Engagement of High School Students With Learning Disabilities in Mathematics Learning

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Abstract

Current U.S. high school students report that they are frequently disengaged in the classroom. Although more troubling in low socioeconomic communities, research indicates that privilege does not predispose a student to becoming a lifelong learner and a productive member of society. In fact, on a macro level engagement is relevant to businesses, because today’s employers disclose that although young people achieve, they are often not engaged. The phenomenon explored in this study described and interpreted the perspectives and engagement of high school students with moderate learning disabilities on learning math. Two theoretical frameworks supported this qualitative study: (1) Fredrickson’s Broaden and Build Theory of Positive Emotions and (2) constructivism, as a theory of learning. As this study sought to understand students’ emotional and cognitive engagement in learning math, data was collected through individual semi-structured interviews that included one Socratic lesson on linear equations. The data was analyzed using an interpretative phenomenological analysis. The findings indicated that high school students with moderate learning disabilities are engaged to learn math when they (1) understood how they learn given their learning differences; (2) created relationships with their teachers and engaged in explicit direct instruction; (3) increased their self-efficacy, emotional and cognitive engagement, and intrinsic as well as extrinsic motivation; and (4) cognitively engaged with inquiry-constructivist learning when offered. Consistent with the contemporary literature, the student-participants appeared to broaden their positive engagement and build their resources through persistence and resilience towards a flourishing self-efficacy.

Key words: engagement, motivation, special education, student voice, constructivism, dialogic inquiry, Socratic pedagogy, and direct instruction.
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Chapter I: Introduction

Two-thirds of U.S. high school students stated that they were bored every day. Nevertheless, students reported that they wanted to become actively engaged in their schooling. They hoped to figure out how they could take responsibility for their learning, and they wanted to find engagement in discovering knowledge and creating understanding. And yet, fifty percent of students had skipped school, while twenty-five percent of the students reported not being challenged by lessons because of immaterial content, a shortage of relevance, and a lack of teacher relationships (Crick & Goldspink, 2014; Yazzie-Mintz, 2010; Zhao, 2012). Likewise, in mathematics classes, a lack of joy and confidence in learning lingered, at times producing little success and an increase in anxiety (Mercer, Jordan, & Miller, 1994; Zhao, 2012). Students, with moderate learning disabilities, revealed “frustration and failure” (Mercer, Jordan, & Miller, 1994, p. 294) in regular education math lessons. Therefore, for today’s educational stakeholders, how to generate authentic student engagement remained a “persistent plague of education” (Zhao, 2012, p. 172).

Indeed, math interest and achievement dropped off in U.S. middle schools from elementary school assessments, which resulted in a lesser number of high school students willing to explore science, technology, engineering, and mathematics classes and careers (Middleton, 2013). As mandates and initiatives incorporated The Massachusetts Curriculum Framework for Mathematics: Grades Pre-Kindergarten to 12/Incorporating the Common Core State Standards for Mathematics (2011) in Massachusetts, policy makers had high expectations for compliance and the affirmation of competitive high-stakes test scores. Simultaneously, administrators and teachers wrestled with thoughtful implementation of the standards while working towards high student scores on the required high stakes tests and developing engagement in deeper learning.
These stakeholders, including the leadership of instructional principals, expected optimum student academic progress by following the academic state standards (Drago-Severson, 2012).

A student’s motivated interest in academic progress was “developmental, interdependent, and influenced by the design of educational experiences” (Middleton, 2013, p. 91). However, in the midst of the negative reports on student disengagement was the literature that continued to point to the effectiveness of divergent methods in teaching and engaging students, including students with moderate learning disabilities. Within the framework of student engagement, authors presented discussions on positive engagement and flourishing as well as debated the pros and cons of instructional methods to engage students. The debate over constructivist learning versus explicit direct instruction took center state in the discussion over supporting authentic student achievement with the result being a pendulum sweep from one, arguably, efficacious pedagogy to the other. Some of these authors differentiated contents in authentic learning, specifically addressing engagement in learning math (Almeida & de Souza, 2010; Briggs, Long, & Owens, 2011; Fredricks, Glumenfeld, & Paris, 2004; Golding, 2011; Kirschner, Sweller, & Clark, 2006; Li & Lerner, 2011; Magliaro, Lockee, & Burton, 2005; McMullen & Madelaine, 2014; Moscardini, 2010; Newmann, et al., 1996; Scheuermann, Deshler, & Schumaker, 2009).

However, the literature remained sparse in specifically addressing (1) the engagement on the learning needs and processing levels distinct to students with intellectual disabilities (Vaughn and Linan-Thompson, 2003); (2) the engagement of students with moderate learning disabilities in math instruction (Scheuermann, Deshler, & Schumaker, 2009); and (3) the hallmarks of cognitive engagement (Fredrickson, 2001).

Where rests some certitude about engendering engagement in learning math within the high school setting, especially as it concerns students with moderate learning disabilities? How
do the students, who are diverse learners, view their experience in learning? What are their interpreted perspectives on their cognitive engagement in learning math? Accordingly, the purpose of this study is to explore the perspectives and educational experience in emotional and cognitive engagement of high school students with moderate learning disabilities as they experience mathematics learning in their academic careers. The time is rife to hear from the students themselves.

**Significance of the Problem**

School restructuring efforts continued down the same, reused paths of change that included such mandates as longer days, more time on learning, highly qualified teachers, and the rigorous implementation of national standards as graduation requirements. However, student disengagement remained endemic and in fact coincided with the strict policies of standards, accountability, and high-stakes tests (Yazzie-Mintz, 2010). Current U.S. high school students reported that they are frequently disengaged in the classroom. 98% state that they are bored at some point during the school day. Although more troubling in low socioeconomic communities, research indicates that privilege does not predispose a student to becoming a lifelong learner and a productive member of society. In fact, on a macro level engagement is relevant to businesses, because today’s employers disclose that although young people achieve, they are often not engaged (Crick & Goldspink, 2014). Smyth (2006) argued for approaching the problem of supporting student engagement from the perspectives of the “existential experiences of young people, and from there, begin to construct more feasible reform platforms…that acknowledge…the emotional and relational investment necessary to become engaged with the social institution of schooling in a manner necessary for learning to occur” (pp. 288-289).
Sustained, positive student engagement in active learning had been found to be a key factor in authentic student achievement (Marks, 2000; Newmann et al., 1996), so therefore it was imperative that the voice of students be fully heard to understand the vagaries in their engagement (Smyth, 2006; Zhao, 2012). One response to kindling engagement for all students was an engaging and supportive classroom instructional method with dialogic discourse and teacher-engendered meaningful involvement (Fletcher, 2005; Fredricks, Blumenfeld, & Paris, 2004; Marks, 2000; Newmann et al., 1996). Studies demonstrated that engagement through authentic pedagogy contributed to authentic achievement, while enhancing student commitment and perseverance through the social support found in active discourse during learning (Marks, 2000; Newmann et al., 1996; Newmann, Marks, & Gamoran, 1996). Thus, student oral language, as defined by extensive talk, interaction, and argument, deepened learning (Scott, Mortimer, & Aguiar, 2006). Students required the opportunities to create knowledge, insight, and self-reflective learning perspectives through their active voice and to interpret their views on learning and understanding to achieve more effectively (Fletcher, 2005).

Of equal importance was the notion of student empowerment through vocal engagement. Student empowerment through active student voice is “an ethical and moral practice which aims to give students the right of democratic participation in school processes” (Taylor & Robinson, 2009, p. 161). “Student voice is the expression of any student about any connection about school, learning, and education” (A. Fletcher, personal communication, November 3, 2013). Active voice, known as the oral participation in a transformative, symbiotic, and collaborative relationship between the student(s) and the teacher, allows students to establish empowering, dialogical relationships while stimulating higher-level thinking, creative problem solving, and
self-assessment through meaningful student involvement (Almeida, 2010; Fletcher, 2005; Stohl, 2010; Taylor & Robinson, 2009).

Stakeholders such as policy makers, administrators, educators, community members, and parents expect to access data findings on empowered student voice as they seek out an understanding of emotional and cognitive engagement in learning for all students. Therefore, this research will add new insight into student engagement as it listens to and interprets the perspectives of eight high school students with moderate intellectual disabilities. These views on their emotional and cognitive engagement, as deemed applicable in the ongoing restructuring demands by today’s stakeholders, may contribute to not only timely school change, but also to the empowerment of students, with moderate learning disabilities, as they navigate their educational futures, their post-secondary careers, and their lives as citizens in a democratic society.

Positionality Statement

An education researcher’s identity and worldview manifests into a unique lens on the world of learning. Guided by a philosophy that academically nurtured and coached students breed authentic academic achievement and thereby become active holistic learners, this researcher remains a caring educator for each student (Doll, 2013, in Flinders & Thornton; Noddings, 1984; Valenzuela, 2013, in Flinders & Thornton). This scholar-practitioner’s aim is to excite students with the beauty of math, the excitement of understanding, the creativity of original thinking, and the exhilarating power of achievement.

After having spent eight years in an urban district, this researcher, a special educator, co-teaches math at an affluent suburban regional district, acts as a chairperson for twenty-three students, and directs an academic support classroom for these same students. Academic support
teaching and facilitation follow the dictates of the services listed in student’s Individualized Education Program (IEP). When comparing the two districts, anecdotal findings indicated that students with moderate disabilities from different socio-economic strata remain strikingly similar in their learning strengths and weaknesses. Although not necessarily evident on first look, most students searched for engagement and hoped to find their unique and self-confident voice. However, they often lack the skills to become resilient, engaged learners.

While working in the urban school district and simultaneously pursuing a Certificate of Advanced Graduate Studies degree in educational leadership, this scholar-practitioner conducted research on inquiry-constructivism in a self-contained math class for students with moderate disabilities. Entitled Inquiry in the Classroom (Stohl, 2010), this qualitative study, although not peer-reviewed, is available on ERIC at www.eric.ed.gov (ED509645). This researcher pursued this course of action research because of substantial prior anecdotal evidence of the success of teacher-facilitated Socratic inquiry on students’ engagement. Van Manen (1990) rationalizes that personal experience is an authentic beginning point for research because “my own life experiences are immediately accessible to me in a way that no one else’s are” and that “one’s own experiences are also the possible experiences of others” (p. 54).

Earlier, a graduate class for a Master’s degree in special education introduced the basic concept of Socratic inquiry for realizing student-centered, yet teacher-facilitated learning. From there, evidence of the success of sustained inquiry as a teaching practice became clear while working for two summers as a mentor-facilitator for high school students at the Chandra Astrophysics Institute at the Massachusetts Institute of Technology in Boston, Massachusetts. Novice physics students, selected from urban communities, answered leading questions and pieced together their independent sense making while constructing group experiments. However,
by year two, this team of educators determined that the students required an additional measure of explicit direct instruction, coupled with the inquiry sessions, in order to learn deeply in a timely manner. This modification alerted this researcher to the possibilities of different methods of authentic pedagogy affecting student engagement in learning.

**A clear, studied positionality.** When it came time to academically write about the individuals studied, we researchers must *other*. A clear, studied positionality constantly hovers, demanding an awareness that allows researchers to work constructively and ethically with the participants. By keeping an eye on the lens of personal identity and its positionality, scholar-practitioners can work toward not objectifying, nor stereotyping participants. Through careful methodology, data collection, analysis, conclusions drawn, and powerful, privileged, yet respectful academic language, scholar-practitioners knowingly position each with the *other*, each inclusive of the other (Briscoe, 2005).

However, biases are inherently stubborn and ingrained. The scholar-practitioner needs to consistently self-reflect on distinct prejudices, identities, and assumptions and then apply frequent attention to ward off research compromise. This capital perspective shows both the differences and the favorable assets of a researcher along historical, social, cultural, and symbolic lines. The strong definition of *self*, sustained by continuous self-assessment, self-awareness, and observation of one’s own reactions and preferred outcomes, allows the researcher to think critically and remain immersed in the interpretative phenomenological analysis, while noting personal bias during the research process (Jupp & Slattery, 2006).

This research study with student-participants with moderate learning disabilities demanded an awareness, respect, and sensitivity to assumptions regarding special education, biased language, and the labeling of students with disabilities. Researchers cannot be afraid to
confront obvious bias. For instance, this choice of research topic on student perspectives reflected a personal choice of passionate interest in which this researcher must ask the following three questions on ethical judgment. (1) Since prior research had been conducted on aspects of this subject, was this researcher predisposed to its success? (2) Not having a disability could this scholar-practitioner truly connect, without pandering, with human participants who learn differently? (3) Likewise, did this research problem of practice leave this researcher close-minded to possible changes in methodology and action taken that would make the study less biased?

**Positionality conclusion.** Identifying and understanding bias and positionality highlight that all research suffers from a certain lack of reliability and validity due to multiple, interpretable, ever-changing viewpoints (Briscoe, 2005). Therefore, this scholar-practitioner recommends that other researchers conduct similar research on this problem of practice of discovering student learning perspectives within different educational and socio-economic settings across the United States, as well as in international schools. For, the belief remains that understanding the perspectives of students with moderate learning disabilities while they engage in mathematics learning requires rigorous study through action research in schools and research in the academy that reaches beyond this researcher’s backyard.

**The Research Question**

This problem of practice addressed describing and interpreting the perspectives of students with moderate learning disabilities on their emotional and cognitive engagement in mathematics. The following question clarified the focus of this qualitative interpretative phenomenological analysis:
How do high-school students with moderate learning disabilities describe their engagement and educational experience in learning math?

The Research Paradigm

A research paradigm is a set of assumptions upon which to base the inquiry of a research problem of practice. Constructivism-interpretivism, as a research paradigm, embraces the validity found in multiple realities of the data and multiple meanings of the phenomenon within the collective interpretations of the individual researcher and the research-participants (Ponterotto, 2005). Butin (2010) specifically labels this paradigm, interpretivism, where the researcher constructs and interprets the data to tell a story. Conclusions no longer reflect one singularity. The researcher, once an unbiased and objective positivist, no longer is set apart from the objectified, studied other. Rather, within the constructivist-interpretivist paradigm, the researcher actively reaches out to and works with the participant for a dialogue of deeper understanding. Together the constructivist-interpretivist and the participants find and construct the interpreted meaning of the study. The participants review the transcript and may provide feedback. The researcher, as an equal participant and an observer, may conduct follow-up inquiry sessions. Individual researcher objectivity becomes a charade and outside researchers analyzing the same data are welcomed to find different conclusions (Ponterotto, 2005).

Definitions

Engagement. Student engagement manifests as an attention to and investment in effortful learning.

Inquiry. Inquiry is classroom questioning found in the teaching practices of direct instruction and Socratic constructivist learning.
Socratic method. The Socratic method pertains to instruction taught through sustained, expert teacher questioning. More specifically, Socratic instruction requires a teacher with expert content knowledge, who instructs through higher and lower order questions that are creatively crafted to serve a student’s answer so that a follow-up question can be offered in a continuous, sustained, and positive manner. Students construct their own knowledge through the Socratic method.

Explicit direct instruction. Explicit direct instruction is an instructional method that requires interactive skills instruction, clear structure and chunked directives, questioning with timely feedback, frequent practice, and continual scaffolding through explicit teacher guidance in carefully noted learning objectives.

Authentic pedagogy. Authentic pedagogy encompasses methods of instruction that support student engagement in critical thinking, in-depth comprehension, questioning, and active communication of meaningful learning.

Student self-efficacy. Student self-efficacy is an established, interactive engagement in meaningful learning often built through teacher-facilitated cognitive autonomy.

Theoretical Frameworks

This qualitative interpretive phenomenological analysis employed the Broaden and Build Theory of Positive Emotions and the learning theory of constructivism as its theoretical frameworks. Fredrickson’s (2001) theory applicably scaffolded the interpretation of student perspectives on their emotional and cognitive engagement in math learning. The theory of constructivism provided supporting and crossover framing of student reflections and perspectives on their cognitive engagement in learning math. Therefore, the purpose of this study was to
interpret and understand how high school students with moderate learning disabilities experience and engage in math.

**Broaden and Build Theory of Positive Emotions.** Fredrickson (2001) grounded a new theory built upon the emergence of positive psychology. She put forth that experiences in positive emotions broaden thoughts and actions into building upon physical, intellectual, social, and psychological resources. Multiple positive emotions lead to undoing negative emotions, thus building resiliency and promoting human flourishing, or “optimal well-being” (p. 218). By extension, this theory has been applied to student cognitive learning, motivation, and achievement in education (Fredricks, Blumenfeld, & Paris, 2004; Lewis, Huebner, Malone, & Valois, 2011).

Lewis, Huebner, Malone, and Valois (2011) provided quantitative results linking positive student life satisfaction to educational engagement. Their study utilized the Broaden and Build Theory of Positive Emotions as well as supported Noddings (2003) contention that student happiness in schools has relevancy. Findings noted that life satisfaction does appear to matter to adolescent students and was related to their engagement in a bidirectional relationship connection between their happiness and positive attitudes and their learning. Positive attitudes and behaviors translated into successful academic performance as well as promoted lifelong learners, who became happy in their jobs, relationships, and life satisfaction. These findings linked the perspective of positive psychology to the overlooked context of education and noted that life satisfaction can be changed through educational interventions and vice versa (Lewis, Huebner, Malone, & Valois, 2011).

Fredrickson’s (2001) Broaden and Build Theory frames this interpretative phenomenological analysis as the study aimed to find meaning in student perspectives on their
learning and “interpretive validity” by “developing a window into the minds of the people being studied” (Johnson, 1997, p. 285). When exploring the perspectives of students with learning differences on their engagement in mathematical learning in order to coalesce multiple, interpretive understandings, this theory provided this researcher with the benchmarks for observing emotions and affect during the three one on one interviews with the eight student-participants. Emotions are “response tendencies,” while affect “refers to consciously accessible feelings” (p. 218). Affect presents through emotions and includes attitudes and moods. Because a positive affect has been shown to link to engagement, the Broaden and Build Theory oversees analysis methods that position emotional and affected participant perspectives within interpretative patterns and themes. More importantly, Fredrickson (2001) puts forth that “joy, interest, contentment, pride, and love” (p. 219) broaden thought-actions and build the resources to engage in intellectual learning. This study examined the perspectives and interpretations of student-participants on how they build positive or negative affect, emotions, and authentic discourse into their intellectual engagement in learning and then whether or not they broaden this engagement into resiliency to continue to deepen and to flourish in their engagement. Through semi-structured interviews, this researcher interpreted whether the student-participants interpreted and believed that they have “a broad, flexible cognitive organization and ability to integrate diverse material” (Isen in Fredrickson, 2001, p. 221).

**Constructivist Theory.** As a framework of theory, constructivism emphasizes the cognitive engagement and the construction of knowledge from the environment, through the individual (Piagetian), and/or in conjunction with the social context (Vygotskian). By thoroughly understanding how knowledge construction works and looks, cognitive engagement through various pedagogic methods becomes apparent in different student affects, risk-taking in
answering questions, trust building, and problem solving (Smyth, 2006). Therefore,

constructivism served as a consistent theoretical lens on the student-participants’ cognitive

engagement in learning math through a Socratic inquiry-constructivist lesson and was also

utilized to interpret their learning engagement interpretations within explicit direct instruction

lessons in their regular education classes.

The following paragraphs describe the history of constructivism and the connections

among constructivism as a theory, as a pedagogy, and as a means of cognitive engagement.

In the early 1700s, Vico presciently posited that human knowing was only possible through

construction (von Glasersfeld, 1989). By the 1950s, the Swiss biologist and developmental

psychologist, Piaget, observed children independently constructing their own knowledge within

their range of experience in order to learn about their world. “The object allows itself to be

treated,” Piaget figuratively posited (as cited in von Glasersfeld, 1989, p. 35). Dewey, the early

20th century American philosopher, psychologist, and education progressive similarly promoted

and described constructivism in a child’s development. Implying the need for social interaction,

he noted that, without facilitation, the child will “go on indefinitely” with little more than

“accidental” knowledge growth (Dewey, 1915/2001, p. 28). Later, Vygotsky, the Russian

philosopher, mirrored Dewey and noted that a child’s construction occurs in collaborative social

environments between a knowledge entry point and the optimum level of achievement. He called

this the zone of proximal development (Vygotsky, 1978).

Piaget’s (1952) constructivism work, applicable to education (Baker, McGaw, &

Peterson, 2007), noted the difficulty in trying to change a child’s deeply ingrained assumptions

and generalizations. Simply stating new knowledge or even showing new knowledge was not

enough to change ingrained perceptions. But when a child, now a student, constructed
knowledge through experience, real-world relevance, and active meaning making, this knowledge became *owned* and could readily connect to new knowledge (Duckworth, 2006). The Chinese proverb, “Tell me and I forget, show me and I may remember, involve me and I’ll understand,” is a hallmark of experiential, constructivist learning. Von Glasersfeld (1989) delineated an example of the tenets of theoretical constructivism, and ended the list with a connection from constructivism as a theoretical framework to constructivism as a teaching method of constructed student knowledge making (Figure 1).
Figure 1. Tenets of the Theoretical Framework of Constructivism as a Jumping Off Point


Theory focused the researcher and allowed for clarification of thought. Van Manen (1990) argued that “practice (or life) always comes first and theory comes later as a result of reflection” (p. 15). And then, “theory enlightens practice,” (van Manen, 1990, p. 15) through the recycling *praxis* of action and reflection. A grounded theory, such as the Broaden and Build
Theory of Positive Emotions can say as much. This theory enabled the development and extension of the recorded words of interviews along with the affect and emotions of the student-participants so that they might transcend meaning into an essence of a phenomenon (Johnson, 1997). Therefore, the Broaden and Build Theory of Positive Emotions is one of two highly applicable theoretical lenses for an interpretative phenomenological analysis such as this research study.

