6-1-2015

How Instructional Strategies Engaged Fourth Graders In Math Learning

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HOW INSTRUCTIONAL STRATEGIES ENGAGED FOURTH GRADERS

IN MATH LEARNING

By

Ryan Wallace Patrie

A DISSERTATION

Presented to the Faculty of

The Department of Education in the College of Arts and Sciences

at the University of New England

In Partial Fulfillment of Requirements

For the Degree of Doctor of Education

Biddeford, Maine

June, 2015

Abstract

The purpose of this qualitative study was to examine the experiences of fourth-grade learners in a math classroom, how fourth graders express their interest and desire to learn math, and how different instructional strategies influence that interest and desire. The participants for this study were all fourth graders enrolled at a rural school district in Maine that serves approximately 1,200 learners in grades pre-kindergarten through Grade 6. Fifteen fourth graders provided the data to determine student perceptions on how they engage in math instruction. The findings of this study indicate strong relationships between instructional strategies and the self-determination theory of motivation. Specifically, students prefer learning that is problem solving oriented, purposeful, future focused, voice in choice in how they learn and that students require relatedness, autonomy and competence when learning math.

University of New England

Doctor of Education
Educational Leadership

This dissertation was presented
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ACKNOWLEDGEMENTS

DEDICATION

I dedicate this manuscript to my wife, Heidi, who has been my faithful supporter and

partner in this journey and to my son, Conley Gabe Patrie, and my daughter, Finley Jean Patrie,

who inspire me to continually model lifelong learning and engage in deep thinking about action

for an ever-changing world. I also dedicate this work to my friends, family, and colleagues, who

helped shape the researcher and teacher I am today. Finally, I am forever grateful to the Lord, for

giving me the strength and perseverance to overcome all obstacles that come my way.

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CHAPTER 1

INTRODUCTION

In 2009, as a response to a school consolidation mandate, several rural Maine

communities combined to share educational services as a cost savings mechanism. A regionally

consolidated school district is one in which several rural towns joined educational services

collectively.

The purpose of this study was to document the experiences of fourth-grade learners in a

math classroom in a regional elementary school. The researcher was interested in understanding

how fourth graders make sense of their learning experiences in the math classroom and how

instructional strategies influence their experience and motivation to learn. The participants for

this study were all fourth graders enrolled at a rural school district in Maine that serves

approximately 1,200 learners in grades pre-kindergarten through Grade 6.

Changes in School Accountability

The No Child Left Behind (NCLB; 2002) law under the Elementary and Secondary

Education Act (ESEA) expects all schools to meet adequate yearly progress (AYP) targets to

reach 100 percent proficiency by 2014 in all content areas. In Maine, AYP was determined

based on the percentage of learners found to be proficient on the Maine Education Assessment

(MEA) until 2011, when it changed to the New England Common Assessment Program

(NECAP) until 2014, when it changed to the Smarter Balanced Assessment Consortium (SBAC;

2010).

This mandate directed all students to be proficient in math and literacy by 2012. Furthermore, the Maine Department of Education (DOE) created an adequate accountability measure by implementing an A-through-F accountability system where schools are categorized as priority, focus, monitor, progressing, or meeting (Maine Department of Education Data Warehouse, 2015). Appendix A provides more information on school accountability in Maine. Several other states, including Alabama, Arizona, Florida, Indiana, Louisiana, Mississippi, New Mexico, North Carolina, Ohio, Oklahoma, South Carolina, Utah, and Virginia, as well as New York City, all have school grading systems. Student achievement and growth in achievement are elements of most or all of these systems (Maine Department of Education Data Warehouse, 2015).

Letter grades are computed through a formula which combines the percentage of learners proficient on NECAP as well as growth measured by the bottom 25 percent while factoring in subgroups such as Special Education, English Language Learners (ELL), and Economically Disadvantaged (Eligible for Free and Reduced Lunch). During the time period 2010 to 2014, Regional School District has hovered between 60-63 percent proficient and proficient with distinction in Mathematics. As of the 2013-2014 school year, Regional School District has fallen below the State of Maine average (Maine Department of Education Data Warehouse, 2013). Five schools in the regional district, two stayed the same, three have lower performance over the last two years.

Introduction to Standards-Based Education

No Child Left Behind and the Maine Department of Education support standards-based education reform as the catalyst to school reform (No Child Left Behind, 2002). Interestingly,

standards-based education reform replaces the traditional letter-grade system with a scoring system of 1 through 4. A 4 means that the student demonstrates an advanced understanding of the skills and concepts and is able to use the mastered skills or concepts to extend learning without assistance. A 3 means that the student meets the standard and is able to use the mastered skills or concepts independently. A 2 means that the student is working toward the standard with continuing assistance from a teacher. A 1 means that the student needs more time to develop the particular skills or concepts. This new scoring system is the opposite of the letter-grade accountability system that Maine has adopted (Maine Department of Education, 2014).

In fact, this data signify that Maine has not drastically improved student outcomes for all. Will standards-based education reform serve as the catalyst for change? As a result of this waiver, the Maine legislature passed 20-A MRSA §253, sub-§9, which mandates that all Maine schools create a standards-based system of reporting layered with multiple assessment pathways by January 1, 2018 (Maine Revised Statutes, 2012). As a result of this mandate, a strategic education plan was developed to serve as a guide to implementing standards-based education reform (Regional School Unit).

