended questions at the end of the assessment to gain more insight into both their extrinsic and intrinsic motivation.

- *What did you enjoy best about your experience?*
- *How could your experience have been improved?*

Some of the responses from these questions indicated that students were triggered by a balance of extrinsic and intrinsic motivation throughout their experience. The comments in Table 22 illustrated this connection.

Table 22

Sample of Some Motivation Question Responses

What did you enjoy best about your experience?	Motivation
I enjoyed how I got to know myself a little bit more.	Intrinsic
The smart shop	Extrinsic
Having a chance to win Nintendo Switch and the puzzle and problems	Extrinsic
Getting to know me better	Intrinsic
I enjoyed most of the activities and the speak exercises	Intrinsic
Learning more about myself and what helps me learn	Intrinsic
Learning about myself	Intrinsic
The puzzles in the games and learning about myself!!!	Intrinsic
Games and quests	Extrinsic
Learning about me	Intrinsic

How could your experience have been improved?	Motivation
If there were more gamified puzzles, my experience could have been improved, but otherwise I really enjoyed it!	Intrinsic/ extrinsic
Built in games	Extrinsic
More games/questions less videos	Extrinsic
Maybe add some questions about common interests. I know that would take a while but that would be cool.	Intrinsic

Teacher Interviews

After the assessments were completed, students and their teachers received access to the students' learning plans and UDL strategies. The teachers also received access to a class profile which was a one-page snapshot of strengths, needs, interests, and learning preferences for each student in the class who completed the assessment. Each teacher participated in a 60-minute online interview to share their feedback of the resources they received. The teachers shared strengths and areas of improvement of the resources.

Teachers' Perspectives of the Resources.

Strengths. Teachers reported that the layout was easy to follow, the quality of content was meaningful, and the resources could help them support the diverse needs of students. Some of the comments expressed were:

It's nice to see it in a box. I like the chart form and having a quick overview straight away, which is nice. Information like main interests, main challenges, or other information about who they are. Anything like that always helps. I looked at a few of them, yes. It was easy to click and look at. - Teacher #1

I was pleased with how detailed it was. And it was very user friendly, easy to read, especially that recap at the beginning. Teacher #4

Right away I really liked how it was broken down like who am I, academic preferences and then it goes to what are my areas for growth. I was super impressed by this and how it was organized. - Teacher #4

I really liked it. I was very impressed right away. I liked how everything was laid out all in one profile like this. Easy to read, easy to look at right off the bat. - Teacher #5

They [students] didn't ask any questions, or they didn't struggle with the technology, as

far as I know. -Teacher #5

I thought it was great. For example, in the “Learning Strengths” section, I could quickly see things like flexibility, goal-directed behavior, and metacognition. It was easy to get a good sense of the student. - Teacher #3

It's so detailed, from beginning to end. I can't even think of what I would add to the plan to make it better to be honest, Very detailed- Teacher #4

Areas of Opportunity. There were a few technical areas of improvement noted by the teachers; some which could have been resolved more easily than others. Most of the technical issues were resolved for the second testing cycle, but some of the feedback required major technology adjustments that will be considered for a future version. Some of the teachers’ comments included:

One day the passwords weren't working, or little random glitches. Which is just what happens when you're developing something. It's not like it was a big deal, because it wasn't, but that kind of thing does affect their experience - Teacher #2

That's why I asked for a printout. If I have a hard copy, I can slip it into a sheet protector and keep it in the front of their binder. That way we can reference it together and use it during a conference after everything's done. - Teacher #3

I'm wondering, is it able to be read to them? For example, a student struggles reading, is it kind of read out loud? - Teacher #5

When asked about the clickable orange buttons, teacher #3 said, “I didn’t realize those were clickable, actually”. Teacher #2 also offered feedback on the difficulty of the questions;

I think the only thing they said was that some of the questions were too simple. Which I think is just the reality of a tool that's designed for a range of students. Not the math,

maybe some of the reading comprehension ones. Or the ones where a story was read to them, and they had to answer questions. It was just that some of them gave the students the impression that the questions were meant for little kids.

Teachers' Perception on Effectiveness. The teachers were asked about their initial reactions and perceptions of the three resources they received upon their student's completion of the assessment; learning plan, class profile, and learning strategies. The teachers provided helpful feedback in the first testing cycle for me to consider further refinements in the assessment for the second testing cycle. The teachers' comments centered on; 1) Building student relationships, 2) Impact of student motivation and autonomy, 3) Effectiveness of learning plan and strategies, 4) Saving time for teachers.

Building Student Relationships. The initial reactions from the teachers upon reviewing the learning plans and class profiles were that both resources could help teachers build stronger student relationships by getting to know students more holistically. Most teachers indicated that the information on the learning plans and class profiles generated meaningful content that might help them better support the students. Teacher 1 reported:

It gives you a better understanding of the student. It's kind of like a trading card, like what you'd have for an athlete. It's nice to know what they prefer to do and just a little more about them. It definitely helps. Teacher #1 also added; It provides meaningful conversation starters and helps build a better understanding of their instructional preferences. But with some kids, it's easier, you can figure them out pretty quickly and build a connection. Others don't say much at all, and it can take a lot longer to understand them, if you ever do.

Teacher 5 also agreed that the information would help build rapport with the students;

If a teacher mentioned something that they talked about in their assessment, you know, if they made their teaching specific to them or said, “Oh, hey, I hear you like badminton.”, like that, like that sort of thing is really good for kids to build rapport.

Some teachers reported they learned more about their students with the assessment information.

Teacher 5 reported, *“they don't say a lot, so we don't know them very well. And that's a way to know a little bit about them. Because I didn't know student I went badminton”*. Teacher 3 continued to express, *“It's so helpful to understand how a student learns, beyond just their grades”*. In response to their perception of the class profile, teacher 3 expressed;

Honestly, I loved how quickly I could get a snapshot of the student: their interests, talents, learning strengths, academic challenges. In just a minute, I could get a holistic picture of the child. At the beginning of the school year, something like that would be extremely useful, especially to help me connect the dots between who the student is and how best to support them.

In addition to the existing information on the assessments, teacher #3 also indicated it might have been helpful to also get information about the student's home life;

I think it would be useful to include a little bit about their home situation. Like, who do they live with? Do they have two homes? That kind of context can really help. I understand it can be personal, but even just some basic insight, without asking for too much detail, would go a long way.

Impact of Student Motivation and Autonomy. Teachers next provided feedback about the impact of student motivation. The teachers made several references to the motivational content on the learning plan, and the types of motivation that were reported. When teacher 2 realized that one student was motivated through guilt, the teacher expressed how they might be able to support

the student. “It’s definitely something to work on with the student, helping them understand why they want to do well, rather than just being hard on themselves.” Teacher 4 commented on how the motivational section may help the student understand themselves better.

I like how it's broken down into simple definitions for the student to understand themselves as well. Yeah. And they're just not reading sort of like jargon or anything that's going to tune out or not really fully understand it. I feel like it's very engaging for them. It's really accessible for them and for us, and then it also gives us language to like, talk about it with them as well.

Motivation was also related to the importance of actively involving students and providing students with voice and choice. Teacher 5 said, “I think it'd be great for them to have their own goal to work on. Kind of self-motivated”. Teacher 4 continued to express, “I think they would be motivated and felt seen by doing this and learning this about themselves, and therefore I think more engaged”. In relation to student voice, several teachers also made the link between motivation and student voice. Teacher 3 reported that, “Anytime students get the opportunity to express their voice, it’s very meaningful to them. Teacher 4 recognized the importance of enabling students to select their own strategies, “They're [students] the ones who are actually saying, I would like to have a five-minute break. So, it's giving them a voice to ask for their recommendations”. Teacher 5 expressed that if teachers provided the students with choice of their strategies, the students may be more engaged in learning.

I think that if they noticed that you were implementing these things they would feel more engaged in class and more willing to participate. I think that if students know that, “Oh, they're listening to how I like to learn”, even if it's not every day, because not everyone

learns that way. But if they feel like the teachers are trying to match their learning styles, then they'll be a little bit more invested in the class.

There were a couple of audio files embedded in the learning plan and teacher 1 commented on how beneficial it would be to hear students' voice; *"I love audios, they go a long way- this will probably resonate with teachers even more because they're hearing it straight from the source"*.

The final section that teachers commented on in relation to motivation was about the extrinsic rewards. Teacher 5 reported that their students were motivated by these rewards; *"I know these boys were very interested in finishing and getting coins because they loved all those prizes"*. Yet, *teacher 4 was more receptive to intrinsic type rewards;*

I guess we have some version of that in our senior classroom where they [students] asked, Can I listen to music while I work on this assignment? And I say yes. Or can I work for 15 minutes and then go take a five-minute break.

Effectiveness of Learning Plan and Strategies. The teachers next commented on the effectiveness of the learning plan and strategies. Teacher 2 and 4 reflected on how well the learning plan aligned with their students' profiles.

What the test showed definitely lined up with what we've noticed about them. I found it interesting that, based on how they answered the questions, they clearly responded honestly, because the results really reflected what we already knew about [student 1].-

Teacher 2

I can tell just like this, this is [student 2] right? Yes. This is exactly like him. But if I had to ask him in person and like I know this student and this is so accurate to him and his goal. So, I think that shows how well the tool has worked for me to know this student. -

Teacher 4

The recommended strategies were also perceived as practical both for the individual student and the whole class. Teacher 2 noted, *“I think that'd be very helpful for a whole class thing for sure. I feel like the class profile would help develop more UDL strategies”*. Teacher 2 continued to say, *“I think it gave me more ideas because I'm still learning as well, you know”*? Teacher 1 reported it might also be helpful to know how to implement the strategies- *“Sometimes, it's hard to know how to use the learning preferences, especially when students list several.”* Teacher 3 agreed on the importance of implementation;

I think it's great. A lot of teachers just don't know how to implement UDL in their classrooms or even understand how it works. So, if you give them a step-by-step model to follow, they're learning while using it.

Saving Time for Teachers. The final area of feedback focused on the time saving benefit of the tool. Most of the teachers shared how the assessment could save them time, especially at the start of the year, in getting to know their students. Teacher 1 reported;

I think it could definitely help, or even replace some of the things I already try to do on my own. I don't have anything quite like this, but I do try to get to know my students as much as I can. Tools like this would be helpful, especially compared to the standard surveys we use, which don't always give you much. Some students just don't share a lot or don't want to complete them at all. So having a profile like this would really help.

Teacher 3 continued with more specifics about the amount of time saving;

More than a time saver, it gives a quick synopsis of what each student believes they're bringing to the classroom and to their learning year. Normally it can take six to eight weeks to get that insight—and that's with daily activities and interactions. But getting a

summary early on might reduce frustration and help you support students sooner. So, in that sense, yes, it could save time.

Teacher 4 shared similar views about the time savings;

It's a faster way to get to know the student on a personal level, something that might take like a couple months into the year, you can get a head start on getting to know the student on a personal level within like even before the year starts and you can connect. It would save lots of time for teachers finding out this information, but through lessons and activities and all the subtle ways of us trying to get to know our students.

And finally, teacher 5 discussed the time saving factor for transitioning students;

I think it would save a lot of time, but I'm also thinking about how beneficial it would be for the kids transitioning in. I mean, we're a pretty small school, so once they've been here for a year, we know them fairly well. But when they're first coming, we hardly know anything about them other than what their previous teacher tells us about them. (grade 6-12 school).

In addition to exploring student motivation and teachers' perceptions on the effectiveness of the tool in supporting motivation, I also needed to obtain feedback about the functionality of the assessment tool.

Functionality Feedback- 1st Testing Cycle

Three issues were identified in relation to the technical functionality of the assessment: 1) video uploads, 2) passwords, and 3) enhancements to the visual layout of the learning plan and class profile.

Video Uploads. The students reported mixed views of the videos with about half of them indicating they were somewhat or very helpful in guiding the experience and the remaining

reported they were a little or not helpful at all. Some of the responses were related to technical issues as one participant commented that the videos were sometimes glitchy. The videos were initially uploaded as MP4 files which slowed down the upload time, so I switched the videos to a video streaming platform to increase upload speed and minimize earlier technical issues (vimeo, n.d).

Passwords. Teacher #2 reported a few technical issues encountered by the students with passwords in the login process. However, once this issue was reported to me, I was able to immediately address it. Assuming there might be ongoing technical issues throughout the development of the tool, I encouraged teachers to continue reporting them to me right away to ensure a positive user experience.

Enhancements to Visual Layout of Learning Plan and Class Profile. The teachers made a few suggestions to further enhance the visual layout of the learning plan and class profile. This included clearer instructions on accessing clickable parts of the learning plan and having the option of a downloadable pdf of the learning plan and class profile. Minor editing changes were made to the learning plan to identify the clickable section. The next section summarized the refinements that were completed prior to the second cycle or would be considered for a future cycle.

Details of the refinements completed based on the functionality feedback are attached as Appendix U.

First Testing Cycle Discussion

The first testing cycle focused on obtaining the initial student and teacher perspectives of the assessment tool. It was conducted with selected students within each classroom to identify further refinements before testing with a full class of students. Six themes were revealed in the

first testing cycle: 1) potential impact on perceived competence, 2) validity of assessment outcomes, 3) Impact of student voice and choice on autonomy 4) teachers benefits of saving time 5) building holistic student relationships, and 6) transitioning from extrinsic to intrinsic motivation. I started by reviewing how the assessment might have been impacting perceived competence.

Potential Impact of Perceived Competence

To gauge the students' experience in completion of the assessment, it was important for me to understand the level of difficulty from the students' perspectives. The assessment included only one general question related to the difficulty of assessment; *How easy or difficult were the questions to complete?* This question was related to the students' perception of all questions as a group rather than their perception of difficulty for each subject. Therefore, it was unclear which specific subjects the students found easier or more difficult. Despite this limitation, the outcome of responses closely aligned the students' actual performance in each subject area. Forty-two percent of students reported that overall the questions were, "a little or a lot of difficult" which were not far off from the percentage of students who faced challenges in Math (50%), Reading Comprehension (59%), and Listening Comprehension (50%). Given that 81.2% of the students in the first testing cycle required special education support, these assessment outcomes were not surprising. These results may have impacted students' competence, especially those who regularly experienced academic difficulties. Rhew et al. (2018) found that due to repeated academic failures, students with special education support may have low self-efficacy affecting their perceived competence. Therefore, it was also important to understand the students' perceived competence in each individual subject rather than their overall competence to know which areas may require more support. In addition to subject level support, the assessment also

considered starting grade levels.

In the first testing cycle, students were provided with questions at their grade level and redirected downwards to the prior level after a specific number of unsuccessful attempts. Depending on the frequency of redirection, this redirection might have negatively impacted students' perceived competence. Both Dewey and Rogers proposed that teaching should begin at a student's readiness level (Feinberg, 2014; Whitely & Cohen, 1972). Whitely and Cohen's (1972) interview with Rogers illustrated an example of the potential increased competence of a student when the student had the opportunity to start at a level of success. It was also important to consider the ability level of students who were working above their current grade level as teacher 2 reported that some students indicated the content was too easy. Based on these findings, I planned a full review of the content to ensure appropriate grade alignment. I also revised the flow in some of the assessments so students could experience initial success before facing more challenging questions. Instead of starting students at their grade levels, I decided to start with questions at a few levels below each student's current grade level (to provide greater chances of success), and then introduce questions at higher levels until the questions became too difficult to continue.

Although students experienced some challenges in responding to questions at their current grade level, most students (88.2%) reported that the content was clear and "easy or very easy" to understand. Therefore, minor refinements were required to the content of the material. However, it was also important to acknowledge that the content was written at a grade 5 proficiency level; which could negatively impact students with reading challenges below the grade 5 level. Since the assessment was designed to be accessible for students of all ability levels, it will be important to embed text to speech functionality in the next version of the

assessment. The implementation of this enhanced technology will depend on future funding opportunities which could include an exploration of organizations and foundations similar to those mentioned by Regan and Steeve (2019) that have developed educational technologies to support students from marginalized populations. In the meantime, the assessment could still be used by students of all ability levels with supplemental guidance from teachers, tutors, parents or anyone who supports the student's education. The third theme is related to the validity of the assessment outcomes.

Validity of Assessment Outcomes

The assessment outcomes were reported on the learning plan based on formulas designed to encapsulate the results of each academic or cognitive assessment. The algorithms were derived from multiple reference sources and my personal experiences with diagnostic assessments and specialized math and literacy programs (Brigance, 2010; Dawson & Guare, 2010; Kaufman & Kaufman, 2014; NBDE, 2023; OME, 2020, Ryan & Deci, 1982; Tirri et al., 2013; Wechsler, 2014). However, the algorithms can only be validated over time with repeated usage and ongoing feedback, analysis, and refinement of the tool. The initial feedback from the survey questions and teacher interviews provided a baseline for the validation of the learning plan and learning strategies outcomes.

Learning Plans. In the first testing cycle, 76% of students reported the learning plan matched their profile, and some teachers also expressed a close alignment between the learning plans and the students' profiles. This initial feedback provided a satisfactory baseline algorithm; however, more long-term testing and refinement will be required to increase validation. One identified issue was the imbalance of students' learning strengths and challenges. For some students, the learning plan showed only learning skills deficits without any strength-based learning

skills which may have negatively affected their motivation. Van Yperen's (2015) study of first year university students found that students who worked on their strengths reported higher levels of intrinsic motivation, competence, and effort intentions than those who focused on their deficits. Since learning skills in my study were based on executive functioning skills of how people learn, these skills might have been reported more frequently as deficits by students with learning challenges. However, other learning skills utilized by school boards might have portrayed strengths, such as teamwork, leadership or communication skills (OME, 2010; New Brunswick Dept of Education, 2023). Therefore, these additional learning skills were added to the assessment for the second cycle of testing. The learning plan also generated learning strategies to help students strengthen their academic and cognitive skills.

Learning Strategies. Students were provided with a list of 10 strategies, and students were directed to select all strategies they perceived would be effective for them. For the purpose of this study, effectiveness was measured by the number of students who selected four or more strategies that might work for them. Since only 59% of students perceived that four or more strategies might be effective for them, further analysis of the algorithm was required to determine the effectiveness of the recommended strategies. To gain a deeper analysis, I increased the list of recommended strategies on the learning plan for the second testing cycle. The intention was to determine if the type of strategies or the order of strategies could be impacting the student's selection of strategies, especially if more strategies were selected between the range of 10 - 20 strategies. Teachers expressed multiple views on the recommended strategies. Some teachers indicated the strategies might provide them with more instructional options both for the individual learners as well as the entire class. The teachers' views mirrored the findings from Lowrey's et al. (2017) study of general education teachers. One teacher in the study found the use of UDL strategies addressed

barriers of learner variability and benefited students of all ability levels in the classroom through active student involvement. Student involvement was further expanded in the next theme related to the impact of students' voice and choice in their learning.

Impact of Students' Voice and Choice in Learning

Student voice and choice aligned with the need for autonomy and providing students with the opportunity to be actively involved in their learning. Most teachers commented on the ways the assessment encouraged choice including the opportunities for students to set goals and select strategies relevant to the student. An alternate assessment which also provided student choice was the Strength Assessment Inventory (S.A.I) questionnaire. A key component of the S.A.I was enabling students to learn about their strengths and challenges, customize their learning activities and create their own goals (Alamri et al., 2020; Lee et al., 2015). Hiemstra and Van Yperen's (2015) study on first year university students also found the students were more intrinsically motivated when permitted to establish their own developmental activities which maximized their strengths and improved their deficits. In addition to the benefits for students, teachers also expressed the time saving benefits the assessment reports could provide.

Teachers Benefits of Saving Time

The teachers provided several examples of how the assessment reports could save them time in efficiently identifying and effectively supporting the diverse needs of students in their classrooms. They appreciated the amount of meaningful information they would be able to gather in such a short time, especially if the assessment were completed near the beginning of the school year. The tool was also viewed as a potential replacement for cumbersome time-consuming processes teachers were required to complete with limited resources. For example, student profiles and class profiles introduced by the Ontario Ministry of Education (OME, 2013) were meant to

provide teachers with similar information included in the learning plans and class profiles in my study. However, teachers were not provided with any online resources to gather this information, so the process was either not utilized or labour intensive for teachers who attempted to create their own versions of the tools (Montgomery, 2022).

One teacher commented on the potential benefits of collecting key information efficiently in transitional years when students were new to the school. Ironically, this teacher was also an Educational Support Teacher from New Brunswick, a province known for their proactive initiatives in inclusive education. The mandate of the Educational Support Teacher was to work collaboratively with the general education teacher in the classroom to support the needs of all students, not only those with learning challenges (Aucoin et al., 2020). Therefore, the teachers in my study indicated that the ability to share online learning plans and class profiles with other teachers would provide an additional time saving benefit. Another benefit expressed by teachers was the ability to build stronger student-teacher relationships.

Building Strong Student-Teacher Relationships

When teachers were asked about their initial reactions to the learning plans and class profiles, most of the responses focused on the benefits of building strong student relationships. Teachers appreciated the user-friendly layout of the learning plan and class profile. They indicated that both resources were easy to read and provided an appropriate amount of detail to help them get to know their students better. They especially liked the strength-based content and metacognition areas related to goal setting.

The teachers perceived the type of content in the tool was more personal than the type of information they currently gathered. As a result, the teachers indicated they might be able to have rich, meaningful conversations with the students and understand how best to support them. These

perspectives aligned with a student-centered approach which assumed teachers might be able to provide effective instruction if they first understood each student's strengths, needs, interests and learning preferences (Rhew et al., 2018; Ryan & Deci, 2020; Streb et al. 2015). An example was found in Klassen et al. (2012) study which reported that when teachers were satisfied with relatedness with their students, the teachers were also more engaged in their teaching. The final theme revealed in the first testing cycle was the students and teachers' perspectives about motivation through external and internal sources.

Transitioning from Extrinsic to Intrinsic Motivation

Although my research was derived from motivational theories focused on intrinsic motivation, the outcome of the students' responses indicated that external motivation sources such as tangible rewards were important indicators of their experience. In response to the questions related to extrinsic motivation sources, a large number of students "enjoyed a lot or somewhat enjoyed" completing the gamified activities (88%), earning coins and gems (77%), and receiving external rewards for their efforts (82%). However, tangible rewards were not the only factor of extrinsic motivation. Ryan and Deci (2020) proposed extrinsic motivation falls on a continuum of four types of regulation; external, introjected, identified, and integrated forms of regulation. Teachers shared mixed views on providing students with external rewards. One teacher indicated the students were motivated to complete the assessment with the knowledge of potential rewards, yet another teacher favored intrinsic rewards where possible. These perspectives mirrored research on the benefits and challenges of external motivators. The cognitive evaluation theory posited that external rewards could lead students to participate in activities due to persuasion or guilt (Ryan & Deci, 1985). Whereas some research suggested that external rewards could benefit some students; especially those without any or limited motivation (Serin, 2018). Therefore, it was important to

further explore the students' level of enjoyment in completing the assessment if some of the external sources were not offered. An additional question was included in the second testing cycle to address this issue.

Despite the student's preference of extrinsic sources, intrinsic motivation also seemed important based on the students' responses to the free format question at the end of the assessment, "*what did you enjoy best about this experience*"? Although some students reported they really enjoyed the rewards and gamified activities, more students stated that learning about themselves was the best part of their experience in completing the assessment. This initial pronouncement of students' metacognitive skills aligned with the first phase of Zimmerman's (2002) self-regulated learning theory; forethought. Zimmerman proposed that prior to becoming self-regulated learners, students' self-motivation should be explored by considering students' perceived self-efficacy and learning goal orientation. This required the development of students' metacognitive skills so students could understand how they learned and have the intrinsic motivation to learn.

Although some of the extrinsic sources in this first testing cycle may have initially triggered students' extrinsic motivation to complete the assessment, the expense of these rewards would not be financially sustainable with the final tool. Therefore, a reward system with a balance of monetary and non-monetary rewards would be more realistic. This first testing cycle provided some meaningful insights to inform my subsequent testing cycles.

Conclusion

My objectives for the first cycle were to test the initial functionality of the assessment and start responding to my research questions; which explored the impact of student motivation and the teachers' perceptions of the effectiveness of the tool in supporting motivation. Technical

refinements were completed on the functionality of the tool prior to the second cycle of testing as detailed in Appendix U. In response to my first research question, I explored the motivation of student participants, primarily with learning challenges. I determined the negative impact of students' perceived competence when students were unable to start at their readiness level, and the assessment outcomes portrayed an imbalance of learning skills strengths and needs. Yet, based on the students' comments, the students seemed to have an overall positive experience in completing the assessment. Most students reported their learning plans were aligned to their individual profiles, and they appreciated a balance of extrinsic and intrinsic sources to fuel their motivation. Yet teachers had mixed views about the distribution of external rewards. Since the assessment was designed to trigger intrinsic motivation, I needed to continue monitoring the influence of external motivational sources in my research objectives. My second research question focused on teachers' initial perceptions on the effectiveness of the tool on supporting student motivation. Overall, teachers indicated the learning plans, learning strategies, and class profiles could be beneficial in helping them build stronger student relationships and enable students to have more autonomy in the learning. Teachers also reported the resources would save them time in gathering information about students to identify student needs and strengths. Since the first testing cycle was based on a small sample of teachers and students primarily with learning challenges, a second cycle was conducted to test the tool with a wider audience of students with and without learning challenges in multiple environments.

Chapter 7- Second Testing Cycle

The research process for the second cycle mirrors the first testing cycle with first recruiting participants and implementing the assessments. I also gathered feedback from both students and teachers, but the sample was larger and more diverse in the second cycle. Prior to starting the second cycle, I completed refinements based on feedback from the first cycle which have been detailed in Appendix U.

The second testing cycle had two purposes: 1) To measure students' current level of motivation and students' perceived motivation upon completion of the assessment and, 2) To explore teachers' perceptions on the effectiveness of the assessment to support student needs of relatedness, autonomy and competence. Therefore, my analysis reviewed the results of each objective separately as shown in Table 23. I started the second cycle with the recruitment of participants.

Table 23

Second Testing Cycle- Impact of Motivation

		Research Process
Phase 3	Design and Construction	<p>Objective for second testing cycle</p> <ul style="list-style-type: none"> ● Measure level of motivation between students with and without learning challenges ● Teacher interviews to explore perceptions on the effectiveness of the assessment. <p>Process</p> <ul style="list-style-type: none"> ● Implement assessment ● Participant formative feedback (pre and post study survey; teacher interview) ● Analyze feedback ● Refine intervention

Recruitment

To determine the transferability with a larger, more diverse participant population, the

teacher participants invited all students in their classes to the study; unlike the first testing cycle, which included only a few students within each class.

Teacher Participant Recruitment

I recruited teachers from three sources; 1) teachers who participated in the first cycle from PEI, Ontario and New Brunswick, 2) teacher conference in New Brunswick, 3) Inclusive Action Network teacher conference in Ontario.

Prior to inviting teacher participants from the first cycle and teachers from the conference in New Brunswick, I sought approval from the respective school boards in New Brunswick, PEI and Ontario. The teacher participants from the Inclusive Action Network teacher conference belonged to a community organization outside the school boards, so I sought approval directly from the community organization.

The teachers from the New Brunswick conference were recruited through an information booth and poster (Appendix V) to attract teacher interest in the study. I gathered contact information (emails of each teacher and their principal) from teachers who expressed interest in participating in the study. Upon approval from the respective school boards, an email (Appendix W) and information letter (Appendix X) about the study were sent to each teacher's principal to obtain their permission for the teacher to participate in the study. Invitation letters were sent directly to community-based educational organizations (Appendix Y). Then consent forms (Appendix Z) were signed by all of the teachers who agreed to participate in the study. A total of 7 teachers participated ($n=7$); two teachers ($n=2$) from the first testing cycle) and five new teachers ($n=5$) from public school boards and an after-school community organization. The teacher criteria and tasks have been outlined in the teacher information letter (Appendix X).

Student Participant Recruitment

Teachers invited the students in their class via parents by emailing parents an invitation (Appendix AA). Each teacher had the opportunity to invite all students within their classrooms for the second testing cycle. An information letter (Appendix AB), consent form and assent form (Appendix AC) were reviewed and signed by students/parents/guardians of students who participated in the study. A total of 50 students ($n=50$) with and without learning challenges participated in the second testing cycle. Students who reported having an Individual Education Plan (IEP) or having challenges in school were categorized into a group called '*students with learning challenges*' ($n=21$) and the remaining students ($n=29$) made up the group of '*students without learning challenges*'. The after-school organization that participated also included students from marginalized populations within a low socio-economic neighbourhood. The student criteria and tasks have been outlined in the parent information letter (Appendix AB). After students were recruited, data collection commenced.

Data Collection

Data was collected from students through the outcomes of the assessment tool, and a pre-study and post-study survey (Appendix AD). In addition to the correlational pre- and post-study questions, the post-study survey also included three descriptive questions related to student motivation. Data was collected from teachers with an online interview (Appendix AE). Pseudonyms were used to ensure confidentiality of data collected. In addition, students had the option to use Avatar or first names only when completing the assessment. Analysis of the findings started with the student survey questions.

Findings

Descriptive Motivational Questions

To continue understanding the student's motivational experience while completing the assessment, I included the two post-assessment questions from the first testing cycle and added an additional question. The new question focused on the students' extrinsic and intrinsic motivation to determine if they would still enjoy the experience without extrinsic rewards. The outcome for each of the first two questions increased or remained stable from the first to the second cycle (Table 24). It illustrated that puzzles, coins, and rewards continued to be important motivators in completing the assessment. However, when students were asked about their experience if rewards were not offered, 53.5% of students indicated they would still enjoy the experience.

Table 24

Comparison of Student Experience in Relation to Extrinsic Motivational Factors

Motivational Related Questions	1st testing cycle	2nd testing cycle
I enjoyed the gamified puzzles and quests.	88.00%	87.20%
I enjoyed earning coins to shop for rewards at the SMART shop.	76.40%	90.70%
I would enjoy the experience even if I DID NOT have a chance to earn rewards at the SMART shop.		53.50%

Correlational Survey Questions

In addition to completing the holistic assessment, the second cycle included a correlational survey (Appendix AD) to explore the student's level of intrinsic motivation (based on the SDT theory) before and after completing the assessment tool. Prior to the assessment, students reported on their current state of motivation at school using adapted questions from the Intrinsic Motivation Inventory (IMI), the Physical Education Autonomy, Related, Competence Scale (PE-ARCS), and

the Health Behaviour in School Aged Children survey (Public Health Agency of Canada, 2016; Ryan, Mimiis, & Koestern, 1983; Sulz et. al, 2016). Upon completion of the assessment, the students reported their perceived motivational state based on their experiences with the assessment tool and the information it generated. The response options on a five-point likert scale were; strongly agree (5), agree (4), neither agree nor disagree (3), disagree (2), strongly disagree (1). To start responding to my first research question, I specifically explored the differences in motivation between students with learning challenges and students without learning challenges using between group independent tests. How does the implementation of a student-directed assessment for learning approach impact the motivation of students with and without learning challenges based on the self-determination theory?