Regarding consideration for transferability, a theoretical lens increases the rigor of a study. Specifically, employing theoretical frameworks more readily link the findings of a problem of practice to other disciplines for the readers (Anfara & Mertz, 2006). Since this research examined engagement in learning, this study may have provided the additional evidence that Fredrickson (2001) argued for by asking, how do “broadened thought-action repertoires [translate] into decisions and action?” (p. 221). In addition, this study hoped to provide evidence that “pedagogical constructivism suggests methods of teaching consonant with cognitive constructivism” (von Glasersfeld, 1989, p. 10), thus bolstering both, the pedagogy and the theory, and best of all providing insight into understanding the educational experiences and emotional and cognitive engagement in learning math by students, who learn differently.
Chapter II: Review of the Literature

The Broaden and Build Theory of Positive Emotions, along with constructivism theory and the research question, scaffolded the investigation of the literature germane to this study. The central question is: How do high school students with moderate learning disabilities describe their engagement and educational experience in learning math? This research aimed to examine, interpret, and understand student-participants’ perspectives on their learning experiences and emotional and cognitive engagement as diverse learners that may have influenced their paths to mathematics knowledge meaning making and constructed learning. This research also intertwined the feelings and affect that accompanied their perspectives on engagement in learning. Therefore, the two theories and the central question provided the path that guided the interrogation of the literature.

The following literature review explores the specific and unique definitions and descriptors of students as diverse learners as they relate to student engagement, dialogic inquiry and student voice, student and teacher perceptions, intrinsic motivation, explicit direct instruction, the historical antecedents and present day contexts of constructivism and direct instruction, and dissenting views, tensions, and counter-arguments. The following key terms guided the literature search and its organization: Engagement, motivation, special education, student voice, constructivism, dialogic inquiry, Socratic pedagogy, and direct instruction.

Student Engagement

Engagement presents as student enjoyment of a challenge just beyond a current ability. Engaged students initiate individual learning, persevere in effort and concentration, and present with the associated positive emotions. Student engagement encompasses the attitudes that students demonstrate in the classroom and towards school. Engagement is also defined as “the
attention, interest, investment, and effort students expend in the work of learning” (Marks, 2000, p. 155). Engagement is impressionable and “amenable to environmental change” (Fredricks, Blumenfeld, & Paris, 2004, p. 59). Notably, engagement “overlaps with, but is not the same as, student motivation” (Fletcher, 2014, p. 1; Lewis, Huebner, Malone, & Valois, 2011).

Instructional practices increase intellectual engagement (Newmann et al., 1996). Indeed, for students with learning disabilities, meaningful classroom discourse, through rich teaching practices, provides disciplined, active engagement in learning (Stone, 2002). One specific response to kindling engagement for all students is an engaging and supportive classroom instructional method where students collaborate, become autonomous, and have fun (Fredricks, Blumenfeld, & Paris, 2004; Marks, 2000; Newmann et al., 1996). Newmann et al. (1996) call this authentic pedagogy. Authentic pedagogy leads to authentic student achievement. Pedagogy described as authentic requires critical thinking and in-depth learning through disciplined inquiry. The look of disciplined inquiry includes the access of prior knowledge, real-world connections, in-depth comprehension, and communication of understandings. Engagement through authentic pedagogy contributes not only to authentic achievement, but also to enhanced student commitment and perseverance brought about by social support for learning and active discourse during learning (Marks, 2000; Newmann et al., 1996).

When educators work to instill degrees of active engagement, they find that various teaching methods engender the attitudes of joy and curiosity in learning. Particularly, experiential learning brings about engagement that students find multidimensional in being emotionally attractive and new, behaviorally focusing, and cognitively rewarding (Appleton, Christenson, & Furlong, 2008; Fletcher, 2014; Lewis, Huebner, Malone, & Valois, 2011). Fredricks, Blumenfeld, and Paris (2004) state that while engagement in the classroom can be
noted to increase academic achievement and perseverance, it is also found to be “higher in classrooms with supportive teachers and peers, challenging and authentic tasks, opportunities for choice and sufficient structure” (p. 87). When students find that the instruction supports their “autonomy and mastery-oriented evaluation rather than competitive evaluation” (Greene, Miller, Crowson, Duke, & Akey, 2004, p. 474), their engagement and achievement improve. Greene et al. (2004) conclude that as students approach achievement through the mastery of meaningful processing and the integration of new information, they begin to feel a perception of self-efficacy, or established, interactive engagement.

Student engagement is evident through the observation of student affect and the student’s level of focus on tasks. When observed in math classrooms, students learn to orally voice their analysis and synthesis while also “participating in mathematical discussions, proposing and defending conjectures, and responding to the arguments of others” (Mueller, Yankelewitz, & Maher, 2011, pp. 370-371). This learning environment in a dialogic community, where students, as diverse learners, are challenged, valued, and respected, engenders student voice through individual and group communication (Mueller, Yankelewitz, & Maher, 2011; Stone, 2002).

Steinberg and McCray (2012) further establish student voice as key to student engagement. Through involvement in decision-making and collaboration, students find that they have increased achievement through caring, meaningful relationships that have been built with their teachers. Positive feelings about school in general allow them to strive toward independent learning and to “think meta-cognitively” (p. 2). Furthermore, these students report that they want challenging learning with lively oral discussions. These students channel the progressive ideas of Dewey (1915/1902/2001) and Freire (1968) when they advocate that they do not want to be simple, passive vessels with knowledge deposited into them (Steinberg & McCray, 2012).
As stated, student engagement can lead to authentic academic achievement. “Students seem to have an intuitive understanding” of the instructional approach “they need and when they need it,” suggest Milner, Templin, and Czerniak (2011, p. 166). Teachers play a critical role in students’ engagement in learning and the support of student autonomy to become intrinsically motivated. When students are allowed to achieve personal goals while constructing their own meaning making and knowledge, they form personal conclusions about the relevance of learning. Therefore, teachers, who provide support in student cognitive autonomy, also promote student cognitive, behavioral, and emotional engagement (Stefanou, Perencevich, DiCintio, & Turner, 2004).

**Dialogic Inquiry and Student Voice**

The dialogical approach, which prompts a discussion between the teacher and the student in the classroom, is a thinking-based, questioning strategy, in which the teacher’s authority is no longer central (Almeida, 2010; Scott, Mortimer, & Aguiar, 2006). Instead, conversation as agreed-upon communication is a “cooperative activity, where both speaker and addressee (hearer) engaged each other using the same guidelines” (Chenail & Chenail, 2011, p. 277). Parsimony in the initiating speaker is valued so that the speaker, the teacher in this case, practices the etiquette to speak plainly while considering the vigorous balance between offering too little information and providing unnecessary verbiage (Chenail & Chenail, 2011). As collaborative discourse, the distinction between the teacher-facilitator and the student transforms into a risk-taking choice to participate or not (Mueller, Yankelewitz, & Maher, 2012). However, Scott, Mortimer, and Aguiar (2006) find that the attainment of quality knowledge construction and focused engagement through dialogue may also include a dose of direct instruction in conjunction with the instruction by inquiry. Watts and Bentley (1987) assert that classroom time
constraints within an classroom questioning session demand that direct instruction and lower-order questions sporadically make their way into the continuation of the dialogue within the constructed learning environment’s scheduled timeframe.

Particular to math, Mercer, Jordan, and Miller (1996) state that the constructivist teacher formulates and guides the dialogue with “just enough” supporting information. This allows all students, including students with learning disabilities, to meet the challenge and push to extend and create their own vocal participation in discovering new knowledge. The teacher-facilitator remains neutral in affect, yet positive and encouraging in support. Keeping away from lecture-driven instruction most of the time, the facilitator also avoids evaluative, judging comments. When teachers ask higher-order cognitive questions (interpretive, evaluative, and inferential) for fifty per cent or more of the time, students increase their engagement, produce more articulate responses, and display more inferential thinking (Cotton, 2001). The students begin to exhibit a “cognitive dissonance” (Mercer, Jordan, & Miller, 1996, p. 148) within this dialogical community, while they formulate a depth of knowledge through active learning. Therefore, the teacher, as the facilitator, orchestrates the questioning session so that the students discover the joy of continually piecing together the right math answer (Lin, Hong, & Cheng, 2009; McMullen & Madelaine, 2014).

In the dialogical approach, the teacher, now acting as the facilitator, and the student, either a typical learner or a diverse learner, work together symbiotically and on equal ground. More specifically, learning through dialogues can provide social empowerment to the marginalized learner. Harding, a feminist epistemologist, as referenced in Phillips (1995), advocates that constructivism is social and political in nature. Thereby, the oral act of constructing knowledge empowers the learner, particularly one who is challenged. Taylor and
Robinson (2009) affirm that the power of student voice can thrive within the social interplay of empowering dialogues.

**Student voice.** “Student voice is the expression of any student about any connection about school, learning, and education” (A. Fletcher, personal communication, November 3, 2013). Student empowerment through voice is “an ethical and moral practice which aims to give students the right of democratic participation in school processes” (Taylor & Robinson, 2009, p. 161), including in pedagogies that create knowledge and engagement. Active voice, as the oral participation in a transformative, symbiotic, and collaborative relationship between the student and the teacher, allows the student to establish an empowering, dialogical relationship while stimulating higher-level thinking and creative problem solving through meaningful student involvement (Almeida, 2010; Fletcher, 2005; Stohl, 2010; Taylor & Robinson, 2009).

Fletcher (2005) defines meaningful student involvement as the process that “continuously acknowledges the diversity of students by validating and authorizing them to represent their own ideas, opinions, knowledge, and experiences through education in order to improve our schools” (p. 5). When students find value in their voice, Groves and Welsh (2010) have shown that student responsibility, participation, collaboration, activism, and leadership increase not only in the classroom but also school-wide and into their community. Although student voice can be perceived as inconvenient, Fletcher (2005) argues that students want not just a voice, but to be legitimately heard. Taylor and Robinson (2009) note that students have long been excluded from their privilege of participation in school and classroom practices.

**Wait time.** Students must be given sufficient wait time to process their answers both before answering (wait time I) and before hearing the next question (wait time II) in a questioning session (Rowe, 1986). In all discourse, students must also have the respect of time
to silently process before continuing their thought without interruption (Tobin, 1987). As the correct answer coalesces into academic success, student self-confidence and motivation can increase. The interplay between open and closed questions provides the scaffolding for debate and argument between the student and the teacher-facilitator (Cotton, 2011; Lin, Hong, & Cheng, 2009). Tobin (1987) specifies that the relationship between teacher questioning methods and student behavior depends on the number and kinds of questions posed and the amount of wait time allowed.

Noting Rowe’s (1986) seminal work on wait time, Almeida (2010) affirms that an increase in teacher pausing increases the quantity and quality of the students’ constructed responses. When adequate wait time is honored, teachers ask fewer questions and those they ask can inquire more deeply. As a best practice, wait time is a useful tool for all students’ successful processing and understanding. When allowed the time to process, students are less confused and become more engaged and confident. The students also discover an esprit de corps through their engagement in successful dialogue. However, wait time is not a stand-alone strategy to engender achievement, but rather another instructional best practice, among many, in the teacher’s arsenal (Tobin, 1987).

Unlike the rapid-fire questioning defined by the Socratic method used most notably within law school pedagogy (Garrett, 1998), the specific success of expert teacher-facilitator Socratic classroom questioning increases with the applied sensitivity to sufficient wait time allotted in the inquiry session. The pedagogical technique of wait time allows students the proper amount of processing time, both after a question is posited and before the next query. As the responses increase in length, the answers develop into higher-order thinking, and the failures
to respond decrease. With a minimum wait of three to five seconds, student engagement increases (Rowe, 1986).

**Student and Teacher Perceptions**

Students are motivated toward their achievement goals with a higher engagement and self-efficacy when they perceive “their classroom as supporting autonomy and mastery-oriented evaluation rather than competitive evaluation” (Greene, Miller, Crowson, Duke, & Akey, 2004 p. 474). Students succeed based upon previous experiences and current perceptions (Bolshakova, Johnson, & Czerniak, 2011; Chang, Hsiao, & Chang, 2011; Renchler, 1992). Chang, Hsiao, and Chang (2011) express that students favor a combination of student-centered and teacher-centered instruction over teacher-centered instruction alone. With teacher-facilitated classroom questioning, the continuous practice of articulation increases the perception of student confidence in the critical thinking experience, even when the answers are not always right (Collier, Gunther, & Veerman, 2002; Stohl, 2010; Thoron, Myers, & Abrams, 2011).

On the other hand, so-called cogenerative dialogues between teachers and students, invented following students’ expression of dissatisfaction in the classroom, create conversations and incorporate diverse perspectives. Students find self-actualization through expressing themselves in these dialogic groups. Authentic learning communities, as exemplified through these empowering dialogues of teachers and students, facilitate student voice, trust building, respect, positive emotional energy, and a “solidarity and collective identity” (Ritchie, Tobin, Roth, & Caramba, 2007, p. 172) within a school.

Furthermore, autonomy-supportive teachers are invested teachers, who listen more, give fewer directives, respect student choice and independent construction, respond to student
questions, and support intrinsic motivation. The specific instructional behaviors of choice and constructivism benefit students, when compared to controlling teacher attitudes in instructional methods (Reeve, Bolt, & Cai, 1999). Interactive dialogue fashions a mentoring relationship between the teacher and the student. More specifically, this relationship can help a student who is worried and uneasy about math. The anxious student can find an ally in the teacher and within structured, non-threatening, success-oriented dialogues (Lin, Hong, & Cheng, 2009; Middleton & Spanias, 1999).

The long-term reward of active dialogues and supportive teachers in the classroom extends into post-secondary student perceptions. When college students with learning disabilities are asked to reflect on their connections with their past high school teachers and the effectiveness of past educators, they rate their teachers’ competence in instruction, interpersonal communication, diverse-learning accommodation implementation, and support in motivation. Those teachers, who individualize instruction while building a relationship through authentic listening, are high on the students’ perceptions of competency in promoting the motivation to learn (Cornette-DeVito & Worley, 2005).

**Intrinsic Motivation**

Motivation is more than the catchall definition of socially acceptable classroom learning behavior. Piaget (1952) notes that motivation accompanies a child's development from birth. Armed with the mantra, “If I can do it, I will,” (Duckworth, 2006, p. 18) children learn by this motivational statement. Motivation is the desire to learn with a positive attitude and enterprising thoughts, actions, and outcomes (Deci, Vallerand, Pelletier, & Ryan, 1991). This human force gives direction to the goal of learning in an active and dynamic way (Mueller, Yankelewitz, & Maher, 2011; Sivan, 1986). Ryan and Deci (1999) sum up the definition of motivation: “To be
motivated means *to be moved* to do something” (p. 54). On the other hand, intrinsic motivation is the free engagement in activities under one’s own volition without outside rewards. Intrinsic motivation comes from the inner-self becoming self-determined (Deci, Vallerand, Pelletier, & Ryan, 1991).

A social constructivist framework notes the increase in student motivation within questioning in classrooms. When brought about by teacher-facilitation, which coaches, guides, and teases out knowledge and complex understanding, motivated learning can begin and grow (Benware & Deci, 1984; Mueller, Yankelewitz, & Maher, 2011; Newmann et al., 1996; Sivan, 1986; von Glasersfeld, 1989). Academic success in the construction of knowledge requires student effort and drive. Willing effort increases motivation (Bonk & Cunningham, 1998; Pintrich, 2003). “The learner’s creativity, higher order thinking, and natural curiosity” (Bonk & Cunningham, 1998, p. 29) contribute to intrinsic motivation, which energizes students when activities are meaningful and authentic (Pintrich, 2003).

Intrinsic motivation to learn and succeed becomes authentic “when students are presented with meaningful, relevant, and challenging tasks; offered the opportunity to act autonomously and develop self-control over learning; encouraged to focus on the process rather than the product; and provided with constructive feedback” (Mueller, Yankelewitz, & Maher, 2011, p. 34). Specifically, the teacher, who triggers higher-order thinking and more effective cognitive learning rather than teacher-centered lectures and superficial activities, engenders engaged learning (Marshall & Horton, 2011). Therefore as cognition progresses, “adaptive self-efficacy and competence perceptions motivate students” (Pintrich, 2003, p. 671).
Likewise, Reeve, Bolt, and Cai (1999) point out that when caring teachers support the autonomy of their students through dialogue and interpersonal skills, students’ intrinsic motivation, understanding, creativity, challenge-acceptance, positive emotions, and academic skills improve. Therefore, student motivation becomes self-determined and valued. Teachers, who support student autonomy and intrinsic motivation, also listen more, ask questions, do not provide solutions, but do “volunteer more perspective-taking statements” (p. 547). Most importantly, the autonomy-supportive educator brings the student into the conversation by nurturing voice, initiative, and perseverance behaviors. The authors highlight that a “flexible, resource-providing, and student-centered instructor” (p. 537) and an autonomy-supportive instructional style can facilitate active rather than passive learning as well as support all students including those with behavioral issues and learning weaknesses (Reeve, Bolt, & Cai, 1999).

Student motivation is evident in positive behavior and the growing ability to take academic risks engendered by the facile educator. The student gains in confidence and begins to lose the fear in speaking out and facing the possible wrong or seemingly misguided answer (Sivan, 1986; Stohl, 2010). This self-determined learning leads to intrinsic motivation (Deci, Vallerand, Pelletier, & Ryan, 1991). Rather than focus solely on the grade earned or given, like the extrinsically motivated student, the intrinsically motivated student’s positive belief and disposition in performance can grow and positively satisfy the learner (Mueller, Yankelewitz, & Maher, 2011).

**Interpersonal relationships.** Within mathematics constructivist classrooms, motivation is socially constructed and its positive manifestation becomes obvious to the teacher-facilitator. The inquiry process recognizes the student as the center of constructionist learning and the teacher as the conductor (Garrett, 1998). This social construction of the interpersonal
relationship between the student and the teacher is a two-way street. The teacher’s motivation directly relates to the student’s motivation and vice versa. Likewise, the teacher’s interest in the material directly relates to the student’s perception of the problem’s worthiness, while the teacher’s self-organization as the sessions progress interrelates to the student’s self-organization of the constructed knowledge (Sivan, 1986; von Glasersfeld, 1989). Therefore, motivation becomes a product of the social constructivist, Vygotskian perspective, where classroom culture falls within the constructivist context. This constructivist, cultural environment manifests in the language of math, the tools of problem solving, and the atmosphere and positive experience in active meaning making (Sivan, 1986). Likewise, the constructed knowledge itself begins just out of range for the students, so that they can access their prior knowledge and then confidently and successfully meet the challenge of discovering the math solution (Pintrich, 2003).

Both the educator and the students learn to become adaptive as they construct, for there is more than one way to solve a math problem and therefore, more than one, usually non-linear path of steps, to the one-and-only-one end point in mathematical problem solving. This acknowledgment prevents negativity when a student takes a wrong direction in cognitive thinking and deducing. Instead, redirection is “socially negotiated” (Sivan, 1986, p. 205) and offered through yet another question. Likewise, within explicit direct instruction, wrong answers are quickly corrected to continue construction of knowledge through a fast pace and positive reinforcement around the gradual release of responsibility model of “I do, we do, you do” (McMullen & Madelaine, 2014, p. 138).

Since teacher quality improves student achievement, the expert teacher-facilitator identifies the suitable follow-up question within the student’s reach that may be able to bring
about a correct answer (Marshall & Horton, 2011). In addition, the expert teacher enables the overall success in the facilitated inquiry-constructivism process (Wongapiwatkul, Laosinchai, Ruenwongsa, & Panijpan, 2011). Within direct instruction lessons, McMullen and Madelaine (2014) point out that the “more proficient and well versed the teacher is in a given area, the more effective he/she is at responding to individual rates of progress in the group [and] being able to adjust instruction throughout the lesson” (p. 146).

Sivan (1986) notes that the inquiry classroom displays a cultural norm of motivated achievement and thereby models itself for the entire school community as a place of student-centered learning of in-depth knowledge construction. Engagement and intrinsic motivation may follow as students find their “willingness, need, desire and compulsion to participate in, and be successful in the learning process” (Bomia et al., as cited in Fletcher, 2014, p. 1).

**Engaging Instructional Methods**

Educators utilize various teaching methods to engage their students (Almeida & de Souza, 2010; Briggs, Long, & Owens, 2011; Golding, 2011; Koh, Tan, Wang, Ee, & Liu, 2007; Marshall & Horton, 2011; McMullen & Madelaine, 2014; Rivera, 1997; Scott, Mortimer, & Aguiar, 2006). Simultaneously, state standards with an eye toward college and career readiness mandate principles of teaching to facilitate increasing student engagement, perseverance, and constructed learning. Specific to math, *The Massachusetts Curriculum Framework for Mathematics: Grades Pre-Kindergarten to 12/Incorporating the Common Core State Standards for Mathematics* (2011) discerns that “students need to understand mathematics deeply and use it effectively” (p. 9). Without specifically defining a pedagogy to accomplish in-depth student learning, these writers argue for an engagement with math whereby students “communicate precisely to others” (p. 17) while discussing, interpreting, and applying math concepts. Without
an understanding of math topics, the writers warn that students “may rely on procedures too heavily” (p. 17). Bloom, Engelhart, Furst, Hill, and Krathwohl (1956) maintain that the road to the deepest understanding is for the students to create the material. Marks (2000) muses, “Perhaps the favorable influence of mathematics on engagement is attributable to the current reform in mathematics education, which has introduced innovative curricular and instructional approaches” (p. 175).

Qualitative and quantitative studies document that constructivist pedagogies, both inquiry-based and direct instruction-based, scaffold learning as students stimulate their own meaning-making (Almeida, 2010; Briggs, Long, & Owens, 2011; Cotton, 2001; Kirschner, Sweller, & Clark, 2006; Loyens, Rikers, & Schmidt, 2008; Marks, 2000; Marshall, Lotter, Smart, & Sirbu, 2011; Mercer, Jordan, & Miller, 1996; Mueller, Yankelowitz, & Maher, 2011; Stefanou, Perencevich, DiCintio, & Turner, 2004). However, because educators and administrators often find the term inquiry to be variable, ill-defined, and lacking in cogent understanding, there is a lingering lack of practicality of inquiry implementation into classrooms (Thoron, Myers, & Abrams, 2011). For the purpose of this study, inquiry is defined as instruction by means of classroom questioning. Teacher-facilitated inquiry-constructivism is at once, according to Gardner’s multiple intelligences of learning, intrapersonal and interpersonal (Eberstadt, 1999; Smith, 2008). The intrapersonal intelligence notes an understanding of self, personal feelings, and strength in working alone, while the interpersonal intelligence shows the strength to work well in dialogical groups and have meaningful social relationships (Smith, 2008). Inquiry is also a dialogue between the teacher-facilitator, who maintains sustained questioning, and the students, who actively construct meaning and solve problems within a dialogic community. Supportive wait and think time, detectable as maintained, silent pauses in
the dialogue, promotes the ability for students to successfully internalize, actively process, and then engage in higher cognition (Rowe, 1986; Tobin, 1987).

In addition, the term *Socratic* addresses a form of inquiry that is sustained in its teacher-facilitated questioning. In teacher-facilitated Socratic inquiry, the teacher asks higher- and lower-order questions based upon the entry point of prior knowledge while building from the student’s most-recent response (Cotton, 2001). The expert teacher scaffolds the dialogue to enable continuing the constructivist discourse (Golding, 2011). More difficult concepts take longer to process and build. If the student is off-track in an answer, the teacher finds the germ of the right answer within the response and, following additional wait time, refocuses the discussion through another question to allow for meaningful engagement so as not to deprive the student of answering successfully (Tobin, 1987). Ideally, Socratic inquiry takes place with one or more students in a small-group session. In mathematics, the constructivist discussion builds to the one right answer by way of the facilitator’s keen direction and content-laden scaffolding.

Divergent studies note that teacher-facilitated direct instruction also provides doses of explicit constructivist learning for students, including learners with moderate disabilities. Through various instructional strategies, including questioning and the quick response to correct errors, direct instruction paves the way toward constructivist learning (Koh, Tan, Wang, Ee, & Liu, 2007; McMullen & Madelaine, 2014; Rivera, 1997). On the other hand, teacher-facilitated inquiry-constructivism often requires that the teacher not approach the inquiry session from a dogmatically progressive point of view, but rather accept that sporadic direct instruction may need to be interspersed to allow the inquiry session to proceed in a timely, yet successful, manner (Scott, Mortimer, and Aguiar, 2006). However, Klahr and Nigam (2004) firmly maintain that
more students require “focused, explicit, and didactic” direct instruction on “phenomena and procedures” (p. 661) than require discovery, or constructivist, learning.

**Historical Antecedents of Constructivism**

Student construction of independent knowledge through oral meaning making is evident throughout the history of pursuing the goal of student engagement. In the eighteenth century, Rousseau (1979/1762) recorded his fictitious student, Emile’s, desire for subjects that interest him and are personally useful. During the dawn of the twentieth century, John Dewey (1915/1902/2001), the philosopher and author of *The School and Society* and *The Child and the Curriculum*, observes two education factions at odds. Dewey writes, on the one hand, there are the sects that embraced teaching through “the subject-matter of the curriculum,” whereas the other sects upheld the self-realization of the child molded by “the contents of the child’s own experience” (Dewey, 1902/2001, p. 106).

In today’s parlance, Dewey (1915/1902/2001) notes the rift between the essentialists and the progressives. The former school of thought upholds the student as a passive vessel that needs to be filled up with specific lessons and facts and figures taught by direct instruction as exemplified by the lecture format and assessed through high-stakes testing (Hirsch, 2006). As an immature human, the child must learn the ways of adulthood through lessons in “well-ordered realities” (Dewey, 1902/2001, p. 107). School is for lessons taught from texts and best exemplified by the classroom chair solely made for listening. Those desks designed to keep students as passive listeners symbolically deny the active and creative constructivism of engaged knowledge making (Dewey, 1902/2001). “Guidance and control” (Dewey, 1902/2001, p. 108) are the essentialists’ buzzwords.
On the other hand, inquiry-constructivism, a student-centered pedagogy facilitated by teacher direction, promotes authentic “intellectual quality” (Newmann, Marks, & Gamoran, 1996, p. 282). Within an inquiry-constructivism session, the student, no longer passive, becomes an active, subjective, experiential learner and an engaged, knowledge producer (Boghossian, 2006; Dewey, 2001; Golding, 2011; Scott, Mortimer, & Aguiar, 2006). Knowledge is not banked. It is created, transmitted, and further built upon (Freire, 1968).

**Historical Antecedents of Direct Instruction**

In the 1960s, Engelmann, an early childhood educator, creates and argues for the comprehensive teaching method of direct instruction. Engelmann and his associates adhere to the prescription that curriculum-based, chunked information and tasks offered quickly and with repetition by an expert teacher facilitate mastery learning for all students. Unison response, with immediate teacher corrections, is a defining feature of direct instruction (McMullen & Madelaine, 2014). The Direct Instruction Follow Through Model of Engelmann, Becker, Carnine, and Gersten (1988) puts forth that all students can learn irrespective of their learning disabilities and/or socio-economic differences. Instructional practices and what is being taught determine academic success. The onus of student learning is on the teacher, who actively, explicitly, and directly demonstrates and guides instruction in a linear manner through frequent formative and summative assessments (Engelmann, Becker, Carnine, & Gersten, 1988; McMullen & Madelaine, 2014). Direct instruction is best used “when the learning objective requires that the learners have direct practice in what must be done, or said, or written” (Magliaro, Lockee, & Burton, 2005, p. 43). Rosenshine, who receives the credit for first defining the term, *direct instruction* and parallels Engelmann’s descriptors, extends the model
through clear, modified lesson guidelines for students with faster and slower learning skills (Magliaro, Lockee, & Burton, 2005).

McMullen and Madelaine (2014) state that direct instruction does not suit every learning challenge. Direct instruction should be folded into an arsenal of different pedagogies. On the other hand, a meta-analysis of direct instructional strategies finds these methods best suited for teaching students with mild to moderate learning disabilities (White, 1988). Although many teachers feel that direct instruction denies their creativity, while instilling passivity and a lack of voice in students, direct instruction has demonstrated, through various measures in multiple studies, support for consistent academic success and increased self-esteem (Engelmann, Becker, Carnine, & Gersten, 1988). Nevertheless, education has embraced “a student-directed or inquiry-led philosophy” (McMullen & Madeline, 2014, p. 143). McMullen and Madeline (2014) counter that studies on the efficacy of inquiry-constructivism are often anecdotal and low quality.

Oppositely, some studies on direct instruction include constructivism as a defining feature. In their review of the direct instruction model, Magliaro, Lockee, and Burton (2005) position direct instruction among various instructional practices. They note that Vygotsky’s theory on social construction of knowledge adds a new perspective to direct instruction. Within Vygotsky’s zone of proximal development, teachers facilitate problem solving through assisted performance. The authors write: “Research that emphasizes the social construction of knowledge has continued to include and elaborate on the contribution that DI [direct instruction] makes to the creation of successful learning environments” (p. 50).

Constructivism

Constructivism, as an epistemology and a pedagogy, adheres to many definitions and differing theories. Specifically, Simon (1995) highlights social constructivism as “a hypothetical
learning trajectory” (p. 141) within insightful, content-laden lesson planning, in which teachers are keenly aware that their own knowledge base may also evolve along with their students’ learning throughout the inquiry session. Both the personal construction of Piaget (1954) and the social construction of Vygotsky (1978) contribute to the sense making in the active pedagogical practice of inquiry-constructivism along Golding’s (2011) continuum (Figure 2).

Figure 2. Functional Continuum of Constructivist Discussions: This Study’s Socratic Methodology Lies to the Center-Right

![Functional Continuum of Constructivist Discussions](image)


Mathematical insights within the cycle of constructivism transcribe from student to teacher and vice versa. Therefore, the teacher, as a constructivist and facilitator, is an active participant in the Vygotskian culture of “collective engagement” (Simon, 1995, p. 141). Following the dictates of Piaget and Vygotsky, constructed learning, especially in mathematics, allows students to internalize the dialogic discussions and build new knowledge within a community of learners (Cobb, Yackel, & Wood, 1992; Golding, 2011). Noddings notes that group work does not work for everyone. In fact, this pedagogy supports teachers, who examine this theory of knowing and can creatively problem solve aspects of student engagement (von Glasersfeld, 1989). Therefore, inquiry-constructivism links intrapersonal and interpersonal knowledge building between the teacher-facilitator and the student (Eberstadt, 1999; Smith, 2008).
Wertsch (1984) furthers the need for reflection on the content-savvy teacher’s “flexibility in using speech to create a new level of intersubjectivity based on the feedback that they receive about the child’s intrapsychological situation” (p. 11). The expert facilitator allows for the unique track of an inquiry session within Vygotsky’s zone of proximal development. This astute educator understands the personal responsibility toward crafting the deeper knowledge that the student begins to construct (von Glasersfeld, 1990). For instance, inquiry-constructivism, as practiced in a history classroom, notes that student engagement, independent learning, and test scores increase when students personally relate to the history issues and use critical thinking skills. These students voice their preference for inquiry as a way to learn over the direct instruction of the lecture format (Savich, 2009).

The facilitator’s techniques vary between “overt classroom control to covert conceptual change and back again” (Golding, 2011; Watts, Jofili, & Bezerra, 1997, p. 310). Cotton (2001) notes the need to supply higher- and lower-order questions into the inquiry session as needed. Expert, sustained teacher-facilitated Socratic inquiry-constructivism also notes this vacillation between higher- and lower-order questions and the continuous evaluative, formative assessments required by the facilitator as the answer begins to take shape and comes more clearly into view (Watts, Jofili, & Bezerra, 1997). Socratic instruction is encapsulated below by the following teacher-facilitated actions (Elder & Paul, 2006, Figure 3).
Figure 3. Teacher-Facilitated Directives in Dialogic Socratic Instruction

Piaget's (1952) constructivism work, adapted to the field of education, highlights the difficulty in trying to change a student's deeply ingrained assumptions and generalizations. Simply stating new knowledge or even showing new knowledge is not enough for deeper learning. Whereas, when students construct knowledge through experience and academic success, this knowledge is *owned* and can then readily connect to new knowledge (Duckworth, 2006). As a seminal proponent of constructivism, Piaget (in Klahr & Nigam, 2004, p. 661) states, “The premise of constructivism implies that the knowledge students construct on their own, for example, is more valuable than the knowledge modeled for them; told to them; or shown, demonstrated, or explained to them by a teacher.” The Chinese proverb, “Tell me and I forget, show me and I may remember, involve me and I'll understand,” is a hallmark of experiential, constructivist learning.

For authentic learning to build, intrapersonal, Piagetian construction of knowledge teams up with Vygotskian interpersonal, constructivist meaning making. To restate, Piaget's (1952) independent, personal construction takes place within Vygotsky's (1978) social and cultural milieu of knowledge construction. Piaget meets Vygotsky. And yet, von Glasersfeld (1989) comments on the firm battle lines between the Progressives and the Essentialists and more precisely between the constructivists and the direct instruction proponents:

Even when students are in what look to be rote learning situations, they must perforce construct, because that is the way the mind operates. So it seems to me that constructivists should talk about weak and strong acts of construction rather than acts involving or not involving construction. (p. 14)
Direct Instruction

Magliaro, Lockee, and Burton (2005) defend direct instruction as “a viable, time-tested instructional model” (p. 41) and note that direct instruction is not defined as teaching by lecture. Rather, the teaching model of direct instruction uses various teacher-directed learning strategies to promote interaction between the students and the teacher and on-task behavior. Key tenets include teacher modeling and quick questioning, chunking of information and goals, positive reinforcement, building toward mastery with practice to further more in depth learning, frequent formative assessments, and structured curricular scripts and learning activities. A hallmark of direct instruction, teacher-facilitated support through scaffolding new skills and concepts from the point of departure of a student’s prior knowledge to the potential developmental point of achievement, follows Vygotsky’s (1978) zone of proximal development (Magliaro, Lockee & Burton, 2005). Through explicit direct instruction of distinct skills, the expert teacher-facilitator encourages learning through understanding knowledge entry points through formative assessments. Positive reinforcement and quickly corrected errors to the answers to questions allow students to find intrinsic motivation as they construct “more independent learning…[and] master the necessary skills (McMullen & Madelaine, 2014, p. 146).

The scripted lessons of direct instruction, often found to be comforting by educators, particularly facilitate the learning of students with lower-performance. When implemented with expertise and used appropriately, direct instruction demonstrates that students focus on tasks, learn concepts, and achieve academic success (Magliaro, Lockee, & Burton, 2005). Although opposing research notes other pedagogies as more efficacious, while perhaps also maligning direct instruction, both sets of researchers, Magliaro, Lockee, and Burton as well as McMullen and Madelaine (2014), report that the support for the efficacy of constructivism over explicit
direct instruction is a matter of philosophy, not quality empirical research. McMullen and Madelaine’s (2014) literature review furthers support for the efficacy of direct instruction in both regular and special education classrooms, as well as with at-risk students. Among the twenty-five studies, these authors note White’s (1988) meta-analysis that provides overarching evidence that direct instruction, as an effective instructional method, supports students with learning disabilities, especially when compared with inquiry learning.

**The argument against constructivist learning.** Kirschner, Sweller, and Clark (2006) contend that when students, particularly novice students, are allowed to construct their own knowledge with only limited teacher guidance, their learning is ineffective. These authors maintain the argument that “minimally guided instruction appears to proceed with no reference to the characteristics of working memory, long-term memory, or the intricate relations between them” (p. 76). When prior knowledge is weak, teacher guidance is minimal, and learning styles undeveloped, constructivist learning does not promote long-term memory. “The aim of all instruction is to alter long-term memory” (p. 77), or it is unsuccessful, state Kirschner, Sweller, and Clark (2006). Therefore, these researchers argue against the authenticity of constructivism as a teaching practice that promotes learning as an experiential construct of processes and procedures and against the progressive assumption that learning through practical applications and projects, without the “facts, laws, principles and theories” (p. 78) of the content, is valid. Instead they note previous research that supports greater learning through direct instruction over the time-consuming, frustrating confusion of discovery learning (Kirschner, Sweller, & Clark, 2006).

Klahr & Nigam (2004) concur and find that direct instruction is superior to discovery approaches in facilitating deeper student understanding, even though discovery learning also
produces significant gains in knowledge acquisition. However, Kirschner, Sweller, and Clark’s (2006) analysis, although supported by significant empirical evidence, is limited in its argument as it only comments on one form, and the most narrow view, of constructivist learning, that of minimal guidance in discovery-based, inquiry-based instruction. Cobern et al. (2010) highlight a deficiency in the research: “True, direct is certainly more efficient than unguided ‘open discovery’, [sic] but no one is really advocating the latter” (p. 93). These authors state that any claim for superiority of one instructional method over the other is overplayed (Cobern et al., 2010).

Cobern et al. (2010) begin to settle the philosophical debate. Their experimental study comparing inquiry versus direct instruction in middle school science classes finds that when both pedagogies are implemented with proficiency, the content learned is comparable. These authors deduce that “expertly designed instructional units, sound active-engagement lessons and good teaching are as important as whether a lesson is cast as inquiry or direct” (p. 93).

Dissenting Views, Tensions, and Counter-Arguments

Although empirical literature defines the characteristics of positive student engagement, the assumption that teachers and students are employing suitable pedagogy and engendering learning environments of emotional and cognitive engagement and achievement is not fully accurate. In fact, the literature points to a systematic decrease in student engagement and student motivation in academic achievement and positive feelings toward school (Fletcher, 2005; Mitra, 2003; Newmann et al., 1996; Ritchie, Tobin, Roth, & Carumba, 2007). Ritchie, Tobin, Roth, and Carumba (2007) argue for dialogues between students and an expert teacher that engender trust, respect, and appropriate follow-through. For, historically, “the intransigence of high schools and subsequent epidemic of student alienation might in large part be caused by the lack
of opportunities to situate students as essential actors” (Mitra, 2003, p 302). Likewise, Fletcher (2005) maintains that teachers must create meaningful partnerships with students that are “sustainable, responsive, and systemic instead of tokenizing their involvement with adult interpretations or by stripping student power by asking students to concur on adult ideas” (p 5). The ongoing sparring between the progressives and the essentialists in education continues due to the requirements of standards-based curriculum and high-stakes testing. Essentialism often promotes strict content learning taught by teacher-led direct instruction, while the progressives promote student-centered learning that is often project-based or constructivist. In general, the former promotes breadth of learning, while the latter promotes depth of learning. However, in the current standards-based, high-stakes testing world of education, teachers remain challenged by their need to impart an established amount of concrete knowledge within a certain, constrained time frame (Hirsch, 2006).

Cobb (1994), who specializes in math education, finds the constructivist teachers’ claims questionable, idealized, lacking in adequate quantitative proof, and trivialized by the oft-recited slogan, “students construct their own knowledge” (p. 4). In addition, Cobb finds the undoubting, firmly held belief in the effectiveness of constructivist teaching practices to be confounding. Null (2004) ponders why constructivism is difficult to put into the classroom. He begins with the lack of educator knowledge in constructivism’s rich history that can support the implementation of the instructional method. In fact, throughout the standards-based history of education, teachers have had difficulty putting these concepts into practice due to ongoing state and district mandates and the accompanying professional development that does not focus on inquiry methods (Almeida & de Souza, 2010).
Another hurdle is the literature’s inability to definitively define constructivism or inquiry-constructivism as one concise form of pedagogy (Alfieri, Brooks, Aldrich, & Tenenbaum, 2010; Davis & Sumara, 2002). To make the latter point, Golding (2011) and Watts, Jofili, and Bezerra (1997) note the wide spectrum of inquiry-constructivism defining characteristics. Briggs, Long, and Owens (2011) concur: “Defining inquiry-based instruction is problematic” (p. 1034). To note the limited appeal in the classroom, “prescriptive constructivists” accept that inquiry-constructivism, as a pedagogy, can be reduced to a list of “useful techniques and tips” (Null, 2004, p. 182).

There are teachers, who provide philosophical support to constructivism. However, they have neither the professional development nor the administrator support to be able to critique and experiment with embedding these ideas into their practice (Almeida & de Souza, 2010). Many teachers are not equipped to teach the practice of high-quality inquiry, because they are not fully trained in the content expertise required to have a quick and nimble facility in reiterative questioning and in “exchanging reflective discussion” (Lin, Hong, & Cheng, 2009, p. 1021). On the other hand, educators may be performing constructivist sessions and not recognizing and labeling them as such. These teachers may simply be using a self-identified best practice. Nevertheless, dissenters continue to state that this practice is too time-consuming and energy absorbing to put in place (Bonk & Cunningham, 1998; Elkind, 2005). Others cry foul because the necessity of one, preordained answer in mathematics does not lend itself to constructivism of new concepts, but merely constructing already preordained answers (von Glasersfeld, 1990).

Creation of a routine inquiry-constructivism learning environment may be beyond classroom expectations. Teachers may be asked to and desire to create inquiry-constructivism sessions, but the reality persists that robust daily sessions may be impractical within the time
constraints and multiple responsibilities of maintaining a standards-based, deadline-prone, mandate-filled classroom learning environment (Watts & Bentley, 1987). While from the point of view of egalitarian student voice and choice, Lin, Hong, and Cheng (2009) state, “Time constraints and the examination-driven nature of the curriculum allow fewer opportunities for students to share control with the teacher over the design and management of learning activities.”

Constructivist classrooms need to be carefully monitored for curriculum faithfulness and content understanding. Terwel (1999) also asserts that constructivism is not a “robust concept” (p. 198), because this practice can only work under the best classroom circumstances. When implemented without research application, professional development, and ongoing reflection, the constructivist classroom becomes an unbalanced social community of unequal student involvement of the active over the passive learner.

Unless community is established between the student and the facilitator, there can be a stigma and stress around being asked questions. Students can interpret questioning as an interrogation and feel the sting of failure in being singled out on the spot to answer a question (Dillon, 1981). Tobin (1987) highlights that some students are conditioned to the rapid-fire approach in some questioning styles and may have a disincentive to partake in inquiry sessions. They may feel apathetic toward learning in this, more measured, way. Therefore, prior to the commencement of inquiry-constructivism sessions, teachers need to prepare students about the process, model the sessions, and point out the academic expectations and motivational benefits. Watts and Bentley (1987) argue for a course designed for student preparedness.