- Impact on relatedness by building holistic student-teacher relationships
- Impact on choice of learning and student-directed learning
- Impact on students' perceived competence

I hypothesized that prior to completing the assessment; there would be a significant difference between students with and without learning challenges on students' current level of intrinsic motivation based on the self-determination theory. Since my objective was to determine if the assessment had a positive impact on student motivation, I tested the extent to which students reported the assessment could meet their needs of relatedness, autonomy, and competence. I also wanted to establish if the assessment could help close the motivational level gap between students with and without learning challenges. Therefore, after completion of the assessment, my hypothesis was that there would not be a significant difference between students with and without learning challenges in their need for relatedness, autonomy, and competence.

Teacher Interviews

The teachers' participation included a 45-minute interview about their experience reviewing the student's learning plans, learning strategies and class profiles to answer my research questions:

- What are the perceptions of teachers about the usefulness of the student-directed assessment tool in helping teachers trigger student motivation through relatedness, autonomy, and competence?
- How do the student-directed assessment outcomes impact the teachers' identification of student holistic learning needs and strengths and the design of instructional strategies?

Based on the outcome of the student results and teacher interviews; further refinements were made on the assessment to measure the transferability to a wider audience of students and teachers across Canada. The data in this phase aligned with the three psychological needs of the self-determination theory; relatedness, autonomy, and competence. I started my analysis with the need of relatedness.

Building Relationships with Relatedness

Relatedness referred to the feeling of belongingness and acceptance in relationships which correlated with student-teacher relationships in the classroom.

Relatedness Prior to Completion of the Assessment. Prior to the assessment, students responded to three statements pertaining to relatedness; the first two from the Health Behaviour in School Aged Children (HBSC) (Public Health Agency of Canada, 2016) and the third based on Roger's belief that consideration of students' interest in teaching positively impacts students' intrinsic motivation (Rogers, 1980). Students responded to their level of agreement with three statements about relatedness:

- I feel my teacher cares about me as a person (HBSC)
- I feel it is difficult to trust my teachers (HBSC)- R
- I feel that my interests are considered in what I learn at school

The second statement, “difficult to trust your teacher” was a reversed statement, so response scores were also reversed for the purpose of consistent analysis with the other questions. Table 25 illustrated the frequency of each of the three individual statement responses prior to completing the assessment. It also included a mean rank to determine the differences in mean between students with learning challenges and without learning challenges.

Table 25

Frequency of Relatedness Questions- Prior to Completing Assessment

	Mean Rank	Agree or Strongly Agree
Teacher cares		70%
Learning challenges mean rank	27.83	
No learning challenges mean rank	23.81	
Trusts teacher		50%
Learning challenges mean rank	24.29	
No learning challenges mean rank	26.83	
Interests considered in school		40%
Learning challenges mean rank	24.67	
No learning challenges mean rank	26.10	

Prior to completing the assessment, 70% of students ($n= 35$) agreed or strongly agreed that their teacher cared about them as a person, 50% ($n= 25$) agreed or strongly agreed that they could trust their teachers, and 40% agreed or strongly agreed that their interests were included in what they learned at school. The mean ranks were lower for students with learning challenges than students without learning challenges for the statements, “interests included in what I learn” ($R1= 24.67$, $R2=26.10$) and “trusts teacher” ($R1=24.29$, $R2= 26.83$). The mean rank was higher for students with learning challenges than students without learning challenges for “teacher cares about me as a person” ($R1= 27.83$, $R2= 23.81$). These findings indicated that students perceived their teachers cared about them more frequently than they perceived they could trust their teachers, and their interests were considered in their learning. A positive correlation was found between ‘teacher cares’ and ‘interests’, $r(48)= .425$, $p<.002$, ‘teacher cares’ and ‘trusts teachers’, $r(48) = .335$, $p<.017$, and ‘interests’ and ‘trust teachers’, $r(48)= .461$, $p<.001$. Therefore, these variables were combined into one construct to compare the differences between students with and without learning challenges. To determine the significance of these variables, a Mann-Whitney U test was conducted since the data was not normally distributed. The Mann-Whitney U test (Table 26) found there was not a significance difference between the students with learning challenges and students without learning challenges for the category of relatedness or any of its related variables prior to completing the assessment.

Table 26*Mann Whitney Test -Relatedness Prior to Assessment*

	Teacher Cares	Trusts Teacher	Interests	Relatedness Total
Mann-Whitney U	255.50	279.00	287.00	282.500
Wilcoxon W	690.5	510.00	518.00	717.500
Z	-1.045	-.514	-.361	-0.438
Asymp. Sig. (2-tailed)	.296	.607	.718	0.661

Relatedness upon Completion of the Assessment. My next objective was to determine the impact of relatedness upon students' completion of the assessment. I wanted to measure the degree to which students perceived the information from the assessment could strengthen their relationships with their teachers. I also wanted to determine if the assessment could minimize the motivational gap between students with and without learning challenges. Therefore, after completion of the assessment, my hypothesis was that there would not be a significant difference between students with and without learning challenges in their need for relatedness. The statements in the category of relatedness after the students completed the assessment were;

- I think the information from my learning plan can help my teachers understand me better as a person
- I feel my interests can be considered in my learning at school

Table 27 illustrates the frequency of each of the two individual statements after completing the assessment. It also included mean ranks to determine the differences in mean between students with learning challenges and students without learning challenges.

Table 27*Frequency of Relatedness Questions- After Completing Assessment*

	Mean Rank	Agree or Strongly Agree
Understand and care about as a person		80%
Learning challenges mean rank	23.69	
No learning challenges mean rank	26.81	
Interests included in learning		72%
Learning challenges mean rank	23.43	
No learning challenges mean rank	27.00	

After completing the assessment, 80% of students ($n= 40$) agreed or strongly agreed that the information from the assessment may help their teacher understand and care about them as a person and 72% ($n= 36$) agreed or strongly agreed that their interests shared with their teachers could be included in what they learned at school. The mean ranks were lower for students with learning challenges than students without learning challenges for both questions. These findings suggested there was a positive impact on students' perception of the information from their assessment and their relationship with teachers, especially for students with learning challenges. To determine the significance of these variables, a Mann Whitney U test was completed since the data was not normally distributed. The Mann-Whitney U test (Table 28) indicated there was no significant difference between students with and without learning challenges for the variables 'teacher cares' ($U=266.50, z= -.832, p= 0.406$); and 'interests' ($U= 261.00, z= -.910, p = 0.363$) after completing the assessment;

Table 28*Mann Whitney Test -Relatedness after the Assessment*

	Teacher Understands and Cares	Interests Considered
Mann-Whitney U	266.500	261.000
Wilcoxon W	497.500	492.000
Z	-0.832	-0.910
Asymp. Sig. (2-tailed)	0.406	0.363

Teachers Perspectives on the Impact of Relatedness. Teachers in the study agreed with the students that it was important for teachers to build relationships with students. Teacher 3 stated, *“It's very important. I think if you don't know them, you're not going to be able to connect with the students. You're not going to be able to teach them”*. Some teachers tried to get to know students with formal surveys sent home to parents or with informal chats in the classroom. Teachers also indicated they might be able to incorporate the strengths, interests, and talents generated from the assessments into their curriculum when they were provided with characteristics about the whole person. Teacher 3 provided an example,

It's very easy to lose my students' focus and their attention span sometimes is very short, so you've got to take all of their interests into consideration. For example, I have one that really loves art, so I try to incorporate art in a lot of what he does. Maybe he will give me a story based on pictures as opposed to in writing, because he's not that great with writing. I have another one that really loves technology. We do technology. I came up with the idea of screen pals. So, there are stories every other week, and they meet with a screen pal in another city.

The teachers expressed that the information on the learning plans would help them build stronger relationships with students, especially information about their whole self. Teacher 3 appreciated the fact that the information was so detailed and stated, *“I just think the layout of it, the way it's all detailed for you as an educator is pretty neat. I think it's a great tool to use to benefit the students”*. Teacher 1 commented about the learning plans,

“There’s a lot of really good information in there and even just what they enjoy, as a lot of these kids are very quiet. So, to read in the plan, what they like doing, or what they enjoy, or what they feel they're good at, that was a lot of really good information that I could use in building those relationships”.

Teachers stated that this information would be especially beneficial if it was provided at the beginning of the year. Teacher 1 commented,

“I like getting to know my students. This would be great to have at the beginning of the year for every class, and get to know everybody's strengths and weaknesses, just to help prep in planning. The learning strengths were really good”.

Some teachers also provided feedback on additional information that may be useful on the learning plans related to their social and emotional being. Teacher 4 thought it might be helpful to ask students, *“What do you want your teacher to know about your school life or home life? Because some kids want to share things that may be affecting them, and so that allows me to have that conversation”*. Some teachers also shared how the learning plan could save them time.

Teacher 3 expressed,

It saves time in the sense that it tells you exactly how the student needs to learn. Then you've given us the tools right there, you have the lesson plans right there that are geared towards the way the student learns. I think it doesn't get any better than that.

Although the learning plan provided teachers with detailed information about each student, I also wanted to determine if a one-page class profile could save time for teachers in viewing a snapshot summary of this information for all students in the class, especially teachers with large class sizes. Teacher 1 said *“trying to get to know everybody and know what works for them is challenging. But I think it's really important, because if you're going to meet all your learners, it's good to know all your learners”*. In response to the teacher's initial reaction to the class profile, Teacher 1 stated,

“I thought it had a lot of really good information. I did like it, because it can be challenging as I teach 97 students in the course of a day, so to have their likes and dislikes, and just being able to get to know them a little bit more, was really nice”.

Teacher 2 found the class profile helpful in identifying learning preferences. His response was, *“It's interesting to see just how all of their preferences are all listed. It helps me see which ones come up over and over again, and allows me to focus on those ones. Those are ones that I definitely don't want to miss, including in my work”*. Teacher 2 also found it helpful to understand how he could better support his students with their challenges. He stated, *“If I see multiple learning challenges that come up over and over again, that gives me a good sign that those are things that many students are going to need to be able to spend time working on”*.

Teacher 4 shared how she would use the class profile, *“It allows me to scan and put in groups in my head, that person needs this, that person needs that. Automaticity is fast for me. I can figure out very quickly what I need to do with what kids based on that”*.

Autonomy through Expression of Voice and Choice of Learning

Autonomy was the second self-determination need measured in the pre- and post-assessment survey. Autonomy was related to students being able to express their views and having

choice in learning.

Autonomy Prior to Completing the Assessment. Prior to the assessment, students responded to two statements aligned with autonomy, one from the HBSC survey (Public Health Agency of Canada, 2016) and the second from Physical Education Autonomy, Related, Competence Scale (PE-ARCS) (Sulz et al., 2016).

The statements included in the pre-assessment survey were;

- I can choose some of the assignments and work I do in class (PE-ARCS-3)
- I am able to express my own views in my classes (HBSC)

Table 29 illustrated the frequency of each of the statements prior to completing the assessment. It also included a mean rank to determine the differences in mean between students with learning challenges and without learning challenges.

Table 29

Frequency of Autonomy Questions- Prior to Assessment

	Mean Rank	Agree or Strongly Agree
Ability to express views		28%
Learning challenges mean rank	20.74	
No learning challenges mean rank	28.95	
Choice of learning		34%
Learning challenges mean rank	29.57	
No learning challenges mean rank	22.55	

Prior to completing the assessment, 28% of students ($n= 14$) agreed or strongly agreed that they had the ability to express their views in their classes and 34% ($n= 17$) agreed or strongly agreed they were able to choose assignments and work they do in class. The mean rank was lower for students with learning challenges than students without learning challenges for the statement, “ability to express views” ($R1= 20.74$, $R2= 28.95$). However, the mean rank was higher for students with learning challenges than students without learning challenges for the question “having a choice in learning” ($R1= 29.57$, $R2= 22.55$). A Mann-Whitney U test was conducted since the data was not normally distributed. The Mann-Whitney U test (Table 30) indicated there was not a significant difference for the variable ‘choice of learning’, $U=219.00$, $z= -1.733$, $p=.083$.

Table 30

Mann Whitney Test –Autonomy Prior to the Assessment

	Express views	Choice in learning
Mann-Whitney U	204.500	219.000
Wilcoxon W	435.500	654.000
Z	-2.040	-1.733
Asymp. Sig. (2-tailed)	0.041	0.083

However, there was a **statistically significant difference** between the students with learning challenges and students without learning challenges for the variable ‘ability to express views’, $U= 204.5$, $z= -2.040$, $p= .041$. There was also a medium effect size of ($r= .39$). Therefore, it was vital for me to consider the students’ perception of the importance of having the opportunity to express their views while completing the assessment.

Autonomy upon Completion of Assessment. Upon completion of the assessment, students were provided with a list of strategies that may help students learn based on their holistic self. Students also had the opportunity to choose which strategies they would like to implement. I wanted to determine the students' perception of the importance of being provided with the choice of selecting their own learning strategies. I also wanted to determine if completion of the assessment would minimize the motivational gap between students with and without learning challenges. Therefore, after completion of the assessment, my hypothesis was that there would not be a significant difference between students with and without learning challenges in their need for autonomy. Students responded to autonomy-related statements to determine the importance of being able to express their views and have a choice of learning while completing the assessment.

- It was important to be able to choose strategies that may work for me.
- It was important for me to express my views to my teacher.

Table 31 illustrated the frequency of responses to each of these individual statements after completing the assessment. It also included mean ranks to determine the differences in mean between students with learning challenges and without learning challenges.

Table 31*Frequency of Autonomy Questions- After the Assessment*

	Mean Rank	Agree or Strongly Agree
Importance of expressing views		80%
Learning challenges mean rank	25.31	
No learning challenges mean rank	25.64	
Importance in having choice of learning		86%
Learning challenges mean rank	22.29	
No learning challenges mean rank	27.83	

After completing the assessment, 80% of students ($n= 40$) agreed or strongly agreed it was important to express their views, and 86% ($n= 43$) agreed or strongly agreed it was important to be able to have choice in their learning strategies. The mean ranks were lower for students with learning challenges than for students without learning challenges in both questions. A positive correlation was found between ‘importance of choice’ and ‘importance of expression’, $r(48)= .500, p<.001$. Therefore, these variables were combined into one construct to compare the differences between students with and without learning challenges. This data was not normally distributed so a Mann-Whitney U test, illustrated in Table 32, retained the hypothesis that there was no significant difference between the students with learning challenges and students without learning challenges for the category autonomy and its related variables, ‘express views’ and ‘choice’ after completing the assessment.

Table 32*Mann Whitney Test -Autonomy after the Assessment*

	Ability to express views	Choice in learning	Autonomy Total
Mann-Whitney U	300.500	237.000	251.500
Wilcoxon W	531.500	468.000	482.500
Z	-0.085	-1.516	-1.090
Asymp. Sig. (2-tailed)	.932	.130	.276

Student Comments in the Oral Expression Activity

In one section of the assessment, students had the opportunity to orally express their views to their teachers. The quality and quantity of responses varied from 1-2 seconds to 3 minutes of audio recordings. Some students simply responded with a typical reply such as, (“I think it was good”- student 8, “it was fun and it was easy”- student 11). While other students, especially those who may be less likely to express their views, provided information that may help teachers understand a little more about them. For example, Student 2 (grade 7) orally expressed to their teacher, *“I feel very shy and a little bit stressed when I speak up in front of the whole class, and when I see a lot of people looking at me, I feel even more stressed and a little bit also nervous”*. And in response to their perceptions about the activities in the assessment, student 14 (grade 8), said *“I learned that I could talk more out loud and that the activities were more challenging than I thought, and how I might improve on talking more aloud or writing and asking teachers to help more.”* Students were also provided with choice in the oral expression activity. In this activity, some students provided teachers with lesson ideas. Student 5 (grade 7) asked their teacher, *“I was wondering if you could do a Christmas project where we could make*

a craft or something, maybe like plate things, like a Christmas tree or something, and then at the end of the year, we could all take it home”.

Teachers Perceptions about the Assessment in Relation to Autonomy

Some of the teachers also reflected on the importance of student voice. While observing the students in her class complete the assessment, teacher 4 stated, *“I think the students felt really good about having an opportunity to talk about themselves and their learning. I was actually quite amazed that they were as engaged as they were”*. Teacher 4 thought that student voice was critical in supporting students and added,

I think it (the assessment tool) is helpful in understanding how they learn, but more importantly, from their perspective. So, the bias of adult perception is removed. And I think that has always been my biggest fight. Whenever I'm speaking to teachers or speaking at the team meetings where adults are talking about the student, I wonder if we have talked to the student? I think for me; that was big because they (students) want to know. They want to be asked, and they want to talk.

Teachers also offered their perspectives of the student’s choice in learning. The teachers had varying views about the type, amount and frequency of choice that should be offered students. Teacher 1 indicated, *“They know themselves best, especially at this point in grade eight. They know themselves better than I do. So, they could definitely tell me what things they enjoy doing in class and what's going to keep them engaged.”* Teacher 4 stated that her inquiry-based learning methods considered choice. She reflected,

Why did the kids need to learn everything at the same time? Because I'm teaching them things like how to write a report, or how to research a topic, or how to present a topic digitally, or how to give a presentation. Those are skills. Doesn't matter what content

they're using. So why can't they decide what part of the curriculum they want to learn at what time of the year?

Teacher 4 also provided an example. She questioned,

Why do I need everybody to produce their learning in this way? Why does it all have to be written on a piece of paper? Why can't it be a poster? I had one group who wrote a song. They wrote a song, did all the music, and sang the song as their presentation. And it was like it was level four, because they nailed every bit of information.

Other teachers were concerned about the amount of choice that should be given. Teacher 3 who primarily supported students with special education needs preferred to provide a balance of routine and choice. Teacher 3 shared,

I do a lot of routines. They need heavy structure. I do provide choice to some degree. Sometimes I will tell them, we're going on a couple class trips. What would you like? Or, if we have to do things with literacy, so it's either this or that, would you like to do this today?"

In relation to student's selection of strategies on the learning plan, teacher 2 stated, *"I think students sometimes look at the options and just pick the ones that they think will be nice, maybe not necessarily, the ones that are actually going to be helpful."* However, teacher 2 provided an example of how they considered a balance of choice of assessment strategies,

In certain areas, I do it often. Like if they want to use an audio book or paper book. For other types of assessments, sometimes there are specific skills that I want them to develop, so I kind of force them to choose a specific type just because I want them to develop certain skills.

The teachers perceived some strategies to be more realistic or practical to implement. Teacher 1

expressed,

I like there are a lot of strategies that you can quickly add - maybe you're not going to do them every day, but you could do them throughout your week- like prepping and reading notes or Kahoot and using checklists and things like that.

Yet teacher 2 stated that other strategies, like movement breaks, may be less practical. Teacher 2 said,

The students can take a break to go get a drink of water, go to the washroom if they need to. But if every student took a five-minute break every class, it probably wouldn't be very productive. I think there's ways to implement that into your teaching as well, where you just make sure you're not doing the same activity for an hour. If you break up the activities, and that does also provide a little transition break time.

Since teachers' time was limited, I wanted to determine if the student-directed assessment could help students become more accountable in implementing their own learning plan through goal setting. In the final feedback question, some students reported they enjoyed setting goals.

However, 9 out of 17 students in the first testing cycle and 28 out of 50 students in the second testing cycle expressed challenges in at least one of two skills related to goal setting; goal directed and metacognition. Some teachers indicated that having choices and setting goals could increase both motivation and accountability. Teacher 1 expressed that, *"If we use the plan and we're meeting their needs and they're having success, the more successful they are, they're going to want to be more accountable. They're more engaged"*. Teacher 1 added, *"I like that the kids have goals, that's something that was a goal for our school improvement plan was trying to get into goal setting with their students"*. After considering the impact of autonomy on a student's motivation, competence was the next area of focus.

Perceived and Actual Competence

Competence Prior to Completing the Assessment. Competence was the third psychological need of the SDT theory addressed in the pre- and post-study survey. In the first testing cycle, competence affected student's academic outcomes in math and reading comprehension, so refinements were made to survey statements to better identify the affected subjects. In the first testing cycle, there was only one single competence-based statement at the end of the assessment, which applied to all subjects. However, in this second testing cycle, students reported a separate competence-based statement for each individual academic subject prior to and upon completion of the assessment. The first pre-assessment statement for the category of competence was adapted from the Intrinsic Motivation Inventory (IMI) (Ryan & Deci, 1982) and related to students' perception of difficulty of school. The statements were;

- I am satisfied with my performance at school (IMI)
- I think this activity might be difficult. (R-)

Table 33 illustrates the frequency of each of these individual statements prior to completing the assessment. It also included mean ranks to determine the differences in means between students with learning challenges and without learning challenges.

Table 33*Frequency of Competence Questions- Prior to the Assessment*

	Mean Rank	Agree or Strongly Agree
Satisfaction of Performance		62%
Learning challenges mean rank	18.43	
No learning challenges mean rank	30.64	
Perceived difficulty of activity		44%
Learning challenges mean rank	18.17	
No learning challenges mean rank	30.81	

Prior to completing the assessment, 62% of students ($n= 31$) agreed or strongly agreed that they were satisfied in their performance in school, and 44% ($n= 22$) agreed or strongly agreed that they perceived the assessment activity may be difficult. The mean ranks were lower for students with learning challenges than students without learning challenges in both questions. This data was not normally distributed, so a Mann-Whitney U test was conducted (Table 34).

Table 34*Mann Whitney U Test -Competence Prior to Assessment*

	Performance Satisfaction	Perceived difficulty of activity
Mann-Whitney U	156.000	150.500
Wilcoxon W	387.000	381.500
Z	-3.089	-3.136
Asymp. Sig. (2-tailed)	.002	.002

The Mann-Whitney U test found *a practically significant difference* between the students with learning challenges and students without learning challenges prior to completing the assessment for ‘satisfactory performance’; $U=156.00$, $z= -3.089$, $p = .002$ with a medium to large total effect size ($r= .437$). A practically significant difference was also found for ‘perceived difficulty’; $U= 150.50$, $z= -3.136$, $p= .002$ with a medium to large effect size ($r= .44$). The next step was exploring the impact on competence upon completion of the assessment.

Competence upon Completion of the Assessment. Similar to the hypothesis for relatedness and autonomy, I anticipated more similarity between the students with learning challenges and students without learning challenges after completing the assessment, so I assumed there would not be a significant difference between the groups. The competence-based statements upon completion of the assessment related to the student’s actual level of difficulty in completing each academic related activity and the extent to which they understood how they learned.

- This activity was difficult
- I better understand how I learn

Table 35 illustrates the frequency of each of the statements responded to upon completion of the assessment. It also included mean ranks to determine the differences in mean between students with learning challenges and without learning challenges.

Table 35*Frequency of Competence Questions- After Assessment*

	Mean Rank	Strongly Agree	Agree	Neither Agree or Disagree	Disagree	Strongly Disagree	Agree or Strongly Agree
Learn best		28%	15%	14%	8%	0%	78%
Learning challenges mean rank	20.93						
No learning challenges mean rank	28.81						
Actual perceived difficulty level		0%	10%	46%	24%	20%	10%
Learning challenges mean rank	25.74						
No learning challenges mean rank	25.33						

Upon completion of the assessment, 78% of students ($n= 39$) agreed or strongly agreed that they better understood how they learned best, and 10% ($n= 5$) agreed or strongly agreed that the academic related activities were difficult. The mean rank was lower for students with learning challenges than students without learning challenges for “understanding how they learn best” ($R1= 20.93$, $R2= 28.81$) and slightly higher than students without learning challenges for the “actual level of difficulty” ($R1= 25.74$, $R2= 25.33$). These findings suggested that although 44% of students ($n= 22$) who “agreed or strongly agreed” the assessment might be difficult prior to the assessment, only 10% ($n= 5$) actually reported it was a little or very difficult upon completion of the assessment. Of the 10% who reported some assessments to be difficult, the breakdown by subject of those who found the assessments difficult were (36% in Math, 11.6% for Reading comprehension, 13.6% for Listening comprehension, 13.6% for written expression). Since the

data was not normally distributed, a Mann-Whitney U test was conducted (Table 36). The Mann-Whitney U did not find any significant difference in total competence between the students with learning challenges and students without learning challenges after completing the assessment; $U= 231.50, z= -1.498, p = .134$.

Table 36

Mann Whitney Test -Competence after Assessment

	Learn Best	Actual difficulty of activity
Mann-Whitney U	208.500	299.500
Wilcoxon W	439.500	734.500
Z	-2.047	-0.105
Asymp. Sig. (2-tailed)	.041	.917

The students' perception of actual difficulty also did not indicate a significant difference between the students with learning challenges and students without learning challenges; $U= 299.500, z= -0.105, p= 0.917$. However, the statement related to "understanding how they learn best" did illustrate a *statistical significant difference* between the two groups; $U= 208.50, z= -2.047, p= .041$ with a small total effect size ($r= .212$). Students and teachers also shared their perceptions about competence.

Student and Teacher Perceptions of Competence. In the oral expression activity, some students who struggled in a specific subject reflected on their experience. Student 15 (grade 8) who struggled in writing orally expressed, "*So I think I can work on my writing. I'm struggling with my writing. I really enjoyed the activities and the challenges. They were a lot of fun. Thanks very much.*" And student 16 better understood how she learned as they stated, "*I can improve my*

English and French spelling, and I learned about myself that I learned better, and I understand more by reading.” Some teachers were also very aware of the impact of a student’s perceived competence on their motivation to learn. Teacher 1 shared an example of her student,

I have a student that really struggles to be engaged because he feels like everything is too hard. So, if we can find ways to get him success, then he's going to be a little bit more motivated to want to keep working. But I think with a lot of those kids, if we can give them those aha moments, or those, I can do this and I get it, then they're going to be more motivated to keep doing them.

Some of the teachers appreciated the level of detail provided in some of the assessment outcomes on the learning plan. Teacher 3 pointed out,

It lets you know exactly where their areas of struggle are, and allows you to tailor your instruction accordingly. For example, when you scrolled up and you had the fractions, you know exactly what their area of struggle is. It's fractions. So, you have to focus on your basic math facts to help them in that area. Even with the literacy component, where you had the different audios, again, it helps you to target where their areas of need are.

An enhancement that would be even more beneficial for teacher 3 would be a follow-up and measurement of the strategies. Teacher 3 indicated,

Maybe a three-month check-in to see whether or not educators have actually tried to implement some of this, and a three-month check-in with the students as well to see if their scoring has gone up or down based on us incorporating this into our programming.

The final theme that was revealed was the level of extrinsic compared to intrinsic motivation apparent in each student’s completion of the assessment.

Extrinsic Versus Intrinsic Motivation

Students Perspectives on Extrinsic and Intrinsic Motivation. Students' perceived extrinsic and intrinsic motivation were determined in two ways; 1) outcomes from a motivation assessment embedded within the assessment, 2) free format comments of student's experience in completing the assessment.

Motivation Assessment. One of the sub-assessments within the assessment tool was adapted from Deci and Ryan's (1982) Intrinsic Motivation Inventory (IMI). The outcomes from this motivation assessment determined the motivation type of each student based on four levels within the STD continuum of motivation; external regulation, introjected regulation, identified regulation, and intrinsic motivation. External regulation and introjected regulation fall closer to level of extrinsic motivation; and identified regulation and intrinsic motivation are more closely related to intrinsic motivation. Therefore, I considered students to be extrinsically motivated if the outcome of their motivation assessment was identified as external or introjected regulation. And I considered them to be intrinsically motivated, if the outcome of the motivation assessment was identified regulation or intrinsic motivation. As a result of my extrinsic and intrinsic motivation analysis; in the first testing cycle, 82.3% of students ($n= 41$) were found to be more extrinsically than intrinsically motivated compared to 74.4% students ($n= 37$) in the second cycle.

Motivation Comments. At the end of the assessment of the first and second testing cycle, I also asked the students, '*what did you like best about your experiences*'. The students reported a mix of comments that could also be related to their motivational tendencies. The free formatted comments illustrated more intrinsic related perspectives from the students in the first cycle as illustrated in Table 37.

Table 37*Student Experiences in Testing Cycle 1 and 2*

Testing Cycle 1 Comments	Testing Cycle 2 Comments
What did you like best about the experience?	
<p>The games/quests; getting to know me better, I enjoyed most of the activities and the speak exercises; having a chance to win Nintendo switch and the puzzle and problems; learning about me; I don't know; Learning more about myself and what helps me learn; finishing the whole thing; I don't know; learning about myself; The puzzles in the games and learning about myself; I'm not sure; all of it was fun, everything; I enjoyed how I got to know myself a little bit more; The smart shop; all</p>	<p>Forming a goal; the memory games; the games; money; learning; the little mini games; reading and puzzles; puzzles; Getting to vent; I don't know; games; money; puzzles; the activities; the coded games; How I didn't have to do a lot; My learning plan; winning stuff; getting a chance to win prizes and the quest and puzzles; it was fun; almost all of it; the smart shop; I liked it all; idk; getting coins for smart shop; I don't know; the end; nothing much I'm only starting to understand more things better.; videos; ending it.; the activates; watching the videos; The gifts and writing; The length of optional questions.; the rewards; the quest; games; All the math; everything</p>

When asked what they liked best about the experience, 6 of the 17 students in the first cycle reported comments related to learning about themselves such as (“getting to know me better”, “learning about me”, “learning about myself”) whereas none of the students expressed these types of comments directly in the second testing cycle. The most prominent comments by students in the second cycle were related to extrinsic motivators about the rewards, games and puzzles which included (“games”, “puzzles”, “winning stuff”, “rewards”) as illustrated in table 40.

Teachers Perspectives on Extrinsic and Intrinsic Motivation. The teachers had mixed views about ways to increase students’ motivation. Teacher 3 stated that external rewards were important for their students who all required special education support. Since some of their students may not go to secondary school or may have to fend for themselves in the future, teacher 3 believed life skills were important, especially how to earn money. Therefore, teacher 3 had a

reward system where students received tokens or “play” money for different tasks, activities, behaviors, or accomplishments they achieved throughout the week. Teacher 3 shared,

On Fridays is when they get paid. They see their dollars, and their incentive once they get their money is that they have what I refer to as a student purchase catalog. Based on what they've been paid, they get to purchase different items. They get to purchase a Tim Hortons donut, they get to purchase a pizza. They get to purchase a movie on the Promethean board. I try to get them to all purchase the movie so that no one's distracted. They get to purchase iPad time. Bring a toy to school. There are various things that they get to purchase.

According to Teacher 1, student’s involvement in learning was a critical component to motivation and engagement. Teacher 1 said, *“It's like when we're looking at the plans and suggestions, a lot of these suggestions are ways that these kids are going to learn, easier to learn. And I think if we're hitting their needs, we're going to help the engagement, because kids that are having their needs met are more likely to be engaged”*.

Although, teacher 2 was receptive to motivating students with external rewards, teacher 2 reported,

“I feel like it (external rewards) can have a very short-term effect. Like, I think it's great for a little project like this. I feel it kind of can lose its effect over time and then obviously, you're limited in what you can provide just due to finances and stuff like that.