Zhao (2012) offers a different lens. Perhaps the non-conformist, yet articulate, student may help to establish a culture of creativity and entrepreneurship in the constructivist classroom beyond the typically expected achievements of $A$ students. As Moscardini (2010) concludes,
“The ultimate goal is that students develop a disposition towards their mathematical learning which involves a sense of themselves as learners who construct mathematical meaning through engaging in mathematical activity, rather than experiencing mathematics instruction as the acquisition of isolated facts and procedures” (p. 136). Through this study’s exploration of the perspectives of high school students with learning disabilities on their mathematics meaning making, student voice in their classroom participation, and self-assessing interpretations on learning, their engagement in learning may authentically come to light.

**Conclusion**

This review of the literature points out the continuing push and pull between the two camps of progressive constructivism and essentialist traditions in teaching methods and engaging student knowledge-building. Applicable to all students, including diverse learners, these instructional strategies continue to fascinate and provoke educational stakeholders. This quandary in the efficacy of one approach over the other versus how engaging one method is over the other support the problem of practice of this study. Through student interviews under the research paradigm of constructivism-interpretivist and the methodology of interpretative phenomenological analysis, this research aimed to find the essence in the interpretations of engagement in mathematics learning by students, who happen to learn differently.
Chapter III: Research Design

The purpose of this study was to explore and interpret the perspectives in math engagement of high school student-participants with moderate learning disabilities. The research question guiding this qualitative study to uncover the varied experiential perspectives of student learning in math was: How do high-school students with moderate learning disabilities describe their engagement and educational experience in learning math?

Methodology

A qualitative approach was a proven resource for “developing a detailed analysis” (Creswell, 2013, p. 105) in social sciences research. By asking simple questions, qualitative research aims to shed light on complex problems and find complex answers (Chenail, 1995). To that end phenomenology, as a type of qualitative research, aimed to describe, through sweeping researcher interpretation, the overall nature, or essence, of a “shared experience” and “lived phenomenon” (p. 104). Furthermore, phenomenology had spawned a more unique form of qualitative analysis called interpretative phenomenological analysis (IPA). IPA found the researcher incorporated into the study as an instrument and co-interpreter, who was deeply immersed in the phenomenological experience (Dowling, 2007). Borrowing from the vocabulary of mathematics, IPA was the best fit approach for this study on the perspectives of high school students with learning disabilities as they experience and interpret the phenomenon of math knowledge construction. Culled from the late nineteenth century writings of German phenomenological philosophers, Hesserl and Heidegger, and then refined into interpretative phenomenological analysis by Smith, Flowers, and Larkin (2009), IPA jumped off from phenomenology’s acknowledgment of the embedded researcher’s philosophical assumptions and interpretations (Creswell, 2013).
Hesserl maintained that bracketing, or separating out, the researcher’s subjectivity was both possible and necessary in notating phenomenological descriptions. Heidegger countered that any descriptive interpretation carried with it a subjective look into sense making and discovering understandings within the very temporal nature of the participant *being* in time and space. Therefore, objective bracketing was not feasible, nor desirable. Instead, researcher explorations and interpretations extended the participants’ interpretations of their distinct realities (Dowling, 2007; Mackey, 2005). In addition, the researcher was open to the fact that preconceptions might not be on the surface of consciousness, but rather through reflection might come to the forefront of interpretive consideration (Smith, Flowers, & Larkin, 2009). Finding intersubjectivity was key to IPA. Intersubjectivity was the phenomenological concept of having a relation to the world. According to Heidegger, the researcher must realize that the connection to the world was a fundamental given to the human condition, not a put upon acknowledgment (Smith, Flowers, & Larkin, 2009).

The researcher distilled the interpretation of the participants’ interpretations of a specific context. This was a so-called double hermeneutic, that was used to develop a unique composite understanding of a phenomenon. Hermeneutics was defined as knowledge and text interpretation. Furthermore, Heidegger’s hermeneutic circle, or the “circle of understanding” (Mackey, 2005, p. 182), delineated interpreting pre-understandings that developed into provisionally interpreted understandings and then developed into a more fully formed interpretation (Mackey, 2005; Smith, Flowers, & Larkin, 2009). Ultimately the IPA researcher became immersed in the unique worlds of each participant and in the gestalt of the total group of participants’ interpretations and their essence of understandings. Smith, Flowers, and Larkin (2009) emphasized the pre-conception-filled, reflective, cyclical, sense making IPA process:
“There is a phenomenon ready to shine forth, but detective work is required by the researcher to facilitate the coming forth, and then to make sense of it once it has happened” (p. 35).

Not attempting to ground a theory or to explain the world, IPA asked for the interpretation of what occurs rather than how or why an experiential phenomenon occurred (van Manen, 1990). The goal of IPA was to provide cyclically analyzed, synthesized, and reflected upon interpretive insights of everyday life in a given context and to offer this slice of life to further deepen understandings of a problem of practice (Smith, Flowers, & Larkin, 2009). Similarities were drawn to actors and dancers who painstakingly interpreted various roles once undertaken by other actors and dancers and then discovered a particular, new, even uniquely revisionary understanding to share with their audience. Parallels were also equated with artists, who painted a portrait and then revisited it over and over following their own critique and reflection, as well as with choreographers, who revised a piece and then heightened their interpretation following critical review and renewed personal insights.

Lowes and Prowse (2001) stated that researchers must note their philosophical affiliation. However, Smith, Flowers, and Larkin (2009) argued that IPA does not require singling out one theorist over another, but rather seeks to elucidate upon the conversation and further the theory of phenomenology. They stated, “IPA is influenced by the core emphases of the approach, and by a number of further elements drawn from the different positions” (p. 34). The researcher turned the key on discovering and examining the lived experiences of a study’s participants. “These meanings,” stated Smith, Flowers, and Larkin (2009), “may illuminate the embodied, cognitive-affective and existential domains of psychology” (p. 34).

Located in the natural context of a regional high school setting with the researcher serving as a participant-observer and participant-interpreter of the students’ perspectives and
their subjective, interpretive views, this study met the characteristics of the qualitative IPA study. In addition, the constructivist-interpretivist research paradigm, the theoretical frameworks of the Broaden and Build Theory of Positive Emotions and constructivism, along with the methodological design of an IPA study with its evolving, emerging semi-structured interviews provided the lens for interpretation and drove painting the essence of a “holistic, complex picture” (Creswell, 2012, p. 46) of viewpoints and in depth interpretive understandings in math learning by students with learning disabilities (Anfara & Mertz, 2006).

Site and Participants

The study site was a regional high school located in a town north of Boston, Massachusetts. The affluent, suburban high school served three bedroom communities with a total population of 23,049. Most of the adults worked in and around Boston with the median family income in the three towns ranging from $102,402 to $115,074. The population was primarily English speaking, with no identifiable minorities at more than one percent. The three towns were homogeneous economically, racially, culturally, and ethnically. The regional school district spent under the state average per pupil. However, the school committee consistently approved the school budget. The student-teacher ratio was 13:1. The district was a Level One school and had been noted for its high achievement on MCAS state tests required for graduation (New England Association for Schools and Colleges, 2014).

To maintain anonymity, the school will be referred to as The Regional High School. This site was chosen because the researcher maintained a professional association with the district as a special educator, and the site allowed ease of accessibility for the student-participants to schedule and attend the interviews. The institutional review board approved this site. The school’s gatekeeper, the principal, welcomed the study.
For this study, the population encompassed eight student-participants, who were purposefully selected from a field of nine students. The criteria included: (a) tenth and eleventh grade students, who were diverse learners with various moderate learning disabilities, (b) a mix of genders, (c) neither high nor low achieving students, who were able to articulate their view of the phenomenon on math learning, and (d) students who demonstrated a relationship with the researcher. There was an attempt to have the participants be representative of the school’s population of student’s with learning disabilities. The sampled students, with moderate learning disabilities in language, mathematics, and/or memory-related and ADHD health disabilities, often struggled with in depth mathematics understanding, memory-retention, and personal achievement levels. However, their motivation to achieve propelled them to earn Bs and Cs in their high school mathematics classes, which included two courses in algebra II, statistics, and trigonometry. The students’ academic support room provided the comfortable interview setting within The Regional High School. A sign was hung outside the door to prevent interruptions (Smith, Flowers, & Larkin, 2009).

Once university IRB approval provided the green light, the Call for Participants was emailed to nine students, five girls and four boys. The goal was to sample eight students with an equal number of boys and girls. All candidates assented and their parent(s) consented to this study. Five girls and three boys were selected primarily because of accessibility of scheduling and time commitments to the interviews. Like the site, the participants’ names were assigned pseudonyms for anonymity. These pseudonyms were culturally germane. In addition, any names or titles mentioned by the student-participants were assigned unidentifiable pseudonyms. Each of the student-participants fit the demographic of The Regional High School, which averaged 94% white between the 10th and 11th grade classes.
Since relationships matter when holding interviews and gleaning salient responses, these high school student-participants worked with the researcher, as the special educator in their academic support classroom, for one to two years (Rubin & Rubin, 2012). However, researcher familiarity and bias was balanced by strong researcher listening skills coupled with reframing or returning to questions as required because the student-participant became off-topic or rambling. Interview schedules and the meeting place in the academic support classroom were professionally maintained. Throughout the interview sessions, respect for the student-participants as developing young adults and students with learning disabilities allowed for trust to support the authenticity of the interview exchanges between the researcher and the students (Seidman, 2006)).

As tenth and eleventh graders, they also had the benefit of more than one year of high school experience and perspective. These students participated in two 45-minute interviews along with one 15-minute follow-up session. During the second 45-minute interview, each student participated in a Socratic inquiry session on linear equations. The final 15-minute interview re-questioned each student on their emotional and behavioral engagement as well as their cognitive engagement and learning experience within the inquiry session. Each interview consisted of open-ended questions (see appendix A) in a semi-structured format to allow the student-participants to engage in a “one-sided” conversation with the researcher. The students understood that the intrigue of participating in the research study along with any learning and self-assessment gained provided the non-monetary remuneration.

Data Collection and Analysis

Data collection. Purposeful, convenience sampling moved into the interviewing phase of data collection. The student-participants represented their viewpoints and experiences during
an introductory interview. The researcher explained the interview process and informed each participant about the interview process. In the interview the researcher spoke very little in this conversation while each student was encouraged and guided to share their perspectives without judgment. This entailed two forty-five minute, semi-structured interviews, and a concluding interview. All interviews followed the guideline mimicking a one-sided conversation. All interviews were conducted at the participant’s pace with a rhythmically probing oversight coordinated by the researcher. The opening question purposefully addressed a highly descriptive first-person account to allow the student-participant to become at ease in speaking openly and deeply within the interview process. This openness led to more sensitive prompts and questions. The questions were concrete, open-ended, and non-leading. All participant responses were taken seriously. The researcher welcomed unexpected paths in the agenda as the student-participants related their unique stories, feelings, and perspectives. Follow-up interviews were also offered for member checking.

Formative analysis and interpretation proceeded after the first interview process allowing the researcher to consider whether a change in questions or technique was required. However, the researcher avoided analyzing simultaneously while interviewing, because the focus remained in the moment of listening fully to each student-participant. During the questioning process, the researcher set aside “certain common interactional habits” (Smith, Flowers, & Larkin, 2009, p. 67) in order to not influence the thoughts of the student-participant. The researcher purposefully avoided speaking to personal experiences or perspectives. The affect of each student-participant was observed and non-verbal behavior was recorded in researcher field notes with an eye to the theoretical frameworks and research question.
Conducting semi-structured, one-to-one interviews was a learned skill that required strong technique (van Manen, 1990). In semi-structured interviews, the researcher prepared a general amount of questions so that follow-up queries could continue the questioning process based upon participant responses (Rubin & Rubin, 2012). During the interviewing, the researcher provided (a) one question at a time and provided wait time for student-participant thinking through patient, silent support; (b) continued assurances of confidentiality; (c) small talk to put the student-participants at ease; and (d) prompts to make the students comfortable and open with being conversational in the interview process that asks the participant to be free to tell detailed stories and relate in depth experiences. The researcher acknowledged and accepted that the semi-structured interview might take on a life of its own, thus taking a different course than originally scheduled. The researcher granted that the student-participant was the expert and that there was a sense of adventure in the interviewing process. In fact, the participant often reset the schedule and the researcher accepted this change in content and course as the researcher became more and more immersed in the student-participant’s worldview and own agenda. Positionality was consistently front and center in order to bracket out preordained conclusions, assumptions, suspicions, and overt concerns (Smith, Flowers, & Larkin, 2009). Therefore, without disciplined, semi-structured interviewing practice in the technique of interpretive information gathering and its flexibility in going more deeply into the probing process, the burden of triangulating the copious amounts of data for both convergence and divergence of the findings might become compromised (van Manen, 1990). The transcripts were given to those student-participants who requested their interviews for their review and confirmation. This so-called member checking allowed for participant validation of the transcripts and for any corrections or further elucidations required. Throughout the research process and thereafter the researcher
maintained ethical data storage in a lock box and through password-protected data storage (Creswell, 2012).

In summary, recorded one-on-one interviews of the eight student-participants produced the rich, qualitative data of student perspectives and lived experience (van Manen, 1990, p. 31). Member checking had the student-participants confirming the information for accuracies, inaccuracies, and changes. Documents, such as field notes and the reflexive/reflective researcher journaling, provided contextual information to further the introspection on reflective interpretations (Boblin, Ireland, Kirkpatrick, & Robertson, 2013).

**Analysis.** This researcher processed the data following prescribed steps suggested by Smith, Flowers, & Larkin (2009) and Creswell (2013). Step 1 finds the researcher becoming immersed in and organizing the data through multiple read-throughs. The researcher highlighted key words and phrases in line-by-line readings of the interview transcriptions. Even though coding per se is not mentioned in IPA data analysis, it does allow for multiple categorizations of the data. Saldaña (2013) noted a number of coding methods that can be mixed and matched to a qualitative study. One such code, chosen for its authenticity, was the method of in vivo coding that highlights quoted participants’ responses that “keep the data rooted in the participant’s own language” (Saldaña, 2013, p. 7). Since in vivo coding “honors” (Saldaña, 2013, p. 61) the participant’s unique voice, this coding method was especially suitable for a study on building the interpretations of perspectives of students with learning disabilities, particularly those who might have been marginalized and not have had a voice.

Additional coding measures employed included emotion coding, such as noting “subjective experience, facial expression, cognitive processing, and physiological changes” (Fredrickson, 2001, p. 218) to highlight participant feelings; dramaturgical coding to ferret out
the authentically interpreted story; and narrative coding to uncover and interpret the “literary, sociological/sociolinguistic, psychological, and anthropological perspectives” (Saldaña 2013, p. 131). Emotion coding was particularly applicable to this IPA study on engagement in learning, since it suited exploring intrapersonal (Piagetian) and interpersonal (Vygotskian) participant perspectives and experiences in constructed math learning (Saldaña, 2013). Affect coding noted the participant’s feelings, such as their attitudes and moods (Fredrickson, 2001). Likewise, free association shed light on the “fluid process of engaging with the text in detail” (Smith, Flowers, & Larkin, 2009).

The researcher discovered categories and patterns through line-by-line color-coded highlighting, as well as identified and interpreted plausibility, perceptive metaphors, and contrasting and comparative data that developed into four generalized themes. Surprises, differentiations, and outliers in the data were honestly addressed (Rubin & Rubin, 2012). The most cohesive representations of triangulating “converging lines of inquiry” (Yin, 2009, p. 115) were focus on by working backwards and forwards in a nonlinear fashion from the research questions, theories, and research paradigm oversights into discovering, uncovering, and interpreting/re-interpreting findings (Boblin, Ireland, Kirkpatrick, & Robertson, 2013; Creswell, 2013). Creswell (2013) proposed that the data become “custom-built, revised, and ‘choreographed’” (p. 182) through an iterative process and inductive analysis, while Saldaña (2013) wrote that researchers codeweave the codes and themes into one parsimonious narrative paragraph.

Through the Broaden and Build Theory of Positive Emotions, the researcher rated the categories according to positives (such as intrinsic and extrinsic motivation) and negatives (such as lack of academic risk-taking). For example, independent discovery and interactive were codes
that highlight engagement in learning either independently (Piagetian) or socially (Vygotskian).

Authentic student engagement in learning also presented as student flourishing (Fredrickson, 2004). Fredrickson (2004) defined flourishing as “a state of optimal human functioning, one that simultaneously implies growth and longevity, beauty and goodness, robustness and resilience, and generativity and complexity” (p. 1373). In one piece of the analysis, the researcher identified and interpreted students as flourishing or not flourishing through the student-participant’s perspectives on their learning experiences across the descriptors of oral sense making, constructivist learning, and emotional and cognitive engagement (Fredrickson, 2004).

In Step 2, interpretative phenomenological analysis encompassed not only the unique expressions of each student-participant, but also interpreted the picture of the participants’ essence of experience that was folded into a coalesced gestalt of experiences. When intently listening to a participant’s words, deconstruction aided in adding flavor and deeper meaning to participants’ intentions. Deconstruction asked the researcher to approach a sentence from the end and move forward in order to gain appreciation for certain words in a participant’s phrasing. Deconstruction also allowed the researcher to see more clearly the context and the interrelationships between interpretations. In addition, noting the function of a student-participant’s words or affect illuminated the student’s position of self within the context. Contextualization provided a nod to the timeframe of perspectives within the narratives as they related key learning events. Polarization acknowledged opposing viewpoints. (Smith, Flowers, & Larkin, 2009).

In Step 3, the researcher delved more deeply into the interpretative analysis. Each student-participant’s words and non-verbal affects were broken apart, analyzed, and re-examined. Emergent themes came to light through repeated categorizations of the fragmented
data that were then coalesced into an increasingly parsimonious, yet complex rudimentary map of interpreted interpretations in the first half of the hermeneutic circle. Finding the right words to elucidate a theme took thoughtful, reflective editing and revisions to truly capture an interpretation of a context (Saldaña, 2013). The researcher completed the second half of the hermeneutic analytic circle in the final interpretative narrative of the collaboration of the researcher-participant and the student-participants blended interpretations (Creswell, 2013; Smith, Flowers, & Larkin, 2009).

In Step 4, the researcher connected the emergent themes, wrote the narrative of their essence, and “packaged” [sic] (Creswell, 2013, p. 187) the story to visualize the coalesced findings. Step 4 also found the researcher answering the research questions with the narrative while also looping the findings through the theoretical frameworks of the Broaden and Build Theory of Positive Emotions and constructivism. The researcher made further interpretations, by completely leaving behind the descriptive in favor of the more deeply interpretative, in order to generalize what had been gleaned and began to tell the essential story of the interpreted perspectives in mathematics learning of high school students with moderate learning disabilities.

**Methodology Summary**

The discovery and description of experiences and perspectives of humans and their conditions continued to compel the researcher to ask questions and seek exploration. More specifically, the IPA researcher became immersed in rich, in-depth data sets within a phenomenological context to uniquely describe and interpret a holistic experience to find its essence. The IPA methodological approach provided a direct link to understanding the “naturalistic generalization” of “human affairs” (Stake, 1978, pp. 4, 2) and thereby added to the wealth of humanistic inquiry (Stake, 1978, Yin, 2009). This interpretative phenomenological
analysis, with its interpretations of the perspectives of students with moderate learning disabilities, sought to add an “intelligible, comprehensive and verisimilar narrative rendering” (Sandelowski, 1991, p. 164) and descriptive existential interpretation of how students learn and view their self-assessments through their authentic engagement and meaning making in the comprehension and construction of mathematics.

**Validity**

Although validity in research is most often acquainted with the causal effects and relationships found in quantitative research, qualitative researchers also seek validity to advance their studies on discovering, describing, and understanding various phenomena (Anthony & Jack, 2009). In studies that demonstrate excellent validity, qualitative researchers have worked toward output that is “plausible, credible, trustworthy, and therefore, defensible” (Johnson, 1997, p. 282). According to Johnson (1997), bias in qualitative research is the largest problem when seeking credible rigor in a study. In dealing with subjectivity, reflexivity by the qualitative researcher is the best strategy toward worthy research. Reflexivity is the ability to be mindful and critical of bias and positionality throughout the research process. In addition, using negative case sampling, where researchers “attempt carefully and purposively to search for examples that disconfirm their expectations and explanations” (Johnson, 1997, p. 284) can also increase credibility and defensibility.

The statement on positionality in Chapter I of this thesis document relayed this researcher’s acknowledgement of bias, while aiming to establish credibility within the problem of practice of discovering and describing the perspectives of students with learning disabilities on their engagement in learning. As Lauckner, Paterson, & Krupa (2012) affirmed:
Trustworthiness, or a study’s soundness, is based on: the extent to which the findings accurately describe/capture the phenomenon studied (i.e., dependability), the extent to which the process of collecting data and coming to conclusions is clear and can be followed by another (i.e., confirmability), and the likelihood that the findings have meaning in other similar situations (i.e. transferability). p. 14

A qualitative, constructivist-interpretivist model allowed for less restriction in methodology, and thereby allowed for the exploration of new, emerging ideas. When supported by multiple sources of data, the findings gave way “to a holistic and in-depth understanding of the phenomenon” (Boblin, Ireland, Kirkpatrick, & Robertson, 2013, p. 7) that supported this study’s validity. Specific to research transferability, a hallmark of validity, the theoretical frameworks of constructivism and the Broaden and Build Theory of Positive Emotions opened up the dialogue with other scholars through commonalities, thus encouraging comparison to and replication of this study. However, the theoretical frameworks must be none too rigidly upheld so that the data analysis did not become short sighted and distorted. In addition, the researcher must honestly confront and examine data outliers and bias. Therefore, validity had been generated when this researcher fully understood the relationship between qualitative research, positionality, and theory (Anfara & Mertz, 2006).

As noted, this qualitative study, with its various data sources, established validity when safeguards against subjectivity were established by consciously and vigilantly using frameworks of theory to examine and sort the copious data of multiple interviews. The researcher triangulated the data sources for not only increased comprehension of the problem of practice, but also for increased validity in the research (Johnson, 1997). Boblin, Ireland, Kirkpatrick, and Robertson (2013) argued that robustness in the data collection was best supported through (a)
member checking; (b) vigilant, questioning “comparative approach to look for other ways of organizing the data so that different findings might be revealed” (p. 6); and (c) reflective journaling and field notes that are reflexive. Johnson (1997) advanced that validity was promoted through the descriptive accuracy found in member, or participant, checking to rectify inaccuracies and through more deeply understanding perspectives through the researcher’s interpretive ability to best feel the participants’ “viewpoints, thoughts, feelings, intention, and experiences” and their “inner worlds” (p. 285).

Consistent self-questioning and reflexivity, sustained engagement in the field, varied data sources and triangulation, member checking, strict adherence to data storage, and a rich description of a real-life context that brings the reader into the experience, all contributed to trustworthiness (Lauckner, Paterson, & Krupa, 2012). In this study, reflexivity in data collection and analysis through a reflective journal and field notes provided dependability. The transcriptions of the one-to-one interviews supplied further dependability as well as confirmability. Transferability was provided through careful, articulated data collection and analysis in the coalesced thick and rich, story-filled details of the transcribed tapes in the individual student-participant interviews as well as the transparent sharing of the researcher-participant field notes and reflective journal.

Qualitative IPA research required complexity of thought, refined decision-making, and iterative review in a non-linear process of revision and newly applied viewpoints and interpretations (Lauckner, Paterson, & Krupa, 2012; Mackey, 2005). Overall, the honest acknowledgment of this researcher’s open-mindedness in the flexibility within the constructivist-interpretivist lens, the judiciousness in the application of the theoretical frameworks of constructivism and the Broaden and Build Theory of Positive Emotions, the over-arching
guidance of the research questions, the reflexive data collection and double hermeneutic interpretive analysis, and the recognition of explicit, inherent, subjective positionality, that were all diligently acknowledged throughout the research timeframe, confirmed the validity, or trustworthiness, in this IPA qualitative study on the perspectives of students with moderate learning disabilities in their engagement in learning mathematics.

**Protection of Human Subjects**

Approval by the university’s Institutional Review Board was attained and allowed the research study to proceed in an ethical manner. The school’s principal, the gatekeeper, provided the permission to conduct this study within the regional high school. Signed consent forms from each of the eight students and their family member were collected. Confidentiality of the student-participants was assured through culturally germane pseudonyms. Also, the site was renamed. Likewise, once the study was completed, the draft document was made available to the student-participants for member-checking review and possible changes. The final document was available to the student-participants and the family contact to view the final results.

Since the researcher was acquainted with the site of the study, the principal, as gatekeeper, allowed for open, cooperative access for in-depth data collections. Likewise, since the researcher took into account the ethical requirements of informed consent or assent of the participants and purposefully sampled for articulate, knowledgeable participants, the discoveries of the interpretations became evident (Sackmann, 1992). Research work with human participants required that the researcher as the scholar-practitioner understood the researcher’s position of power. The researcher pledged to treat the participants as individuals and not as classifiable objects. In addition, the researcher aimed to take into account preconceptions of privileged universals, which favored the traits and the language of the hegemony and thus
“marginalizes, disenfranchises, subordinates, and generally ascribes inferiority to characteristics that differ from the privileged groups’ characteristics” (Briscoe, 2005, p. 27). For this reason, some discerning participants might choose not to work honestly with the researcher, thus sabotaging the research. Conversely, there was also the concern that some participants might self-censor due to a desire to please the researcher or for their desire to either sway or skew the research (Briscoe, 2005). To this end, the researcher recognized the potential vulnerability and ethical challenges in these participants, who were students with learning disabilities. Vulnerable populations include children as student-participants. Vulnerability addresses human participants who “may have insufficient power, intelligence, education, resources, strength, or other needed attributes to protect their own interests” (Levine, Faden, Grady, Hammerschmidt, Eckenwiler, & Sugarman, 2004, p. 3).

Although Creswell (2013) notes the hazards of power imbalance and job-related political risks in conducting research with known participants, Rubin and Rubin (2012) highlight the benefits. For instance, when working with an at-risk population, the researcher, who had established relationships with the potential participants, and perhaps was also acquainted with their families or guardians through professional associations, engendered a cultivated trust that supported Stake's notions of the researcher with “an insider view [thus], seeking to understand the human experience” in data discoveries (as cited in Boblin, Ireland, Kirkpatrick, & Robertson, 2013, p. 1269). Van Manen (1990) continued the argument that the sensitive researcher, who garnered relationships, could “only understand something or someone for whom we care” (p. 6) through creative language that was evocative and poetic (p. 13). Therefore, this study’s participants were sampled from the pool of students, who had worked with this researcher in an academic support class in the high school for over one and one-half years.
This researcher purposefully selected student-participants from the pool of tenth and eleventh grade mathematics students with moderate disabilities. Following initial requests and interviews with the potential student-participants and their parents or guardians to discuss interest in the project, an invitation and information letter along with a consent form for student participation was sent home for written permission from parent(s) or guardian(s). Particularly, the letter’s information included the purpose of the study and the detailed description of the voluntary participation along with the description of the audio tapings used, any risks or inconveniences, confidentiality and privacy issues, and key benefits to the child. Likewise, the letter stated that withdrawal or non-participation in certain aspects of the study was acceptable and did not affect assessments or grades. The letter also provided researcher phone numbers and email for any questions. In addition, the university advisor’s information was available for study-related problems, questions, or discussion of rights. All data will be stored for three years in a lock box and/or in password-protected data storage.

Since this study addressed the perspectives and interpretations of student-participants, who have learning differences, this researcher remained cognizant of listening intently to their voice and upholding their wellbeing and comfort. Through member checking, the accuracy of their viewpoints and words was preserved. Throughout the time of this IPA study, the student-participants contribution to the discussion in the scholar and educational communities was respected and upheld.

**Conclusion**

If student voice and student engagement in mathematics learning through the perspectives of students with moderate learning disabilities were to find relevance in the classroom, then knowledge construction must reflect engagement that allows for oral meaning
making and the construction of meaningful knowledge. Unfortunately, many barriers lie in the way of authentic dialogic engagement in learning. Student voice is inhibited by administration and policymaker mandates, teacher philosophies and training, and personal inhibition. Under the umbrella of the constructivist-interpretivist research paradigm, the rich data of this IPA qualitative study may provide further insight into student interpretations of their engagement, understanding, and deeper learning. Extensive interviews as recorded documentary evidence, field notes, and a reflective journal gathered during this interpretative phenomenological analysis study, were analyzed for authentic interpretations of metacognition. This researcher maintained a reflexive focus on positionality throughout the time frame. Member checking and triangulation of the data established trustworthiness. This study aimed to begin to free the student-participants with learning disabilities from any passivity and to let their voices and perspectives ring true.
Chapter IV: Research Findings

The purpose of this study was to explore the educational learning experiences of eight high school student-participants with moderate learning disabilities. Each student provided prolific descriptions of their mathematical learning experiences, specifically how they engaged in their math content lessons and how they cognitively engaged in an instructional method that was new to them. The following brief biographies inform the reader on the attributes of each student-participant.

Tiler. Tiler is a 17-year-old eleventh grade girl. She had been diagnosed with a health (ADHD) disability along with executive functioning deficits and required the services of and the accommodations and modifications defined in an Individualized Education Program (IEP). She attended regular education high school classes with the support of a one period academic support class. During the interviews Tiler stated, “I think you learn that it’s not supposed to be this hard. Yeah. Not that it’s hard, but you learn that it comes easier for other people.” She spoke to understanding that her desire to learn may come “to the point where I frustrate people.” “In the last couple of years,” she continued, “[I’m] pretty significantly [aware of my learning differences]. Because the comprehension isn’t there. Studying a lot is the number one strategy. But how you study is the number one method. Studying that doesn’t work for you, then don’t use it. You’re not going to comprehend any more material that way.” Tiler earned a needs improvement score on her physics MCAS freshman year. Sophomore year she scored proficient on both English and math MCAS. Tiler said she would like to major in clinical social work in college.

Thomas. Thomas is a 17-year-old eleventh grade boy. He had been diagnosed with a health (ADHD) disability as well as specific learning disabilities in English language arts and
mathematics. He required the services of and the accommodations and modifications defined in an Individualized Education Program (IEP). He attended regular education high school classes with the support of one period of an academic support class. Thomas stated, “I think I am a hard worker and I try my best to my ability all the time. But it takes me a little bit longer to understand it than everyone else. It’s OK. Anyone can learn it. They just have to learn it at their own speed. Yeah, I see how I am a little bit different than anyone else and how anyone with my disability is always different. I am pretty sure that everyone is different and we can learn from each other in our own little way,” stated Thomas. On his MCAS he scored needs improvement on physics during his freshman year while scoring proficient in English and math during his sophomore year. He explored business as a college major.

Sarah. Sarah is a 16-year-old tenth grade girl. She had been diagnosed with a health (ADHD and anxiety disorder) disability. She required the services of and the accommodations and modifications defined in an Individualized Education Program (IEP). She attended regular education high school classes with the support of one period of an academic support class. Sarah earned a proficient score on her physics MCAS taken during her freshman year. Sarah stated, “I feel like I'm a little slower but I feel like it takes me another step in order to catch up and then once I'm there I get it. When we're working with group, I always kind of feel like I'm asking what's going on and I kind of like to step behind and everyone's filling me in.” Sarah scored a proficient on her freshman physics MCAS. Sarah was a competitive skater. She hoped to explore biology as a possible college major.

Paul: Paul is a 16-year-old tenth grade boy. He had been diagnosed with a written expression specific learning disability. He required the services of and the accommodations and modifications defined in an Individualized Education Program (IEP). He attended regular
education high school classes with the support of one period of an academic support class. Paul stated, “I really do enjoy learning. In most of my classes I don’t usually raise my hand unless it’s something I’m usually confident on. And sometimes I have a really low self-esteem. I just feel it every once in awhile. Usually, when I get something wrong it makes me feel pretty down and stuff. To me I’m pretty shy as a person, but somehow I find a way around to understand a problem. To me, I think, knowing everything is definitely above everything else.” Paul would like to explore becoming a doctor and/or teacher. He considered going into politics and dreamed of becoming president. He scored an advanced on his physics MCAS during his freshman year.

**Olivia.** Olivia is a 16-year-old sophomore girl. She had been diagnosed with a health (attention and short-term memory issues) disability. She required the services of and the accommodations and modifications defined in an Individualized Education Program (IEP). She attended regular education high school classes with the support of one period of an academic support class. Olivia confided, “I think I learn differently than others because I have to try. I know most of my friends don’t have to study. So, when they’re out, I’ll be in the house studying. So, it’s different for me than for them. But, I think everybody learns differently. I think that it makes me, me.” Olivia was a topnotch lacrosse athlete, who committed to a college during her sophomore year. During her freshman year, she scored proficient on her physics MCAS.

**Hannah:** Hannah is a 17-year-old junior girl. She had been diagnosed with a health (attention and executive functioning) disability. She required the services of and the accommodations and modifications defined in an Individualized Education Program (IEP). She attended regular education high school classes with the support of one period of an academic support class. Hannah said, “People would see me in a smaller room with not a lot of people. People would look at me differently. But they really don’t. Everyone’s really accepting. And even if they’re
not, who cares, it’s your learning. I mean, if they have something to say, they can say it. It’s not going to change you. You have a disability; you have to accept it. They don’t really look at you differently, because I feel when you’re in high school you’re more mature and you’re understanding that everybody’s different. Nobody’s like you.” Hannah focused on maintaining a high level of independence in learning and managing her school-based organization. She skated competitively. She earned needs improvement on her physics MCAS during freshman year. She earned proficient on her English and needs improvement on her math MCAS during her sophomore year.

**Candace.** Candace is a 17-year-old junior girl. She had been diagnosed with a specific learning disability in mathematics. She required the services of and the accommodations and modifications defined in an Individualized Education Program (IEP). She attended regular education high school classes with the support of one period of an academic support class. Candace noted, “That was a huge part of my math disability because I wouldn’t ask for help. And that’s one thing I’ve learned through the years is to self-advocate and ask questions. If you don’t understand something, just ask for help. You’re not going to learn anything just sitting there. Sometimes I just wish I didn’t have it, but I don’t really see myself different than anyone else. I mean we all learn in different ways, so I think I just learn a little bit slower than some people. I don’t think it’s a bad thing. If I have the right skills to learn, then I understand it. Pretty much the main thing is to focus and I want to beat myself, if that makes sense, to not go lower than an A, because that’s what I had since freshman year.” noted Candace. She studied ballet and performed in *The Nutcracker*. Candace earned needs improvement on her physics MCAS freshman year. During her sophomore year, she scored proficient in English and needs improvement in math.
Andrew. Andrew is a 16-year-old tenth grade boy. He had been diagnosed with a health (ADHD) disability as well as a specific learning disability in written expression. He required the services of and the accommodations and modifications defined in an Individualized Education Program (IEP). He attended regular education high school classes with the support of one period of an academic support class. Andrew earned a proficient score on his physics MCAS taken during his freshman year. Andrew noted, “I feel like I take in the information slower than other students. I think I’m a visual learner rather than reading something once. I feel like I’m a slow learner, but I don’t let that get the best of me. More slow and steady making sure of everything I’m doing rather getting through it once and pass it in. I feel like I want to put my hand up, but for some reason if someone else is doing it, I just don’t put my hand up. I could definitely be one of those people; I could do it.” Andrew was a talented athlete. He enjoyed track and Ultimate Frisbee. He also showed a strong talent in organizing events with his friends and peers. He scored proficient on his physics MCAS during his freshman year.

Through an analysis of their voiced experiences and engagement, four themes were identified and ultimately became the superordinate themes in response to the research question: How do high school students with moderate learning disabilities describe their engagement and educational experience in learning math? The four themes are:

(1) Awareness of learning differences;

(2) Relationships with teachers;

(3) Self-efficacy, engagement, and motivation in learning; and

(4) Cognitive engagement in a Socratic inquiry mathematics lesson.

Each of these themes are presented and discussed below.
Awareness of Learning Differences

Student involvement in school begins with their ability to make connections to their learning and education (A. Fletcher, personal communication, November 3, 2013). In this study, when students with moderate learning disabilities described their learning strengths and weaknesses, they noted their slower processing speed and longer task completion rate. Concurrently, they noted their desire to engage, achieve, and meet their individual goals (Greene, et al., 2004; Rowe, 1986; Tobin, 1987).

When the researcher asked the student-participants what learning was like for them, all eight students began to build a picture of positive outlooks on the challenges of learning differently within inclusive classrooms. The participants freely acknowledged their moderate learning disabilities and noted that their struggles were not highly insurmountable. They touched on various strategies such as (1) effortful immersion in learning; (2) a continued, focused engagement in concentration; (3) a slowly developing voice in questioning and answering in academic risk-taking; and (4) an acknowledgment that a personal understanding in their unique ways of learning and studying, with the strengths and weaknesses of a moderate learning disability, took more time and specific strategies to accomplish. They regularly interspersed challenges in achieving the grades and goals they desired. Recovering from the sting of a wrong answer and struggling with the self-advocacy to asks questions and to understand learned material in the classroom were prevalent in their words. They spoke of staying home to study, while friends went out.

However, overall they told of positive experiences in learning engagement: (1) Persevering in learning; (2) Being organized and great note-takers; (3) Seeking out alternative resources online; (4) Not allowing longer time on tasks to get them down; and (5) Feeling
genuine acceptance from their regular education peers. A few spoke eloquently about realizing that they were who they were and that they liked learning this way because it was the only way they knew how. Finally, two students noted that along their educational path, they had come to the realization that their education was for them alone and they had to take it for themselves.

On the micro level, the student’s individual voices provided particular insights. Even though Paul earned mostly As in his classes and had the exemplary study skills to support his achievement, he told of feeling a “really low self-esteem” because “usually when I get something wrong it makes me feel pretty down.” Avoiding the judgment of the wrong answer in front of the whole class, he spoke of blossoming during teamwork and individual peer-tutoring sessions. He also described focusing during the “entire class no matter what” in order to “know everything.” He preferred mild-mannered teachers in whose classes he was not always on the edge of his seat facing anxiety in being called upon. He summarized his feelings on learning differently and realized he had to apply himself to learning:

I kind of know my learning difference from the other kids and at an early age I wasn’t good at writing. I couldn’t express too much, but with symbols in math I could fly by everyone else. But, in real time I began understanding math, and that school actually matters, was in middle school because the teachers were all strict and for the most part it made me like oh, this is real life.

Thomas reiterated Paul’s desire to learn even though it took him longer to understand and required him to “study more than anyone else and just practice more.” He shared, “I don’t always remember how to do things.” And yet, he spoke of a strong self-advocacy when speaking in the classroom: “Sometimes you have to be the first person to ask the question, because not
everyone wants to do it. It made me feel like it benefited the class. Like I had value in the classroom.” He continued his holistic musing:

I see how I am a little bit different than anyone else and how anyone with my disability is always different. I am pretty sure that everyone is different and we can learn from each other in our own little way.

Hannah thought globally, as well, so that she could achieve independently. She said, “It’s just you for yourself. You have a disability; you have to accept it.” A self-described visual learner, she talked of her strong organizational skills and continuous note taking to enhance her memory, both of which she honed in the classroom and at home. “You have to be able to know how you learn so you can learn the material and do just as well as the person who is like, ‘I can read it once and remember it’.”

Tiler rationalized that she knew no other way to learn and so her moderate disability in comprehension felt normal to her, even though “you learn that it comes easier for other people.” She hoped that she did not frustrate people with her repeated questioning and strong desire to know. To study for assessments, Tiler created tests online to quiz herself in addition to realizing “in the last year or two that creating the material to study with, whether that’s writing out the math problem that you intend to look over or looking up a study guide that has vocab, I feel that’s more beneficial than just reading it through.” Olivia also found that “I don’t know how not to learn this way; so I don’t know any different.” Through orally quizzing herself and having her friends find connections to sports while they quiz her, Olivia found she could begin to remember concepts. She also found that setting a goal to raise her grade in math increased her motivation to achieve. Candace also tried to “beat myself” in order to increase her grades.
A positive attitude also helped Candace, but “sometimes I get frustrated because I just want to know it and I can’t know it,” she offered. Sarah noted that she was rarely “fully focused” and that she was “the last one to figure problems out.” Therefore, in teamwork her peers would end up giving her the answers. Consequently, she confided, with soft knowing laughter, that she felt “like the caboose.”

Andrew noted a positive attitude when he commented, “I feel like I’m a slow learner, but I don’t let that get the best of me.” He discovered a “slow and steady” learning style and although he had not been able to volunteer in the classroom, he felt that he could do it and “definitely be one of those people.” Continuing on the note of self-advocacy, Candace shared that asking questions was necessary for her learning. “If you don’t understand something, just ask for help. You’re not going to learn anything just sitting there.”

**Relationships With Teachers and Their Instructional Methods**

When students have a strong relationship with a teacher, they find that, as their math anxiety lessens, their math learning increases. The teacher-student relationship builds when instructional methods strike a chord with the student. Explicit direct instruction has been shown to play a major role in generating math knowledge. Moreover, the strategies of explicit direct instruction, with, for example, its teacher modeling and questioning, chunking of information, and positive reinforcement, support knowledge acquisition of students with moderate learning disabilities (Magliaro, Lockee, & Burton, 2005; McMullen & Madelaine, 2014). This kismet of finding the best fit between teacher, student, and instructional practice often leads to engagement and motivation in future math classes (Cornette-DeVito & Worley, 2005; Lin, Hong, & Cheng, 2009; Middleton & Spanias, 1999).
Along the way in their academic careers, many of this study’s student-participants related that they had one mathematics teacher that made the greatest difference in their engagement in learning. They described how they became active learners because they learned how to comprehend the material through their teacher’s instructional methods. These instructional methods used various techniques found in the explicit direct instruction model. Whether proposing daily note taking, reiterating problems until everyone was onboard, or demanding independent organization of materials, these middle school and ninth grade teachers made a strong impression on these students.

The students credit these academic experiences as pivotal in turning around their feelings of disenfranchisement or misbehavior. Before this life-changing happening, the students did not feel that their teachers understood how they learned. “Finally, someone would ask a question and she didn’t make you feel awkward to ask questions,” remarked Candace about her ninth and tenth grade math teacher, Ms. Ames, with whom she looped for two years. This educator taught the math content systematically, while also teaching the study skill of how to take notes. This note-taking ability also helped her in her other classes. Candace conveyed:

It’s all about the teacher. The teacher has to know how first to teach you. So I remember one time I raised my hand to ask a question and the teacher put me on the spot by asking what was something times something. And everyone was laughing at me. This was so awkward. I never asked a question again in that whole year. And then Ms. Ames came along and then it was not awkward to ask questions.