Teacher 4 agreed to consider alternative methods to external rewards which may have a short-term impact on motivation. Teacher 4 views were,

I've always found that material rewards are tricky, because if you give somebody a material reward, then it's kind of like Pavlov's dog where they keep salivating and they

keep expecting the same thing every time they do that task. Whereas I have found that intrinsic rewards like kids that actually feel really good about what they've done are far more impactful and far more powerful and far more effective.

An example teacher 4 provided was,

If I'm teaching a skill, but they're choosing the content, and they get excited about the content, and they're choosing how they want to present it, they get excited about that. And so, the classroom management is not as much of an issue, because they are engaged and enthralled in what they're doing. It's a reward because you get to choose what you want to do, and therefore what you want to do, you like, and if you like doing it, it doesn't feel like work

Overall, the outcomes of the student assessment and feedback obtained by both students and teachers helped identify further enhancements required for the third testing cycle related to the impact of motivation. It was also important for me to gather feedback pertaining to the functionality of the assessment prior to the third testing cycle.

Functionality of Assessment- Second Testing Cycle. To enhance the functionality of the assessment, I continued to obtain feedback from teachers through their interviews. I also gathered feedback on the teacher's observations and perceptions of the student's experiences in using the tool.

Teacher's Feedback on the Functionality of the Assessment.

PDF version of the assessment. An area of improvement noted by several teachers in the first and during the second testing cycle was the ability to print the learning plan as a PDF.

Teacher 1 commented,

“I think the only thing I would say would be to be able to print the learning plan as like a PDF file, for those that like paper, or people who don't always want to go into a program. If you could print it and have it maybe in a book, or to be able to share it with a parent and print a copy off for them, or another teacher, where we have a team. There are four of us, and we teach all the same kids in the run of the day. So it'd be really nice to be able to print it off and hand it to the math teacher”.

Based on this feedback, a printable version was developed during the second cycle and teacher 4 found this feature helpful and said, *“I can print it out, and then I can highlight stuff”.*

Selection of Learning Strategies. In addition to building relationships, autonomy was also critical to trigger intrinsic motivation. After the first cycle of testing, the number of recommended strategies increased from 10 to 20 strategies to test the effectiveness of the strategies. However, some teachers suggested it might be less overwhelming for the student to start with fewer strategies with the option to select additional strategies not on the list. Teacher 4 stated, *“maybe less initial recommendations, but then a dropdown list of additional strategies”.*

Implementation of Learning Strategies. Teachers also provided feedback on the effectiveness of the strategies. Teacher 2 and 4 expressed that more content may be helpful to show students “how” to implement the strategies they selected. Teacher 2 said that some of the strategies were helpful and shared,

Step by step instructions are good as I'm not always good at doing that, because we think an assignment is easily understandable, and we forget for the kids they don't understand how the assignment works and they often need more steps than what I have planned.

Teacher 4 saw the benefits of many of the strategies on the learning plan but thought an explanation of how they would be implemented might be beneficial. Teacher 4 said, *“Teachers*

are given the what, this is what we need you to do. But they need to know exactly how to do it in the entire class, when I have 20 other people?" Teacher 4 believed knowing "how to" implement also applied to students and said,

A strategy is only as good as how well it can be used by a student independently. The beauty with the independent piece is that the self-esteem that a child gets out of being able to do something on their own without having to ask for help or feeling that they're inadequate allows them to feel like they are learners that are capable and a capable learner can do so many things.

Student Experiences Completing the Assessment.

Testing Environment. The students' environment and technical experiences may have contributed to their productivity and engagement throughout the assessment completion. During the first and second testing cycles, students completed the assessments in a variety of demographic and physical settings. The range of demographics included students from low income to high income socioeconomics, and the settings included public and private school environments as well as publicly funded after school tutoring programs. Within these environments, educators had the option to enable students to complete the assessment onsite during the regular curriculum programming, independently at home or a combination of both. Based on the teacher interviews, benefits and challenges were found within each type of environment depending on the implementation approach including timing, type of classroom, available technology, parental support, and student interaction with other students.

Students in the first testing cycle completed the assessment at home with minimal disruption, while those in the second cycle completed the assessment in a classroom setting simultaneously with other students. Students in the first cycle also completed the assessment

over a shorter period (1-2 weeks) than those in the second cycle (3-4 weeks). Also, there were a few more technical challenges with the school devices by students in the second cycle than students in the first testing cycle who used their own devices. However, these classroom experiences were inconsistent as teacher 4 who participated in both the first and second testing cycles reported a positive classroom experience. In relation to the student support needed from teacher 4 in the classroom, teacher 4 stated that,

I didn't have to do a lot once they got going. That was pretty clear what they needed to do. There were a few little IT glitches. But other than that, they were pretty clear. I was actually quite amazed at how they understood what they needed to do, and they were able to articulate that to me.

Registration Process. Regardless of the classroom in which they completed the assessment, some students in the second testing cycle had some technical difficulties with the registration process. To make the holistic assessment more secure from the first to the second cycle, the registration required confirmation of students' email. However, the technical issues experienced with this extra level of security may have also created some frustration for the students upon starting the assessment.

The refinements for the functionality feedback of the second testing cycle have been included as Appendix AF. Several themes were revealed in the second testing cycle which led to my discussion.

Second Testing Cycle Discussion

The second testing cycle provided the opportunity to test the holistic tool with a larger sample of students with diverse needs in multiple settings. The themes that emerged aligned with the three psychological needs of the self-determination theory; 1) Building holistic student

relationships through relatedness, 2) Influence of perceived competence on actual level of difficulty, 3) Developing student-directed learners through autonomous voice and choice, 4) Motivation in relation to extrinsic and intrinsic motivation. Statements aligned to relatedness, autonomy, and competence were presented to the students before and after they completed the assessment. Comparisons of the outcomes were made using independent “between group” tests prior to and upon completion of assessment, with two groups of students; students with learning challenges and students without learning challenges. I wanted to explore if there were differences between these groups prior to and after completing the assessment for each of the statements aligned with relatedness, autonomy, competence, and total motivation. A summary of the results is illustrated in Table 38.

Table 38

Comparison of Motivation for Students with and without Learning Challenges

	Pre-Assessment		Post-Assessment	
Relatedness	Teacher Cares	Not significant	Teacher Cares	Not significant
	Interests	Not significant	Interests	Not significant
Autonomy	Choice	No significant difference	Choice	Not significant
	Express Views	Statistically significant	Express Views	Not significant
Competence	Performance	Practically Significant	Performance	Not significant
	Perceived Difficulty	Practically Significant	Learn Best	Statistically significant

Each of these results and their potential impact on motivation has been explained within the following discussion. The first theme I addressed was the impact of building holistic student relationships.

Building Holistic Student Relationships through Relatedness. Building holistic student relationships meant teachers' attempts to understand a student as a whole person, including their strengths, needs, interests, and learning preferences. Strong student-teacher relationships might help students develop a sense of belonging and build trusting, caring relationships with their teachers through the fulfillment of relatedness (Ryan, 1991; Ryan & Belmont, 1991; Ryan & Lynch, 1989). Therefore, the statements aligned with relatedness were:

Before completion of the assessment

- I feel my teacher cares about me as a person
- I feel it is difficult to trust my teachers
- I feel that my interests are considered in what I learn at school

After completion of the assessment

- I think the information from my learning plan can help my teachers understand me better as a person
- I feel my interests can be considered in my learning at school

The mean rank of the responses for students with learning challenges was lower than the mean rank for students without learning challenges prior to and after completing the assessment. This implied that the need for relatedness might have been less fulfilled for students with learning challenges than those without learning challenges. However, when comparing the gap between both groups, the Mann-Whitney U tests found no significant differences between the two groups in the relatedness category. Therefore, the need for relatedness could have been just as important for students with or without learning challenges. The teachers in Montgomery's (2022) study also identified strong teacher-student relationships as a critical component in maintaining successful inclusive classrooms and affecting student motivation. Building student relationships was dependent on specific assessments and reports at teachers' disposal.

After students completed the assessments, teachers reviewed the students' learning plans, learning strategies and a class profile one-page snapshot of the students' strengths, needs, interests, and learning preferences. The teachers expressed that the information they received would be beneficial in helping them build relationships with students. The teachers indicated they could gather meaningful information they may not normally be able to access and could utilize this information to better understand and support the diverse needs of students in their classrooms. Some teachers also suggested the consideration of additional information about students' home life as students have unique experiences outside of school that could be impacting their learning. This issue was further explored in James (2021) study on the school

experiences of marginalized students which highlighted barriers such as limited access to school resources and lack of parental support with homework. Despite the importance of student-teacher relationships, the HBSC (2016) found a decline in student's connectedness with teachers during the transitional years from grade six to grade ten. The recognition of students' interests was another part of building student-teacher relationships.

Prior to completing the assessment, only 40% of students agreed or strongly agreed that their interests had been included in what they learned at school. However, after the assessment, 72% agreed or strongly agreed that their interests shared with their teachers during the assessment could be included in what they learned at school. These results were similar to the outcomes of the student survey in phase one where only a small percentage of students reported their interests had been included in Math (32.8%) and English/Language Arts (35.3%). Although teachers might find it challenging to incorporate interests into the curriculum, steady progress has been made in some environments. Gross et al. (2018) study of students and teachers in personalized learning environments found that 62% and 58% of middle and high school teachers respectively were incorporating students' interests into the curriculum more than half of the time. Students in Gross et al (2018) reported similar responses with 55% and 45% of middle and high school students respectively who believed their interests were incorporated at least half the time. When teachers had the resources to get to know their students quickly, the need for relatedness could be fulfilled for all students regardless of any learning challenges. Competence was the next psychological need of the self-determination theory that was addressed in the pre- and post-study survey.

Influence of Perceived Competence on Actual Level of Difficulty. Competence referred to a student's perceived as well as actual ability level in a task. An individual may have perceived

a task to be difficult but in fact performed well on the task or vice versa (Deci, 1992; Dweck, 2016, Ryan & Deci, 2020). Therefore, it was important to explore the differences between students with and without learning challenges before they started the assessment and after completing the assessment. The statements related to competence were:

Before completing the assessment:

- I am satisfied with my performance at school (IMI)
- I think this activity might be difficult.(R-)

After completion of the assessment:

- This activity was difficult
- I better understand how I learn

The mean rank of these questions for students with learning challenges were lower than the mean rank for students without learning challenges before and after completing the assessment. Prior to completing the assessment, a practically significant difference was also found in the competence related statements between students with and without learning challenges. This was not surprising given that perceived competence tended to be less fulfilled by students with learning challenges. Deci et al. (1992) indicated it might be possible to move students' behaviors from extrinsically to intrinsically motivated actions and increase students' perceived competence by providing students with the opportunity to master experiences. The responses regarding the student's perceived level of difficulty of each topic in the assessment might make it easier for teachers to identify a student's perceived competence and an appropriate starting point with gradual mastery experiences.

Upon completion of the assessment, the gap narrowed for the statements related to perceived competence. There was no significant difference between students with and without

learning challenges in ‘perceived difficulty’ and a statistically significant difference for ‘learn best’. This meant that completion of the assessment might have had a larger impact on students with learning challenges than students without learning challenges. The revised flow of assessment questions from easier to more difficult might have accounted for this change of perceived competence. Regardless of students’ ability level, prior to completing the assessment; more students (44%) thought the assessment would be difficult than students who actually reported it was a little or very difficult (10%). These outcomes mirrored Dweck’s (2016, Dweck & Yeager, 2019; Yeager & Dweck, 2020) fixed mindset theory which proposed that individuals who believed their abilities could not change might avoid difficult tasks for fear of failing. The next theme focused on developing student-directed learners through autonomous voice and choice.

Developing Student-Directed Learners through Autonomous Voice and Choice.

Students were provided two statements before completing the assessment about their existing opportunities to express their views and have a choice in learning.

- I can choose some of the assignments and work I do in class
- I am able to express my own views in my classes

Upon completion of the assessment, students also responded to statements about the importance of having choice and being able to express their views.

- It was important to be able to choose strategies that may work for me.
- It was important for me to express my views to my teacher.

Although 80% of students reported it was important to be able to express their views in class, only 28% reported having the current ability to do so. Similarly, 86% agreed or strongly agreed it was important to be able to have choice in their learning strategies, yet only 34% agreed or

strongly agreed that they were able to choose assignments and work they do in class. These outcomes aligned with the perspectives of some teachers in this study who expressed it was important to provide choice but only under specific circumstances. The results of my study also mirrored Gross et al. (2018) study which found that only 30% and 22% of middle and high school teachers respectively allowed their students to set their own learning goals at least half of the time. Limiting student choice might stifle the need for autonomy for students with and without learning challenges.

In my study, a significant difference was found between students with and without learning challenges on the autonomy related statements prior to completion of the assessment. This suggested that the assessment might have had a larger impact on students with learning challenges than those without learning challenges. Therefore, it was important to continue to find ways to provide choice and actively involve students in their learning. The CASEL program illustrated success in actively involving students in the development of their learning profiles (CASEL, 2020). This was achieved by first increasing students' awareness of their strengths, interests and learning preferences, and enabling students to make choices in their learning which complemented their profiles.

Students in my study were also provided a choice of selecting learning strategies they felt might be helpful. Teachers indicated these strategies were effective and could be utilized with individual students as well as the entire class. However, some teachers were concerned about too much unstructured choice and that some strategies might not be practical to implement. In contrast, Rogers argued that providing students with more choice did not minimize teachers' role, as teachers still needed to educate students on how to become self-directed learners (Rogers, 1969). In *Freedom to Learn*, Rogers (1969) suggested teachers might trigger intrinsic motivation

by promoting student self-direction. According to Rogers (1969), this could be achieved with teacher-student contracts where students negotiated with the teacher about what and how they would like to learn. The teachers in my study expressed similar perspectives when recognizing that each student's learning plan could be implemented into actionable strategies. The concept of actionable learning plans would encourage students to also have more voice or advocacy in their learning. It was also important that students and teachers understood that students simply selected potential strategies, but teachers would make the final decision about which strategies could be implemented within the class. Prior to implementation, goal setting needed to take place.

Despite the importance of goal setting, two skills related to goal setting (meta cognition and/or goal directed) appeared as challenges on 37 out of 67 of the students' learning plans in the first and second testing cycles. As a result, the goal setting module was refined to provide students with explicit instruction in how to set SMART goals. Goal setting was also a fundamental component of the self-regulated learning theory (SRL) which proposed that meta cognitive skills such as goal setting and planning had to be developed before students could become self-directed learners (Jossberger et al., 2010; Saks and Leijen 2014; Zimmerman, 2002). Both Voskamp et al (2022) and Granberg et al (2021) studies illustrated the practical development of SRL skills for grade seven and eight students.

In addition to the text-based assessment questions, students also expressed their views through oral expression activities. Based on the comments recorded, students seemed to appreciate the opportunity for this alternate method of expression, especially those who struggled speaking in larger groups. Based on students' varying comfort levels of oral expression, the assessment provided the option for students to express themselves any way they wished (ie,

music, art, video, Tik Tok, writing, rap). Providing students with choice and voice to become student-directed learners would not absolve teachers from their roles as facilitators; especially with students who may have a lower level of perceived competence. However, it might save teachers time in supporting the diverse needs of all students in large class sizes. The final theme for the second testing cycle was exploring the impact of total motivation in relation to extrinsic and intrinsic motivation.

Impact of Motivation in Relation to Extrinsic and Intrinsic Motivation. In addition to testing each of the three individual psychological needs of motivation, I also wanted to explore the impact on extrinsic and intrinsic motivation. The study found that students in both the first and second testing cycles were initially more extrinsically than intrinsically engaged in completing the assessment. This assumption was based on the favorable reactions to receiving external rewards based on students' free format comments at the end of assessment. Upon completion of the assessment, the post-assessment survey feedback seemed to indicate some movement towards intrinsic motivation, especially with students in the first cycle who reported how much they enjoyed learning about themselves. Despite this movement towards intrinsic motivation, only 53.5% of students in the second cycle reported they would still enjoy the experience without the external motivators of puzzles, coins and rewards. Teachers shared mixed views in relation to supporting intrinsic or extrinsic motivational sources but generally they agreed an appropriate balance could be beneficial. These perspectives mirrored Bear et al's (2017) study which found that the common use of external rewards did not negatively impact intrinsic motivation; but rather performance was enhanced by a balance of extrinsic and intrinsic motivators.

I continued to discover meaningful insights from the second testing cycle in relation to my prior learnings from the first testing cycle and alignment to my research questions.

Conclusion

The major differences between the first and second testing cycles were the diversity of participants and the correlational testing between students with learning challenges and students without learning challenges. In all the independent tests, students with learning challenges had lower mean ranks than students without learning challenges. Before students completed the assessment, significant differences were also found for all variables except 'relatedness'. This indicated 'relatedness' might have as much impact on motivation for students with and without learning challenges. After students completed the assessment, there were not any significant differences found between students with and without learning challenges. These results suggested a narrowing of the gap of the impact of motivation between students with and without learning challenges upon completing the assessment. In the second testing cycle, teacher feedback was like the first testing cycle in relation to teachers' perceptions of the learning plan, learning strategies and class profile helping teachers to build holistic student relationships and support student autonomy. However, in the second testing cycle, teachers had mixed views about the frequency and type of choice that should be provided to students. Some teachers were concerned that some strategies could not be practically implemented when giving everyone a choice all the time. Yet, other teachers expressed that choice would enhance students' self-regulated and self-directed learning skills, making students more accountable through teacher guided goal setting. Teachers continued to also have mixed views about using externally motivating sources, contrary to over half of the students reporting that external rewards were a motivating factor in completing the assessment. Based upon these findings as well as evidenced based research (Bear et al, 2017; Zimmerman, 2002), I concluded that a balance of extrinsic and intrinsic sources could be beneficial for students at least until students had developed some self-directed learning skills.

After completing the second cycle, I collected sufficient data from the teachers' interviews to respond to my second and third research questions pertaining to teachers' perception of the effectiveness of the assessment. However, in order to finish responding to my first research question about the impact of the assessment on students' motivation, I needed to complete a third testing cycle.

Chapter 8 - Third Testing Cycle

In the first and second testing cycles, I was able to determine the impact of motivation between students with and without learning challenges at different points in time before completing the assessment and after completing the assessment. However, since the students responded to different statements before and after completing the assessment, this limited my ability to determine the effect of completing the assessment for each individual student. Therefore, I completed a third testing cycle using paired within-group tests to finish answering my first research question:

- How does the implementation of a student-directed assessment for learning approach impact the motivation of students with and without learning challenges based on the self-determination theory?
 - Impact on relatedness by building holistic student-teacher relationships
 - Impact on choice of learning and student-directed learning
 - Impact on students' perceived competence

I had two objectives for the third cycle, 1) To test transferability of my research, and 2) To determine the impact on motivation after students completed the assessment as illustrated in Table 39. I started by considering the factors of transferability.

Table 39

Phase 3- Third Testing Cycle

		Research Process
Phase 3	Design and Construction	<p>Objective of third iterative cycle of testing</p> <ul style="list-style-type: none"> ● Test transferability of research ● Within group paired test of impact of motivation on students with and without learning challenges <p>Process</p>

- Implement assessment
- Participant formative feedback (pre and post study survey; teacher interview)
- Analyze feedback
- Refine intervention

Transferability referred to using the assessment with varying sample sizes, demographics, and other environmental factors. To validate the transferability of my research beyond the participants in the first and second testing cycles, I needed to continue testing the assessment in a variety of environments with diverse participants. More importantly, I had to test the impact of motivation upon completion of the assessment ‘within the same group’ of students. I also wanted to consider students with and without learning challenges from multiple grade levels and environmental settings. However, I did not need any teacher participants for the third cycle.

Recruitment

I recruited students from any type of educational or community organization between grades 5-10. The organizations invited the students via parents by emailing parents an invitation (Appendix AG). An information letter was sent to parents and students (Appendix AH). Consent and assent were implicit based on automatic completion of the assessment online, so signed returned forms were not required. The student criteria and tasks have been outlined in the parent information letter (Appendix AH). A total of 32 students ($n=32$) participated in the third cycle. After the participants were recruited, the next step was to conduct the testing and collect data.

Data Collection

Student data was collected through the completion of the assessment and a pre-study and post-study survey (Appendix AI). Pseudonyms were used to ensure confidentiality of data collected. In addition, students had the option to use Avatar or first names only when completing the assessment.

Findings

To respond to my first research question, I needed to determine the impact of student motivation within the same students before and after each “individual” student completed the assessment.

The within-group tests included three types of groups;

- 1) All students as one group
- 2) Students with learning challenges and students without learning challenges.
- 3) Students in three different grade levels (junior elementary- grade 5/6, senior elementary- grade 7/8, high school- grade 9/10).

Within Group Testing

Within group tests measured the change of a variable within the same individual or group based upon the implementation of an intervention. One way to test transferability of the holistic assessment was to measure the change in ‘perceived student motivation’ prior to and upon completion of the assessment. This was completed by having participants respond to the same pre- and post-test statements. The only difference between each statement was that the post survey statement was precluded with “after completing this activity” and focused on perception as illustrated in Appendix AI. This pre- and post-test comparison was completed to compare all students as well as students within different grade and ability level groups. In the third cycle, I reduced the likert scale from five items (strongly agree, agree, neither agree or disagree, and strongly disagree) to three items (agree, neither agree nor disagree, disagree). I made this decision for two reasons. First, I often combined the ‘agree/strongly agree’ and ‘disagree/strongly disagree’ responses when reporting my data in the previous cycles, so the extra layer of strongly agree or strongly disagree did not seem necessary. Secondly, a three-item scale might simplify the

assessment for the students especially if they had difficulty determining the difference between agree and strongly disagree or disagree and strongly disagree. I started the analysis of my within group testing with the results of all students regardless of ability or grade level.

Individual Variable Paired Tests of all Students

A frequency test was first completed on each of the seven motivational variables for all students before and after completing the assessment as noted in Table 40.

Table 40

Frequency on Individual Variables all Students- Prior to and upon Completion of Assessment

	Before the Assessment				After the Assessment		
	Disagree	Neither Agree nor Disagree	Agree		Disagree	Neither Agree nor Disagree	Agree
Teacher Cares	15.6	18.8	65.6		0.0	15.6	84.4
Interests	28.1	21.9	50.0		6.3	25.0	68.8
Choice	18.8	37.5	43.8		0.0	9.4	90.6
Express Views	21.9	18.8	59.4		3.1	18.8	78.1
Satis Performance	12.5	12.5	75.0		6.3	9.4	84.4
Difficulty of Activity	12.5	40.6	46.9		3.1	46.9	50
Learn Best	18.8	28.1	28.6		6.3	15.6	78.1

The number of students who agreed with each statement increased in all variables from before to after completing the assessment. The largest increase was found in the variable, 'learn best'. Prior to the assessment, only 28.6% of students ($n= 9$) reported they knew how they learned, and upon completing the assessment, 78.1% ($n= 25$) indicated they knew how they learned. Large increases were also noted in the two variables related to autonomy; express views and choice. Prior to completing the assessment, only 43.8% of students ($n= 14$) reported they had the option to choose learning strategies that work for them in class, but upon completing the assessment, 90.6% of students ($n= 29$) indicated that during the assessment they were provided the option to choose

learning strategies that may work for them. In relation to expression of views, prior to completing the assessment, 59.4% of students ($n= 19$) believed they had the opportunity to express their own views in class, then after completing the assessment, 78.1% ($n= 25$) indicated they were able to express their own views during the assessment. The last variable with a notable increase was “teacher cares”; prior to the assessment, 65.6% of students ($n= 21$) reported believed their teacher understood and cared about them as a person and this increased to 84.4% of students ($n= 27$) who believed the information from this assessment would help their teachers understand and care about them as a person. I next conducted a paired test to determine the relationship of these variances. Since the data was not normally distributed, I used a nonparametric paired test; Wilcoxon signed-rank test in Figure 41.

Figure 41

Individual Variables on all Students- Prior to and upon Completion of Assessment

	Teacher Cares	Interests	Choice	Express Views	Satisfactory Performance	Perceived Difficulty	Learn Best
z	-2.299	-1.941	-3.466	-2.443	-1.058	-1.076	-2.007
Asymp sig. (2 tailed)	.022	.052	<.001	.015	.290	.282	.045

- Wilcoxon Signed Ranks Test
- Based on negative ranks

Significant differences were found between the pre and post assessments for the individual variables teacher cares ($z= -2.299, p= .022$) with a medium to large effect size ($r= .46$), choice ($z= -3.466, p= <.001$) with a small effect size ($r= .108$), express views ($z=-2.443, p= .015$) with a medium to large effect size ($r= .432$) and learn best ($z= -2.007, p= .045$) with a medium effect size ($r= .355$). No significant differences were found for the variables; satisfactory performance ($z= -1.058, p= .290$), difficulty of activity ($z= -1.076, p= .282$), and interests ($z=-1.941, p= .052$).

Relatedness, Autonomy and Competence - All Students

I next reviewed the free format comments that were aligned to the categories relatedness, autonomy, and competence for all students.

Student Free Format Responses. The first free formatted question aligned with relatedness. The responses to this question revealed three themes: teacher support, teachers' perception of students, and building better relationships. Listed below is the relatedness question, and examples of some of the responses within each theme.

Relatedness Question. *What other ways could the information from the learning plan impact your relationship with your teachers?*

Teacher support

- Student #18- "It can help the teacher accommodate to my unique needs and help me achieve my goal more efficiently"
- Student #21- "Well I could tell my teachers so they could know where I am most comfortable and at my best in class. This could ensure that the teacher doesn't assume I am slacking off or disrupting the class"

Teachers' perception of student

- Student #17- "Knowing why I couldn't get my work done"
- Student #24- "It would help them understand me better"
- Student #28- "I think that my teacher would see that I'm more excited about school and I'm more motivated to do work"

Building better relationships

- Student #16- "We could have a better relationship because I won't be stressed since I know what I'm doing"

The question related to competence included responses under two themes: understand how I learn and improve specific learning skills. The question and examples of some of the responses in each theme are listed below.

Competence Question. *How could the information collected help you improve any academic challenges you have?*

Understanding how I learn

- Student #15- “Help me better understand my weaknesses so I can get more informed help”
- Student #16- “Now I know that I learn well visually so that could help me improve”
- Student #18- “It helps me understand myself more, and provides me with ways to overcome these challenges rather than to just give up”
- Student #19- “While it alerts me of my weaknesses, they were all things I am aware of and have been working around for years”
- Student #21- “Before I wasn't too sure about what I struggled with in school but now that I have the information to tell me what my strengths and weaknesses in school, and I feel like I can improve and learn more”

Improve specific learning skills

- Student #17- “By keeping track of tasks”
- Student #28- “It made me feel happy and it really helped for memorizing reading and writing”

In relation to the question about autonomy, most students reported they “didn’t know” or “they weren’t sure”. However, a couple of other answers related to the appreciation of having the option. Below is the question, and examples of the responses.

Autonomy. *How could this experience provide you with more choice in your learning?*

- Student #15- “I’m not sure”
- Student #20- “I don’t know”
- Student #21- “I have more options that I've learned I can get from the information about me too”
- Student #28- “It definitely made me feel like I could choose the answer because there are multiple answers”
- Student #29- “I really don’t know”

Table 42 provided a summary of the within-group outcomes for all students as a collective group. Next, I conducted within-group tests for students with and without learning challenges.

Table 42

Impact of Motivation for all Students - Prior to and after Completing Assessment

Paired Tests Results - All Students
Teacher Cares- practical significant difference (Medium to large effect size)
Interests- no significant difference
Choice- statistical significant difference (Small effect size)
Express views- practical significant difference (Medium to large effect size)
Satisfactory Performance- no significant difference
Difficult activity- no significant difference
Learn best- statistical significant difference (Medium to large effect size)

Paired Tests - Students with and without Learning Challenges

Individual Motivational Needs- by Ability Level. I started with frequency tests of how

often students with and without learning challenges responded to each of the seven individual variables before and after completing the assessments as illustrated in Table 43 and Table 44.

Table 43

Frequency of Individual Motivational Needs - Pre-Assessment

	Learning Challenges	No Learning Challenges
	Mean Rank	Mean Rank
Teacher Cares	14.64	17.02
Interests	14.00	17.00
Choice	12.36	17.66
Express Views	13.07	17.46
Satis Performance	16.50	16.50
Difficulty of Activity	15.79	16.70
Learn Best	11.5	17.90

Table 44*Frequency of Individual Motivational Needs - Post-Assessment*

	Learning Challenges	No Learning Challenges
	Mean Rank	Mean Rank
Teacher Cares	14.43	17.08
Interests	14.36	17.10
Choice	15.71	16.72
Express Views	12.86	17.52
Satis Performance	14.0	17.20
Difficulty of Activity	17.86	16.12
Learn Best	15.71	16.72

The mean ranks for students with learning challenges were consistently lower than the mean ranks of students without learning challenges in all variables prior to and after completing the assessment, except the post-test score of the variable ‘difficulty of activity’. I continued to complete a within-group paired test for each of the seven individual variables for students with and without learning challenges.

Paired Tests by Ability Levels

Since the data was not normally distributed, a Wilcoxon Rank test was used to measure the effect on the individual variables before and after students with and without learning challenges completed the assessment as illustrated in Figure 45.

Figure 45*Individual Variables by Ability Levels - Prior to and upon Completion of Assessment*

2 Ability Groups	Teacher Cares	Interests	Choice	Express Views	Satisfactory Performance	Perceived Difficulty	Learn Best
Learning Challenges							
z	-1.134	-1.342	-2.070	-1.342	-.816	-1.414	-2.121
Asymp sig. (2 tailed)	.257	.180	.038	.180	.414	.157	.034
No Learning Challenges							
z	-1.994	-1.554	-2.804	-2.070	-1.732	-.676	-1.103
Asymp sig. (2 tailed)	.046	.120	.005	.038	.083	.499	.270

- Wilcoxon Signed Ranks Test
- Based on negative ranks

Individual Variables Paired Tests- Students with Learning Challenges. Significant differences were found for students with learning challenges for choice ($z = -2.070, p = .038$) with a medium effect size ($r = .365$), and learn best ($z = -2.121, p = .034$) with a medium effect size ($r = .375$). No significant differences were found for students with learning challenges for teacher cares ($z = -1.134, p = .257$), satisfactory performance ($z = -.816, p = .414$), difficulty of activity ($z = -1.414, p = .157$), expression of views ($z = -1.342, p = .180$), and interests ($z = -1.342, p = .180$).

Individual Variables Paired Test- Students without Learning Challenges. Significant differences were found for students without learning challenges for teacher cares ($z = -1.994, p = .046$) with a medium effect size ($r = .352$), choice ($z = -2.804, p = .005$) with a large effect size ($r = .495$), and expression of views ($z = -2.070, p = .038$) with a medium effect size ($r = .365$). No significant differences were found for students without learning challenges for satisfactory performance ($z = -1.732, p = .083$), difficulty of activity ($z = -.676, p = .499$), interests ($z = -1.554, p = .120$), and learn best ($z = -1.103, p = .270$).

A summary of the results of the impact of motivation on students with and without learning challenges prior to and after completing the assessment is detailed in Table 46. I next conducted paired tests with students of different grade ranges.

Table 46

Impact of Motivation within Ability Level - Prior to and after Completing Assessment

	Paired Tests Results
Individual Motivational Needs Students with Learning Challenges	Teacher Cares- no significant difference Interests- no significant difference Choice- statistical significant difference (medium effect size) Express views-no significant difference Satisfactory Performance- no significant difference Difficult activity- no significant difference Learn best- statistical significant difference (medium effect size)
Individual Motivational Needs Students without Learning Challenges	Teacher Cares- statistical significant difference (medium effect size) Interests- no significant difference Choice- practical significant difference (large effect size) Express views- statistical significant difference (medium effect size) Satisfactory Performance- no significant difference Difficult activity- no significant difference Learn best- no significant difference

Paired Tests - by Grade Levels

The final group of paired tests were completed for students within varying grade ranges: junior elementary-grade 5/6, senior elementary- grade 7/8; high school- grade 9/10. Wilcoxon Signed Ranks was used to analyze the individual variables (teacher cares, interests, choice, expression of views, satisfactory performance, perceived difficulty and learn best) before and after students in different grade levels completed the assessment as illustrated in Figure 47.

Figure 47*Impact of Individual Variables by Grade Range Level*

3 Grade Groups	Teacher Cares	Interests	Choice	Express Views	Satisfactory Performance	Perceived Difficulty	Learn Best
Junior Elementary							
z	-.577	-.577	-1.300	-1.518	-.447	-1.342	-1.265
Asymp sig. (2 tailed)	.564	.564	.194	.129	.655	.180	.206
Senior Elementary							
z	-2.271	-2.333	-2.271	-1.857	-.756	-1.000	-.966
Asymp sig. (2 tailed)	.023	.020	.023	.063	.450	.317	.334
High School							
z	0	-1.443	-2.714	-.577	-.447	-.276	-1.633
Asymp sig. (2 tailed)	1.0	.149	.007	.564	.655	.783	.102

Wilcoxon Signed Ranks Test
Based on negative ranks

Junior Elementary Grades. No significant differences were found in junior elementary grades for any of the individual variables: teacher cares ($z = -.577$, $p = .564$), interests ($z = -.577$, $p = .564$), choice ($z = -1.300$, $p = .194$), express views ($z = -1.518$, $p = .129$), satisfactory performance ($z = -.447$, $p = .655$), perceived difficulty ($z = -1.342$, $p = .180$), and learn best ($z = -1.265$, $p = .206$).

Senior Elementary Grades. Significant differences were found for students in senior elementary grades in teacher cares ($z = -2.271$, $p = .023$) with a medium to large effect size ($r = .401$), interests ($z = -2.333$, $p = .020$) with a medium to large effect size ($r = .412$) and choice ($z = -2.271$, $p = .023$) with a medium to large effect size ($r = .401$). No significant differences were

found in the other variables: express views ($z = -1.857, p = .063$), satisfactory performance ($z = -.756, p = .450$), perceived difficulty ($z = -1.000, p = .317$), and learn best ($z = -.966, p = .334$).

High School Grades. A **significant difference** was found for high school students in choice ($z = -2.714, p = .007$) with a medium to large effect size. No significant differences were found in the other six variables: teacher cares ($z = 0, p = 1.0$), interests ($z = -1.443, p = .149$), express views ($z = -.577, p = .564$), satisfactory performance ($z = -.447, p = .655$), perceived difficulty ($z = -.276, p = .783$), and learn best ($z = -1.633, p = .102$).

A summary of the outcomes of the impact of motivation on students in junior elementary, senior elementary and high school grade levels prior to and after completing the assessment is outlined in Table 48. I next moved to a discussion of all the paired tests in the third testing cycle.

Table 48

Impact of Motivation Within Grade Levels- Prior to and after Completing Assessment

	Paired Tests Results
Junior elementary	Teacher Cares- no significant difference Interests- no significant difference Choice- no significant difference Express Views- no significant difference Satisfactory Performance- no significant difference Perceived Difficulty- no significant difference Learn Best- no significant difference
Senior elementary	Teacher Cares- practical significance difference Interests- practical significance difference Choice- practical significance difference Express Views- no significant difference Satisfactory Performance- no significant difference Perceived Difficulty- no significant difference Learn Best- no significant difference

High school	Teacher Cares- no significant difference Interests- no significant difference Choice- practical significant difference Express Views- no significant difference Satisfactory Performance- no significant difference Perceived Difficulty- no significant difference Learn Best- no significant difference
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Discussion of Impact of Motivation with Paired Tests

The first objective of the third testing cycle was to test the transferability of the assessment within different ability and grade levels in varying environments. A total of 32 students participated in the study including; students with learning challenges ($n= 7$) and students without learning challenges ($n= 25$). The purpose of the paired “within group” tests was to compare differences in the impact of motivation before and after students completed the assessment. I further analyzed the testing by 1) all individual students 2) students’ ability - students with and without learning challenges, and 3) grade level ranges- junior elementary, senior elementary and high school.

Impact of Motivation for all Students. Prior to completing the “within group” tests, I conducted frequency tests to identify the percentage of all students that “agreed” with each of the individual motivational needs statements prior to and after completing the assessment. The percentage of students who agreed with the seven statements increased from before starting the assessment to after completing the assessments. The most substantial changes were found in the variables; ‘teacher cares’, ‘choice’, ‘express views’, and ‘learn best’. These outcomes aligned with the results of the Wilcoxon Signed Ranks tests. In the Wilcoxon Signed Ranks tests, there were no significant differences found on the variables; interests, satisfactory performance, and difficulty of

activity. However, there were significant differences found on the individual variables; ‘teacher cares’, ‘choice’, ‘express views’, and ‘learn best’. Further, medium effect sizes were found in the variables; ‘teacher cares’, ‘express views’, and ‘learn best’ but only a small effect size for ‘choice’. The significant differences in the variables ‘choice’ paralleled the outcomes from the student survey in my first phase of research where more than 81% of students reported it was important to have a choice in their learning yet less than 18% of students were provided a choice of learning in Math or Language Arts. Seventy-five percent of students in the student survey also indicated they would be very interested in having more choice in learning if the opportunity was presented. Applying the principles of UDL into the curriculum might be one method of explicitly enabling more opportunities for all students with and without disabilities to express their views, receive information the way they learn best and have more choice in learning (CAST, 2024). I next explored the impact of motivation on three psychological needs of the self-determination theory, relatedness, competence, and autonomy using free format student comments at the end of the assessment.

Students were asked how they perceived their need for relatedness, autonomy and competence might have been impacted upon completing their assessment. The most substantive comments aligned with the student’s needs for relatedness. Students perceived that the information from the assessment might help their teachers understand who they really were instead of having an existing negative perception. The students also indicated that the teacher might be able to support them better, now that they know what the students need. In relation to competence, students reported that they better understand themselves and how they learned as a result of completing the assessment. Students also reported that once they knew how they learned, it was easier for them to improve their learning skills. In relation to autonomy, there

were less free format comments reported. Those who did respond to the autonomy-related question did not seem to know how their need for autonomy might be impacted after completion of the assessment. These students might not have fully developed their self-regulated learning skills yet to become autonomous learners. However, Granberg et al's (2021) study illustrated the positive change that could take place in perceived autonomy and motivational beliefs when a teacher explicitly taught his grade seven students SRL during a series of math lessons.

The outcomes measuring the collective experience of all students suggested that the assessment could have a positive impact on motivation for all students regardless of their ability or grade levels when students' needs for autonomy, relatedness, and competence were satisfied. An example of this application was also illustrated in Basham's (2016) study when teachers actively involved students in the development of their learning plans and teachers used the student's strengths, interests, needs and learning preferences to personalize their instruction. However, Davis (2017) and Herald (2017) were more critical of student involvement, especially in the absence of a teacher who was still considered the content expert of curriculum content. Although autonomy was provided throughout students' completion of the holistic assessment in my study, collaboration was required with the student and teacher about the final strategies with the teacher having the final say about what strategies would be implemented. After analyzing the impact of motivation on all students, I separately reviewed the impact on students with learning challenges and students without learning challenges.

Impact of Motivation for Students with and without Learning Challenges.

Individual motivational needs. I started by examining the frequency students with and without learning challenges responded to each of the seven individual variables before and after they completed the assessment. The mean ranks for 6 out of 7 individual variables were lower

for students with learning challenges than students without learning challenges before and after completing the assessment. The largest differences between the responses of both groups were found in the statements related to expressing one's own views, having choice in learning, and understanding how students learned best prior to completing the assessment. This implied that prior to completing the assessment, students with learning challenges might have been less motivated in school than students without learning, particularly in fulfillment of autonomy needs and understanding how they learned. Yet the gaps between the two groups narrowed upon completion of the assessment with an increase in mean rank for students with learning challenges for the statements related to 'expressing own views' and understanding how students 'learned best'.

This perspective mirrored the views of teacher and tutor participants in Voskamp et al's (2022) study on the exploration of self-regulated and self-directed learning. Although participants in the study had mixed views related to impact of motivation on students' self-regulated and self-directed learning skills, most participants perceived motivation had less to do with students' ability than opportunities to engage in interesting and challenging tasks. To determine the impact on motivation upon completion of the assessment for each of the separate groups of students with and without learning challenges, I conducted within group Wilcoxon Signed Ranks tests on each of the 7 questions related to motivational needs. Significant differences for students with learning challenges were found in the variables; 'choice' and 'learn best'. Further, there were medium effect sizes in these two variables. This paralleled the outcomes in the frequency tests on individual variables.

Significant differences for students without learning challenges were also found in the variable 'choice', as well as 'teacher cares' and 'express views'. There was also a large effect

size in 'choice' and medium effect sizes in 'teacher cares' and 'express views'. The literature also found that opportunities for choice and expression of views and teacher relatedness could positively impact the motivation for all students regardless of their ability levels, especially when considered together. One example was observed by Streb et al. (2015) which found that student engagement increased when teachers highlighted both autonomy (choice and expression of views) and relatedness. The need for choice could also be impacted by students' level of perceived competence. According to SDT (Rodgers et al., 2014; Ryan, 1982), a student might not desire choice (autonomy) if they feel they are unable to complete a task (competence).

The results for autonomy related statements paralleled the findings from the second testing cycle, which also noted a significant difference in autonomy between students with and without learning challenges. This suggested that prior to completing the assessment, students with learning challenges may have been less motivated than students without learning challenges, or their self-regulation learning skills might not have been developed yet. According to Zimmerman (2002, 2015), students' self-regulated learning skills were a factor of student motivation, and if these skills were not developed during the first phase (forethought) of the SRL process, students' self-efficacy and learning goal orientation could be compromised. This perspective was further maintained by teachers in Voskamp et al's (2022) study who perceived that student's motivation was impacted by students' self-regulated learning skills rather than the students' academic ability level.

The variable 'teacher cares' had a larger effect on students without learning challenges than students with learning challenges upon completion of the assessment. One reason could be related to the formal student-teacher relationships already established by students with learning challenges through the implementation of their IEPs. The assessment might have provided

students without learning challenges with an alternative format to also increase relationships with their teachers. The Ontario Ministry of Education (OME, 2013) attempted to initiate a student profile to help teachers enhance student relationships. However, more than half of the 8,230 secondary school students who completed an Ontario Student Trustees' Association (OSTA) (2018) survey about the use of these student profiles, perceived their teachers still did not understand their needs. These outcomes suggested that the completion of the assessment impacted the motivation of both students with and without learning challenges. The final analysis I completed was within students of different grade levels.

Impact of Motivation for Students by Grade Levels. Wilcoxon Signed Ranks tests were conducted on the individual motivational variables for students in junior elementary, senior elementary and high school grade levels prior to and after completion of the assessment. There were not any significant differences found in any of the variables for elementary grades. This suggested that completion of the assessment might not have impacted the motivation of students in grades 5 and 6. In some school districts, the first transitional year starts from grade 5 to 6 but in others, the first transition starts from grade 6 to 7.

In contrast, practically significant differences with medium to large effect sizes were found in the variables 'teacher cares', 'interests' and 'choice' within the senior elementary grade range, which may be the first school transition for students progressing from grades 6 to 7. Therefore, the transitional experiences of this group might have accounted for the findings of this grade range. To address these transitional challenges, Kift et al. (2010) developed a pedagogical transition framework to strengthen students' cognitive skills. When using the framework, Uka and Uka's (2020) study on self-regulated learning found a positive relationship between student's transitional experiences, motivation, and self-regulated learning skills. The assessment

also impacted the need for relatedness for senior elementary students. A parallel relationship was found in the HBSC study (2016), where students' sense of belongingness or relationships with teachers found a significant decline from grade 6 - 10 in students' perception of the degree to which their teachers cared about them as a person.

A practically significant difference with a medium to large effect size was also found for the variable 'choice' for high school students in the paired tests. These findings implied that completion of the assessment had the greatest impact on senior elementary and high school students, specifically on autonomy related needs. This significant impact on autonomy was a trend revealed throughout all testing cycles, particularly for senior elementary and high school students. This supported Vygotsky (1986) beliefs that students might not have the maturity to develop specific metacognition skills to understand how they learned and become autonomous learners until adolescence. These findings also aligned with Jones and Khan (2017) research which found that social, emotional and cognitive demands could be impacting students during these transitional years from junior elementary to middle school or middle school to high school. Eccles and Roeser (2012) also proposed that the need for autonomy increased with age, yet teachers might have found it more challenging to implement autonomous strategies in the classroom in middle school and high school. However, there may also be other changes specific to the transition from senior elementary to high school. For example, only 20% of teachers in Gross et al. (2018) collaborative research study reported that they allowed their students to set their own learning goals at least half of the time. In addition, the study found high school students received fewer opportunities for self-directed learning than middle school students. These results were interesting given the higher maturity level involved, therefore, less choice in learning might also negatively affect students' need for autonomy.

Despite the significant findings for autonomy and relatedness, intrinsic motivation could only be triggered with the simultaneous fulfillment of all three needs; autonomy, relatedness, and competence (Rodgers et al., 2014; Ryan, 1982).

Conclusion

The purpose of the third cycle of testing was to explore the transferability of the assessment with a diverse population of students in varying environments. The within-group paired tests demonstrated significant differences in several individual variables for all students, students with and without learning challenges and students within varying grade levels. This implied that the completion of the assessment positively impacted students' motivation in multiple ways. Upon completion of the assessment, the collective group of all students seemed to be positively impacted by the individual motivational variables of 'teacher cares', 'choice', 'express views', and 'learn best'.

A positive impact on motivation was also found for students with learning challenges upon completion of the assessment in the motivational variables of 'choice' and 'learn best'. The motivation of students without learning challenges was impacted by the variable 'choice' and 'relatedness' and 'express views'. In relation to grade levels, the perceived motivation of senior elementary grades was most affected by the motivational variables, specifically, 'teacher cares', 'interests' and 'choice'. The completion of the assessment also had a positive impact on the motivation of high school in grade 9 and 10 in the need for 'choice'. In contrast, the motivation of students in the lower junior elementary grades was least impacted by the completion of the assessment. These outcomes suggested that the completion of the assessment might be transferable in increasing the motivation of students with and without learning challenges in the transitional years from grades 6-10. Upon completion of the three iterative cycles, the final phase of the DBR

process was evaluation and reflection, which has been detailed in chapter nine.

Chapter 9- Phase 3: Evaluation and Reflection

The final phase of the DBR process is called Evaluation and Reflection. This involves creating a draft framework of the assessment tool, designing principles, and designing the final tool as illustrated in Table 49. The process starts with a reflection of the key phases in the DBR process, specifically evaluating how the data in each of the testing cycles from chapters 6, 7, and 8 responds to each of my research questions.

Table 49

Phase 4- Evaluation and Reflection

Phase 3	Evaluation and Reflection	<ul style="list-style-type: none"> ● Draft framework of intervention ● Design principles ● Design final tool
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Throughout the testing cycles, the framework was consistently updated and refined based on the study results to respond to my research questions:

- How does the implementation of a student-directed assessment for learning approach impact the motivation of students with and without learning challenges based on the self-determination theory?
 - Impact on relatedness by building holistic student-teacher relationships
 - Impact on choice of learning and student-directed learning
 - Impact on students' perceived competence
- What are the perceptions of teachers about the usefulness of the student-directed assessment tool in helping teachers trigger student motivation through relatedness, autonomy, and competence?
- How do the student-directed assessment outcomes impact the teachers' identification of student holistic learning needs and strengths and the design of instructional strategies?

I first reflected on my first research question.

Reflection on Research Question 1

My first research question focused on the experiences of the students and most of the data was collected from pre and post study surveys before and after students completed the assessment tool.

Impact of Motivation on all Students

Before reviewing the impact of motivation on the three self-determination theory needs, I started with a review of total motivation on all students with or without learning challenges to answer the question:

- *How does the implementation of a student-directed assessment for learning approach impact the motivation of students with and without learning challenges based on the self-determination theory?*

I completed paired tests in the third cycle to determine the change in motivation before and after all students collectively completed the assessment. Tests were conducted within the individual motivational variables; teacher cares, interests, choice, express views, performance satisfaction, perceived difficulty, and learn best. Significant differences with medium effect sizes were found in ‘teacher cares’, ‘express views’, and ‘learn best’. A significant difference was also found in ‘choice’ however, the effect size was small as illustrated in Table 50.

Table 50

Paired Tests- Impact of Assessment Completion- All Students Individual Variables

	Teacher Cares	Interests	Express Views	Choice	Performance	Difficult Activity	Learn Best
All students							

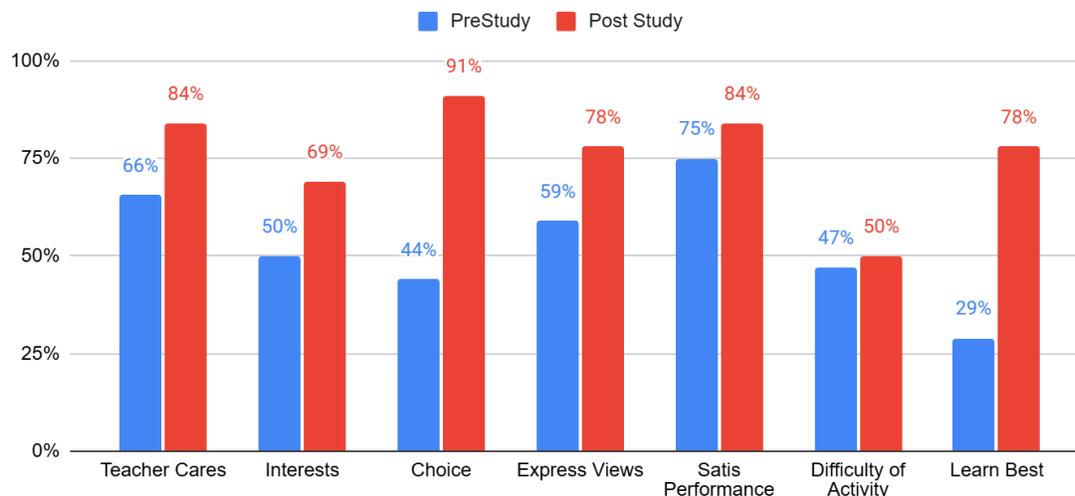
NOTE:  No significance Significant, Small Effect Significant, Medium Effect Significant, Large Effect

The percentage of students who reported they agreed with each individual variable prior to and upon completion of the assessment is illustrated in Figure 23.

Figure 23

Pre- and Post Test Motivation for all Students

All Students- Third Cycle- % Agreed with Motivation Statements



Based on these findings, I concluded that completion of the assessment increased the motivation of participants collectively in the third cycle of my study in some of the variables related to autonomy, competence, and relatedness. To determine if grade levels contributed to students' motivation upon completion of the assessment, a paired test was conducted with a summary of the significant results shown in Table 51.

Table 51*Grade Group Paired Tests- Impact of Assessment Completion*

	Relatedness		Autonomy		Competence		
	Teacher Cares	Interests	Express Views	Choice	Performance	Perceived Difficulty	Learn Best
Junior Elementary							
Senior Elementary							
High School							

NOTE:	No significance	Significant, Small Effect	Significant, Medium Effect	Significant, Large Effect

The largest impact of motivation was found in the senior elementary students (grades 7 and 8) with practically significant differences found in ‘teacher cares’, ‘interests’ and ‘choice’.

Completion of the assessment also positively impacted the need for ‘choice’ for students in high school with a practically significant difference. However, significant differences were not found in any of the motivational needs for elementary grade students. These outcomes implied that, although the motivation of all students (Table 50) was positively affected by the assessment tool, the assessment tool could be especially beneficial for students in the transitional years between grades 7 – 10 (Table 51). After responding to my first research question in relation to motivation for all students, I next reflected on the impact of motivation independently for students with learning challenges and students without learning challenges.

Impact of Motivation ‘Within’ Students with and without Learning Challenges

To determine the impact of motivation on completion of the assessment within each independently related group, I conducted paired tests before students started the assessment and

after they finished the assessment. A significant difference was found in some motivational variables (choice and learn best) for students with learning challenges, as well as students without learning challenges (teacher cares, choice, express views). Thereby, I was able to conclude that in addition to increasing the motivation of students collectively as one group, completion of the assessment also increased the motivation of students with learning challenges as well as students without learning challenges when analyzed as two separate groups. The next step was to review each of the three subsections of question #1.

Reflection on Subsections of Research Question #1:

I needed to determine how completion of the assessment impacted the motivation of students with and without learning challenges with respect to, 1) Relatedness with holistic student-teacher relationships, 2) Autonomy and choice in learning, and 3) Students' perceived competence.

Therefore, I started by creating a summary of the impact of motivation on the individual variables aligned with relatedness, autonomy, and competence in the second and third testing cycles as illustrated in Tables 52, 53, 54, and 55, and Figures 24 and 25. Table 52 illustrates the mean ranks, and Table 53 illustrates the level of significance of the individual variables between students with and without learning challenges in the second testing cycle.

Table 52

Second Testing Cycle - Between Ability Groups Mean Ranks- Prior to Assessment

<i>Mean Ranks</i>	Relatedness		Autonomy		Competence		
	Teacher Cares	Interests	Express Views	Choice	Performance	Perceived Difficulty	Learn Best
Challenges	27.83	24.67	20.74	29.57	18.43	18.17	N/A
No Challenges	23.81	26.10	28.95	22.55	30.64	30.81	

Figure 24

Mean Rank by Ability- Second Cycle Post-Study

Mean Rank by Ability- Second Cycle Pre-Study

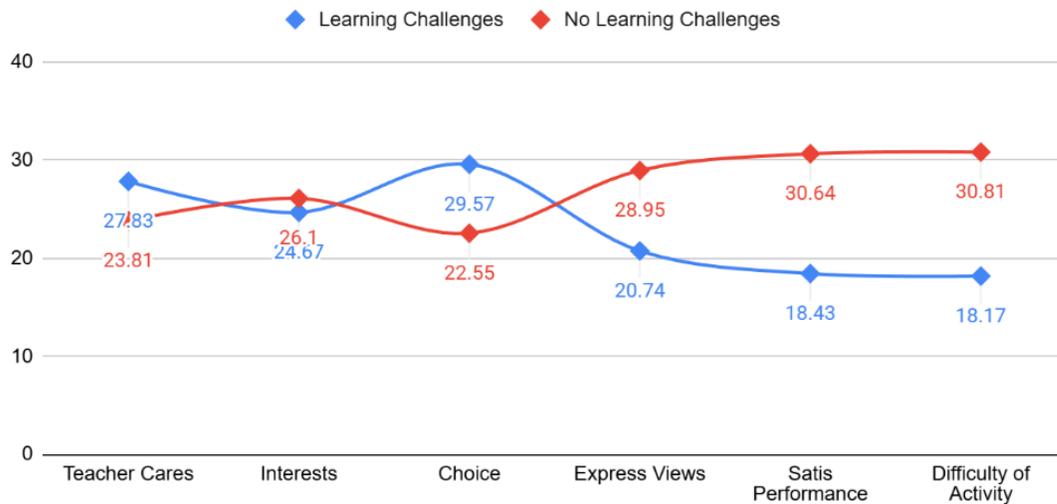


Figure 25

Mean Rank by Ability- Second Cycle Pre-Study

Mean Rank by Ability - Second Cycle Post-Study

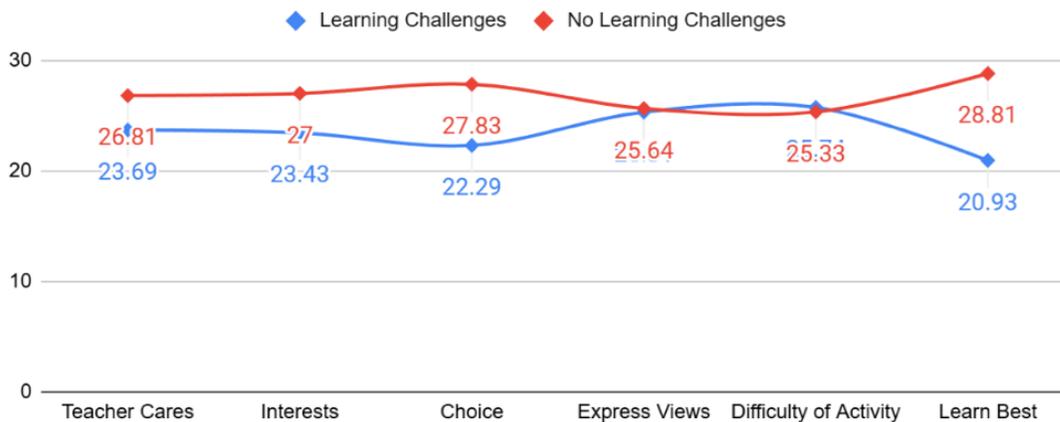


Table 53*Second Testing Cycle - Between Ability Groups-Level of Significance*

	Relatedness		Autonomy		Competence		
	Teacher Cares	Interests	Express Views	Choice	Performance	Difficult Activity	Learn Best
Pre Assessment							
Post Assessment							

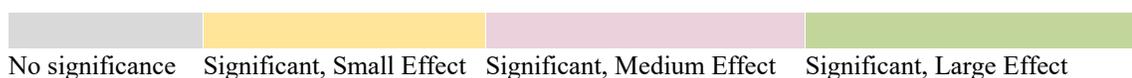
**NOTE:**

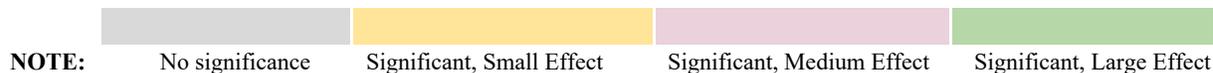
Table 54 illustrates the mean ranks, and Table 55 illustrates the significance of the individual variables within students with and without learning challenges in the third testing cycle.

Table 54*Third Testing Cycle- Within Groups Mean Ranks- Impact of Assessment Completion*

	Relatedness		Autonomy		Competence		
	Teacher Cares	Interests	Express Views	Choice	Performance	Difficult Activity	Learn Best
Challenges	14.64	14.00	13.07	12.36	16.50	15.79	11.50
No challenges	17.02	17.00	17.46	17.66	16.50	16.70	17.90

Table 55*Third Testing Cycle- Within Groups Significance- Impact of Assessment Completion*

	Relatedness		Autonomy		Competence		
	Teacher Cares	Interests	Express Views	Choice	Performance	Difficult Activity	Learn Best
Challenges							
No challenges							



Impact on Relatedness with Holistic Student-Teacher Relationships. The first part of research question #1 explored the impact on relatedness by building holistic student-teacher relationships. The mean rank for ‘teacher cares’ for students with learning challenges was lower than students without learning challenges in the third testing cycle (Table 54), yet higher in the second cycle (Table 52). Regardless, there were not any significant differences found in the relatedness variables in the second cycle independent tests between students with and without learning challenges (Table 53). However, a significant difference in the relatedness variable, ‘teacher cares’ was found for students without learning challenges in the third cycle paired test (Table 55) upon completion of the assessment.

Conclusion Impact of Relatedness. The outcome of relatedness suggested that completion of the assessment might only have impacted the need for relatedness for students without challenges and had limited effect on students with learning challenges. This could be related to student perspectives that some teachers already had preconceived biases about the students or may not have wanted to build student relationships as indicated by some of the students' comments (student 16, 21 and 28) in the post survey. Given my previous research highlighted the importance of relatedness for all students, I needed to consider more opportunities within the assessment to satisfy the need for relatedness for all students. The next part of research question #1 was the impact on autonomy and choice of learning.

Impact on Autonomy and Choice of Learning. The mean rank was lower for students with learning challenges than students without learning challenges for the variable ‘choice’ in the third testing cycle (Table 54) but higher in the second cycle (Table 52). Prior to completing the assessment in the second cycle, a significant difference was also found in ‘express views’ between students with and without learning challenges (Table 53). However, there was not a significant

difference in any of the autonomy variables between these groups upon completion of the assessment in the second cycle. This suggested the need for autonomy might have been equally satisfied by students with and without learning challenges upon completion of the assessment in the second cycle. Varying results were found on the paired tests in the third cycle (Table 55) within each group of students with learning challenges and without learning challenges. The paired test for students with learning challenges found a significant difference with medium effect sizes in choice (Table 55). Similarly, a significant difference, but with large effect size, was found in choice for students without learning challenges upon their completion of the assessment (Table 55). A significant difference with a medium effect size was also found in express views for students without learning challenges (Table 55).

Conclusion Impact of Autonomy. The need for autonomy seemed more fulfilled for students without learning challenges than students with learning challenges upon completing the assessment. One factor which might have accounted for the significant differences in autonomy could be the students' level of self-regulated learning. Some students might not have sought the need for autonomy or choice until they felt comfortable in how to make choices. The free format comments by some students (#15, 20, 29) indicated students may not know how to apply autonomy in their learning. Therefore, some students might have required more guidance from teachers or a stronger level of relatedness to satisfy their need for autonomy. Despite the differences in autonomy, the overall results of my study suggested that the completion of the assessment might be able to satisfy the need for autonomy to some degree for all students, with or without learning challenges. Hence, in addition to providing students with a choice in the assessment strategies, I also needed to embed more instruction or guidance on how to implement the assessment strategies. The third part of research question #1 explored the impact on students'

perceived competence.

Impact on Students' Perceived Competence. To measure perceived competence, independent tests were again completed in the second cycle between both groups of students with and without learning challenges. The largest mean rank gaps were found in the competency variables; satisfactory performance and difficulty of activity (Table 52). To determine the influence of completing the assessment, within group paired tests were also completed. The largest impact was noted in the "learn best" variable which found a significant difference and medium effect size within students with learning challenges (Table 55). The 'learn best' variable measured the students' perception of how they learned best. Several free formatted comments in the three testing cycles suggested that students enjoyed learning about themselves and how they learned best.