Paul also had a math teacher that changed his academic life while in eighth grade. He explained that Ms. Burns, his pre-algebra teacher, drilled through direct instruction and made sure everyone understood the concepts through asking questions of each student. Paul felt motivated to learn
because he “was kind of afraid” to be called upon in class. “It motivated me, I guess, to do it all out the best I could and get it right” said Paul.

Comparatively, a few student-participants found that their teachers did not explain the material thoroughly. Instead they (1) provided the content too quickly; (2) failed to maintain an environment where students felt comfortable asking questions; or (3) treated students with learning disabilities differently. Nevertheless, Hannah felt that although teachers needed to treat all students the same and make sure all students were learning, the students themselves also had the responsibility to become engaged in their learning. Like Paul, Hannah noted that Ms. Burns helped her learn by making sure “everyone understood the material before we took a quiz or a test. If one person didn’t, then the whole class would…keep practicing, too.” Olivia proclaimed that she did not like a math teacher in middle school because she felt the teacher did not like her. However, when a later teacher cared what she had to say, then Olivia could relate to the teacher, begin to achieve, and not clown around. Hannah concluded that love of a subject helped in learning, but hating a subject and refusing to do the work only brought about “negative results, so if you hate a subject it’s not going anywhere. You have to take it, so you might as well just get over it.”

**Self-efficacy, Engagement, and Motivation in Learning**

Studies highlight the connection between student engagement and motivation. As these barometers of learning increase mastery of information, students’ perception of self-efficacy, or interactive engagement, improves. Therefore, higher engagement and increased self-efficacy intrinsically and extrinsically motivate students toward achievement when they feel supported in their autonomy as they seek academic success (Greene, et al., 2004). These intertwined, mutually inclusive affects in focus and meaning making cycle forward and backward creating
deeper cognition, that continue to increase self-efficacy, motivation, and engagement in further learning (Pintrich, 2003). Of course, all students, including students who learn differently, benefit from increased self-efficacy in learning brought about by nourished engagement and motivation (Lewis, Huebner, Malone, & Valois, 2011; Reeve, Bolt, & Cai, 1999; Stefanou, Perencevich, DiCintio, & Turner, 2004; Stone, 2002).

Most of the student-participants in this study began by stating that they were extrinsically motivated to get high grades as they prepared for college. Candace stated, “If I don’t get a good grade, above a B, it makes me feel bad. Like I need to get a really good grade. You think about college, too.” Many of the students also spoke about their self-advocacy in classroom participation, questioning, and peer tutoring. Thomas said, “Someone else might have a question, but they don’t want to ask it. So, you should be the one to ask the question.” Andrew concurred and said that by asking a question there may be other students who had the same question.

Sarah remarked that being motivated was “knowing you have to get something done. It’s my mindset to finish what I’m doing.” In regards to setting goals in math learning, Olivia contributed, “I think if you try, then you’ll accomplish more. I’m ending with an A minus grade right now in my worst subject [math], so I’m putting all my effort towards math and I think I am winning the game.” Taking a page from her competitive lacrosse playing, she remarked, “I don’t like to lose.” Paul also pointed to a competitive edge when he stated, “You can’t let go of yourself and your grades. Makes me like study, study, study.”

Many of the students said that the math classes in which they found engagement and achievement were settings where they also found they had more fun. Most of the students remarked that when they found a subject interesting then they were more likely to be intrinsically
motivated to learn. Candace continued, “The first day [Ms. Ames] was like ‘put all of your
egative thoughts away and start fresh.’ And that’s what I did.” Hannah noted, “Being engaged
gives you the confidence of talking, not even just in front of your class or with your teacher, but
going yourself out there in general” and realizing that “everybody else is basically on the same
boat as you.” Hannah continued that finding the confidence to talk in front of the class also
created respect from the teachers. “You want them to respect you just as much as you respect
them.”

When this researcher informed the student-participants about intrinsic versus extrinsic
motivation, they also stated that they cared about in depth learning as well as the extrinsic
motivation of attaining grades. Tiler said that being motivated included wanting to gain deeper
knowledge. She mused that someone who wanted to learn more and further their engagement in
learning demonstrated active student voice by knowing “how to ask the questions.” She noted a
chicken and the egg phenomenon in learning: “I think it’s definitely a reciprocal action once you
understand the content, you use an active voice and you contribute to what’s being taught, but
you cannot contribute to what’s being taught, if you don’t know what’s going on.”

Paul noted that helping his classmates understand “makes me feel warm-hearted. I
wouldn’t exactly just give them the answer. Explanation is way better than just giving the answer
away.” He continued to self-assess the role he plays in his learning and the learning of others.
His strong acknowledgement of his positive learning behavior spoke to his self-efficacy in
attaining his academic goals:

For the most part I have figured out the game. In my opinion the game is understanding
everything clearly and staying focused in every math class and every chapter even though
some chapters may be boring and not as interesting. I definitely feel it’s almost my duty
to help other students if they don’t know it that well. It kind of makes me feel like my own teacher in a way. And if we’re working individually, the people around me, if they’re having any trouble they’ll be like, ‘Hey, Paul, can you help me out with that.’ It definitely supports the teacher and let’s them [the teachers] have some peace to themselves.

**Cognitive Engagement in Socratic Inquiry Mathematics Lesson**

The interactive, dialogic approach of interpretive, evaluative, and inferential classroom questioning has been shown to promote engagement through articulated student responses (Cotton, 2001). The “cognitive dissonance” (Mercer, Jordan, & Miller, 1996, p. 148) within a teacher-facilitated inquiry session increases active learning. Specific to the type of inquiry instruction utilized in this study, the students, as diverse learners and developing academic risk-takers, constructed the math answers through higher and lower order questioning tailor-made for them from their previous response (Lin, Hong, & Cheng, 2009).

The student-participants spoke to their engagement in learning when partaking in their content area classes. They also answered questions on their cognitive engagement in learning after taking part in a Socratic inquiry lesson on linear equations. This lesson was a part of the second of two 45-minute interview sessions in which they participated. As defined earlier in this document, a Socratic lesson was run through higher and lower order questions. This researcher, as the teacher-facilitator, led each student along the path of constructed knowledge by means of astute questions. Each question was chosen to build off the student’s previous answer and the quality of the question created was based upon the value in the correctness in the student’s answer.
Each student-participant discovered that they constructed their own knowledge and created a deeper understanding in certain concepts in the lesson on linear equations. Along the way they also corrected any errors in prior knowledge and lingering misunderstandings. Since this lesson on linear equations was a review of the students’ learning, the Socratic session started with four linear equations written on the board. The researcher chose them for their simplicity and patterning. Therefore, these four equations provided a prior knowledge assessment, in which lapses in memory and some ill-formed, mistake-ridden concepts were discovered. These holes in understanding helped to create the questions asked.

The concept of linear equations was a math topic found in the various classes of pre-algebra, algebra, geometry, and algebra II, as well as in a senior math class at The Regional High School. In other words, linear equation graphing and patterning along with understanding the behavior of lines was a topic common to most high school mathematic curricula. Nevertheless, this researcher, as a special educator, had anecdotally noted that students with learning disabilities, in general, had never fully owned the material, nor did they accurately remember it from one year to the next. This incomplete knowledge observed in virtually every student’s understanding created the rationale for the topic of this study’s Socratic session.

The lesson involved starting with four equations written on the board: \( y = x + 1 \), \( y = -x + 1 \), \( y = 2x \), and \( y = -2x \). The students were asked if the four equations were all linear representations. From there the students, in their own language and in their best language of math, pieced together the behavior of these lines on a graph. Their expectations and predictions for graphic and calculated patterning began to be dispelled and any ill-conceived knowledge was reformulated. Most incorrect knowledge centered around the equations of horizontal and vertical lines, that is, \( y = \) any number is a horizontal line, while \( x = \) any number is a vertical line. The
students also initially struggled with the realization that if \( y = 0 \), then \( y = 0 \) is a line that is drawn on the x axis.

All of the students actively and fully participated in their own individual lesson. Students reported that the Socratic inquiry session was different, challenging, difficult, and really made them work hard. Hannah remarked that she found herself immersed in this new method of teaching, while realizing that the subject matter was a review. She found herself vacillating between being anxious to being positive about the experience:

You didn’t even tell me that I had to do it. I just wanted to, because I feel its important to try new things even though when I was looking at it, I was like, oh god, I don’t know what’s going to happen next, because I haven’t taken it in so long. But I think things that scare you and you try them, makes you feel much better for yourself and your learning in general. I feel like if you gave me a problem, I could do it like we did.

Many of the student-participants noted that the session left them feeling positive toward learning because of the focused concentration involved. Many also felt fulfilled in the rigor of thinking throughout the interactive process in order to construct the right answer(s) independently.

All of the students reported being cognitively engaged during the Socratic lesson. Hannah said, “There were no distractions and I was really focused on getting down to what the answer would be.” However, she did not think the Socratic session was particularly challenging even though “it made me work hard to figure out what the equation was. I feel like I was thinking when you were teaching me, that you were teaching it to me backwards…it was a way that I was never taught before.” On the other hand, Paul thought direct instruction was simpler since “it doesn’t involve the mind as much.” He continued to compare inquiry with direct instruction: “The Socratic method asks questions which will make your mind think a lot more to
what the solutions might actually be. More logical thinking instead of coming to a conclusion right away."

During each Socratic session, the researcher reported a concentration and intensity in body language and facial comportment by all of the student-participants. Some students leaned forward. Most were very still, yet active during the entire inquiry session. All students maintained a purposeful focus when they were thinking about the questions asked. They also kept a determined focal point on the board where they eyed the illustrated graphing and the tables of values. The look of this studied focus on the countenance of each student-participant was one of openness coupled with an eager concentration in eye movement around the board and with the researcher-teacher. The students cooperated with this researcher in the teacher role and were not afraid to state what they thought was the answer, whether right or wrong. The students freely took academic risks and continued to create their individual understanding even when another question clearly noted that the direction they were taking was wrong. They did not become discouraged. No one looked at the clock or asked to take a bathroom break. They sustained their determined intensity throughout the approximately twenty-minute session. Constructed knowledge eventually brought each student-participant to the satisfaction in either new knowledge or revised prior understandings. Mastery and enlightenment were achieved for the moment.

The interactive nature of Socratic learning. The Socratic session was designed to bring each student-participant to their uniquely constructed, yet accurate understanding of linear patterns and the behavior of lines. Any ill-conceived knowledge was corrected by the give and take between the student and this facilitator. Hannah noted how the session was “interactive for both of us.” She further commented, “When we were doing it, I didn’t notice
there was a particular order we were going in. But now that I look back, you have to figure out one thing to get to the next.” Regarding the prior knowledge that was tapped into and the logic in the build up of the questioning as a means to increasing in depth understanding, Olivia said, “It helped me by having me think about what I know, instead of a teacher just telling facts to me about it. I think that helped me understand it more.” She also felt like she had a voice in the lesson. She liked how she had to think about the problem within the back and forth of the question and answer technique and that she was not simply taught the method and then given the answer. “I think I would learn more, if it was this type of lesson,” she summarized.

Regarding how he felt during the Socratic session, Paul reflected, “There was a lot of questioning, and it made the gears turn in your head, pretty much, a lot more than just being instructed.” He liked how he was not told what to do. “You have to think to do the Socratic method,” he proposed. Hannah also weighed in by saying that the interaction between this teacher-facilitator and her helped her figure out the problem “with you guiding me through the way to try and figure out what the answer would be.” She noted how engagement remained the primary factor in learning in both direct instruction and Socratic lessons: “Because if you’re just sitting there and you don’t have a connection and aren’t engaged with the teacher and with the lesson, then I feel like you’d have no clue.”

**Risk-taking during Socratic inquiry.** Whereas most student-participants spoke of being uncomfortable asking questions and participating in general in their math classes, they openly took risks during the one-on-one Socratic lesson. Paul spoke to the risk-taking and the no-wrong-answer philosophy within Socratic inquiry:

It’s taking a risk and you might get it wrong, but there might be a question that might help you out to figure out if the answer is actually wrong or not, instead of being told that
it’s wrong. The question might actually help you find the next answer. I think the Socratic method provides a lot more background information and a lot of information in general on whatever subject it may be. Since this is math and linear equations, I definitely will remember that $y = 0$ will be a horizontal line and that $x = 0$ will be a vertical line. I forgot about that, and I needed a review.

**Teacher-facilitated guided learning.** The student-participants noted how they had to figure out the answers themselves without being told that they were right or wrong. They found they had to sustain their cognitive engagement by looking at the board and listening to the questions. Andrew noted that the systematic questioning “helped me to understand because it went by piece by piece. It helped me see where everything was coming together as one.” Some also remarked on how they discovered new concepts. Sarah stated that she newly realized the patterning in both the graphs and the tables of value. She added, “You were leading me through the steps and then I could do it by myself. If somebody gave me a step of instructions on how to graph this, I’d probably get it all wrong. Seeing and doing the examples, I understand how it goes.” In addition, Tiler commented that the Socratic method showed her another way to dissect a problem in order to find any wrong paths taken during finding a math solution:

I think the Socratic method allows you to break it down a little more so you can know when to retrace your steps rather than analyzing parts of the problem that you did well and looking for an incorrect part when there’s not. And then the Socratic method allowed you to go back to the step that you did do wrong and realize what did you do wrong.

**The Socratic mindset in positive learning.** Within the inquiry lesson there was a change in mindset. Andrew saw this and noted that during a Socratic questioning, “I had to take a second to think about what I was doing, while if I was in the classroom, I’d probably just be of
what my mind told me and not often take a step back to be sure I was doing the worksheet right or wrong.” He continued to describe his cognitive engagement and the wait time it took to process and think about his answers: “I felt like each time I was doing a step I had to make sure, I took a second to, I thought to myself what the next step would be and whether that step would make sense or not. I felt like I knew what I was doing, but I needed the extra time to recall.” As far as constructing his own knowledge with self-efficacy, Andrew continued, “But, I did feel like I had control and a say in knowing that it was true.”

Hannah summed up, “Towards the end when I got y = 0, I didn’t realize that I taught myself, but I didn’t realize that I did everything just based off of a conversation with you.” Noting her positive engagement, she stated: “I feel that it was just like not important, but amazing to see that just the littlest hints can help you figure out what you are doing wrong.” Tiler voiced, “I think it’s more valuable to construct your own knowledge rather than doing it completely dependently.” She also noted the cognitive engagement required in the guided learning: “It allowed me to see where I was struggling and what I needed to do to get back on track to the correct answer. And you think more about the applications of the knowledge rather than just getting to the answer.”

A final point reiterated by all the student-participants was that the Socratic inquiry session gave each of them a unique and positive learning experience. They understood that this instructional method was successful to their understanding and to fixing any misconceptions they might have had on patterning and the behavior of lines. Each student-participant demonstrated to this researcher and spoke to a level of cognitive engagement and openness to this novel instructional method.

**Researcher perspectives on Socratic learning.**
The data findings delineated in this chapter attempted to provide clarity in how high school students with moderate learning disabilities engage in learning. These findings showed that despite the differences in math content currently studied as well as the contrasts in moderate learning disabilities among the students, each student-participant shared similar experiences while (1) engaging in math learning overall and (2) independently engaging in one Socratic lesson. Chapter five positions these similar student-participant experiences within the context of Fredrickson’s Broaden and Build Theory of Positive Emotions and the theory of constructivism as well as within the literature review that were used for over-arching guidance in this study.

**Summary of Findings**

Reflecting upon and recalling their learning experiences and perspectives on their engagement in learning math elicited telling descriptions from the student-participants. Four themes surfaced from their rich stories in their academic experience as students with moderate learning disabilities. Some noted that a specific math teacher provided the relationship and instruction that became a turning point in their engagement and achievement. Others stated that the more they understood how they learned, the more they found a positive self-acceptance and a growing self-efficacy. They all considered themselves cognitively engaged and robustly focused in their Socratic inquiry lesson on linear equations. The essence of their story is beginning to take shape.
Chapter V: Discussion of Research Findings

The findings of this study attempted to illuminate the engagement of high school students with moderate learning disabilities on their math learning. Current research demonstrates that the emotional and cognitive engagement of students, including students with moderate learning disabilities, increases motivation and self-efficacy in learning (Greene, Miller, Crowson, Duke, and Akey, 2004; Lewis, Huebner, Malone, & Valois, 2011; Reeve, Bolt, & Cai, 1999; Stefanou, Perencevich, DiCintio, & Turner, 2004; Stone, 2002). Some of this contemporary research addresses engagement in math inquiry, while some addresses the math engagement of students, who learn differently (Miller and Mercer, 1997; Scheuermann, Deshler, & Schumaker, 2009; Thoron, Myers, & Abrams, 2011; Tzur, Hagevik, & Watson, 2004). The ability of all students to have voice in their learning is also promoted as key to student engagement (Mueller, Yankeleowitz, & Maher, 2011; Steinberg & McCray, 2012; Stone, 2002). In addition, a large body of the contemporary research debates the teaching methods that promote student engagement, pitting explicit direct instruction against inquiry learning with each method seemingly winning out the efficacy battle equally (Fredricks, Blumenfeld, & Paris, 2004; Magliaro, Lockee, & Burton, 2005; Marks, 2000; McMullen & Madelaine, 2014; Newmann et al., 1996). Other studies note that a strategic choice between explicit direct instruction and inquiry learning meets the needs of students with learning disabilities (Impecoven-Lind & Foegen, 2010; Scheuermann, Deshler, & Schumaker, 2009).

Although this research study did not argue the efficacy of instructional methods, it did discuss student perspectives on their learning and their relationships with their teachers under the explicit direct instruction in their classrooms, particularly within their math classes, as well as through the interactive one-on-one Socratic inquiry math lesson on linear equations. Since the
student-participants purposefully sampled for this study were chosen for their desire to learn and their passing grades, along with their prior relationship with the researcher, the research question that guided this study was: How do high school students with learning disabilities describe their engagement and educational experience in learning math?

An interpretative phenomenological analysis (IPA) supported the collection and interpretation of the student-participants’ interview data. These research findings underpinned the contemporary empirical literature that was found to support this study. The one major deficit in the literature was a lack of numerous studies on cognitive engagement. This study supplied some key findings on the cognitive engagement in math learning by students with moderate learning disabilities as they engaged in one Socratic inquiry lesson. The significance of this study furthered the conversation about student engagement.

Since this study’s student-participants were engaged in their learning, the question of how they were engaged in their learning remained paramount. These findings added to the current literature that focuses almost solely on emotional and behavioral engagement and began to provide further discussion on student cognitive engagement in learning. The discussion of the study’s findings and the recommended implications for future research are found below. These recommendations are intended for future research either in schools as action research or in the academy as a means to further the understanding of engagement of all students in learning math. Four themes were culled from multiple passes through the data transcripts of the eight student-participants’ three interviews. The themes presented are the same as those organized in the research data analysis: (1) Awareness of learning differences; (2) Relationships with teachers and their instructional method; (3) Self-efficacy, engagement, and motivation in learning; and (4) Cognitive engagement in a Socratic inquiry mathematics lesson.
Key Findings

There were several key findings drawn from this study and are discussed below.

**Awareness of learning differences.** Students with learning disabilities often struggle with attentional difficulties, memory and processing challenges, and language issues (Impecoven-Lind & Foegen, 2010). This study’s student-participants revealed honest, insightful, and self-reflective interpretations of how they learned. The interview questions often referred to how they viewed their learning as students with learning differences. They easily shared that they understood the strengths and limitations of their learning disability. Their positive engagement in learning and their self-efficacy to set goals overshadowed their concerns in their slower processing and short-term memory deficits, need for constant reiteration, and their lack of autonomy in the classroom due to their shyness or lack of confidence in asking questions. They shared their descriptive words on their learning differences that proved to be eloquent, forthright, and uncompromising in noting the challenges in learning the mathematics curricula in regular education high school classrooms with the support of an academic support class.

They listed a number of different strategies for the classroom that they used to remain engaged, stay focused, and achieve. These included: (1) Trying to maintain a purposeful focus; (2) Taking notes even when not instructed to; (3) Looking at the board and then looking at the paper; (4) Asking questions and self-advocating for understanding to the best of their ability; (5) Acknowledging that they need more time to comprehend; and (6) peer-tutoring others so that they may learn more deeply. They used memory enhancement tricks like creating tests online for self-quizzing and viewing lessons online for the reiteration of concepts perhaps through an alternative teaching style. They knew that they were auditory or visual learners. They realized they must learn to overcome shyness or a lack of confidence to be able to self-advocate and
participate regularly in their classes. They talked of finding and using their voice in the classroom and outside of school. Common to this group of tenth and eleventh grade boys and girls was a strong desire to set goals, stay positive, and find confidence even though they realized that learning was a struggle for them that required sustained time-on-task, resilience, and persistence. These eight student-participants consistently communicated a strong sense of self-acceptance in who they were as learners.