Conclusion Impact of Competence. According to Zimmerman (2002), perceived competence could be increased when students understood how they learned and what could be impacting their learning. Based on the outcomes of perceived competence, it was important for me to continue educating students about how they learned in the assessment. It might also be beneficial to continue enabling students to share their learning plans and assessment outcomes with individuals who supported them including their teachers, tutors, parents, or any other support person. Hence, the next two research questions focused on teachers' perceptions of the effectiveness of the assessment resources in supporting the diverse needs of students.

Reflection on Research Question 2

My second research question explored the effectiveness of the assessment tool in helping teachers trigger student motivation through relatedness, autonomy, and competence:

- *What are the perceptions of teachers about the usefulness of the student-directed assessment tool in helping teachers trigger student motivation through relatedness, autonomy, and competence?*

In the first testing cycle, teachers shared their views of how the assessment could help them 1) build student relationships and 2) provide more choices to support autonomy and 3) increase perceived competence.

Building Student Relationships. In the first testing cycle, teachers expressed that the learning plan and class profile could help them enhance their relationships with all students due to the type of personalized content provided. The teachers also reported that the holistic information about students' strengths, interests, and learning preferences could help them gather information they would not be able to normally access so readily and help them support meaningful conversations with students. They also suggested additional information that could be considered to help teachers understand the student's home life or experiences outside the classroom.

Supporting Autonomy. There were a few sections in the assessment where students could openly express their views through audio recordings and free formatted questions. The teachers appreciated the opportunity to hear directly from the student. The teachers indicated that student voice was critical in increasing motivation and promoting accountability and self-directed learning. During the second testing cycle, teachers continued to provide similar feedback as in the first cycle about autonomy; especially the importance of offering choice in learning. However, teachers had mixed views about the frequency and amount of choice that should be provided to students. Responses varied from always providing choice to only providing choice in specific circumstances because it might be difficult to implement all the time.

Increase Perceived Competence. In the second testing cycle, teachers commented that the

information about students' challenges on the learning plan and class profile could help them easily identify what students need and how to support them. Teachers perceived that the oral expression audio files might help in hearing from students who may not generally ask for support in a classroom setting.

Total Motivation. In relation to motivation, teachers appreciated the information on the learning plan and class profile about how students were motivated, and teachers reported this information could guide them on how to enhance student motivation. Some teachers also expressed how engaged the students were in completing the assessment and how much they enjoyed the external rewards. However, other teachers cautioned the importance of providing a balance of extrinsic and intrinsic rewards due to the potential short-term effects of the rewards and potential dependency on external rewards to complete tasks.

Conclusion Research Question 2. Based on the information collected in the teacher interviews, the teachers expressed a variety of ways the holistic assessment could help them support students' motivation through relatedness, autonomy, competence, and overall motivation. All teachers found benefits in the information received from the learning plans and class profile. In fact, some had additional suggestions to make the information even more robust. They also shared views about how they might be able to support students' academic, social and emotional development with the information received. However, the mixed views expressed by teachers in the area of choice and motivational support required further review and analysis to increase the effectiveness of the assessment for all teachers.

One common theme expressed by the teachers was the time saving benefit of the resources, especially the ability to collect meaningful student data in a very short time which would normally take months to obtain. They also recognized the time saving benefits in

administering the assessment since it was student-initiated and required minimal supervision from teachers. However, this lack of supervision also resulted in an obstacle when some teachers provided too much autonomy and not enough guidance for the students. In order to address this issue, I had to consider environmental and technology issues in the assessment implementation process. I also considered the addition of an action plan component as suggested by some teachers to guide students in the implementation of their strategies while increasing accountability.

In addition to determining the effectiveness of the assessment on supporting students' motivation, I wanted to determine the effectiveness of the assessment in identifying and supporting students' needs.

Reflection on Research Question 3

My third research question explored the impact of the assessment in helping teachers identify the needs, strengths, and strategies to support students' holistic profiles. Teacher interviews were conducted to respond to my third research question.

- *How do the student-directed assessment outcomes impact the teachers' identification of student holistic learning needs and strengths and the design of instructional strategies?*

During the first testing cycle, teachers reported on the functionality of the assessment and if it could help teachers identify the diverse needs and strengths of students. Identifying student needs was completed through a review of each student's learning plan and the class profile. Teachers' initial reactions to the learning plan and class profile were the layout was easy to follow, and the quality of content was meaningful. They also appreciated the level of detail provided in the assessments so they could quickly determine each student's ability level in core Math and English topics and where students needed the most support. The teachers also reported on the

effectiveness of the learning plan and the recommended learning strategies aligned to each student's profile. The general feedback was that the learning plans were well aligned to the individual students' profiles. Teachers also perceived that the strategies provided additional instructional ideas that teachers could use for individual students as well as the entire class based on the principles of Universal Design for Learning (UDL). Despite these new ideas, teachers had mixed views of the practicality of some of the strategies, such as the "the option of 5-minute breaks". Some teachers indicated the information on students' strengths, interests, and talents could easily be embedded into the curriculum while others reported this may be difficult to do.

Conclusion Research Question 3. The feedback collected from the teacher interviews indicated that the assessment resources would be beneficial in helping teachers identify the learning needs of students and design instructional strategies to support the diverse needs. However, mixed views were shared on the effectiveness of the strategies. Therefore, ongoing review and measurement of the effectiveness of the strategies will be required to continue meeting the needs of all teachers.

The multi-phase DBR process also enabled refinement of most of the technical issues identified prior to each testing cycle. In addition to minor technical issues, a future version of the assessment will require more extensive technology features to ensure accessibility for all learners and to keep abreast of market demands. The final component of the fourth phase of the DBR process was the development and design of draft principles of the assessment tool.

Development of Draft Principles of the Holistic Assessment

The draft design principles in phase four of the DBR process instilled the transferability of the holistic assessment. In my study, a prototype of the assessment was initially designed in phase one, based on considerations from my literature review, commercialization consultation, and

student survey. The prototype was then tested and refined in three iterative cycles. This testing determined that the holistic assessment could have a positive impact on student's perceived motivation and may also be able to save time for teachers in identifying and supporting the diverse needs of students in inclusive classrooms. To support the transferability of the assessment in multiple settings, my draft principles were derived from the initial considerations of my prototype and the key findings from my testing cycles. These principles were also grounded on concepts of the self-determination theory and self-regulated learning since both had significant impacts to the assessment process and my final outcomes. I started by reviewing the initial considerations of the prototype.

Initial Considerations of the Prototype

In my initial design of the prototype, several factors focused on student-directed learning including; active student involvement in their learning, strength-based assessment approaches and student voice and choice in their learning needs. Another consideration included a balance of extrinsic and intrinsic sources to help students learn how they learn while rewarding them for their efforts. These factors included a combination of academic, cognitive, and social emotional needs; awareness of executive functioning skills; and engaging activities such as puzzles, videos, and external rewards. Finally, I considered aspects to support teachers' practices which included: universal strategies to support the diverse needs of individual students as well as the entire class. The assessment tool also included learning plans and a class profile with students' strengths, needs, interests, and learning preferences to identify learning needs and build holistic relationships with students. Next, I reflected on the key findings of my research.

Key Findings of Student Experiences

The assessment was completed by a total of 99 students with and without learning

challenges in the three testing cycles. I first identified key findings of all students then separately by students with and without learning challenges.

All Students

Relatedness and Autonomy Needs in Transitional Grade Levels. Completion of the assessment tool positively impacted the perceived motivation in variables aligned with relatedness, autonomy, and competence of student participants in grades 5-10. The most significant increases were found in teacher cares, interests, and choice for students in the middle transitional grades 7 and 8 and choice for students in grades 7-10.

Unfulfilled Needs in Existing School Experiences. Prior to completing the assessment, students' perception of motivational needs in their existing school experiences was lower than their perception of these needs after completing the assessment. The largest increases upon completion of the assessment were found in teacher cares and understands needs, having a choice in learning, the ability to express their views and understanding how they learned. Based on these outcomes along with students' generally positive comments about their experience in completing the assessment, I concluded that completion of the assessment had some impact on students perceived motivation. However, to further analyze the effects on students of differing ability levels, I also explored the differences between students with and without learning challenges.

Students with and without Learning Challenges

Motivational Gap Narrowed. In the second cycle, prior to completing the assessment, the motivational needs of students with learning challenges were less fulfilled than students without learning challenges. The most significant differences were found in autonomy (ability to express views) and competence (perceived difficulty of activity, understanding how students learned). Then upon completion of the assessment, the gap of perceived motivation narrowed between

students with and without learning challenges; suggesting the motivational needs of both groups were similarly fulfilled with the assessment. To determine the specific impact of the completion of the assessment on each individual student, in the third cycle, I completed within group tests to analyze the outcomes of students with learning challenges separately from students without learning challenges.

Students with Learning Challenges. The perceived motivation for students with learning challenges increased in autonomy and choice of learning upon completion of the assessment. Completion of the assessment also helped students with learning challenges better understand how they learned. Therefore, it seemed like completion of the assessment may have positively impacted the needs of autonomy and competence for students with learning challenges. However, students without learning challenges encountered differing experiences.

Students without Learning Challenges. Completion of the assessment seemed to have a greater impact on their need for relatedness for students without learning challenges; specifically in the variable, 'teacher cares'. The need for autonomy was also positively impacted by students without learning challenges for both variables; ability to express views, and choice of learning. The results of these two groups suggested it was just as, or more important, for students without learning challenges than students with learning challenges to have their teachers understand and care about them as a person. The results also implied that the motivation of students with learning challenges could be dependent on them understanding how they learned. Regardless of these differences, the need for autonomy, especially having a choice of learning, seemed to have positively triggered students with and without learning challenges upon completion of the assessment. In addition to students' experiences, I also identified key findings of teacher participants.

Key Findings of Teacher Experiences

During each testing cycle, after the students completed the assessment, teachers received the outcomes of the assessment results in the form of a learning plan, learning strategies, and a class profile. Although the students completed the assessments independently, the teachers monitored the students' completion of the assessments. Teachers participated in online interviews to determine the effectiveness of the resources for their practices, with key findings in the areas: administering the assessment, building student relationships, supporting student needs, and supporting student autonomy.

Administering the Assessment. The assessment provided time saving benefits for teachers in administering the assessment and efficiently gathering student information. A semi-structured testing environment with minimal supervision was most effective in administering the assessment to minimize distractions while students were completing the assessment.

Building Student Relationships. Teachers reported that the learning plans and class profiles could help them build holistic relationships with their students.

Supporting Student Needs. Teachers also indicated the learning plans could help them easily identify and support students' needs and guide students to practically implement the recommended learning strategies. The audio files also helped teachers hear directly from students who may not generally ask for support in a classroom setting.

Supporting Student Autonomy. Teachers reported that students were engaged and motivated by external rewards when completing the assessment; however, teachers recommended a balance of internal and external awards. Teachers were receptive to providing students with a balance of choice in their learning, but some teachers still wanted to determine when and how choice was provided. To increase student accountability, teachers recommended an action plan to

provide students with guidance in the implementation of strategies. The final component in the development of my design principles was the alignment of the self-determination theory and self-regulated learning process.

Alignment of Self-Determination Theory and Self-Regulated Learning Process

My study was derived from the self-determination theory which proposed intrinsic motivation was triggered with the fulfillment of three psychological needs; relatedness, competence, and autonomy. However, an individual's motivational tendencies could fall into a range of motivational types between extrinsic motivation and intrinsic motivation (Deci & Ryan, 1985; Ryan & Deci, 2020). My literature review found that prior to becoming intrinsically motivated self-directed learners, students needed to be self-regulated learners (SRL) (Jossberger et al., 2010; Robinson & Persky, 2020; Saks & Leijen 2014). Depending on a student's level of motivation and cognitive skills development, students might require explicit teacher guidance to become self-regulated or self-directed learners (Voskamp et al., 2022; Vosniadou et al, 2020). Yet, research has indicated self-regulated skills were not generally taught in school (Harding et al, 2017; Oates, 2019). Therefore, my design of draft principles started with teacher support to guide students through the assessment using the self-regulated learning process. Zimmerman's (2002) self-regulated learning process includes: 1) Forethought, 2) Performance, and 3) Self-reflection. My current study tested two components of the forethought phase 1) self-motivation beliefs and 2) task analysis which includes goal-setting and strategic planning, as illustrated in Figure 26.

Figure 26*Design Principles Based on Integration of Self-Regulated Learning*

Self-Motivation Beliefs. Self-motivation beliefs are the first part of forethought and they are the positive beliefs about the student’s abilities, the value of the task, and the potential for success. The Australian Science and Mathematics School (ASMS) illustrated how the teaching of these SRL skills embedded into the curriculum could increase students’ self-awareness of how they learned, impacting their self-motivation beliefs. My assessment also aimed to increase students' self-awareness and their motivational belief by helping students understand their strengths and needs and how they learned best. The assessment keeps students engaged while measuring a balance of students’ academic and cognitive strengths and needs.

Academics. The academic assessments start at the student’s challenge/ability level in order to ensure success and instill perceived competence. The current version of the assessment is suitable for students with and without learning challenges in grades 5-10 (with a grade 5 reading proficiency level). Students most impacted by the assessment are in grades 7 to 10.

Cognitive. The cognitive assessments identify students’ learning skills and educate students how they learn so they want to learn.

Engagement. A variety of puzzles, videos, and audio are included in the assessment tool to

keep students engaged and on task.

Teacher Feedback. The assessment includes a variety of critical thinking activities in each module. A teacher check-in is recommended at the end of each of the three levels to encourage reflection and determine if the student requires additional support.

Task Analysis. Task analysis is the second part of the forethought phase, and it includes goal setting and strategic planning. According to Black and Wiliam (2009; Smit et al, 2017; Wang, 2011), students' active involvement in goal setting, self-assessment and teacher feedback could enhance students' SRL skills. A successful example of goal setting and strategic planning was found in Granberg's et al's (2021) case study of a grade seven mathematics teacher, who implemented these formative assessment practices in a classroom over an eight-month period. I also incorporated goal-setting and strategic planning in my assessment process.

Goal-Setting. The third level of the assessment educates students about SMART goal-setting based on their assessment outcomes. SMART goals involve identifying specific, measurable, attainable, relevant, and time-bound goals to provide direction and motivation. During the last level of the assessment, students are also recognized for their achievement in completing the assessment with a balance of internal and external motivational sources to support students' transition to intrinsic motivation. The final part of forethought is strategic planning.

Strategic Planning. Strategic planning includes the development of a plan to achieve the student's goals, including identifying appropriate strategies and resources. Voskamp et al's (2022) study recognized the importance of explicit instruction to develop metacognitive skills such as planning, monitoring progress and reflection. An example of implementation and reflection was found in Granberg et al's (2021) study when students completed a pre and post survey to measure their perceived autonomy and self-efficacy prior to and after completion of the math lessons study.

The students in my study also completed similar surveys prior to and upon completion of my assessment. The outcome of these surveys might help both teachers and students understand the level of students' motivation prior to implementing each student's learning plan.

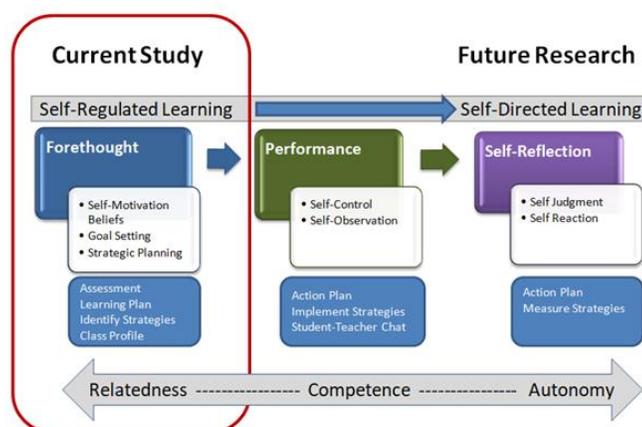
Learning plans, strategies and class profile. Each learning plan includes five initial strategies aligned with each student's learner profile. The choice of these actionable UDL based strategies are determined by each student in collaboration with their teacher. It is recommended that teachers initiate conversations with students based on information from the student learning plan and the teachers' class profile. This would support students' need for relatedness in building student-teacher relationships and student's need for autonomy in having a choice in learning.

Future Development

After self-regulated learning has been developed, the transition to intrinsic self-directed learning could be considered as illustrated in Figure 27.

Figure 27

Future Development- Transition from Self-Regulated to Self-Directed Learning



The following future developments are recommended in the rest of the self-regulated process.

Performance Phase

The second phase of the self-regulated learning process is performance which includes

self-control and self-observation (Zimmerman, 2002). This phase is intended to guide the self-control and self-monitoring of an individual's performance. In my study, the performance phase aligned the implementation of the assessment outcomes through the development of an action plan.

Action plan. Subsequent to my research, an action planning module was developed to support students' implementation of learning strategies. The strategies are supplemented by short videos, step-by-step checklists, and additional resources to provide students with the appropriate guidance. After students' strategies are implemented, students would be ready for the self-reflection phase.

Self-Reflection Phase

The third phase of the self-regulated learning process is self-reflection. Self-reflection is intended to trigger an individual's self-reactions and self-judgements (self-evaluations) of their performance outcomes (Zimmerman, 2002). Self-reflection influences the forethought and performance phases, completing the entire self-regulation process. Once the self-regulation learning process has been completed, students might possess the skills to become self-directed learners. Self-reflection will occur after the action plan is implemented, and students monitor the progress and effectiveness of their learning strategies. However, the self-reflection phase was not part of my research.

Measure Effectiveness. In each student's action plan, the student will reflect on the effectiveness of each strategy and share their outcomes with their teachers/educators. An ongoing review and analysis of the learning strategies will be completed to ensure practicality and effectiveness.

Other Considerations

Prior to introducing the assessment to students, teachers also needed to consider the environment and scheduling to ensure a smooth implementation.

Environment. The assessment can be completed independently by students with minimal supervision in a structured environment to keep students on task.

Scheduling. The total time to complete the assessment is approximately 75-90 minutes depending on the pace of each individual student. Due to the quality and quantity of content, it is recommended that the assessment be completed in 3-5 sessions of 15-30 minutes each for students to gain the maximum potential from the experience.

Text to speech. Since the current version is only accessible to students at the grade 5 reading level, text to speech will be integrated in the next version to make the assessment fully accessible to all students.

Final Design of the Assessment Tool Resources

The existing version of the assessment tool is available online, and I will be monitoring registration closely to assess market demand for the assessment.

Student Experience

Figures 28 and 29 illustrate a visual of the student dashboard and topics within the assessment.

Figure 28

Visual of Student Dashboard

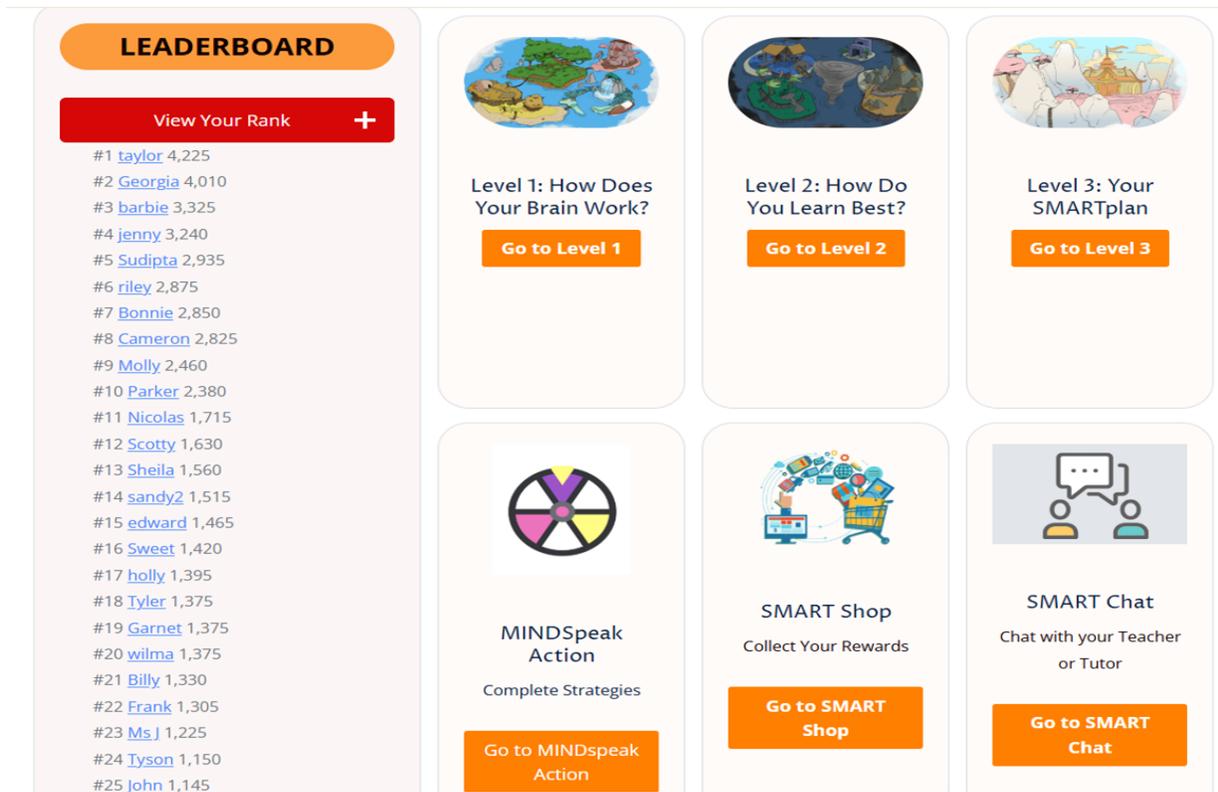
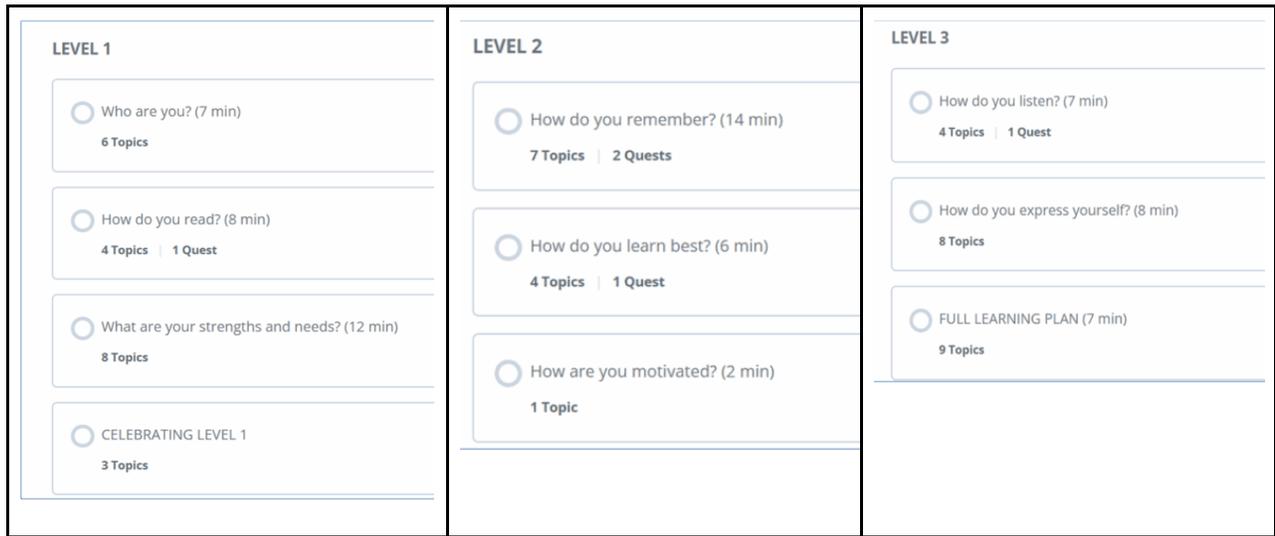


Figure 29

Key Topics within the Assessment



Teacher and Organization Experience

The teacher receives a class profile and a learning plan for each student. Figure 30 illustrates a visual of the organization or teacher classes. The organization can invite either teachers or students or both to their classes.

Figure 30
Organization or Teacher Class Dashboard

	Group	Teacher	Student	Group leaders	Students	Class Profile
Delete	Study Smart 2025 class 1	Invitation email	Invitation email	Patricia Trotter Mickey Moore	1	View

-

+
Your membership allows 5 classes. Avoid using special characters. Spaces allowed. You have created 1 class.

Save

Figure 31 illustrates a visual of the class profile which is accessed from the class dashboard

Figure 31
Visual of Class Profile

Mr. Kumar									
Name	Interests	Talents	Learning Strengths	Learning Challenges	Academic Challenges	Learning Preferences	Motivational Type	Assessment Preferences	Instruction Preference
Cameron Learning Plan <hr style="border: 1px solid red;"/> <small>100% COMPLETE Last activity on February 19, 2025 5:01 pm</small>	I enjoy playing sports, watching sports, listening to music, walking or hiking.	I'm good at Baseball.	<ul style="list-style-type: none"> organization response inhibition teamwork physical 	<ul style="list-style-type: none"> working memory emotional control metacognition 	<ul style="list-style-type: none"> math operations reading comprehension written expression 	<ul style="list-style-type: none"> picture smart people smart body smart 	<ul style="list-style-type: none"> extrinsically motivated 	<ul style="list-style-type: none"> multiple choice tests hands on assignments small group presentations 1-on-1 discussions 	<ul style="list-style-type: none"> video or presentation
Georgia Learning Plan <hr style="border: 1px solid red;"/> <small>100% COMPLETE Last activity on February 21, 2025 4:52 pm</small>	I enjoy listening to music, relaxing or having quiet time, other interests.	I'm good at baseball and soccer.	<ul style="list-style-type: none"> flexibility response inhibition humour creative 	<ul style="list-style-type: none"> working memory emotional control sustained attention prioritization goal directed 	<ul style="list-style-type: none"> math operations oral expression written expression 	<ul style="list-style-type: none"> people smart 	<ul style="list-style-type: none"> introjected regulation 	<ul style="list-style-type: none"> problem solving tests hands on assignments 1-on-1 presentations 1-on-1 discussions 	<ul style="list-style-type: none"> using hands or body
Holden Learning Plan <hr style="border: 1px solid red;"/> <small>95% COMPLETE Last activity on February 15, 2025 10:20 pm</small>	I enjoy playing sports, creating or performing some form of art, playing computer or video games, walking or hiking.	I'm good at baseball.	<ul style="list-style-type: none"> humour physical 	<ul style="list-style-type: none"> prioritization response inhibition metacognition 	<ul style="list-style-type: none"> oral expression written expression 	<ul style="list-style-type: none"> people smart 	<ul style="list-style-type: none"> introjected regulation 	<ul style="list-style-type: none"> multiple choice tests visual assignments small group presentations 1-on-1 	<ul style="list-style-type: none"> using hands or body

Attached is a link to a **sample learning plan** which is accessed through the class profile.

<https://studysmart.ca/topics/full-plan/?id=358219761968400>. A two-minute video provides an overview of the features and benefits of the final assessment: <https://studysmart.ca/videos/>.

Conclusion of Evaluation and Reflection Phase

My evaluation and reflection phase started with a reflection of how my data responded to each of my research questions. This process highlighted the most significant impacts of motivation for students with and without learning challenges in grades 5-10 who completed the assessment. Draft principles were then developed, derived from Deci and Ryan's (2000) self-determination theory and based on Zimmerman's (2002) self-regulated learning process. Any educator or student utilizing a Canadian curriculum in a public, private or community-based educational setting can now use these principles to guide their implementation and completion of the assessment. After these draft principles have been further explored outside this research, my final design principles can be developed. The final section of my research in chapter 10 outlined my limitations, implications, and opportunities for future research.

Chapter 10- Conclusion

The purpose of my research was to develop and test an assessment solution that could help teachers efficiently identify and effectively support the diverse needs of students in inclusive classrooms while increasing student motivation. This concluding chapter highlights my limitations, implications, and opportunities for future research. I start with my limitations.

Limitations

My study included three limitations related to; 1) small student participant sample size, 2) timing of my research, and 3) the design of my pre- and post-study survey.

Small Student Participant Sample Size

The first and second testing cycles involved the recruitment of teachers and students from public school boards in Ontario, PEI and New Brunswick. Prior to obtaining consent from teachers and assent from students, I had to obtain approval from each school board and school principals of the respective teachers, as well as consent from the students' parents. Due to the lengthy layered process, access to student participants was limited. This negatively affected the sample size of student participants in the quantitative component of my research; 17 students ($n=17$) in the first cycle, 50 students ($n=50$) in the second cycle, and 32 students ($n=32$) in the third cycle. The central theorem was considered to obtain a minimum of 30 students for normal distribution, and effect size was used to determine the impact of significant findings. However, larger sample sizes would be needed to increase reliability and validity of the overall findings. The limitation is related to the timing of my research.

Timing of Research in Relation to True Environment

Although the assessment tool could be used by students anytime throughout the year, the outcome would have its greatest benefits to teachers at the beginning of a school year or school

term when teachers were gathering information to get to know their students. Hence, the preferred times to test the assessment tool would have been during the months of September/October or January/February. However, these months were also busy periods for teachers to participate in an external research study. The testing cycles then took place after teachers had already identified some of the students' academic needs; first cycle in May/June, second cycle in November/December, and third cycle in April/May. Despite this limitation of timing, teachers expressed that the holistic information they received from the assessment tool (including students' interests, learning preferences, and motivational types) were still valuable for teachers to deepen relationships with their students. The limitation of timing negatively affected my original intention of measuring the effectiveness of the assessment tool in the classroom environment, and the design of my pre- and post-study survey.

Pre- and Post-Study Survey Design

The initial intention of my research was to develop the assessment tool and test the effectiveness of its application in the classroom setting over a 10-week period. This length of time seemed reasonable to measure the impact of motivation using identical statements or questions in a pre- and post-study survey. However, due to timing limitations previously discussed, I decided to conclude my research upon students' completion of the assessment without testing its application in the classroom. Therefore, instead of measuring students' *actual* impact of motivation, I measured students' *perceived* motivation which resulted in modifications to my pre- and post-study survey. Since the pre-study and post-study statements were no longer identical, my analysis in the second testing cycle was limited to independent 'between-group' tests between students with learning challenges and students without learning challenges. In the third testing cycle, I was able to further refine the pre- and post-study statements so they could also be used for

‘within-group’ tests to measure each student’s perceived motivation prior to and upon completion of the assessment. Upon reflection of these limitations, I next considered the implications of the assessment tool.

Implications

There were three key objectives of the assessment tool in my research: 1) save time for teachers in identifying the holistic needs and strengths of students, 2) help teachers design and implement effective strategies to support the diverse needs of all students in inclusive classroom settings, 3) guide students to become motivated student-directed learners.

Upon review of each student-directed assessment and learning plan and a one-page class profile, the teachers in my study expressed that these resources would save them time in understanding student needs and getting to know their students holistically. Based on the self-determination theory, these factors could fulfill students’ need for relatedness triggering intrinsic student motivation. Therefore, this assessment tool could address delays in obtaining psychological reports and determining additional educational support that may be required for students with formally diagnosed disabilities as well as those with invisible learning challenges.

In addition to considering the needs of students with learning challenges, my research also found students without learning challenges benefitted from completing the assessment tool especially, in fulfilling their needs for relatedness and autonomy. In fact, more students without learning challenges than with learning challenges perceived the information from the assessment might help their teachers better understand their needs and care about them as a person. Inclusive education is about considering the needs and strengths of all students regardless of their ability level, grade level, and other unique identities of the student. The student-initiated design of the assessment tool enabled all students in inclusive classrooms to simultaneously express their views,

have choice in their learning and complete the assessment within a reasonable 90-minute period with minimal additional time required from the teacher. Therefore, this assessment could make it easier for teachers to support the diverse needs of all students in inclusive classroom settings in a timely manner, while minimizing the stigmatization that might occur if only students with learning challenges complete the assessment.

The third objective of the assessment tool was to support students to become motivated student-directed learners. The pre- and post-study surveys completed by the students suggested that students were motivated by being actively involved in developing their own learning plans and selecting from a choice of learning strategies aligned to their profiles. Although my study found that the opportunity for choice was important to students, teachers had mixed views on the amount and type of choice in learning that should be provided to students. These varying views might have been related to teachers' misconceptions about self-regulated and self-directed learning. According to Zimmerman (2002), self-regulated learning is a prerequisite to self-directed learning, so some students might exhibit limited self-directed skills if they have not yet mastered self-regulated learning. However, this deficit of skills may be less related to a student's ability or disability, than students being taught the foundational self-regulation skills. This perspective supports Voskamp et al. (2022) and Granberg et al. (2021) studies where students showed an increase in self-regulated and self-directed skills when provided explicit instruction and guidance. This view also aligns with those of Rogers who believed that students have the potential to become motivated self-directed learners when teachers were facilitators who guided students rather than always feeling the need to provide explicit instruction. The key components of my assessment tool considered several factors to teach students specific self-regulation skills including increased self-awareness of strengths, needs, learning preferences and motivational type;

goal-setting; and strategic planning. Therefore, teachers could also use this tool as a first step in guiding students to become motivated student-directed learners. The final part of my study was to determine future research opportunities.

Future Research

The development and iterative testing of my assessment tool illustrated the potential use of the tool by students and teachers for multiple purposes in various educational environments. However, completing the assessment tool alone does not maximize its full capabilities and impact. The assessment tool only introduced students to the first phase of the self-regulated learning process; forethought through self-motivation beliefs, goal setting, and strategic planning. To determine the true impact of motivation after the implementation of the selected learning strategies, students would need further guidance on the two remaining phases of self-regulated learning; implementation and self-reflection. Upon completion of my initial research, I made further enhancements to the assessment tool which now includes a separate action planning module and a communication portal for students and teachers to continue a collaborative learning experience. An instructional guide was also created to further support teachers in providing explicit instruction on self-regulated learning, without requiring an abundance of extra time. Therefore, this assessment tool can now support the entire self-regulated learning process.

To measure the effectiveness of these additional resources, further research would be required. Although I was able to gather meaningful data from teacher interviews and student surveys in my initial study, the addition of student interviews in future research would provide more opportunities for triangulation and gathering rich data from the students directly. Similarly, the consideration of teacher surveys as a supplement or replacement to teacher interviews might address some of the teacher recruitment challenges I encountered in relation to timing limitations.

Finally, a comprehensive ongoing review of the data outcomes from the individual sub-assessments within the assessment tool would increase the validity of the assessment tool itself especially if it becomes more widely used in the future.

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Appendix A

Student Survey- Ethics Approval



To: Dr. Kathy Snow
Faculty of Education

Protocol Number: REB Ref # 6011849

Title: A Collaborative Holistic Assessment and Instructional Approach
for Supporting Students and Teachers in Inclusive Classrooms

Date Approved: January 31, 2023 End Date: One year from date of approval

This research proposal has been reviewed by the UPEI Research Ethics Board and it complies with the Tri-Council guidelines for research involving human participants. Please be advised that the Research Ethics Board currently operates according to the Tri-Council Policy Statement 2: Ethical Conduct for Research Involving Humans (2018) and applicable laws and regulations.

It is your responsibility to ensure that the Annual Renewal and Amendment Form for Approved Studies is forwarded to Research Services prior to the renewal date. The information provided in this form must be current to the time of submission and submitted to Research Services not less than 30 days prior to the anniversary of your approval date. The Renewal/Amendment form can be downloaded from the Research Services website (<http://www.upei.ca/research/forms>).

The Research Ethics Board advises that IF YOU DO NOT return the completed Ethics Renewal form prior to the date of renewal:

- Your ethics approval permit will lapse;
- You will be required to stop research activity immediately;
- You will not be permitted to restart the study until you reapply for and receive approval to undertake the study again.

Lapse in ethics approval may result in the interruption or termination of funding.

Any proposed changes to the study must also be submitted on the same form to the UPEI Research Ethics Board for approval. Notwithstanding the approval of the REB, the primary responsibility for the ethical conduct of the investigation remains with you.

A handwritten signature in black ink that reads "Mike MacLellan".

Sincerely,

Mike MacLellan, Ph.D.
Chair, UPEI Research Ethics Board

Appendix B

First Testing Cycle- Ethics Approval- Original



To: Dr. Kathy Snow
Faculty of Education

Protocol Number: REB Ref # 6012149

Title: PHASE 2: A Student-Initiated Assessment Approach to Support Students and Teachers in Inclusive Classrooms

Date Approved: September 15, 2023

End Date: One year from date of approval

This research proposal has been reviewed by the UPEI Research Ethics Board and it complies with the Tri-Council guidelines for research involving human participants. Please be advised that the Research Ethics Board currently operates according to the Tri-Council Policy Statement 2: Ethical Conduct for Research Involving Humans (2018) and applicable laws and regulations.

It is your responsibility to ensure that the Annual Renewal and Amendment Form for Approved Studies is forwarded to Research Services prior to the renewal date. The information provided in this form must be current to the time of submission and submitted to Research Services not less than 30 days prior to the anniversary of your approval date. The Renewal/Amendment form can be found and completed in your UPEI Researcher Portal account (<https://upei.researchservicesoffice.com/Romeo.Researcher/>).

The Research Ethics Board advises that IF YOU DO NOT return the completed Ethics Renewal form prior to the date of renewal:

- Your ethics approval permit will lapse;
- You will be required to stop research activity immediately;
- You will not be permitted to restart the study until you reapply for and receive approval to undertake the study again.

Lapse in ethics approval may result in the interruption or termination of funding.

Any proposed changes to the study must also be submitted on the same form to the UPEI Research Ethics Board for approval. Notwithstanding the approval of the REB, the primary responsibility for the ethical conduct of the investigation remains with you.

Sincerely,

Jessica Strong, Ph.D.
Chair, UPEI Research Ethics Board

Appendix C

First Testing Cycle- Ethics Approval- Amended



To: Dr. Kathy Snow
Faculty of Education

Protocol Number: REB Ref # 6012149

Title: PHASE 2: A Student-Initiated Assessment Approach to Support Students and Teachers in Inclusive Classrooms

Date Approved: March 28, 2024 (amendment only) End Date: September 14, 2024

This research proposal has been reviewed by the UPEI Research Ethics Board and it complies with the Tri-Council guidelines for research involving human participants. Please be advised that the Research Ethics Board currently operates according to the Tri-Council Policy Statement 2: Ethical Conduct for Research Involving Humans (2018) and applicable laws and regulations.

It is your responsibility to ensure that the Annual Renewal and Amendment Form for Approved Studies is forwarded to Research Services prior to the renewal date. The information provided in this form must be current to the time of submission and submitted to Research Services not less than 30 days prior to the anniversary of your approval date. The Renewal/Amendment form can be found and completed in your UPEI Researcher Portal account (<https://upeiresearchservicesoffice.com/Romeo.Researcher/>).

The Research Ethics Board advises that IF YOU DO NOT return the completed Ethics Renewal form prior to the date of renewal:

- Your ethics approval permit will lapse;
- You will be required to stop research activity immediately;
- You will not be permitted to restart the study until you reapply for and receive approval to undertake the study again.

Lapse in ethics approval may result in the interruption or termination of funding.

Any proposed changes to the study must also be submitted on the same form to the UPEI Research Ethics Board for approval. Notwithstanding the approval of the REB, the primary responsibility for the ethical conduct of the investigation remains with you.

Sincerely,

Jessica Strong, Ph.D.
Chair, UPEI Research Ethics Board

Appendix D

First Testing Cycle- Ethics Approval (renewal extended)



To: Dr. Kathy Snow
Faculty of Education

Protocol Number: REB Ref # 6012149

Title: PHASE 2: A Student-Initiated Assessment Approach to Support Students and Teachers in Inclusive Classrooms

Date Approved: August 02, 2024 (renewal) End Date: One year from date of approval

This research proposal has been reviewed by the UPEI Research Ethics Board and it complies with the Tri-Council guidelines for research involving human participants. Please be advised that the Research Ethics Board currently operates according to the Tri-Council Policy Statement 2: Ethical Conduct for Research Involving Humans (2018) and applicable laws and regulations.

It is your responsibility to ensure that the Annual Renewal and Amendment Form for Approved Studies is forwarded to Research Services prior to the renewal date. The information provided in this form must be current to the time of submission and submitted to Research Services not less than 30 days prior to the anniversary of your approval date. The Renewal/Amendment form can be found and completed in your UPEI Researcher Portal account (<https://upeiresearchservicesoffice.com/Romeo.Researcher/>).

The Research Ethics Board advises that IF YOU DO NOT return the completed Ethics Renewal form prior to the date of renewal:

- Your ethics approval permit will lapse;
- You will be required to stop research activity immediately;
- You will not be permitted to restart the study until you reapply for and receive approval to undertake the study again.

Lapse in ethics approval may result in the interruption or termination of funding.

Any proposed changes to the study must also be submitted on the same form to the UPEI Research Ethics Board for approval. Notwithstanding the approval of the REB, the primary responsibility for the ethical conduct of the investigation remains with you.

Sincerely,

Jessica Strong, Ph.D.
Chair, UPEI Research Ethics Board

Appendix E

Second Testing Cycle – Ethics Approval (original)



To: Dr. Kathy Snow
Faculty of Education

Protocol Number: REB Ref # 6012233

Title: Phase 3: A Student-Initiated Assessment Approach to Support Students and Teachers in Inclusive Classrooms

Date Approved: November 07, 2023

End Date: One year from date of approval

This research proposal has been reviewed by the UPEI Research Ethics Board and it complies with the Tri-Council guidelines for research involving human participants. Please be advised that the Research Ethics Board currently operates according to the Tri-Council Policy Statement 2: Ethical Conduct for Research Involving Humans (2018) and applicable laws and regulations.

It is your responsibility to ensure that the Annual Renewal and Amendment Form for Approved Studies is forwarded to Research Services prior to the renewal date. The information provided in this form must be current to the time of submission and submitted to Research Services not less than 30 days prior to the anniversary of your approval date. The Renewal/Amendment form can be found and completed in your UPEI Researcher Portal account (<https://upeiresearchservicesoffice.com/Romeo.Researcher/>).

The Research Ethics Board advises that IF YOU DO NOT return the completed Ethics Renewal form prior to the date of renewal:

- Your ethics approval permit will lapse;
- You will be required to stop research activity immediately;
- You will not be permitted to restart the study until you reapply for and receive approval to undertake the study again.

Lapse in ethics approval may result in the interruption or termination of funding.

Any proposed changes to the study must also be submitted on the same form to the UPEI Research Ethics Board for approval. Notwithstanding the approval of the REB, the primary responsibility for the ethical conduct of the investigation remains with you.

Sincerely,

Jessica Strong, Ph.D.
Chair, UPEI Research Ethics Board

Appendix F

Second Testing Cycle – Ethics Approval (revised)



To: Dr. Kathy Snow
Faculty of Education

Protocol Number: REB Ref # 6012482

Title: Phase 3B: A Student-Initiated Assessment Approach to Support Students and Teachers in Inclusive Classrooms_revised

Date Approved: April 30, 2024

End Date: One year from date of approval

This research proposal has been reviewed by the UPEI Research Ethics Board and it complies with the Tri-Council guidelines for research involving human participants. Please be advised that the Research Ethics Board currently operates according to the Tri-Council Policy Statement 2: Ethical Conduct for Research Involving Humans (2018) and applicable laws and regulations.

It is your responsibility to ensure that the Annual Renewal and Amendment Form for Approved Studies is forwarded to Research Services prior to the renewal date. The information provided in this form must be current to the time of submission and submitted to Research Services not less than 30 days prior to the anniversary of your approval date. The Renewal/Amendment form can be found and completed in your UPEI Researcher Portal account (<https://upei.researchservicesoffice.com/Romeo.Researcher/>).

The Research Ethics Board advises that IF YOU DO NOT return the completed Ethics Renewal form prior to the date of renewal:

- Your ethics approval permit will lapse;
- You will be required to stop research activity immediately;
- You will not be permitted to restart the study until you reapply for and receive approval to undertake the study again.

Lapse in ethics approval may result in the interruption or termination of funding.

Any proposed changes to the study must also be submitted on the same form to the UPEI Research Ethics Board for approval. Notwithstanding the approval of the REB, the primary responsibility for the ethical conduct of the investigation remains with you.

Sincerely,

Jessica Strong, Ph.D.
Chair, UPEI Research Ethics Board

Appendix G

Third Testing Cycle – Ethics Approval



To: Dr. Kathy Snow
Faculty of Education

Protocol Number: REB Ref # 6012928

Title: Phase 4: A Student-Initiated Assessment Approach to Support Students and Teachers in Inclusive Classrooms

Date Approved: March 17, 2025

End Date: One year from date of approval

This research proposal has been reviewed by the UPEI Research Ethics Board and it complies with the Tri-Council guidelines for research involving human participants. Please be advised that the Research Ethics Board currently operates according to the Tri-Council Policy Statement 2: Ethical Conduct for Research Involving Humans (2018) and applicable laws and regulations.

It is your responsibility to ensure that the Annual Renewal and Amendment Form for Approved Studies is forwarded to Research Services prior to the renewal date. The information provided in this form must be current to the time of submission and submitted to Research Services not less than 30 days prior to the anniversary of your approval date. The Renewal/Amendment form can be found and completed in your UPEI Researcher Portal account (<https://upei.researchservicesoffice.com/Romeo.Researcher/>).

The Research Ethics Board advises that IF YOU DO NOT return the completed Ethics Renewal form prior to the date of renewal:

- Your ethics approval permit will lapse;
- You will be required to stop research activity immediately;
- You will not be permitted to restart the study until you reapply for and receive approval to undertake the study again.

Lapse in ethics approval may result in the interruption or termination of funding.

Any proposed changes to the study must also be submitted on the same form to the UPEI Research Ethics Board for approval. Notwithstanding the approval of the REB, the primary responsibility for the ethical conduct of the investigation remains with you.

Sincerely,

Jessica Strong, Ph.D.
Chair, UPEI Research Ethics Board

Appendix H

Student Survey Questions

DEMOGRAPHIC INFORMATION
What grade are you in? Grades 5, 6, 7, 8, 9, 10, 11, 12
What type of school do you attend? Public, private etc.
Do you have an individual education plan (IEP)? An IEP is a document that outlines special education support you have provided with to help you learn better.
What is your current achievement level in Math?
What is your current achievement level in English/ language arts?
STRENGTHS AND INTERESTS
<p>What are your learning skill strengths?</p> <p>ORAL COMMUNICATION (enjoy taking part in class discussions and doing presentations)</p> <p>WRITTEN COMMUNICATION (enjoy writing ideas and thoughts on paper)</p> <p>TECHNOLOGY SKILLS (enjoy working with computers and electronics)</p> <p>TEAMWORK (enjoy working with others and sharing ideas in groups)</p> <p>WORKING INDEPENDENTLY (can work on my own, know what do when I finish a task)</p> <p>ORGANIZATION (keep my desk and work in order, plan what I need to do, use an agenda or calendar)</p> <p>RESPONSIBILITY (complete my homework and assignments on time, follow rules and class routines)</p> <p>TAKES INITIATIVE (ask questions when I don't understand something, willing to try new things)</p> <p>SELF-DIRECTED (set goals and work towards achieving them, take ownership of my learning)</p> <p>NOTE TAKING (takes clear notes that are easy to read)</p> <p>MEMORY (can remember things for a short time as well as a long time)</p>
<p>How often does your teacher allow you to use your learning strengths in your Math class?</p> <p>Frequently, Often, Sometimes, Not at all</p>

How often does your teacher allow you to use your learning strengths in your English/language arts class?

Frequently, Often, Sometimes, Not at all

What are your interests and talents?

Sports (team, individual, competitive, non-competitive)

Music Performance (playing an instrument, singing)

Music Appreciation (listening to music)

Visual Arts (drawing, painting, photography etc)

Performing Arts (dance, drama),

Games (board games, video games, computer games, outdoor games)

Other

How often does your teacher include your interests in your Math lessons?

Frequently, Often, Sometimes, Not at all

How often does your teacher include your interests in your English/language arts instruction?

Frequently, Often, Sometimes, Not at all

LEARNING PREFERENCES AND CHALLENGES

Which ways do you learn best?

Listening to the teacher or others talk about a lesson

Watching a video or presentation

Looking at images and visual diagrams

Doing something with my hands or body

How often does your teacher teach you the way you learn best in your Math class?

Frequently, Often, Sometimes, Not at all

How often does your teacher teach you the way you learn best in your English/language arts class? *Frequently, Often, Sometimes, Not at all*

What ways do you prefer to be tested or show your knowledge?

Completing written tests which include essays and short answers
 Completing written tests that are multiple choice and short answers
 Completing written tests that require showing my work to solve problems
 Creating an audio file to communicate my knowledge through voice
 Creating a video presentation instead of presenting in person
 Doing presentations in front of the class
 Creating a visual project or assignment with images, pictures, charts or diagrams
 Creating a project on the computer or other technology device
 Doing a research project to gather information and write a report
 Doing other projects which allow me to make something with my hands

Which testing methods have you experienced in your Math class?

Completing written tests which include essays and short answers
 Completing written tests that are multiple choice and short answers
 Completing written tests that require showing my work to solve problems
 Creating an audio file to communicate my knowledge through voice
 Creating a video presentation instead of presenting in person
 Doing presentations in front of the class
 Creating a visual project or assignment with images, pictures, charts or diagrams
 Creating a project on the computer or other technology device
 Doing a research project to gather information and write a report
 Doing other projects which allow me to make something with my hands

What testing methods have you experienced in your English/language arts class?

Completing written tests which include essays and short answers
 Completing written tests that are multiple choice and short answers
 Completing written tests that require showing my work to solve problems
 Creating an audio file to communicate my knowledge through voice
 Creating a video presentation instead of presenting in person
 Doing presentations in front of the class
 Creating a visual project or assignment with images, pictures, charts or diagrams
 Creating a project on the computer or other technology device
 Doing a research project to gather information and write a report
 Doing other projects which allow me to make something with my hands

How engaged and motivated are you to learn in your Math class?

Extremely engaged, Very engaged, Somewhat engaged, Not engaged at all

What would make you engaged and more motivated to learn in Math class?

Open answer _____

How engaged and motivated are you to learn in your English/language arts class?

Extremely engaged, Very engaged, Somewhat engaged, Not engaged at all

What would make you more engaged and motivated to learn in English/language arts class?

Open answer _____

What are your learning skill challenges?

ORAL COMMUNICATION (uncomfortable participating in class discussions, doing presentations)

WRITTEN COMMUNICATION (hard to express ideas on paper)

TECHNOLOGY SKILLS (limited knowledge of computers and electronics)

TEAMWORK (prefer to work on own than with others)

WORKING INDEPENDENTLY (difficulty working on my own, prefers more guidance and direction)

ORGANIZATION (difficulty keeping things in order or finding things)

RESPONSIBILITY (need reminders to start homework and complete assignments on time)

TAKES INITIATIVE (difficulty asking for help when needed, after to make mistakes)

SELF-DIRECTED (prefers structure and being told what to do)

NOTE TAKING (hard to take notes and listen at the same time)

ATTENTION (hard to stay focused, easily distracted)

MEMORY (hard to remember things for a short time or a long time)

PROCESSING (takes a long time to process things)

ANXIETY (nervous or anxious in taking tests)

What types of support have you received in Math to help you deal with some of your challenges?

I use an audio recorder to say my answers instead of writing them out

I tell my answers or thoughts to the teacher who writes them out for me

I take tests in a small group setting

I take tests in a quiet room

I use a calculator or formula sheet

I use physical tools to stay focused (ie. fidget toys, chairs)

I have extra time to complete tests and assignments

I take timed tests over several days

I take as many breaks as I need

I have different test questions than the other students

I use alarms to help me stay on track with my time

Other _____

What types of support do you receive in English/language arts to help you deal with some of your learning challenges?

I use an audio recorder to say my answers instead of writing them out

I tell my answers or thoughts to the teacher who writes them out for me

I use a computer or tablet to take notes

I get class notes from the teacher or another student

I record my lessons instead of taking notes

I take tests in a small group setting

I take tests in a quiet room

I use physical tools to stay focused (ie. fidget toys, chairs)

I have extra time to complete tests and assignments

I take timed tests over several days

I take as many breaks as I need

I have different test questions than the other students

I complete different projects than the rest of the class

I use alarms to help me stay on track with my time

Other _____

STUDENT'S INVOLVEMENT IN AND CHOICE OF LEARNING

How often have you been allowed to choose how and what you want to learn in your Math class?

Frequently, Often, Sometimes, Not at all

How important is it to you to have choices of how and what you want to learn in Math?

Extremely Important, Very Important, Somewhat Important, Not important at all

How often have you been allowed to choose how and what you want to learn in your English/language arts class? *Frequently, Often, Sometimes, Not at all*

How important is it to you to have choices of how and what you want to learn in English/language arts? *Extremely Important, Very Important, Somewhat Important, Not important at all*

FOLLOW UP

Would you like to be considered for a future research study to test a new technology app that might make learning easier?

Yes No

Thank you for participating in this project.

Appendix I

Parent Invitation to Student Survey

Supporting Students and Teachers in Inclusive Classrooms

Students in grades 6-10 have a chance to win a Nintendo Switch or JBL speaker by participating in a 10-minute survey!

If you are the parent/guardian of a child in grades 6 - 10, we are inviting your child to participate in a research project that will explore the learning experiences of students and instructional approaches of teachers. The outcome of the research may initiate the development of a technology-based solution to help teachers identify the learning needs of all students earlier and provide students with the resources and support they need to become successful learners.

Click on the research link to obtain more information and access the survey.

Appendix J

Parent/Student Information Letter- Student Survey

Title of study:

A Collaborative Approach for Supporting Students and Teachers in Inclusive Classrooms

Purpose of the Study

The purpose of this study is to understand students' learning experiences and the choices and resources provided to them to support their learning.

The following research questions guide this study:

- o What are students' perceptions about their current level of engagement in their math and English/language art courses?
- o How do students' level of involvement and choice in learning impact their perceived level of engagement in their math and English/ language arts courses?
- o To what extent does a collaborative holistic learning approach impact students' perceived level of engagement in their math and English/language arts courses?

Voluntary Participation

The parent/guardian of the participant will review the information letter and consent form and provide an online consent in advance of the students completing the survey. An assent form will be completed by students under the age of 18, and the participation of the student is voluntary. A parent/guardian may be present while the student is completing the survey. If required by the student, the parent/guardian can assist the student in the completion of the survey.

Survey Details

Each student will complete an online survey which will include questions about the students' interests, learning strengths and needs, learning preferences, and the type of instruction provided to them.

Time Commitment

- Approximately 10 minutes to complete the survey

Compensation

Each child who participates in this study will be provided with a chance to win their choice of either; a **Nintendo Switch or JBL speaker** for every 100 surveys submitted. The name of one of the students' parents/guardians will be entered into a draw to keep the students' name

anonymous for this research study.

Possible Risks and Benefits

There are no known or anticipated risks associated with participation in this study. The results shared by participants of this study will help school boards and Ministries of Education understand the types of resources and support teachers require in order to satisfy the needs of students in inclusive classrooms.

Withdrawal from Research

Participants have the opportunity to withdraw their participation any time before the final analysis of the study, which is estimated to be April 30, 2023. A request to withdraw from the study can be made by emailing the researcher at dpmontgomery@upei.ca.

Confidentiality & Storage of Data

Data will be collected, handled and stored with password protection on the University of PEI's secured Google drive cloud storage system. Data will be anonymized in the data collection process with only the researcher aware of the identity of the parent/guardian while the identity of the student from which the data was collected will remain anonymous. However, Google Forms including IP addresses collected by Google can be accessed via Homeland Security. Data must be retained for at least five years, as per the 'Procedures for Stewardship of Research Records and Materials' at the University of Prince Edward Island'. The data will be destroyed after a period of 5 years.

Reporting of Results

The results of the study may be used in academic journal publications for the purpose of developing an assessment and learning experience that can meet the needs of all students in inclusive classrooms.

Questions

If you have any questions concerning the study, please direct your inquiries to Diane Montgomery (researcher) at 416-562-0359 or diane@montgomery.ca or Dr. Kathy Snow (supervisor) at 902-620-5152 or ksnow@upei.ca. Any concerns regarding your involvement in this study may be directed to the UPEI Research Ethics Board, researchcompliance@upei.ca or (902) 620-5104.

Appendix K

Parent Consent and Student Assent- Student Survey

Parent Consent

This survey explores the learning experiences of students in grades 6 - 12 in inclusive classrooms. The results from this research will inform the development of a technology-based solution to help teachers identify the learning needs of all students earlier and provide students with the resources and support they need to become successful learners. If you are interested in permitting your child to complete this survey, please review the following forms.

- An information letter with full details of the study (**link to information letter**)
- An assent form and the questions that will be in the survey (**link to assent form and survey**)
- A consent form should you decide to permit your child to complete the survey

In appreciation for your child's time, they will be entered in a draw for a 1 in 100 chance to win their choice of either; an iPad, Nintendo Switch or JBL speaker.

This first part of the survey should be completed by the parent/guardian to provide consent for their child to complete the survey and provide the parent/guardian contact information. The name of the student will remain anonymous throughout the entire form.

By checking the applicable box and providing my name in the next section, I (student's parent/guardian) confirm I have reviewed the consent form and I am electronically providing my consent.

I consent to provide my child with the opportunity to participate in this study.

I do not consent to have my child participate in this study.

I'm not sure if I want my child to participate in this study as I have further questions so I will contact Diane Montgomery at dpmontgomery@upei.ca for answers to my questions.

Student Assent Form- Title of Study- Supporting Students in Classrooms

Why are you being asked to be part of this project?

My name is Diane Montgomery, and I am completing a project to find out more about how students in grades 6-10 learn and what they need to do well in school. So, I'm inviting you to complete this survey.

If you join this project, what do you have to do?

If you agree to be part of this project, you will complete a 10-minute survey which will ask you about how you learn.

Will the project help you and other students?

The information will help teachers find out how students learn so they can help them better.

What do you get for being in the project?

Since you helped us, you will be entered in a draw for a 1 in 100 chance to win your choice of either; an Ipad, Nintendo Switch or JBL speaker

Will any part of the project hurt? The project will not hurt, and you only have to answer the questions you would like.

Does your parent/guardian know about this project?

Your parent/guardian knows about this project and is allowing you to take part in it if you want. But you can talk to them first to decide if you want to take part in it.

Do you have to be in this project?

You don't have to be in this project. It is up to you. No one will be mad, no matter what you decide. If you say yes now, you change your mind later, and stop being part of the project. If you decide to you don't want to be in the project anymore, you or your parent/guardian can call or email me before April 30 at 416-562-0359 or dpmontgomery@upei.ca

Who will see the information collected about you?

When we are finished with this project, we will write a report, but it will not have your name on it. Nobody will know you were in the study to protect your privacy. Nobody will know about the answers in your survey except the people doing the project. But you can ask your parent/guardian for help in completing the survey if you like. The survey information will be kept safely locked up.

What if you have any questions?

You can ask any questions about this project. If you have a question later that you didn't think of now, either you can call or have your parent/guardian contact me (Diane Montgomery) at 416-562-0359 or dpmontgomery@upei.ca or my supervisor, Dr. Kathy Snow (supervisor) at 902-620-5152 or ksnow@upei.ca.

Thank you for taking the time to assist me with this project. Please check the box below if you would like to continue with this survey or if you do not want to continue with this survey.

I would like to continue with the survey and have made this choice on my own.

I do not want to continue with the survey.

Appendix L

Teacher and Principal Invitation to the Study- First Cycle

Subject Line: Invitation to Research Study to Support Teachers in Inclusive Classrooms

I am following up to thank you for our recent conversation about supporting students and teachers in inclusive classrooms. I completed over 100 conversations with students, parents, teachers, principals, centralized school board staff and organizations that directly support students with diverse learning needs. These conversations helped validate the need for the student-initiated assessment and learning process and tool that we discussed. Therefore, I have received approval to conduct a formal research study to develop and test this process/tool with a limited number of general education teachers in inclusive classrooms (in grades 6-9) in selected school boards in Ontario, Alberta, P.E.I, and New Brunswick. This study will take place between September – December 2023 or February – May 2024 (dependent upon the school board). I have attached a teacher and student information letter with specific details about the study including benefits and compensation for the teachers and students in the study in appreciation for their time.

If you are interested in participating in the study, would like more information or would like to refer any interested individuals, please email me at dpmontgomery@upe.ca by (date).

Diane Montgomery, PhD Candidate
University of Prince Edward Island

Principal Invitations to the study

Although teachers and students have been recruited outside the school board and have provided their consent to participate in the study, the principal will still need to approve the research within their schools. Therefore, principals will be advised of the study upon ethics approval from their school boards.

Invitation to Principal (for teacher participant)

Subject Line: Invitation to a Research Study to Support Teachers and Students in Inclusive Classrooms

My name is Diane Montgomery, a PhD candidate at the University of PEI and I am conducting a research study to support teachers and students in inclusive classrooms. This involves the development of a student-initiated assessment and learning process and tool to help teachers understand and support the needs of students. I will be testing this process with

students and teachers in several provinces across Canada for an 11-week period from October-December 2023 or February – April 2024 (**dependent upon school board**).

I am reaching out to you as your teacher; (**name of teacher**) has expressed an interest in participating in this study and has provided us with consent for us to contact (**him/her**) directly. However, as (**his/her**) administrator, we would like to provide you with information about the study and also request your approval for (**name of teacher**) to participate in the study.

If you would like more information about the study, feel free to email me at dpmontgomery@upei.ca or call me at 416-562-0359.

If you would like to support your teacher in participating in this study, please respond to this email by (**date**) as the study will be starting the week of (**date**).