Of particular interest was the ease with which the students assessed their cognitive engagement while taking part in an inquiry session for the first time. The Socratic lesson on linear equations took place during the second of their two 45-minute interviews. The assessment of their learning engagement within the Socratic lesson took place during the last of their three research interviews. There was time between these two interviews for the students to reflect. The students were sent a list of questions to help in this self-reflection on the Socratic lesson, but only one student utilized the list and came in with some formulated answers. All of the student-participants’ self-efficacy and self-assessment on engagement that was noted prior to the Socratic session appeared to have contributed to their ability to reflect on their cognitive learning engagement within the one-on-one, interactive, dialogic, constructivist Socratic inquiry math lesson.

Their cognitive engagement and positive approach allowed the students to be open to this novel means of learning, sustain their perseverance in answering questions, remain heavily engaged in the questioning process, and maintain a resilience in piecing together their learning to discover or rediscover the answer(s) to the linear equation Socratic lesson. None of the student-participants relayed any resistance to engaging in this learning opportunity. Each remained uniquely focused on the intent of the instruction while apparently enjoying the newness of the
constant questioning of the inquiry session. When their answer was answered with another question that repositioned their thinking, they never interpreted their ill-conceived answer with a negative attitude or with any pushback. Nor did they interpret all re-questioning as judgmental or finding fault with their reasoning or intelligence. They simply soldiered on until they constructed a complete and accurate picture of the patterning in both graphing and completing tables of values of the various linear equations. They were able to orally relate, in the language of math, the final, overarching meaning in the math lesson on linear equations. Each student-participant came away with a deeper synthesis of how the linear equations related to the graphs drawn and a firmer understanding of the behavior of lines.

When comparing these findings with the literature, there was consistency in how these high school students with moderate learning disabilities engaged with their high school learning and matched their strategies to the recommendations in effective special education practices required to support their inclusionary regular education settings (Vaughn & Linan-Thompson, 2003). Over the course of their academic careers, these eight students had come to dissect and understand how they learn and what they needed to accomplish to achieve at the level they had set for themselves. They understood that they needed to avail themselves of their regular education teachers’ content knowledge delivered through an “explicit and systematic instruction” (p. 145) while working with a special educator on their “area of instructional need” (p. 145). The researcher perceived the participants as students, who wanted to achieve and were systematically and gainfully working toward their goals of higher grades and in depth learning. However, it must be noted that these student-participants were not culturally and linguistically diverse. None was on a free or reduced lunch. Therefore, their ability to self-assess their learning strengths and challenges, as well as orally interpret their learning experiences, parallels the linguistic benefits
of being a part of society’s higher socio-economic group. Nevertheless, these findings on the awareness of these students, with moderate learning disabilities, on their educational experiences do indicate a significantly positive and broadened, authentic engagement in learning math that is building as they move through their academic careers.

**Relationships with teachers and their instructional methods.** Various instructional routines, provided with adequate wait time, have been shown to address the needs of students with moderate learning disabilities and build toward authentic academic performance (Impecoven-Lind & Foegen, 2010; Rowe, 1974; & Tobin, 1987). In this study, most of the student-participants described how various math teachers related to them as learners. These positive experiences in the classroom increased their learning engagement. Three of the students credited key math teachers with turning them into productive students. Before finding a teacher with an instructional method and personal style that related to them (a happenstance of scheduling and prescribed curriculum), these students related three specific characteristics that described their old learning affect: (1) disengaged; (2) apathetic; and/or (3) disruptive. But once they had found a teacher who connected with them as people and as learners, they learned how to learn and became engaged. They took these new skills and transferred them to their other classes and future learning moving forward in their academic careers. These students communicated that they felt these particular teachers liked them and cared about them.

It could be assumed that these teachers also came into these three students’ lives at the most synchronistic time when the instructional method they offered met the student’s need to learn. Nevertheless these students found that these specific teachers offered a relationship in learning. Similarly, Kane and Maw (2005) found that a “‘radical collegiality’ where teacher instruction has been enhanced through dialogic encounters with their students” was key to
understanding. The students also found that they were taught by an instructional method, much like the explicit direct instruction defined in the literature (Magliaro, Lockee, & Burton, 2005; McMullen & Madelaine, 2014). This instruction resonated because it included teaching the following skills: (1) Concrete mandates and systematic problem solving; (2) Reiterative problem solving until every student understood the concept; and/or (3) Precise note-taking prowess. The participants described these math environments as life changing for them as learners. Each student indicated that the strong relationship with this teacher was one of respect and deep affection. As they related their remembrances of this purposeful engagement in math learning with this specific educator, their countenances showed joy and excitement in their accomplishments.

Although not all student-participants spoke about a specific teacher relationship that unlocked their motivational learning, all participants noted a positive perception on the various instructional methods that helped them learn. Again, these participant descriptions matched the instructional method of explicit direct instruction and included many of the tenets sited in the current research: (1) Reiterated instruction toward mastery; (2) Questioning and quickly corrected errors; and (3) Positive reinforcement. Thus, these findings supported the contemporary research that explains that explicit direct instruction is an efficacious way to learn, especially for students with moderate learning disabilities (Magliaro, Lockee, & Burton, 2005; McMullen & Madelaine, 2014). Although this qualitative study did not cover a comparative look at explicit direct instruction versus constructivist learning, it did provide a look into interpreted descriptions of both instructional methods by students with moderate learning disabilities. The student-participants’ interpretations of their cognitive engagement in Socratic inquiry are noted below.
In further analyzing interpretations on their math learning in the classroom, multiple students reported that they felt included in their classes and that the regular education setting supported their developing autonomy as learners with moderate learning disabilities. One student related that when she needed to leave the classroom to test in a separate setting, a fellow student was nonplussed to hear her state that she was on an IEP. She also offered that if others were not accepting of the accommodations that she utilized, it did not matter to her because this education was for her alone. Further examination of these findings supported contemporary literature that states that students achieve their goals when they find voice, trust, respect, and positive energy with their teachers (Ritchie, Tobin, Roth, & Caramba, 2007).

**Self-efficacy, engagement, and motivation in learning.** In the reiterative exploration of the research findings, the researcher interpreted that all the student-participants experienced some motivation and self-efficacy. When this motivation and self-efficacy was processed with their engagement in learning, the students demonstrated authentic academic performance and improved self-efficacy. Since this study did not examine achievement in terms of quantitative grade scores, the term *authentic academic performance* was often used instead of the quantitative term *authentic academic achievement*. Authentic academic performance could be linked to the students’ descriptions of repeated goal setting and consistent achievements in learning. Nevertheless, student’s Massachusetts state assessment scores were noted in each participant’s biography to serve as a quantitative assessment benchmark for the reader.

When speaking in a positive manner about their extrinsic and intrinsic motivation, the student-participants’ supported the current empirical literature that points to the effort required to become a motivated achiever (Bonk & Cunningham, 1998; Pintrich, 2003). Extrinsic motivation was of the utmost importance to these students. Getting good grades and bettering their grades
was a strong motivational factor. Grades were the first thing they spoke of when discussing motivation. However, most also agreed that they were intrinsically motivated to learn more deeply, especially when a subject interested them. The students repeatedly addressed that they were motivated to learn and accomplish their goals through (1) developing a confident self-advocacy, active voice, and drive to achieve; (2) enhancing their study skills; (3) peer-tutoring and helping others; and (4) maintaining a positive, persevering attitude and the resiliency to start anew. These goals and strategies supported acknowledgement of the student-participants’ belief in their positive, confident self-efficacy in engaged, motivated math learning.

**Cognitive engagement in a Socratic inquiry mathematics lesson.** Current research notes that motivation builds positive behavior that then encourages academic risk-taking, self-efficacy, and satisfaction as a learner (Deci, Vallerand, Pelletier, & Ryan, 1991; Mueller, Yankelewitz, & Maher, 2011). In regard to being open to learning by means of a novel instructional method, all of these student-participants rose to the challenge and excelled at independently taking part in one Socratic math lesson. The researcher noted that all of the students easily understood the construct of the continuous questioning involved in learning through inquiry and freely immersed themselves into the Socratic learning lesson without any faltering in concentration, need to take a break, or clock-watching. This broadened engagement and positive perception of the Socratic tasks spoke to the higher order thinking skills required in the Socratic lesson. Green et al. (2004) link pedagogical and classroom strategies in higher order learning and meaningful processing, engagement, and motivation to more positive perception of classroom tasks, greater academic achievement, and self-efficacy to achieve mastery goals.

The positive manner with which each student approached the lesson spoke to Fredrickson’s (2004) Broaden and Build Theory of Positive Emotions. This theory posited that
positive emotions, such as those brought about by an interesting math lesson, could give rise to contentment, a desire to play, and engagement in the “thought-action repertoire.” (p. 1367). The only missing piece in this recipe for learning engagement was the teacher-facilitator who showed a strong relationship with the student and provided a safe environment for learning and academic risk-taking. Nevertheless, each Socratic session with its positive learning and strong cognitive engagement in learning fit into the picture painted by Broaden and Build Theory.

Fredrickson (2004) put forth that a high level of positive emotions “produce optimal functioning, not just within the present, pleasant moment, but over the long-term as well” (p. 1367). This, then, is the essence of the theory: That positive emotions broaden engagement and thereby build “enduring personal resources” (p. 1369). During the month long time frame of this study’s data gathering, the researcher noted that the three interviews with each of the eight participants allowed each student to continue to reflect upon their engagement as well as articulate on their cognitive engagement in inquiry learning. The close time frame of a few days between interviews seemingly allowed the students to maintain their reflective thinking on their engagement.

The student-participants’ learning experiences in the Socratic inquiry session were consistent with existing literature on the efficacy of constructivist learning as a link to disciplined inquiry and authentic student engagement (Fredricks, Blumenfeld, & Paris, 2004; Marks, 2000; Newman et al., 1996). The research posits that the student-participants should be engaged in this authentic pedagogy partly due to the relationship that the researcher-teacher, as the Socratic facilitator, had with each student prior to the inquiry session (Reeve, Bolt, & Cai, 1999). Many of the students articulated the positive relationship that they perceived with the researcher. One student noted that without this researcher’s facilitation in academic learning and instruction on
behavior comportment in relating to her teachers, she would not be achieving at her current level. This understanding of each student’s learning disability and personal characteristics as these relate to learning allowed the researcher to craft a Socratic lesson unique to each student and within Vygotsky’s zone of proximal development (von Glasersfeld, 1990). The ability of the students to relate their prior mathematics knowledge on linear equations to the new patterning and calculations entertained and then independently construct their own knowledge through the use of critical thinking skills supported and transferred Savich’s (2009) findings on in depth knowledge making. Savich’s study was set in a history classroom, thus illustrating the ease of transferability between these studies.

Socratic inquiry utilizes a student-centered approach to learning within a highly teacher-centered facilitation process (Golding, 2011). In keeping with contemporary literature, the student-participants shared that they found an independent engagement within the Socratic lesson when both student-centered and teacher-centered practices were combined (Chang, Hsiao, & Chang, 2011). It was that sense of “teaching backwards” that one student described. She noted how both she and the researcher were working interactively through the facilitated guidance while she was figuring out the graphing and calculating independently. The students voiced how they enjoyed not being told what to do or that they were wrong. Instead, they were allowed to realize where they were wrong and keep going in the pace of their problem solving before being asked another question. Even when they did not understand a question or started down a wrong path in reasoning, they commented that the next question helped them to right their thinking. Many noted that the inquiry process made logical sense. One student pointedly noticed that she was the center of the learning. Many felt the power of their active voice in cognitively solving the puzzle of the Socratic lesson on linear equations. However, due to
memory issues and the fact that this was only one Socratic lesson on the review topic of linear equations, many students may not be able to demonstrate the denouement of their individual Socratic lesson at will.

In referencing current studies on engagement, emotional and behavioral engagement takes up the bulk of the studies (Fredrickson, 2004; Lewis, Huebner, Malone & Valois, 2011; Marks, 2000). On the other hand, cognitive engagement has been studied less as a distinct entity (Greene et al., 2004; Li & Lerner, 2011). However, in this study the student-participants were able to detail how they cognitively constructed their own math understanding while being led along in an interactive discourse on linear equations. Comparing and contrasting student experiences, the researcher noted that many students described the mental challenge in trying to figure out the solutions. Another student noted that he would be more likely to remember the material following this instructional method. Contemporary literature notes that teacher-facilitated inquiry-based instruction leads to higher-order thinking (Marshall & Horton, 2011). Others spoke of the personal learning fulfillment found in the active discourse of Socratic inquiry, while one student noted, the focused interaction of one on one dialogic inquiry allowed for a focused concentration without any distractions. Many students concluded that Socratic inquiry would allow for further in depth learning if it were used more often as an instructional method.

Socratic inquiry, as an instructional method, also supported student autonomy and self-efficacy along with cognitive engagement. All of the students reported realizing they were independently constructing their knowledge. One of the students spoke of digging deep to find answers. She noted that her strong cognitive engagement found her simultaneously trying to retrieve prior knowledge while aiming to answer the questions and solve the problems. The total
immersion in the inquiry interaction was so all-inclusive that it was only when the lesson was over that one student remarked that she realized there were systematic steps provided through the questions that led to the correct conclusions. She reported that she was feeling the give-and-take engagement between this researcher as teacher and herself. She stated that this interaction within the inquiry session propelled her to the right answer. Regarding the level of cognitive concentration required, one student highlighted that the Socratic method required deeper thinking because engaging in a dialogic conversation with the teacher-facilitator was the ultimate act of independent learning. He ultimately found out that he had become self-taught.

**Findings in Relation to the Theoretical Framework**

This study was informed through two theoretical frameworks: The Broaden and Build Theory of Positive Emotions and constructivism. These theories provided a consistent lens on the exploration of the perspectives and experiences of high school students with moderate learning disabilities as they engaged in learning math.

**The Broaden and Build Theory.** The student-participants in this research study provided a rich description of engagement and learning that adhere to Fredrickson’s (2004) Broaden and Build Theory of Positive Emotions. Fredrickson cites key factors that shed light on an individual’s positive emotions through “thought-action repertoire” (p. 1369) where emotions such as joy, interest, contentment, and love create positive actions such as play, exploration, integration, and a continuous cycle of these actions within safe relationships. Empirical research links the theory to cognition and intrinsic motivation and thus provides a strong connection to the field of education. This supporting research also highlights an education link when it posits that “positive emotions broaden the scopes of attention, cognition and action, and that they build physical, intellectual and social resources” (p. 1369). All the student-participants in this study
reportedly flourished when engaging with full attention and concentration on a new method of learning through Socratic inquiry instruction. They described understanding their learning disabilities, coming to terms with how they learn differently, and persevering in taking the opportunities provided by their education for themselves with a hearty resiliency.

The Broaden and Build Theory also delineates how positive emotions broaden engagement that then builds into flourishing achievement. Fredrickson (2004) cites several past studies that support the connection between positive affect and creative, flexible, integrative, and efficient thought and increased performance. Most notably, she notes the connection between positive emotions and the openness to new information. The student-participants in this study clearly displayed this thought-action when they eagerly embraced learning through the Socratic inquiry method, an instructional approach that was novel to them. Within this one lesson they remained flexible and open when confronted with the inquiry process. They were focused and efficiently engaged with the process of answering the specific question that was asked of them. They also noted a fondness for this teaching style and would be open to having the option of learning in this manner in the future. The student-participants’ preference for different teaching methods demonstrated openness to variety - another hallmark of broadened cognition brought about by positive emotions. As Fredrickson points out, there is strong evidence that “positive affect broadens cognition” (p. 1370).

The Broaden and Build Theory also cites evidence that positive emotions undo negative emotions. The student-participants voiced repeatedly how they worked to overcome their learning disabilities and sought out positive strategies to their challenges. Fredrickson (2004) remarks that positive emotions serve as “efficient antidotes for the lingering effects of negative emotions” (p. 1371). Certainly, the student-participants in this research eloquently painted
pictures of their resiliency and perseverance in trying to learn deeply, self-advocate, and aim to increase their voice in the classroom. Indeed, the Broaden and Build Theory also touches upon how positive emotions propel psychological resiliency. Therefore, this research added another piece to the repertoire of understanding how positive emotions enhance engagement and efficient resiliency in learning and how students may “intuitively understand and use the benefits of positive emotions to their advantage” (p. 1371) as they build their resources toward optimal flourishing as attentive, cognitively astute, complex students and adults.

**Constructivism theory.** The findings of this study strongly exemplified the tenets of constructivism that linked the student-participants’ intellectual and cognitive value in constructed knowledge to the teaching method of inquiry-constructivism (Newmann, Marks, & Gamoran, 1996). Theoretical constructivism notes that all knowledge is constructed and that math knowledge, in particular, is built through a process of reflective, abstract thinking. The mind builds cognitive structures that then are processed into results, much like the way a computer takes in information and outputs transformed structures (von Glasersfeld, 1989).

When the student-participants actively engaged in the one Socratic lesson during their second 45-minute interview during this research process, they demonstrated an active, cognitive engagement in following the purposeful questioning as they independently constructed knowledge on linear equations through active teacher facilitation (Dewey, 2001; Golding, 2011; Scott, Mortimer, & Aguiar, 2006). Following reflection on their inquiry learning, they noted how they transformed key understandings on linear equations through the Socratic process. They also spoke about how the consistent questioning, that was informed by their previous answer, had a systematic feel. This orderly give and take of questions and answers allowed them to construct their own learning independently. The researcher noticed how the students continued to
show an eager affect in academic risk-taking, while freely answering the questions, finding trust within the Socratic method, and continuing to actively problem solve (Smyth, 2006). In keeping with constructivism theory, the students had concretely illustrated, through their emotional and cognitive engagement with the mathematic material, the exact process of theoretical constructivism as the creation of cognitive activity that adapts and builds toward deeper, meaningful learning.

**Implications for Future Research**

The overarching intention of this study was to understand the engagement and experiences of high school students with moderate learning disabilities as they learn math. Considering the educational experiences and engagement, particularly the cognitive engagement, of the eight high school student-participants, the following recommendations and suggestions are offered with the aim of understanding and increasing the overall engagement of students, who learn differently. Recommendations include action research performed in schools and empirical research conducted in the academy (Vanderlinde & van Braak, 2010).

**First Recommendation: Action Research.** The researcher recommends that schools examine relationship practices and instructional methods as a means to the engagement in learning by students with moderate learning disabilities. The student-participants in this research study spoke eloquently and positively about their strong relationships with their teachers. They also spoke to their academic engagement in explicit direct instruction classes as well as to the cognitive learning engagement they found within a Socratic inquiry math session. Therefore, it is recommended that school administrators, educators, parents, and community members as well as policy makers seek to understand the possible benefits to student engagement in learning by means of explicit direct instruction, inquiry constructivist teaching, relationship building, and the
support of student voice. It is recommended that administrators and educators create professional development and professional learning community time to examine instructional practices, relationship building, and the benefits of student voice. Action research can support data findings to substantiate implementation of these practices.

The researcher also recommends that schools examine inquiry-constructivism and pilot the Socratic method as a mathematics instructional technique. It is suggested that any piloting activities start in small group settings, since the student-participants noticed the importance of learning in a one on one dialogic relationship. Contemporary research indicates that interactive constructivist learning benefits the learning of all students (Cobb, Yackel, & Wood, 1992; Newmann et al., 1996; Piaget, 1952; Smith, 2008; Vygotsky, 1978). Indeed, students voice their preference for inquiry constructivism over direct instruction (Savich, 2009). Nevertheless, administrators and educators must fully immerse themselves in understanding the vast spectrum upon which inquiry lies (Golding, 2011, Figure 1). A complete understanding of the varying amounts of teacher facilitation, from complete student-directed inquiry to authoritative teacher-directed inquiry, along with the research that supports each variance, can build a complete picture for writing professional development curricula or creating professional learning community discussions on the many facets of inquiry instruction, particularly the Socratic method (Cotton, 2001; Elder & Paul, 2006; Golding, 2011; Watts, Jofili, & Bezerra, 1997).

This study’s findings indicated positive effects of student engagement, especially when students found their voice. All of the student-participants noted that they were working on bettering their active student voice in their classes by participating and answering questions. One student spoke of peer tutoring as a means to create his voice when he was, by nature, shy and often non-responsive in the classroom. A few students noticed that their nascent voice in
school was contributing to their confidence in their customer service jobs outside of school. Most noted their strong, independent voice in the dialogic discourse in the Socratic approach to teaching math. Certainly, all of these student-participants had a strong opinion on their learning and engagement within the study’s interviewing process, which contributed to the development of their voice.

Consistent with current literature, the student-participants believed that having an active voice was crucial to their engagement in learning, especially when the learning was student-centered, interactive, cooperative, and filled with academic risk-taking (Almeida, 2010; Chenail & Chenail, 2011; Mueller, Yankelewitz, & Maher, 2012; Scott, Mortimer, & Aguiar, 2006). Likewise, the students addressed learning through multiple methods for enrichment in engagement and understanding (Conboy & Fonseca, 2009). Future research should include the students’ voice when exploring their learning engagement. Therefore, the researcher recommends sitting students at the table within the inclusive discussion on furthering student engagement opportunities in school. Who better to ask about their engagement than the students themselves? Current research parrots this opinion and states that dialogical conversations and active student voice are both ethical and moral, as they empower students in meaningful engagement and engender critical thinking and creativity (Almeida, 2010; Fletcher, 2005; Stohl, 2010; Taylor & Robinson, 2009). The earlier that students discover their own voice, then the sooner their unique skills and passions will enable fulfilled lives, economic opportunity, and a better world.