Diane Montgomery, PhD Candidate

University of Prince Edward Island

Appendix M

Teacher Information Letter - First Testing Cycle

Teacher Information Letter

Title of study: A Student-Initiated Approach for Supporting Students and Teachers in Inclusive Classrooms- Phase 1

Purpose of the Study

The purpose of this study is to develop a technology-based student-initiated assessment for learning process to enable students to directly communicate to their teachers the student's strengths, needs, interests and learning preferences prior to the start of the school year. This will provide teachers with a consolidated holistic snapshot of all students in the class and help teachers reduce time in identifying and supporting the needs of all learners. A second objective is to help students become more involved in and accountable for their learning and the choices they make to achieve their learning goals.

The following research questions guide this study:

- How does the implementation of a student-initiated assessment for learning process/tool impact student engagement and motivation?
- What are the perceptions of teachers about the usefulness of the student-initiated assessment for learning process/tool to support diverse learners?
- How do the student-initiated assessment outcomes impact the teachers' identification of student learning needs and the design of instructional strategies?

Inclusion Criteria

The inclusion criteria for TEACHERS are:

- General education inclusive classroom teachers
- Teaching at a public or separate school board in Ontario, PEI, Alberta or New Brunswick
- Teaching Math or English in grades 6-9.

Teach in a diverse classroom based on diverse skill level, race and socio-economic context including:

at least two students with formally identified learning challenge, at least two students with a known learning challenge not formally assigned an Individualized Learning plan (the structure used by schools for supporting formally identified students learning needs); at least two students from a low socio-economic or minoritized racial (non-White) population.

Voluntary Participation

Participation is voluntary. Participants will review an information letter and consent form.

Study Details

Each teacher will support two or three of their students in a two-phase study. The tasks for the first phase of the study include:

- Identifying 2-3 students who meet the student inclusion criteria to potentially participate in the study. The teacher will contact the parents/guardians of students (using a recruitment template) to obtain parent/guardian's consent and student's assent for the student to participate in the study.
- A 1 hour audio recorded interview to provide insights, feedback and recommendations about the student-initiated assessment for learning process. This interview will be audio recorded using the Zoom platform. Individual transcripts for each teacher will be available for review by each respective participant within one month at the end of the data collection.

Time Commitment

The total time for participation in the study will be approx. 1.25 hours as follows:

-Teacher interview – 1 hour

-Review and finalize recommended UDL strategies- 15 minutes

Compensation

Each teacher who participates in the study will be provided with additional educational resources for one or more students in their class that participates in the study. These resources will include:

- An opportunity for a student of your choice (with parental permission) to receive a complementary Kaufman Test of Educational Achievement (KTEA) assessment which will be administered by a qualified assessment examiner. The results of this assessment will enable the teacher to better understand and support the needs of the student. Value is approx. \$800 each

- A library of UDL strategies and UDL lessons created by teachers for teachers.
- Ongoing access of the final ALP tool.

Possible Risks and Benefits

There are no known or anticipated risks associated with participation in this study. The results of this study will test the feasibility of a new technology-based student-initiated assessment for learning process to help teachers support the needs of all students in inclusive classrooms. Teachers will benefit by receiving information obtained through this process to help inform their instructional strategies. The teacher's time will also be reduced when information is obtained directly and independently from the student outside the classroom setting.

Withdrawal from Research

Teacher and student participants have the opportunity to withdraw their participation any time before the final analysis of the study which is estimated to be (2 months after end of data collection). A request to withdraw from the study can be made by emailing the researcher at dpmontgomery@upe.ca. If a student withdraws, their teacher can continue in the study with the teacher's remaining students or teachers can invite additional students to participate in the study.

Confidentiality & Storage of Data

Live Communication

Face-to-face contact will be required with the teacher and researcher and all information communicated through these channels will remain confidential. The teacher will be participating in an online interview on zoom. Pseudonyms will be used for any reporting of data at the end of the study.

Other Data Collection

Transcripts from the interviews will be completed using Otter.ai software and the analysis of the transcripts will be coded using Atlas.ti software. The recordings, transcripts, consent forms and output of coded data will be stored with password protection on the University of PEI's secured Google drive cloud storage system.

Pseudonyms will be used to ensure confidentiality of data collected with only the researcher and student aware of the identity of the teacher. Data must be retained for at least five years, as per the 'Procedures for Stewardship of Research Records and Materials' at the University of Prince Edward Island'. The data will be destroyed after a period of 5 years.

Reporting of Results

The results of the study will be used for a doctoral dissertation and may also be used in

academic journal publications.

Questions

This project has been reviewed by the UPEI Research Ethics Board and it complies with Tri-Council guidelines for research involving human participants.

If you have any questions concerning the study, please direct your inquiries to Diane Montgomery (researcher) at 416-562-0359 or diane@montgomery.ca or Dr. Kathy Snow (supervisor) at 902-620-5152 or ksnow@upei.ca. Any concerns regarding your involvement in this study may be directed to the UPEI Research Ethics Board, researchcompliance@upei.ca, or (902) 620-5104.

Appendix N

Teacher Consent Form- First Testing Cycle

Collaborative Approach for Supporting Students and Teachers in Inclusive Classrooms

Your signature on this form means:

- You have read the Information Letter about the Research. You have been able to ask questions about this study, if you want, and are satisfied with the answers.
- The total amount of time required to participate in the study is 1.75 hours.
- You understand that the information in the interview will remain confidential
- You understand that the discussion in the focus group will be audio recorded.
- You understand what the study is about and what you will be doing.
- You understand that the research in this study is minimal risk.
- You understand that you are free to withdraw from the study until the results are analyzed (2 months after the end of data collection) without having to give a reason, and your withdrawal from the study will not affect you now or in the future. You may withdraw by sending an email to the researcher at dpmontgomery@upei.ca.
- You understand if you withdraw from the study, any data collected from you will be destroyed.
- You understand that the information you provide will be confidential within the limits of the law. You understand you can keep a copy of the signed and dated consent form.
- You understand that you can contact the UPEI Research Ethics Board, researchcompliance@upei.ca or (902) 620-5104 if you have any concerns about the ethical conduct of this study.
- You understand that this project has been reviewed by the UPEI Research Ethics Board and it complies with Tri-Council guidelines for research involving human participants.

I consent to participate in the first phase of this study.

I do not consent to participate in the first phase of this study.

The second phase of the study will be conducted based on the outcomes of the first phase upon which your ongoing participation is desired.

I agree to be contacted to obtain further details about the second phase of the study

I do not want to be contacted to potentially participate in the second phase of the study.

Your email address is required to provide you with a summary report of this research (if

requested).

Email _____

Would you like a summary report of the findings of this research?

Yes No

Name of Teacher _____ **Name of Student** _____

Signature of Teacher _____ **Date:** _____

Name of Researcher _____

Signature of Researcher _____ **Date:** _____

Signature of Researcher: *I have explained this study to the best of my ability. I invited questions and gave answers. I believe the participant fully understands what is involved in being in the study, any potential risks of the study and that he/she has freely chosen to be in the study.*

Appendix O

Student Participant Invitations - First Testing Cycle

Subject line of Email: Invitation to Participate in a Research Study to Support Students in Inclusive Classrooms

This fall I will be participating in a research study to test the effectiveness of a student-initiated assessment for learning process that may help me to better identify and support the needs of all students in my class. I also have the opportunity to invite 2-3 students in the class to participate in the key components of a two-phase study. The first phase of the study will include each student in the study completing an online assessment about the student's academic skills, learning strengths and needs, interests, and learning preferences so I can better support them in the classroom. This assessment includes twelve short 5–10-minute quizzes which can be completed on a mobile phone, tablet, laptop or desktop computer. The estimated time to complete the entire assessment is 1.5 hours, but the short quiz format enables the assessment to be completed in incremental periods over a 2-week time frame.

I believe your child may benefit from this research, so with your consent, I would like to invite your child to participate in this study. Full details of the study are outlined in the **attached information letter** along with a **consent form** (to be completed by you) and **assent form** (to be completed by your child) should you agree to participate.

In appreciation of your child's time and efforts, they will receive a package of resources to support their learning including:

- The option of a complimentary Kaufman Test of Educational Achievement (KTEA) which is a diagnostic assessment that measures an individual's achievement levels in the areas of math, reading, writing, and oral communication. Value of approx. \$800.
- Ongoing access to an online learning assessment platform to help me have a better understanding of your child's strengths, interests, needs, learning preferences and motivational tendencies
- A learning plan with recommended strategies to help me support your child the way they learn best and help your child develop skills of their choice and become more accountable for their own learning.
- A \$25 Amazon gift certificate and a 1 in 40 chance to win their choice of an additional reward valued from \$100-\$300.

If you are interested in the study or would like more information, please call Diane Montgomery (the researcher) at 416-562-0359 or email her directly at dpmontgomery@upei.ca by (date).

If you would like to accept this invitation to participate in the study, please sign and return the consent form back to Diane Montgomery at dpmontgomery@upei.ca by (date) as the research will begin the week of (dates). Diane will then arrange a 15 minute zoom call with you and your child to get your child started on the assessment and answer any questions either of you may have about the process.

Teacher Signature

Appendix P

Parent/Student Information Letter - First Testing Cycle

A Student-Initiated Approach for Supporting Students and Teachers in Inclusive Classroom

Purpose of the Study

The purpose of this study is to develop a technology-based student-initiated assessment and learning tool to enable students to directly communicate to their teachers the student's strengths, needs, interests and learning preferences so teachers can support students earlier by teaching students the way they learn best. A second objective is to help students become more involved in and accountable for their learning and the choices they make to achieve their learning goals.

The following research questions guide this study:

- How does the implementation of a student-initiated assessment and learning tool impact student engagement and motivation?
- How does the implementation of a student-initiated assessment and learning process/tool explain differences in the student's level of accountability in their learning?

Voluntary Participation

The parent/guardian of the participant will review the information letter and consent form and provide an online consent of students to participate in the study. An online assent form will be completed by students under the age of 18 and the participation of the student is voluntary.

Study Details

Each student will participate in a 2-week study which will include:

- An online holistic assessment of their academic and learning needs, strengths, interests, learning preferences and motivational tendencies. The estimated completion time is 1-1.5 hours.
- One pre-study and one post-study survey (10 min)

Time Commitment

- The total time for participation in the study will be approx. 1.25- 1.75 hours as follows:
 - Online assessment – 1-1.5 hour
 - Pre- and post-study surveys – 10 minutes

Compensation

Each child who participates in this study will be provided with

- A chance to win 1 of 5 prizes valued from \$100-\$300 based on 300 participants.
- Complimentary access to the assessment and learning tool.

Possible Risks and Benefits

There are no known or anticipated risks associated with participation in this study. The results of this study will test the feasibility of a new technology-based student-initiated assessment and learning tool to help teachers support all students in inclusive classrooms.

Withdrawal from Research

Participants have the opportunity to withdraw their participation any time before the final analysis of the study which is estimated to be April 30, 2024. A request to withdraw from the study can be made by emailing the researcher at dpmontgomery@upei.ca.

Confidentiality & Storage of Data

Data will be collected, handled and stored with password protection on the University of PEI's secured Google drive cloud storage system. Data will be anonymized in the data collection process with only the researcher aware of the identity of the student participant from which the data was collected. However, Google Forms including IP addresses collected by Google can be accessed via Homeland Security. Data must be retained for at least five years, as per the 'Procedures for Stewardship of Research Records and Materials' at the University of Prince Edward Island'. The data will be destroyed after a period of 5 years.

Reporting of Results

The results of the study will be used for a doctoral dissertation and may also be used in academic journal publications.

Questions

This project has been reviewed by the UPEI Research Ethics Board and it complies with Tri-Council guidelines for research involving human participants. If you have any questions concerning the study, please direct your inquiries to Diane Montgomery (researcher) at 416-562-0359 or diane@montgomery.ca or Dr. Kathy Snow (supervisor) at 902-620-5152 or ksnow@upei.ca. Any concerns regarding your involvement in this study may be directed to the UPEI Research Ethics Board, researchcompliance@upei.ca. or (902) 620-5104.

Appendix Q

Consent Form for Parent/ Guardian- First Testing Cycle

A Collaborative Approach for Supporting Students and Teachers in Inclusive Classrooms

Your signature at the end of this form means:

- You have read the information letter about the research. You have been able to ask questions about this study, if you want, and are satisfied with the answers.
- The total hours required for the entire study is approximately 1.25 – 1.75 hours
- You understand what the study is about and what your child will be doing.
- You understand that the research in this study is minimal risk.
- You understand that your child is free to withdraw from the study until the results are analyzed (April 30, 2024) without having to give a reason, and your child’s withdrawal from the study will not affect them now or in the future. Your child may withdraw by sending an email to the researcher at dpmontgomery@upei.ca.
- You understand if your child withdraws from the study, any data collected from them will be destroyed.
- You understand that the information your child provides will be confidential within the limits of the law. However, data provided through US-based platforms, such as Google, can be accessed by Homeland Security as per the US Patriot Act.
- You understand that a copy of your consent form will be emailed to you at the email you provided in this form.
- You understand that you can contact the UPEI Research Ethics Board, researchcompliance@upei.ca or (902) 620-5104 if you have any concerns about the ethical conduct of this study.
- You understand that this project has been reviewed by the UPEI Research Ethics Board and it complies with Tri-Council guidelines for research involving human participants.

Grade level of the child participating in this study as of Sept. 2023. Only students in grades 6-9 can participate in the study.

Grade 6 Grade 7 Grade 8 Grade 9

By checking the applicable box and providing my name in the next section

___ *I consent to provide my child with the opportunity to participate in this study.*

___ *I do not consent to have my child participate in this study.*

Would you like a summary report of the findings of this research? Yes No

Your email address is required if you would like a summary report of the findings.

My email address is: _____

Name of Parent/Guardian _____

Name of Child _____

Signature of Parent/Guardian _____

Date: _____

Name of Researcher _____

Signature of Researcher _____ ***Date:*** _____

Signature of Researcher: I have explained this study to the best of my ability. I invited questions gave answers. I believe the participant fully understands what is involved in being in the study, potential risks of the study and that he/she has freely chosen to be in the study.

Appendix R

Student Assent Form – First Testing Cycle

Title of Project -Supporting Students in Classrooms

Why are you being asked to be part of this project?

My name is Diane Montgomery, and I am developing a technology tool that students can use to communicate directly with their teachers, have more choices in their learning and get more support from their teachers. I am focusing on students in grades 6-9 so I would like to invite you to this study.

If you join this project, what do you have to do?

If you agree to be part of this project, you will get different types of educational support to help make learning easier. The things you will have to do are:

- Complete a series of nine short, gamified quizzes of approx. 5-12 minutes each. The total time to complete the assessment is approx. 1- 1.5 hours, but you can stop and go and complete them over several sessions.
- Complete a pre-study and post-study survey which is a total of approx. 10 minutes.

Will the project help you and other students?

You and other students will have the chance to tell teachers about how you learn best and what type of learning makes you happiest so they can support you better in the classroom.

What do you get for being in the project?

Since you helped us, you will receive;

A chance to win 1 of 5 prizes valued from \$100-\$300 based on 300 participants.
Access to a variety of gamified activities to help you learn better.

Will any part of the project hurt? The project will not hurt and you only have to participate as much as you want.

Does your parent/guardian know about this project?

Your parent/guardian knows about this project and is allowing you to take part in it if you want. But you can talk to them first to decide if you want to take part in it.

Do you have to be in this project?

You don't have to be in this project. It is up to you. If you say yes now, but you decide you don't want to be in the project anymore, you or your parent/guardian can call or email me before April 30, 2024, at 416-562-0359 or dpmontgomery@upei.ca

Who will see the information collected about you?

When we are finished with this project, we will write a report, but it will not have your name on it. Nobody will know you were part of the project except the people doing the project to protect your privacy. Any information we collect from you will be kept safely locked up.

What if you have any questions?

You can ask any questions about this project. If you have a question later that you didn't think of now, either you can call or have your parent/guardian contact me (Diane Montgomery) at 416-562-0359 or dpmontgomery@upei.ca or my supervisor, Dr. Kathy Snow (supervisor) at 902-620-5152 or ksnow@upei.ca.

Grade level of the child participating in this study as of Sept. 2023. Only students in grades 6-9 can participate in the study.

Grade 6 Grade 7 Grade 8 Grade 9

Name of Student _____

Signature of Student _____ **Date:** _____

Name of Researcher _____

Signature of Researcher _____ **Date:** _____

Signature of Researcher: I have explained this study to the best of my ability. I invited questions and gave answers. I believe the participant fully understands what is involved in being in the study, any potential risks of the study and that he/she has freely chosen to be in the study.

Appendix S

1st Testing Cycle Survey

Quality of Content	How easy or difficult were the questions to complete?
	How easy or difficult was it to understand the rest of the material in your experience?
	How helpful were the videos in guiding the experience?
Quality of Learning Plan	The information on my learning plan matched who I am as a person.
	How many of the recommended strategies in the learning plan could support you in your learning? Scale of 1-10
Achievement and Rewards	How much or little did you enjoy the gamified puzzles in this experience?
	How much or little did you enjoy earning coins and gems to guide your experience?
	How much or little did you enjoy shopping for rewards at the SMART shop?
	What are your most preferred items in the SMART shop, if any? School related items; small entertainment items; chance to win big prizes; art, music and sports experiences
Overall Experience	My technical experience using the tool was satisfactory. If disagree or strongly disagree, what technical issues did you experience
	How much or little did you enjoy your overall experience in this activity?
	What did you enjoy best about the experience?
	How could your experience have been improved?

Appendix T

Teacher Interview - 1st Testing Cycle

Introduction Script from Researcher:

Thank you for joining me today and agreeing to be part of this study. The purpose of this interview is to share your experiences and feedback about the information you received from the online assessment that was completed by your students. I will be asking you some general and specific questions about how this information may or may not help you and your students and suggestions for enhancement. I would like to encourage you to be open and honest in your discussion and know that all information shared in this session will remain confidential by me. The session will be approx. 30 minutes long and you also have the option to withdraw from the study altogether by sending an email to me at dpmontgomery@upei.ca.

My hope is that the information shared in this session will not only help me but may also be of some benefit to each of you as you share your experiences. Do you have any questions for me before we get started?

The assessment tool generated a learning plan and UDL recommendations based on the student's responses. What was your initial reaction when you saw this plan?

What did you think of the type of information that was included in the plan?

What were the benefits or usefulness of the information in the learning plan? How helpful or not helpful was the information to you? In the recommended instructional strategies? In understanding how the student learns? In any other ways?

What information was missing or could be more helpful?

What did you think about the instructional strategies that were recommended by the assessment tool?

The assessment tool also generated a class profile which included a snapshot of information from each of the student's learning plan.

What was your initial reaction when you viewed the class profile?

Note: a class profile will include the information of all students who complete an assessment tool which in the case of this research will only be a few students per class.

How would your reaction change (or not) if all students in your class completed the assessment tool?

What were your thoughts of the information provided in the class profile?

What were the benefits or usefulness of the information in the class profile?

What additional information could you provide me to improve the class profile?

Specific Questions:

How realistic or practical would it be to implement the recommended strategies?

Did the information from the learning plan and class profile enhance your relationship with the students who completed them? Why or why not?

What other supports or resources do you think are necessary to help you implement and maintain inclusive practices within your classroom?

Appendix U

Feedback and Refinements from Feedback - First Testing Cycle

Refinements Completed Prior to the Second Testing Cycle

Following my analysis of student and teacher feedback, the following action items were identified for refinement and revisions completed prior to the second cycle of testing.

Academic and Cognitive Assessments

- **Pre- and Post Study Surveys-** I embedded a pre-study and post-study motivation-based survey to be completed prior to and upon completion of the holistic assessment.
- **Revision of flow of questions.** I started some questions 2-4 levels below each student's current grade level, and then introduced questions at higher levels for the following:
 - Math questions revised to start at 4 levels below current grade level
 - Reading comprehension questions revised to start 2-3 levels before current grade level
 - Instead of one general question about all subjects, reflective questions were developed after the completion of each set of the math and literacy questions.

Learning Plan and Strategies

- **Learning Strategies-** I continued to review and refine existing and new learning strategies to maintain alignment with student profiles.
- **Learning skills-** I added more strength-based learning skills to assessment including teamwork and leadership skills to create a more realistic balance of strengths and needs on the learning plans.
- **Learning strategies-** I increased the number of recommended strategies on the learning plan from 10 to 20 strategies. A complete review of the strategies was also completed for further editing or removal of strategies if perceived as ineffective.
- **Learning plan-** Clearer instructions were completed on how to click on the subject areas in the learning plan for more details. Wording was revised to "click here for math details".

Student Engagement

- **Reward System-** I continued a reward system based on a balance of monetary and

non-monetary rewards.

- **Gamified Experience-** I continued to refine and add more gamified puzzles.
- **Post Assessment Motivation Assessment-** I included a question in the post-assessment survey to determine the student's perceived level of enjoyment without any external rewards.
- **Video enhancements-** I switched videos to Vimeo streaming platform. The videos were also reviewed and further edited to shorten them and remove irrelevant content.
- **Technical issues-** Some minor glitches with the technology which were fixed once reported.

Revisions Considered for a Future Version

- **PDF version-** Having the option to download a pdf version of the class profiles and learning plans. This revision was made during the second cycle after this functionality was requested by more teachers.
- **Quality of assessment content-** The content for the reading fluency, reading comprehension and listening comprehension were revised and updated for the second version of the assessment to make them a little more challenging, especially for the higher grades.
- **Text-to-speech enhancements-** Embed text to speech functionality to enable accessibility of content for students lower than grade 5 reading level. This functionality will be completed for the next version of the assessment.

Appendix V

Teacher Conference Poster





UNIVERSITY
of Prince Edward
ISLAND



**WANT TO SAVE TIME
in the classroom?**

- Student-initiated online assessment
- Class profile snapshot of students
- **UDL** instructional strategies
- **Ready-to-use UDL** lesson plans



**Identify + Support
diverse needs of students
in inclusive classrooms**

Express Interest Here
Beta test these solutions in
Design Based Research Study



Contact
Diane Montgomery, UPEI PhD Candidate, dmontgomery@upei.ca
Funded by Mitacs and SSHRC

Appendix W

Principal Invitation- Second Testing Cycle

Invitation to Principal (for teacher participants who expressed interest)

Subject Line: Invitation to a Research Study to Support Teachers and Students in Inclusive Classrooms

My name is Diane Montgomery, a PhD candidate at the University of PEI, and I am conducting a research study to support teachers and students in inclusive classrooms. This involves the development and testing of a web-enabled student-initiated assessment tool to help teachers understand and support the needs of students. I am currently testing this tool with students and teachers in several provinces across Canada.

I am reaching out to you as your teacher; (name of teacher) has expressed an interest in participating in this study with his/her students (and appropriate parental consent). The students will complete a 1.5-hour online assessment (at home) to help teachers efficiently identify and effectively support the needs of all students in their classrooms. The teachers will then review the results and participate in a 30-minute interview to share perspectives on the effectiveness of the assessment results and recommended instructional strategies. As (name of teacher's) administrator, I would like to provide you with detailed information about the study and request your approval for (name of teacher) to participate in the study.

Therefore, I have also attached an information letter and the approval letter from the (name of school board) research ethics department. If you would like more information about the study, feel free to email me at dpmontgomery@upei.ca or call me at 416-562-0359.

If you would like to support your teacher in participating in this study, please respond to this email by (date) as the study is currently in progress. Upon receipt of your decision, I will contact your teacher to obtain their consent (if approval received) or advise them they will not be participating in the study (if approval not received).

I have also attached a separate email transcript below that you can forward to other teachers should you wish to also invite additional teachers from your school to be considered as participants in this study.

Diane Montgomery, PhD Candidate

University of Prince Edward Island

Email for principals to invite teachers to the study:

Name of teacher,

Diane Montgomery, a PhD candidate at the University of PEI, is conducting a research study to support teachers and students in inclusive classrooms. The study involves your students completing an online assessment tool about their academic and learning skills, interests, and learning preferences in order to help you reduce time in identifying and supporting their needs. The tool will generate a learning plan with recommended UDL instructional strategies that can be implemented to benefit the individual student as well as the entire class.

Time Commitment:

- **Students**-completion and review of online assessment (1.75 hours at home)
- **Teachers**- pre-study survey, review the results of assessment and participate in a 40-minute online interview to share perspectives on the effectiveness of the assessment results and recommended instructional strategies (1.5 hour)

Teacher compensation:

- \$50 Amazon Gift Certificate

Student compensation:

- 1 in 300 chance to win either a Nintendo Switch Lite, JBL Speaker or Beats Headphones
- 1 in 20 chances to win one of two x \$25 Amazon gift cards.

I have also attached an information letter with more specific details about the study, and a consent form should you decide you want to be considered as a participant. Your participation in the study is completely voluntary and there are no negative consequences should you decide not to accept this invitation. The study is currently in progress, so if you are interested, please sign and email a copy of the consent form directly to Diane Montgomery at dpmontgomery@upei.ca by (date). You can also contact Diane directly 416-562-0359 if you have more questions.

Diane Montgomery, PhD Candidate, University of Prince Edward Island

Appendix X

Teacher Information Letter- Second Testing Cycle

Title of study: A Student-Initiated Approach for Supporting Students and Teachers in

Inclusive Classrooms

Purpose of the Study

The purpose of this study is to develop a technology-based student-initiated assessment for learning process to enable students to directly communicate to their teachers the student's strengths, needs, interests and learning preferences prior to the start of the school year. This will provide teachers with a consolidated holistic snapshot of all students in the class and help teachers reduce time in identifying and supporting the needs of all learners. A second objective is to help students become more involved in and accountable for their learning and the choices they make to achieve their learning goals.

The following research questions guide this study:

- How does the implementation of a student-initiated assessment for learning process/tool impact a student's perceived level of engagement and motivation?
- What are the perceptions of teachers about the usefulness of the student-initiated assessment for learning process/tool to support diverse learners?
- How do the student-initiated assessment outcomes impact the teachers' identification of student learning needs and the design of instructional strategies?

Inclusion Criteria

The inclusion criteria for TEACHERS are:

- Grade 6-10 general education classroom or resource teachers at a public or separate school board in Ontario, PEI, or New Brunswick. However, all research and research materials will be conducted in English, so the participants require satisfactory proficiency of the English language.
- Teachers in a private or community-based educational organization who support grade 6-10 students

Voluntary Participation

Participation is voluntary. Participants will review an information letter and consent form.

Study Details

Each teacher will support their students in this study. The tasks include:

- Invite the students in the teacher's class (via parent/guardian) to participate in the study (using a recruitment template). Obtain parent/guardian's consent and student's assent for

students to participate in the study.

- Review student's assessment results and recommendations proposed from the assessment for learning process. (Approx. 30 minutes).

- Participate in a 30-minute interview to provide insights, feedback and recommendations about the student-initiated assessment for learning process. This interview will be audio recorded using the Zoom platform. Individual transcripts for each teacher will be available within one month at the end of the data collection (Approx. 30 min)

Time Commitment

- The total time for participation in the study will be approx. 1.5 hours as follows:

-Online interview – 30 minutes

-Review and finalize recommended UDL strategies- 30 minutes

-Pre-study survey (5 min)

-Classroom reminders (15 min)

Compensation

Each teacher who participates in the study will be provided with:

- \$50 Amazon Gift Card
- An opportunity for a student of your choice (with parental permission) to receive a complementary Kaufman Test of Educational Achievement (KTEA) assessment which will be administered by a qualified assessment examiner. The results of this assessment will enable the teacher to better understand and support the needs of the student. Value is approx. \$800 each (only available to teachers in public, private and separate schools)
- A library of UDL strategies and UDL lessons created by teachers for teachers.

Possible Risks and Benefits

There are minimal anticipated risks associated with participation in this study. The results of this study will test the feasibility of a new technology-based student-initiated assessment for learning process to help teachers support the needs of all students in inclusive classrooms. Teachers will benefit by receiving information obtained through this process to help inform their instructional strategies. The teacher's time will be reduced when information is obtained directly and independently from the student outside the classroom setting. However, there may be a possibility of additional time required by teachers interacting/supporting students around use of the tool or the discovered outcomes.

Withdrawal from Research

Teacher and student participants have the opportunity to withdraw their participation any time before the transcripts have been reviewed by the teachers, which is estimated to be (2 months after end of data collection). A request to withdraw from the study can be made by emailing the researcher at dpmontgomery@upei.ca. If a student withdraws, their teacher can continue in the study with the teacher's remaining students or teachers can invite additional students to participate in the study.

Confidentiality & Storage of Data

Live Communication

Face-to-face contact will be required with the teacher and researcher via Zoom and all information communicated through these channels will remain confidential. Pseudonyms will also be used for any reporting of data at the end of the study.

Other Data Collection

Transcripts from the zoom sessions will be completed using Otter.ai software. The transcripts will be completed within 6 weeks and teachers will have 2 weeks to review the content of the transcripts. The analysis of the transcripts will be coded using Atlas.ti software. The recordings, transcripts, consent forms and output of coded data will be stored with password protection on the University of PEI's secured Google drive cloud storage system.

Pseudonyms will be used to ensure confidentiality of data collected with only the researcher and student aware of the identity of the teacher. Data must be retained for at least five years, as per the 'Procedures for Stewardship of Research Records and Materials' at the University of Prince Edward Island'. The data will be destroyed after a period of 5 years.

Reporting of Results

The results of the study will be used for a doctoral dissertation and may also be used in academic journal publications.

Questions

This project has been reviewed by the UPEI Research Ethics Board and it complies with Tri-Council guidelines for research involving human participants. If you have any questions concerning the study, please direct your inquiries to Diane Montgomery (researcher) at 416-562-0359 or dpmontgomery@upei.ca or Dr. Kathy Snow (supervisor) at 902-620-5152 or ksnow@upei.ca. Any concerns regarding your involvement in this study may be directed to the UPEI Research Ethics Board, researchcompliance@upei.ca. or (902) 620-5104.

Appendix Y

Organization Invitation Letter - Second Testing Cycle

Subject Line: Invitation to a Research Study to Support Teachers and Students in Inclusive Classrooms

Organizational Leader,

I am following up on our recent discussion about my PhD dissertation research which focuses on supporting teachers and students in inclusive classrooms. The research involves the development of a web-enabled student-initiated assessment tool designed to save teacher's time in efficiently identifying and effectively supporting the diverse needs of students in inclusive classrooms.

This phase of the study requires the participation of one or more teachers from your organization and the students they support.

Time Commitment:

- **Students**-completion and review of online assessment (1.75 hours at home)
- **Teachers**- pre-study survey, assign the research task to students, provide 3 reminders to students, review the results of assessment and participate in a 30-minute online interview to share perspectives on the effectiveness of the assessment results and recommended instructional strategies (1.5 hour)

The inclusion criteria for teachers:

- Teachers in an educational or community-based educational organization in Ontario, PEI or New Brunswick who support grade 6-10 students

The inclusion criteria for students:

- Grade 6-10 students in Ontario, PEI or New Brunswick who are invited to the study by their teachers.