**Second Recommendation: Research in the Academy.** For the academy, the recommendation is for future research to continue the exploration into the engagement of students with moderate learning disabilities as they learn math. This can be conducted with varying socio-economic
populations of students within different levels of education. Various contents can also be addressed in future studies. Comparative studies can explore student versus teacher perspectives and direct instruction versus inquiry-constructivism on student engagement.

Research can illuminate the process of the shifting culture in our schools as well as add to the findings in dynamic school reform. The progress of progressives must continue unless it becomes frozen in formalism. By providing further empirical research on exploring student engagement, targeted, practical, and applicable solutions for school improvement and effectiveness may be attained. Additional research can examine the capacity to make these changes in educational practice and improve student and school outcomes where free and independent citizens continue to build upon democratic society (Cremin, 1959).

Additional phenomenological research with different participant populations and within different settings can add enlightenment to the current strength of contemporary literature. However, case studies, both qualitative and quantitative, can also strengthen the argument for advancing student engagement in learning by means of instructional practices, relationship building, and meaningful student voice. Focus groups can also add further perspectives to student engagement. The hope of this study is that its significance and transferability are determined valid and applicable, and thereby reviewed, debated, and piloted in classrooms beyond the researcher’s backyard and throughout the United States and worldwide (Vanderlinde & van Braak, 2010).

**Conclusion**

As schools seek to restructure and grow into more authentic learning environments that nurture students with the twenty-first century learning skills (International Society for Technology in Education, 2016; New England Association of Schools and Colleges, 2011) they
require for their post-secondary education and future productive lives, stake-holders must examine all avenues for developing student engagement in learning. It is wise to reference hooks (1994), when she noted, “The classroom remains the most radical space of possibility” (p. 12). Thus, the benefits of positive student engagement require careful analysis into how learning can broaden and build (Fredrickson, 2001). It becomes incumbent that administrators, educators, parents, community members, policy makers, and students provide opportunities for equal and open access for all students to become strongly engaged in their learning. As previously cited, contemporary research provides the arguments and debates for the various paths to engagement (Cobb, Yackel, & Wood, 1992; Eberstatd, 1999; Elder & Paul, 2006; Engelmann, Becker, Carnine, & Gersten, 1988; Golding, 2011; Magliaro, Lockee, & Burton, 2005; McMullen & Madelaine, 2014; Piaget, 1954; Savich, 2009; Smith, 2008; von Glasersfeld, 1990; Vygotsky, 1978; Wertsch, 1984; White, 1988). Careful unpacking of current empirical research can support the actions that broaden and build the way forward to authentic student self-efficacy and positive learning experiences in interactive engagement (Greene et al., 2004).

As an interpretative phenomenological analysis, the findings from this study came down to an essence of how the student-participants with moderate learning disabilities interpreted their educational experiences and engagement in learning math. It all started with their ability to reflect on their learning. From there, each student constructed key understandings (Derry, 1996). Overall, the students revealed a positive engagement in their desire to learn through their (1) strong focus on goal setting; (2) intrinsic and extrinsic motivation; and (3) open acknowledgement of the challenges of learning differently. They understood the value in finding and creating relationships with their teachers. They recognized how they needed to increase their self-efficacy and active voice to increase their academic performance. They expressed a
productive attitude toward learning and specifically broadened their perspectives by openly immersing themselves in the novel instructional method of Socratic inquiry. From the experience of this Socratic dialogue, the students self-assessed and reported on their cognitive engagement in the math lesson. They noticed that independently constructed knowledge required a mindfulness and artful focus that widened their lens on learning and understanding. Through their dialogic constructivist learning, they also revealed a social empowerment that they may carry forward as they continue to discover ways to thrive. Overall the student-participants demonstrated a favorable, creative resourcefulness, perseverance, and resilience in finding diverse strategies to achieve their goals. To this researcher, they showed a charming intelligence in relating their perspectives so that their stories tell of a foundation of rich resources for flourishing as students, adults, and future members of society (Fredrickson, 2001).

Story relates to the human experience (Sandelowski, 1991). Findings from three one-on-one conversational interviews, conducted with each of the eight students with moderate learning disabilities, created an interpretative story of broadened experiences in learning and positive perspectives on their engagement in learning math (van Manen, 1990). The findings were expressed through a timeline of cycled flash forwards and flash backs of student-participant voice, critiqued and interpreted student perspectives, and through a strong, partially bracketed, yet acknowledged interpretive researcher point of view and positionality (Mackey, 2005). The plot entailed exploring student engagement in math learning. The setting was a Massachusetts regional high school, where the characters portrayed in the story of engagement in learning were students with various moderate learning disabilities. The interpreted understandings about how students learn through being engaged also played a role in developing a cogent story (Sandelowski, 1998). With interpretive storytelling, the hope is that the researcher engaged the
reader so that the research findings create reflection and application in order to advance
“collective understanding” (Boote & Beile, 2005, p. 3) and thoughtful replication within the
parameters of the academy and the trenches of educational practice.
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Regional Educational Laboratory’s School Improvement Research Series website:

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Appendix A

Student Questions for Study of
Engagement of High School Students With Learning Disabilities in Mathematics Learning

Interview #1

Part 1: Introductory Protocol

You have been selected to speak with me today because you have been identified as someone who has a great deal to share about the experience of being a high school student, who is a diverse learner.

To remind you, this research project focuses on the experience, perspectives, and interpretations in mathematics of high school students, who have moderate learning disabilities. In this study, I hope to gain more insight into how students, such as you, perceive your engagement in mathematics learning. Hopefully this study will allow you and me to better understand and support your engagement in learning as a high school student, who learns differently, as you move through your academic career.

Because your responses are important and I want to make sure to capture everything you say, I would like to audio tape our conversation today. I will also be taking written notes during the interview process. Only I, and possibly a professional transcriptionist, will be privy to the audio files. If a transcriptionist is used, that person will have signed a confidentiality statement, and will also only be provided with the recording labeled by pseudonym, meaning the transcriptionist will never know your name, this maintaining confidentiality. I can assure you that all responses
will be confidential and only pseudonyms will be used when quoting from the transcripts. Only your pseudonym will be attached to the transcript and used throughout the research study.

I would like to begin recording this session now. Is that acceptable with you? OK, the audio recording has begun.

To meet our human subjects requirements at the university, participants have to read and verbally agree to the Consent Form that I sent you. I’d like to go over this form with you now. The Consent Form for this study, titled “Engagement of High School Students With Learning Disabilities in Mathematics Learning,” states that all participants must 10th or 11th graders in this regional high school. You are being asked to participate in two interviews focused around your math learning and engagement in mathematics throughout your academic career. There are no foreseeable risks or discomforts to you for taking part in this study, and there are also no direct benefits to you for participating in the study aside from perhaps increasing your voice and active discourse skills as well as deepening your understandings of your engagement in learning. Your part in this study will be handled in a confidential manner. Only the researcher will know that you participated in this study. Any reports or publications based on this research will use pseudonyms and will not identify you or any other participant as being part of this project. The decision to participate in this research project is up to you. You do not have to participate and you can refuse to answer any question. Even if you begin the study, you may withdraw at any time. If you have any questions about this study, contact information for me as well as the Principal Investigator is listed, and contact information is also listed for the Director of Human Subject Research Protection at Northeastern University should you have any other questions about your rights in this research (and you can call that person confidentially, if you wish).

Do you have any additional questions or concerns about the interview process or this form? Do you give your verbal consent? Great, thank you.

This is the first of two interviews. We have planned for this interview to last 45 minutes. We will then do the second interview 3-7 days from now, which will also last approximately 45 minutes.

Today, I have several questions that I would like to cover. Please take your time in answering and expound on your answers at any time throughout the interview. This interview process listens to your perspectives. It can be defined as a one-sided conversation. You have the floor!

Do you have any questions at this time?
Part 2: Interview Introduction

As I’ve mentioned, the intent of this study is to gain better understanding into what it means to be a high school student, who is a diverse learner. The approach to this qualitative study will be to first explore a student-participant’s background, experiences, and stories in math engagement throughout the student-participant’s academic career, and finally to ask the student-participant to reflect upon the meaning and interpretations of the experience in math knowledge building.

Today’s interview will cover these steps. I will ask you focused questions about your overall mathematics engagement and interpreted experiences, as well as questions directly related to your time in mathematics learning in high school.

Are you ready to begin?

Part 3: Questioning

Story of Engagement in Mathematics Learning

Objective: Responsive interviewing begins with easy questions, then asks the tough questions, and follows through with questions that tone down the emotionality to finish with collegial regard for the student–participant (Rubin & Rubin, 2012).

Academic and Personal Implications of Engagement in Mathematics Learning

I’d like to start by asking you some questions in regards to your mathematics learning background. There is no rush in answering these prompts or questions. You will be given time
to think upon your answers. If we do not cover all of the questions, we will pick up from where we left off for the second interview.

1. Knowing there is no right or wrong answer to any of these questions and prompts, please share with me all you can about your thoughts, experiences, opinions, and interpretations to the following prompts and questions:
   a. Relate a story about your most positive or negative engagement in math learning experience. This story can be from any time in your academic career.
   b. Do you find there are certain times and certain ways in which you are engaged in math?
   c. Are there certain things that teachers do that you find engaging?
   d. Are there strategies that you use to engage yourself in math learning? How are you cognitively engaged in math learning?
   e. What is learning like for you overall?
   f. If applicable, why do you do well in some math classes and not as well in others?
   g. When you are engaged in math do you have more self-confidence? In what way?
   h. Do you participate regularly in your math learning? Why, when, and how?
   i. Are there times when you are more motivated to learn? What does being motivated mean to you and how does it look on you?
   j. Do you remember math information better when you are more engaged? How?
   k. Can you connect your math knowledge when you are engaged? How does this look? Can you provide an example?
   l. Do you find you can communicate more clearly when you are engaged in learning? How does engaged communication look on you? Please provide an example.
   m. Once you find your voice, how does this make you feel? How does your active voice contribute to your engagement in learning?
   n. Do you think you have figured out or are figuring out the “game” to learn math? Please describe what it means to have figured out the game.

Academic History and Disability(ies) in Relation to Topic

I am now going to ask you questions focused on the topic of the study, engaging in mathematics as a student with a moderate learning disability(ies).

Description of Self

1. How would you personally describe yourself as a learner?
   a. To what degree are you aware of your learning difference?
      i. How does this impact your own sense of self as a learner?
ii. What strategies have you learned and do you use as a learner?
iii. How would you describe positive learning? How does positive learning feel?

School Experience

2. What is it like to be a high school student with a moderate learning disability(ies)?
   a. How do you describe yourself as a learner in relation to other learners?
   b. Can you recall a specific time when this has had an impact on your school experience especially as it relates to your engagement in mathematics?

Relationships/Membership in a Community of Learners

3. Can you tell me about your connection with others who learn differently?

4. Is there a time you can recall when your teachers, both regular education and special education, impacted your ability to connect and engage in mathematics? Kindly describe this time.

Part 4: Wrap-up

That concludes the questions for today’s interview. Before we wrap up, do you have any questions?

I want to confirm the time for the next/final interview: ___

Thank you so much for your participation, and I will email you with a gentle reminder of the final interview on __.
Interview # 2

Picking up where we left off and reflecting on the meaning of engagement in learning

Objective: To encourage participants to continue to reflect on the meaning and interpretations of mathematical learning engagement and experience along with the intellectual, social, and emotional implications of their perspectives.

Part 1: Introductory Protocol

Today’s interview will allow us to pick up where you left off and follow up on and further expound on questions and stories, interpretations, and experiences related from the first interview, as well as extend your interpretations through your reflections on the first interview. Similar to last time, I will be audio recording this interview. Are you ready to begin?

Part 2: Questioning

1) You talked about how you saw yourself as a math learner with a moderate learning disability(ies).
   a. Where do you see your sense of mathematics engagement heading in the future?
2) Given what told me about your math experiences in school, tell me what you understand about your engagement as a student, who learns differently.
3) Given what you said about your connection to students and teachers, what significance do you place on these relationships as they relate to your engagement in mathematics?
4) Considering your personal learning experiences in engagement, tell me what you now understand in regards to the impact of your understanding on your own unique engagement with mathematics learning and the cultural implications of having voice in your engagement in your other classes and whether this voice extends as well with your family and friends.
5) How would you define active student voice?
6) Considering your active discourse on math engagement and motivation in learning as demonstrated in some of your answers in this interviewing process, can you describe any new connections you may make between your student voice to your life outside of school and your life as a citizen in our democracy?

7) Considering your active voice on articulating your math engagement and motivation in learning, do you find you now have the voice to articulate your understanding of engagement in mathematics learning with others? Can you describe the cultural implications of sharing your insights and interpretations with others? How does this deepen your personal engagement in learning, especially in math learning?

8) How have you changed as a math learner and as a possible engaged learner in your other classes through the process and result of engaging in these interviews?

Part 3: Wrap-up

Thank you, that concludes the interview questions for this interview.

Would you prefer I contact you in person, via email, or telephone for the final 15-minute interview in order to ask any follow-up questions for clarification and further elucidation.

Sometime over the next month, I will give or email you word-for-word transcripts of your interviews and my initial interpretations. If you chose, you can review the information, and you will have one week from the date of transmission to provide me with any feedback, alterations, or corrections. Please confirm the email address to which you would like me to send the transcripts?

Once this thesis study is complete, which will most likely be 3-6 months from the last date of the end of the interview process, would you like to receive an electronic copy of the document?

Do you have any questions for me?

Thank you so much for your participation in this study!

Ms Stohl

Reference

Appendix B

An Example of a Section of One Socratic Inquiry Lesson
Appendix C

Unsigned Consent Form

Northeastern University

Consent Form

Northeastern University, Department of Education

Name of Investigator(s): Dr. Sara Ewell (Principal Investigator), Christina Stohl (Student Researcher)

Title of Project: Engagement of High School Students With Learning Disabilities in Mathematics Learning

Informed Consent to Participate in a Research Study

We are inviting your child to take part in a research study. This form will tell you about the study, but the Student Researcher (Christina Stohl) will explain it to you first either over the phone or through a secure email server. You may ask this Student Researcher any questions that you have. When you are ready to make a decision regarding your child participating in this study, you may tell the Student Researcher if you want to participate or not. Your child does not have to participate if you, or your child, do not want to. If you decide to participate, the researcher will ask you to sign this statement and will give you a copy to keep. As a final safeguard, your child will be asked to assent to taking part in the study during the Intake Interview.

Why is my child being asked to take part in this research study?

We are asking your child to be in this study because your child is a 10th or 11th grader at Masconomet Regional High School, who has a moderate learning disability.

Why is this research study being done?

The purpose of this research is to explore the perspectives and experiences in math engagement of high school students with moderate learning disabilities.

What will my child be asked to do?

If your child decides to take part in this study, we will ask that your child participate in two 45-minute interviews bookended by an intake interview and a concluding interview (conducted by Christina Stohl, the Student Researcher) to answer questions and prompts that seek to understand your child’s engagement and experiences in mathematics learning experiences in his or her own
words. This Student Researcher will be conducting the interviews in private one-to-one interviews with your child. An adult witness will be present throughout the interview. Your child will also be asked to reflect upon each interview for the next interview, as well as perhaps write down any thoughts he or she would like to share at the next interview. The parent or guardian will be informed that the researcher provides (a) one question at a time and provides wait time for processing and thinking for the student-participant through patient, silent support; (b) continued assurances of confidentiality; (c) small talk to put the student-participant at ease; and (d) prompts to make the student-participant comfortable and open with being conversational in the interview process that asks the student-participant to be free to tell detailed stories and relate in depth experiences.

**Where will this take place and how much of your child’s time will it take?**

The study will take place at Masconomet Regional High School and will take about 2 hours of your child’s time after school during after-school help from 2:15pm-3:00pm. The anticipation is that this study will take 15 minutes for the intake interview, 45-minutes each for the two main interviews, and an additional 15 to 30 minutes for a concluding interview. Before school time may also be carved out for the 15-minute interviews. After the study is concluded and the interview is transcribed, your child will be able to review the document to make any additional suggestions, corrections, or comments. This is called member checking.

**Will there be any risk or discomfort to my child?**

There are no foreseeable risks or discomforts to your child for taking part in this study. However, if your child feels uncomfortable at any time, he or she may refuse to answer any question or end the interview at any time without penalty. Even if your child begins the study, your child may withdraw at any time without penalty. If your child does not participate or if your child decides to quit, your child will not lose any rights, benefits, or services that your child would otherwise have as a student at Masconomet Regional High School.

**Will my child benefit in this research?**

There are no direct benefits to your child for participating in the study. However, your child’s participation along with the information learned may help us, including your child, to understand more about the authentic experiences associated with learning mathematics by students, who learn differently. Also, your child may learn more about how he or she learns. Your child’s participation may also increase your child’s self-efficacy and active voice.

**Who will see the information about my child?**

Your child’s part in this study will be handled in a confidential manner. Your child’s identity will be matched to their responses. However, no reports or publications will use this information that can identify your child in any way or any individual as being of this project. Only the researchers will know that you participated in this study. Any reports or publications based on
this research will only use pseudonyms, and will not identify you or any other participant as being part of this project.

**If my child or I do not want to take part in the study, what choices do I have?**

The decision to participate in this research project is up to you and your child. Your child does not have to participate. 

**Can my child stop his or her participation in this research study?**

Your child’s participation in this research study is completely voluntary. Your child does not have to participate if you, or your child, do not want to. Even if your child begins the study, your child can refuse to answer any question at any time without penalty. Even if your child begins the study, your child may withdraw at any time without penalty. If your child does not participate or if your child decides to quit, your child will not lose any rights, benefits, or services that your child would otherwise have as a student at Masconomet Regional High School.

**Who can I contact if I have questions or problems?**

If you have any questions about this study, please feel free to contact: Christina Stohl (Tel: 781.593.2976, Email: stohl.c@husky.neu.edu) the person mainly responsible for the research. You can also contact, the Principal Investigator: Dr. Sara Ewell (Northeastern University, Boston, MA, Email: s.ewell@neu.edu) the Principal Investigator.

**Who can I contact about my rights and my child’s rights as a participant?**

If you have any questions about your rights in this research, you may contact: Nan C. Regina, Director

Northeastern Univ., Human Subject Research Protection

360 Huntington Ave., Mailstop: 490 Renaissance Park

Boston, MA 02115-5000

Phone: 617.373.4588; Fax: 617.373.4595

n.regina@neu.edu

You may call anonymously if you wish.

**Will your child be paid for participation?**

Your child will not be paid for participation.

**Will it cost me, or my child, anything to participate?**

There will be no costs incurred by you, or your child, during this study.

**Is there anything else I need to know?**
Your child must be at least 18 years old to participate unless you, as the parent or guardian, gives written permission. You may keep this form for yourself.

I agree to have my child, _________________________________, take part in this research.

_________________________________________________________  Date

Signature of parent or guardian agreeing to allow the child to take part

_________________________________________________________  Date

Printed name of person above

_________________________________________________________  Date

Signature of person, who explained the study to the parent or guardian of the participant above the obtained consent

_________________________________________________________

Printed name of person above

Thank you.

Christina Stohl
November 30, 2015

Laurie Hodgdon, Ed.D  
Principal  
Masconomet Regional High School  
20 Endicott Road  
Boxford, MA 01921

RE: Permission to Conduct Research Study

Dear Dr. Hodgdon:

I am writing to request permission to conduct a research study at our high school. I am currently enrolled in the College of Professional Studies at Northeastern University in Boston, MA, and am in the process of writing my doctoral thesis. The study is entitled “Engagement of High School Students with Learning Disabilities in Mathematics Learning.” This study seeks to answer the question: How do high-school students with moderate learning disabilities describe their engagement and educational experiences in learning math?

I hope that the school administration will allow me to recruit eight or nine 10th and 11th grade boys and girls, with moderate disabilities, from the school to anonymously complete a fifteen minute intake interview, two forty-five minute interviews on math engagement, and a final fifteen to thirty minute interview. The student-participants will also read the final draft for me to check for any changes. Interested students, who volunteer to participate, will be given a consent form to be signed by the parent or guardian (copy enclosed) and returned to the primary researcher at the beginning of the survey process. When the agree to participate in the research study at the intake interview, they will also sign a consent form (copy enclosed).

If approval is granted, student participants will take part in the interviews primarily in the Student Researcher’s classroom and available private spaces at Masconomet Regional High School. The interview protocols for the thesis project will remain confidential and anonymous (copies of interview protocols enclosed). The student participant’s part in this study will be held confidential manner. The student participant’s identity will be matched to their responses. However, no reports or publications will use this information that can identify the student participants in any way as being of this study. Any reports or publications on this research will be use pseudonyms, and will not identify any student participants as being part of this project. Since the participants will be minors with moderate learning disabilities, another adult will be present during all interview sessions. None of the consent forms will be incurred by either the school or the individual student participants.

Your approval to conduct this study will be greatly appreciated. I would be happy to answer any questions or concerns that may arise. You may contact me at my email address: cstoil@masconomet.org

If you agree, kindly sign and return the signed form through email. Kindly submit this signed letter of permission on our in letterhead acknowledging your consent and permission for me to conduct this research study at Masconomet Regional High School.

Sincerely,

Christina Stohl  
Program Coordinator  
Masconomet Regional High School

Enclosures: Appendices A-D included below
Approved by:

Laurie Hodgdon, Ed.D Principal

Print your name and title here

Signature

Date

Nov. 30, 2015