Teacher compensation:

- \$50 Amazon Gift Certificate

Student compensation:

- 1 in 300 chance to win either a Nintendo Switch Lite, JBL Speaker or Beats Headphones
- 1 in 20 chances to win one of two x \$25 Amazon gift cards.

I have attached an information letter with more details about the study as well as the research approval letter to conduct this research.

If you would like to invite any of your teachers to participate in this study (based on the criteria in the information letter), please forward them the attached email script and have them contact me directly if they are interested. If you would like more information about the study, feel free to email me at dpmontgomery@upei.ca or call me at 416-562-0359.

Email for organizational leader to invite teachers to the study:

Name of teacher,

Diane Montgomery, a PhD candidate at the University of PEI, is conducting a research study to support teachers and students in inclusive classrooms. The study involves the students in your class completing an online assessment tool about their academic and learning skills, interests, and learning preferences in order to help you reduce time in identifying and supporting their needs. The tool will generate a learning plan with recommended UDL instructional strategies that may benefit the student.

Dates of Study:

- Study can be conducted over any 3-week consecutive period between June 1- November 30, 2024

Time Commitment:

- **Students**-completion and review of online assessment (1.75 hours at home)
- **Teachers**- pre-study survey, assign research task, provide 3 reminders to students, review assessment results and participate in a 30 minute online interview (1.5 hour)

Inclusion Criteria:**Teachers:**

- Grade 6-10 general education classroom or resource teachers at a public or separate approved school board in Ontario, PEI, or New Brunswick.
- Teachers in a private or community-based educational organization in Ontario, PEI or New Brunswick who support grade 6-10 students

Students:

- Grade 6-10 students in Ontario, PEI or New Brunswick who are invited to the study by their teachers.

Incentives in Appreciation of Participation:**Teachers:**

- \$50 Amazon Gift Certificate

Students:

- 1 in 300 chance to win either a Nintendo Switch Lite, JBL Speaker or Beats Headphones
- 1 in 20 chances to win one of two x \$25 Amazon gift cards.

I have also attached an information letter with more specific details about the study and a consent form should you decide you want to be considered as a participant. Your participation in the study is completely voluntary and there are no negative consequences should you decide

not to accept this invitation. The study is currently in progress so if you are interested, please sign and email a copy of the consent form directly to Diane Montgomery at dpmontgomery@upei.ca by (date). You can also contact Diane directly 416-562-0359 if you have more questions.

Diane Montgomery
PhD Candidate

Appendix Z

Teacher Consent Form- Second Testing Cycle

A Collaborative Approach for Supporting Students and Teachers in Inclusive Classrooms

Your signature on this form means:

- You have read the Information Letter about the Research. You have been able to ask questions about this study, if you want, and are satisfied with the answers.
- The total amount of time required to participate in the study is 1.5 hour.
- You understand that the discussion in the interview will be audio recorded.
- You understand what the study is about and what you will be doing.
- You understand that the research in this study is minimal risk.
- You understand that you are free to withdraw from the study until (2 months after end of data collection) without having to give a reason, and your withdrawal from the study will not affect you now or in the future. You may withdraw by sending an email to the researcher at dpmontgomery@upei.ca.
- You understand if you withdraw from the study, any data collected from you will be destroyed.
- You understand that the information you provide will be confidential within the limits of the law. You understand you can keep a copy of the signed and dated consent form.
- You understand that you can contact the UPEI Research Ethics Board, researchcompliance@upei.ca or (902) 620-5104 if you have any concerns about the ethical conduct of this study.
- You understand that this project has been reviewed by the UPEI Research Ethics Board and it complies with Tri-Council guidelines for research involving human participants.

___ *I consent to participate in this phase of the study.*

I do not consent to participate in this phase of the study.

Your email address is required to provide you with a summary report of this research (if requested).

Email _____

Would you like a summary report of the findings of this research?

Yes No

Name of Teacher _____

Signature of Teacher _____ **Date:** _____

Name of Researcher _____

Signature of Researcher _____ **Date:** _____

Signature of Researcher: I have explained this study to the best of my ability. I invited questions and gave answers. I believe the participant fully understands what is involved in being in the study, any potential risks of the study and that he/she has freely chosen to be in the study.

Appendix AA

Parent Invitation - Second Testing Cycle

Subject line of Email: Invitation to Participate in a Research Study to Support Students in Inclusive Classrooms

This spring, I am participating in a research study which may help me better support the needs of all students in my class. This research includes students completing an online assessment about their strengths and needs. The estimated time to complete the research is 1.5 hours, but it can be completed in short periods of time over a 2-week time frame.

I would like to invite your child to participate in this study. Full details of the study are outlined in the **attached information letter** should you agree to participate.

If you are interested in the study or would like more information, please call Diane Montgomery at 416-562-0359 or email her directly at dpmontgomery@upei.ca by date.

If you would like to accept this invitation to participate in the study, please sign and return a copy of the attached consent form to me by date. Your child also needs to sign the attached assent form.

Teacher Signature

Appendix AB

Parent/Student Information Letter- Second Testing Cycle

Holistic Approach for Supporting Students and Teachers in Inclusive Classrooms

The purpose of this study is to develop a student-initiated assessment for learning process to enable students to directly communicate their strengths and needs to their teachers to enable teachers to support students earlier and teach them the way they learn best. A second objective is to help students become more involved in and accountable for their learning.

The following research questions guide this study:

- How does the implementation of a student-initiated learning assessment process impact a student's perceived level of engagement and motivation?

Inclusion Criteria:

- Attending a public, private or charter English or French language school in Ontario, PEI, or New Brunswick. However, all research and research materials will be conducted in English, so the participants require satisfactory proficiency of the English language.
- In grades 6-10 in the 2024-2025 school year.
- Has access to either a computer, tablet or phone mobile device through a Wifi internet connection.
- Has been invited to participate in the study by their teacher who is also participating in the study.

Voluntary Participation

The parent/guardian of the participant will review the information letter and consent form and provide consent of students to participate in the study. An assent form will be completed by students under the age of 18, and the participation of the student is voluntary.

Study Details

This study will be conducted over a 2-week period and includes:

- Completion of a pre-study and post-study survey
- Completion of an online learning assessment of the student's academic skills, learning

strengths and needs, interests, learning preferences and motivational tendencies.

- Completion of the assessment will be at home using a mobile phone, tablet, laptop or desktop computer. The assessment is designed for the student to be able to complete it independently however, the student can seek support from a parent/guardian or the researcher.
- Upon completion of the assessment, the student will have the opportunity to select instructional strategies that may work best for them from a list of strategies recommended by the assessment and learning tool.

Time Commitment

The total time for participation in the study will be approx. 1.75 hours as follows:

- o A pre-study survey will be conducted prior to completion of assessment (7 min)
- o Online learning assessment will take approximately 1.5 hours in total to complete. However, the assessment includes twelve short quizzes of approx. 5-10 minutes each allowing the assessment to be completed in incremental periods over a 2-week time frame.
- o A post-study survey will be conducted after completion of the survey (7 min)

Compensation

Each child who participates in this study will be provided with:

- 1 in 300 chances to win a Nintendo Switch Lite, JBL Speaker or Beats Headphones
- 1 in 20 chances to win one of 2 x \$25 Amazon Gift Cards.
- An online learning assessment to help the student and student's teacher have a better understanding of the student's strengths, interests, needs, and learning preferences.
- A learning plan with recommended strategies to help the student's teacher support the student the way they learn best and help the student become more accountable for their own learning.

Possible Risks and Benefits

The results of this study will test the feasibility of a new technology-based student-initiated assessment for learning process and tool to help teachers support all students in inclusive classrooms. This poses minimal risk to students as they are asked to complete an online self-assessment about their learning. Completing the tool might result in surprises for some students as they learn about themselves. Students will benefit from their participation by having the opportunity to directly communicate their needs and also have choice in the instructional strategies that will help them.

Withdrawal from Research

Participants have the opportunity to withdraw their participation any time before (2 months after the end of data collection period). A request to withdraw from the study can be made by emailing the researcher at dpmontgomery@upei.ca.

Confidentiality & Storage of Data

Live Communication

In this study, the student will have contact with the researcher and teacher. The researcher will require contact with the student and parent/guardian through email to keep the student on track with the progression of the ALP and to enable the student to seek additional support through the assessment for learning tool process. All information communicated through this channel will remain confidential. Pseudonyms will also be used in the reporting of all data at the end of the study.

Other Data Collection

Research data will be stored with a password on each single document and with password protection on the University of PEI's secured Google drive cloud storage system. Data from the assessment for learning process will be collected and stored using pseudonyms with password protection on a secure Learn Dash Learning Management System solely administered and owned by the researcher. Pseudonyms will be used throughout the data collection process with only the researcher and teacher aware of the identity of the student participant from which the data was collected.

Data must be retained for at least five years, as per the 'Procedures for Stewardship of Research Records and Materials' at the University of Prince Edward Island'. The data will be destroyed after a period of 5 years.

Reporting of Results

The results of the study will be used for a doctoral dissertation and may also be used in academic journal publications.

Questions

This project has been reviewed by the UPEI Research Ethics Board, and it complies with Tri-Council guidelines for research involving human participants. If you have any questions concerning the study, please direct your inquiries to Diane Montgomery (researcher) at 416-562-0359 or dpmontgomery@upei.ca. Dr. Kathy Snow (supervisor) at 902-620-5152 or ksnow@upei.ca. Any concerns regarding your involvement in this study may be directed to the UPEI Research Ethics Board, researchcompliance@upei.ca. or (902) 620-5104.

Appendix AC

Parent Consent /Student Assent Forms- Second Testing Cycle

A Collaborative Approach for Supporting Students and Teachers in Inclusive Classrooms

Your signature at the end of this form means:

- You have read the information letter about the research. You have been able to ask questions about this study, if you want, and are satisfied with the answers.
- The total hours required for the entire study is approximately 1.75 hours over a 2 week period
- You understand what the study is about and what your child will be doing.
- You understand that the research in this study is minimal risk.
- You understand that pseudonym names will be used for all reporting of the data at the end of the study to maintain anonymity.
- You understand that your child is free to withdraw from the study until (2 months after end of data collection) without having to give a reason, and your child's withdrawal from the study will not affect them now or in the future. Your child may withdraw by sending an email to the researcher at dpmontgomery@upei.ca.
- You understand if your child withdraws from the study, any data collected from them will be destroyed.
- You understand that the information your child provides will be confidential within the limits of the law. You understand that a copy of your consent form will be emailed to you at the email you provided in this form.
- You understand that you can contact the UPEI Research Ethics Board, researchcompliance@upei.ca or (902) 620-5104 if you have any concerns about the ethical conduct of this study.

You understand that this project has been reviewed by the UPEI Research Ethics Board and it complies with Tri-Council guidelines for research involving human participants.

Grade level of the child participating in this study as of Sept. 2023. Only students in grades 6-9 can participate in the study.

Grade 6 Grade 7 Grade 8 Grade 9 Grade 10

By checking the applicable box and providing my name in the next section

I consent to provide my child with the opportunity to participate in this study.

I do not consent to have my child participate in this study.

Would you like a summary report of the findings of this research? Yes No

Your email address is required if you would like a summary report of the findings and to keep you updated on the progress of the research.

My email address is: _____

Name of Parent/Guardian _____ *Name of Child* _____

Signature of Parent/Guardian _____ *Date:* _____

Name of Teacher _____ *School* _____

Name of Researcher _____

Signature of Researcher _____ *Date:* _____

Signature of Researcher: I have explained this study to the best of my ability. I invited questions and gave answers. I believe the participant fully understands what is involved in being in the study, any potential risks of the study and that he/she has freely chosen to be in the study.

Student Assent Form

Title of Project -Supporting Students in Classrooms

Why are you being asked to be part of this project?

My name is Diane Montgomery, and I am developing a technology tool that students can use to communicate directly with their teachers, have more choices in their learning and get more support from their teachers. I am focusing on students in grades 6-10 so I would like to invite you to this study.

If you join this project, what do you have to do?

If you agree to be part of this project, the things you will have to do are:

- Complete twelve short gamified quizzes of approx. 5- 10minutes each. The total time to complete all quizzes is approx. 1.5 hours but you can stop and go and complete them over several sessions.
- Complete a short survey before and after the activities to share your experiences about completing the activities.

Will the project help you and other students?

You and other students will have the chance to tell teachers about how you learn best and what type of learning makes you happiest so they can support you better in the classroom.

What do you get for being in the project?

Since you helped us, you will receive

- 1 in 300 chance to win a Nintendo Switch Lite, JBL Speaker or Beats Headphones
- 1 in 20 chance to win one of 2 x \$25 Amazon Gift Cards

- Access to a variety of gamified activities to help you learn better.
- Ongoing support to help you achieve your academic and learning skills goals.

Will any part of the project hurt? The project will not hurt and you only have to participate as much as you want. You can stop at any time throughout the process.

Does your parent/guardian know about this project?

Your parent/guardian knows about this project and is allowing you to take part in it if you want. But you can talk to them first to decide if you want to take part in it. Even if your parents allow you to take part, it is your choice of whether or not you want to take part in the project.

Do you have to be in this project?

You don't have to be in this project and nothing bad will happen if you decide not to take part. It is up to you. If you say yes now, and you decide you don't want to be in the project anymore, you or your parent/guardian can call or email me before (2 months after end of data collection) at 416-562-0359 or dpmontgomery@upei.ca

Who will see the information collected about you?

When we are finished with this project, we will write a report but it will not have your name on it. Nobody will know you were part of the project except your teacher and the people doing the project to protect your privacy. Any information we collect from you will be kept safely locked up.

What if you have any questions?

You can ask any questions about this project. If you have a question later that you didn't think of now, either you can call, or have your parent/guardian contact me (Diane Montgomery) at 416-562-0359 or dpmontgomery@upei.ca or my supervisor, Dr. Kathy Snow (supervisor) at 902-620-5152 or ksnow@upei.ca. You can also contact me if you need any help in using the tool.

Grade level of the child participating in this study as of Sept. 2024. Only students in grades 6-10 can participate in the study.

Grade 6 Grade 7 Grade 8 Grade 9 Grade 10

Name of Student _____

Signature of Student _____ **Date:** _____

Name of Researcher _____

Signature of Researcher _____ **Date:** _____

Appendix AD

2nd Testing Cycle Survey

PE-ARCS / IMI/ HBSC - Strongly Agree, Agree, Neither Agree or Disagree, Disagree, Strongly Disagree		
	Existing School Experiences (prior to instrument completion)	Perception of Motivation Impact (after completion of instrument)
Relatedness	I feel my teacher cares about me as a person (HBSC)	I think the information from my learning plan can help my teachers understand and care about me as a person.
	I feel it is difficult to trust my teachers (HBSC)- R	
	I feel that my interests are considered in what I learn at school	I feel my interests can be considered in my learning at school.
Competence	I am satisfied with my performance at school (IMI)	I better understand the reason for my performance in math and literacy
	School is difficult for me (IMI)- R-revised	I better understand how I learn
	I think this activity might be difficult (R-)	<p>This activity was difficult (R)</p> <p>Choice to rate level of difficulty after:</p> <ul style="list-style-type: none"> ● Math operations ● Reading comprehension ● Listening comprehension ● Written expression ● Auditory/Visual Memory <p>Questions:</p> <p>What did you think of the questions?</p> <ul style="list-style-type: none"> ● They were very easy ● They were a little easy ● They were okay ● They were a little difficult ● They were very difficult.
Autonomy	I can choose some of the assignments and work I do in class (PE-ARCS-3)	It was important to be able to choose strategies that may work for me.

	I am not able to express my own views in my classes (HBSC)- R	It was important for me to express my views to my teachers.
		Questions only for Post Assessment
		The information on my learning plan matched who I am as a person.
		I enjoyed the gamified puzzles and quests.
		I enjoyed earning coins to shop for rewards at the SMART shop.
		I would enjoy the experience even if I DID NOT have a chance to earn rewards at the SMART shop.
		My technical experience using the tool was satisfactory. If disagree or strongly disagree, what technical issues did you experience
		How many of the recommended strategies in the learning plan could support you in your learning? Scale of 1-10
		What are your most preferred items in the SMART shop? School related items; small entertainment items; chance to win big prizes; art, music and sports experiences
		What other type of rewards would you have liked to see?
		What did you enjoy best about the experience?
		How could your experience have been improved?

Appendix AE

Teacher Interview - 2nd Testing Cycle

Introduction Script from Researcher:

Thank you for your time today. The purpose of this interview is to share your experiences and feedback about the information you received from the online assessment that was completed by your students. I will be asking you some questions about how this information may or may not help you and your students and suggestions for enhancement. I would like to encourage you to be open and honest in your discussion and know that all information shared in this session will remain confidential by me. The session will be approx. 30 minutes long and you also have the option to withdraw from the study altogether by sending an email to me at dpmontgomery@upei.ca.

My hope is that the information shared in this session will not only help me but may also be of some benefit to you as you share your experiences. Do you have any questions for me before we get started?

The ALP tool generated a learning plan and UDL recommendations based on the student's responses. What was your initial reaction when you saw this plan?

What did you think of the type of information that was included on plan?

What were the benefits or usefulness of the information in the learning plan? How helpful or not helpful was the information to you? In the recommended instructional strategies? In understanding how the student learns? In any other ways?

What information was missing or could be more helpful?

What did you think about the instructional strategies that were recommended by the ALP?

The ALP tool also generated a class profile which included a snapshot of information from each of the student's learning plans.

What was your initial reaction when you viewed the class profile?

Note: a class profile will include the information of all students who complete an ALP which in the case of this research will only be a few students per class.

How would your reaction change (or not) if all students in your class completed the ALP?

What were your thoughts of the information provided in the class profile?

What were the benefits or usefulness of the information in the class profile?

What additional information could you provide me to improve the class profile?

Specific Questions:

How realistic or practical would it be to implement the recommended strategies?

Did the information from the learning plan and class profile enhance your relationship with the students who completed them? Why or why not?

What other supports or resources do you think are necessary to help you implement and maintain inclusive practices within your classroom?

Appendix AF

Feedback and Refinements - 2nd Testing Cycle

Technical Functionality Feedback - Second Testing Cycle

The technical feedback in the second testing cycle was based on the teacher's experiences as well as the teachers' perceptions of the student's experiences. The teachers provided suggestions on some technical features, the selection and implementation of learning strategies. They also provided feedback on a few issues to enhance the student experience. Based on the teacher's feedback, I made the following enhancements prior to the third testing cycle.

Refinements Completed Prior to the Third Cycle

- **Printable PDF-** A printable pdf was created for both the learning plans and class profiles
- **Reduction of Strategies-** The initial strategy list was reduced from 20 to 10 strategies.
- **Registration-** A simpler registration process was implemented
- **Environment-** Recommendation to complete assessment in a structured environment with some supervision.
- **Timing-** I reduced the total time to complete the assessment from 90 to 75 minutes. I also proposed completion of the assessment within 3-5 sittings of 15-30 minutes each.
- **Presentation Layer Overhaul-** The most significant revision was an overhaul of the presentation layer which included hiring a graphic artist to create professional illustrations and a refined storyline to align with the existing gamified theme. The goal was for these enhancements to result in a more engaging, gamified feel for the students than the previous traditional LMS layout with a seemingly long table of contents of activities.

Future Enhancement

- **Action Plan Module-** I planned to develop an action planning module upon completion of the research

Appendix AG

Organization Invitations- 3rd Cycle

Invitation to Educational or Community Based Organization

Subject Line: Invitation to a Research Study to Support Teachers and Students in Inclusive Classrooms

Organizational Leader,

My name is Diane Montgomery, and I am completing a PhD dissertation research which involves the development of web-enabled holistic assessment to save teachers time in identifying and supporting the diverse needs of students in inclusive educational settings.

Participation in this research is available to

- Teachers in an educational or community-based educational organization in Canada who support grade 5-10 students
- Students in Canada in grades 5-10 who are recommended to have a grade 5 reading English language proficiency level.

The time commitment required by:

- Students is 90 minutes to complete an online assessment
- Teachers is 60 minutes which includes a review of the assessment results (15 minutes) and participation in a 45 minute online interview to share perspectives on the effectiveness of the assessment results and recommended instructional strategies

In appreciation for their participation:

- Teachers will receive a \$50 Amazon gift card
- Students will receive a \$25 Amazon gift card AND a 1 in 100 chances to win a X box One Wireless Controller, JBL Speaker or Beats Headphones

Attached are two email templates you can use to invite students to the study depending on how you would like your organization to participate in the study.

1. You can either invite students to complete the assessment without any connection to your organization. (Use template #1)
2. Students can complete the assessment at your organization or at home with their assessment outcomes shared with your organization. (Use template #2) In template #2, please choose which option you will use and revise the words

“(home/organization site)”

Please forward a copy of this invitation to your teachers and if you or your teachers would like more information about the study, feel free to email me at dpmontgomery@upei.ca or call me at 416-562-0359. The teacher’s participation in the study is completely voluntary and there are no negative consequences should they decide not to accept this invitation. If interested, the teachers can sign and email a copy of the consent form directly to me at dpmontgomery@upei.ca by (date).

Template #1: Email for organizational leader to invite students via parents to the study:

Subject line of Email: Invitation to Participate in a Research Study to Support Students in Inclusive Classrooms

This spring, (organization name) is participating in a research study which may help teachers better support the learning needs of your child. This research includes students completing an online assessment about their strengths and needs. The estimated time to complete the assessment is 90 minutes, but it can be completed in short periods of time over a 2-week time frame.

In appreciation for your child’s participation, they will receive:

- A \$25 Amazon gift card AND a 1 in 100 chances to win a Xbox One Wireless Controller, JBL Speaker or Beats Headphones

Full details of the study are outlined in the **attached information letter**. If you would like your child to access this tool or would like more information or a summary of the research results, please call Diane Montgomery at 416-562-0359 or email her directly at dpmontgomery@upei.ca by date.

Template #2: Email for organization supporting students onsite (ie. Tutoring program) to invite students via parents.

This spring, (name of organization) is participating in the testing of a new tool that may help your child and us have a better understanding of how your child learns. This includes students completing an online assessment about their strengths and needs which may help us better support your child with the shared learning plan your child and us will be able to view.

The assessment will be completed (at home/organization site) during the period of (dates).

The estimated time to complete the assessment is 90 minutes, but it can be completed in short

periods of time over a 2-week time frame.

Appreciation for Participation your child will receive:

- A \$25 Amazon gift card AND a 1 in 100 chances to win an Xbox One Wireless Controller, JBL Speaker or Beats Headphones

Full details of the study are **attached HERE**. Please let us know (**by date**) if you would prefer your child not to complete this assessment.

If you require more information or would like a summary of the research results, please call Diane Montgomery at 416-562-0359 or email her directly at dpmontgomery@upei.ca.

Appendix AH

Organization Parent and Student Information Forms- 3rd Cycle

A Student-Initiated Approach for Supporting Students in Inclusive Classrooms

Purpose of the Study

The purpose of this study is to develop an assessment process to enable students to directly communicate to their teachers so they can get the support they need earlier. It is also to help students become more involved in their learning.

The following research questions guide this study:

- How does the implementation of a student-initiated learning assessment process impact a student's perceived level of engagement and motivation?

Inclusion Criteria:

- Attending a public, private or charter English or French language school in Canada. Research materials will be conducted in English so the participants require satisfactory English language level.
- In grades 5-10 in the 2024-2025 school year.
- Recommended that students are able to read at a minimum grade 5 English reading level
- Has access to either a computer, tablet or phone mobile device through a Wifi internet connection.

Study Details

This study includes:

- Completion of an online learning assessment about learning strengths and needs resulting in a highly tailored learning plan. The initial learning plan will be shared through the online tool with the organization who provided student access to the assessment. Students can also share the plan with their teachers, parents or anyone else supporting them in their learning by emailing or printing a pdf copy.
- Completion of a pre-study and post-study survey
- Completion of the assessment will be at home or organization (determined by organization) using a mobile phone, tablet, laptop or desktop computer. The assessment should be completed independently but a student can get support if needed from a parent/guardian or the researcher.

Time Commitment

- o Approximately 90 minutes in total to complete but can be completed in short

periods of 5-10 minutes each over 2 weeks

Compensation

Each child who participates in this study will be provided with:

- A \$25 Amazon gift card
- 1 in 100 chances to win a one of an Xbox One Wireless Controller, JBL Speaker or Beats Headphones
- An online learning assessment
- A learning plan with strategies to help the students get supported the way they learn best and become more accountable for their own learning.

Possible Risks and Benefits

The results of this study will test the feasibility of a new technology based assessment tool to help teachers support all students in inclusive classrooms. This poses minimal risk to students as they are asked to complete an online self-assessment about their learning. Completing the tool might result in surprises for some students as they learn about themselves. Students will benefit from their participation by having the opportunity to directly communicate their needs and also have choice in the instructional strategies that will help them.

Voluntary Participation

Students who wish to complete the assessment will be advised that the information collected is part of the beta testing period and may be used for research purposes. However, participation in completing the assessment is voluntary.

Withdrawal from Research

Participants can withdraw their participation any time before (2 months after the end of data collection period). Any information collected up to and before the participant withdraws will be destroyed. A request to withdraw from the study can be made by emailing the researcher at dpmontgomery@upei.ca.

Confidentiality & Storage of Data

In this study, the student may have contact with the researcher. The researcher will require contact with the student through email (registered on the website) to keep the student on track and provide any support student needs. All information communicated will remain confidential. Pseudonyms will also be used in the reporting of all data at the end of the study.

Research data will be stored with a password on each single document and with password protection on the University of PEI's secured OneDrive/SharePoint storage system. Data from the process will be collected and stored using pseudonyms with password protection on a secured Learn Dash Learning Management System solely administered and owned by the researcher. Pseudonyms will be used for teacher and student participants to ensure confidentiality of data collected. Only the researcher and the organization that provided the student with a link to complete the assessment will be aware of the identity of the student and

will be able to view the student's learning plan. Organizations that did provide parents with the link to the assessment are not aware of the identity of the student and will not be able to view the student learning plan. The student has the option to share the data which formulated their learning plan with their teacher or anyone outside of this research who is supporting the student with their learning. Only the researcher will have access to the pre- and post-study surveys.

Data must be retained for at least five years, as per the 'Procedures for Stewardship of Research Records and Materials' at the University of Prince Edward Island'. The data will be destroyed after a period of 5 years.

Reporting of Results

The results of the study will be used for a doctoral dissertation and may also be used in academic journal publications.

Expressed Consent

Sharing the student assent form and website with your child indicates your parent/guardian consent.

Questions

This project has been reviewed by the UPEI Research Ethics Board and it complies with Tri-Council guidelines for research involving human participants. If you have any questions concerning the study, please direct your inquiries to Diane Montgomery (researcher) at 416-562-0359 or dpmontgomery@upei.ca Dr. Kathy Snow (supervisor) at 902-620-5152 or ksnow@upei.ca. Any concerns regarding your involvement in this study may be directed to the UPEI Research Ethics Board, researchcompliance@upei.ca. or (902) 620-5104

Student Information Form

Title of Project -Supporting Students in Classrooms

Why are you being asked to be part of this project?

My name is Diane Montgomery and I am developing a tool to help you talk to your teacher about who you are and how you learn best so they support you better. It is with students in grade 5-10 so I would like to invite you to this study.

If you join this project, what do you have to do?

If you agree to be part of this project, the things you will have to do are:

- Complete some short 5- 10 minutes quizzes. You can start and stop anytime. The total time is about 90 minutes.
- Complete a short survey at the beginning and end of activity.

What do you get for being in the project?

Since you helped us, you will receive

- A \$25 Amazon gift card
- 1 in 100 chances to win a one of an Xbox One Wireless Controller, JBL Speaker or Beats Headphones
- Access to a variety of gamified activities to help you learn better.

Will any part of the project hurt? The project will not hurt and you only have to do it if you want to. You can stop at any time.

Does your parent/guardian know about this project?

Your parent/guardian knows about this project and is allowing you to take part in it if you want. But you should talk to them first before doing it. Even if they say you can, you can decide for yourself if you want to do it. It's your choice.

Do you have to be in this project?

You don't have to be in this project and nothing bad will happen if you decide not to take part. It is up to you. If you say yes now, and you decide you don't want to be in the project anymore, you or your parent/guardian can call or email me before (2 months after end of data collection) at 416-562-0359 or dpmontgomery@upei.ca

Who will see the information collected about you?

When we are finished with this project, we will write a report but it will not have your name on it. Nobody will know you were part of the project except the organization who invited you and the people doing the project to protect your privacy. The organization who gave you access to the tool will also be able to see your learning plan so they can support you. Only the researcher will have access to the pre- and post-study surveys. Any information we collect from you will be kept safely locked up.

What if you have any questions?

You can ask any questions about this project. If you have a question later that you didn't think of now, either you can call, or have your parent/guardian contact me (Diane Montgomery) at 416-562-0359 or dpmontgomery@upei.ca or my supervisor, Dr. Kathy Snow (supervisor) at 902-620-5152 or ksnow@upei.ca. You can also contact me if you need any help in using the tool.

Appendix AI

3rd Testing Cycle Survey

PE-ARCS / IMI/ HBSC -, Agree (3), Neither Agree or Disagree (2), Disagree (1),		
	Pre-Intervention (prior to instrument completion)	Post Intervention (after completion of instrument)
Relatedness	I feel my teacher understands and cares about me as a person (HBSC)	I think the information from my learning plan may help my teachers understand and care about me as a person.
		How could the information from your learning plan impact your relationship with your teachers?
	I feel that my interests are considered in what I learn at school	After completing this activity, I feel that my interests could be considered in what I learn at school.
Competence	I am satisfied with my performance at school (IMI)	After completing this activity, I think I may become more satisfied with my performance at school
	I understand how I learn	After completing this activity, I better understand how I learn
		How could the information collected help you improve any academic challenges you have?
	I think this activity might be difficult.(R-)	This activity was difficult (R)
		Choice to rate level of difficulty after: <ul style="list-style-type: none"> ● Math operations ● Reading comprehension ● Listening comprehension ● Written expression ● Auditory/Visual Memory Questions: What did you think of the questions? <ul style="list-style-type: none"> ● They were very easy

		<ul style="list-style-type: none"> ● They were somewhat easy ● They were okay ● They were a little difficult ● They were very difficult.
Autonomy	I am provided the option to choose learning strategies that work for me (PE-ARCS-3)	During this activity, I was provided the option to choose learning strategies that may work for me
		How could this experience provide you with more choice in your learning?
	I am able to express my own views in my classes (HBSC)- R	During this activity, I was able to express my own views (R)
		Questions only for Post Assessment
		The information on my learning plan matched who I am as a person.
		I enjoyed earning coins to shop for rewards at the SMART shop.
		I would enjoy the experience even if I DID NOT have a chance to earn rewards at the SMART shop.
		I encountered technical difficulties completing the assessment. If disagree or strongly disagree, what technical issues did you experience
		I enjoyed completing this activity.
		What did you enjoy best about the experience?
		How could your experience have been improved?