A. Create Equitable Opportunities for Students to Succeed	B. Ensure All Students Experience High Quality Staff and Instruction	C. Build Community Collaboration and Communication	D. Maintain and Improve Operations and Facilities	E. Model Excellent Governance
⇩	⇩	⇩	⇩	⇩
Students	**Teaching Staff**	**Community**	**Operations**	**School Board**
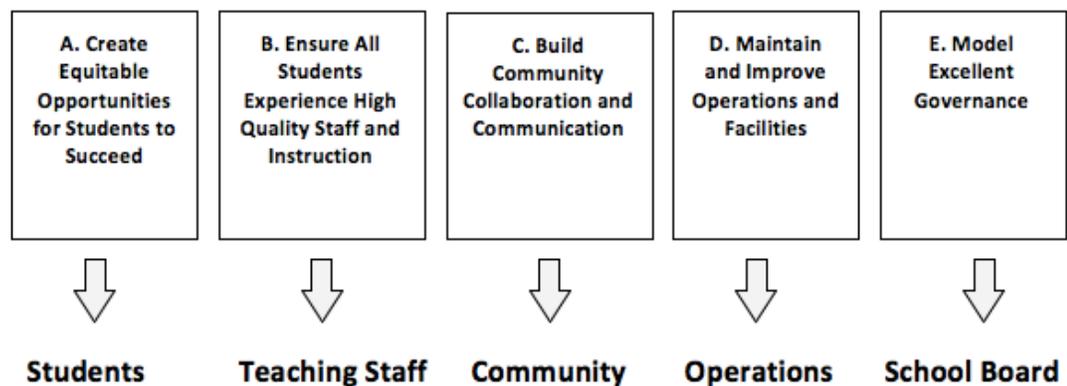
Figure 1. Major components of the Regional School District Strategic Education Plan.

The standards movement ultimately seeks to improve teaching and learning. Instruction today involves districts creating and administering criterion-referenced assessments where student growth is measured in standards mastery. Instruction today requires creating and administering assessment tools to diagnose and inform instruction. State or local school districts are given the task of aligning these national standards, and researchers continue to question how standards-based education is affecting teaching and learning. For this reason, researchers are very aware of the variations among districts, schools, and teachers.

Standards-based reform today. The direct effects of changes in school accountability and the mandate that all schools deliver a proficiency-based system of teaching and learning are not easy to document and their principles may or may not be embraced by school-based educators. For example, the current assessment framework adopted in Maine, SBAC, remains controversial. Students are expected to be able to demonstrate proficiency of standards that have not been fully implemented in schools. Educators are faced with the challenge of employing a standards-based system of teaching and learning with limited professional development and support. The semantics of the standards are difficult to understand; therefore, schools need to unpack the language of the standard to begin to understand specifically what students need to know, understand, and be able to do. The movement toward employing standards, however, continues to be understood and adopted differently, depending on the lens of the district. For example, some districts are promoting mass customized learning, while others are transitioning from a standards-referenced system to a standards-based system.

Changes in Teaching and Learning

The Industrial Age model of education is focused on scheduling, school calendar, seat time, and staff bargaining agreements (Schwahn & McGarvey, 2012). Progressing all students

through grade levels and learning the same information at the same time was found to be ineffective and will not create highly skilled thinkers who can compete in the information-age global economy. Education approaches must reflect contemporary society. One change includes the use of appropriate technology, allowing different strategies for children to learn at any time and in any way. Maine recently approved a virtual school network that invites all Maine students to experience their education system through technology. This paradigm shift requires schools to change how information is delivered and shared. Collins and Halverson (2009) described a "just in time" learning structure where the student learns the material "just in time," in order to accomplish a task (p. 14). This transformation requires school leaders to redefine what students and teachers look like during the learning process. Teachers can become facilitators of knowledge so that learners can begin to articulate what information they want to learn and how they want to demonstrate their learning. Students will be able to move through learning at their own rate and at their own pace, with the teacher guiding them through the new information. In an effort to support this transformation, educators must acknowledge technology and its increasingly important role in supporting more flexible, focused learning. This will require a shift in thinking and it will demand that schools invest in technology and create professional development opportunities for teachers to learn how to safely integrate technology as a tool to support learning. Appropriate use of technology will also allow learners to master material outside of the confines of the classroom and will require that teachers become more available to support students in those media.

Students may learn new information through webinars, podcasts, and videos. Teachers may serve as facilitators of learning through supporting the media devices available to their students and through providing coaching and guidance of the learning process. Lecturing will no

longer be a common method for presenting new information. The new future of learning affords the learner the opportunity to change the way they experience the learning process by shaping the "subject, pace and pattern" (Fielding, 2004b, p. 307). Finally, learners and their experiences need to drive the future of teaching and learning. Learners can contribute to the conversation about what they learn, how they learn, and how they apply their learning.

Changes in Leadership

Maine's educational leaders are grappling with implementing standards-based education in which learners progress through specific standards that describe what they need to know, understand, and be able to do. Thoughtfully managed standards-based education affords learners an opportunity to progress through standards at their own pace and in their own way. For example, learners may demonstrate their understanding of specific skills in different ways, such as through virtual presentations, voice threads, or community service. As a response to this mandate and understanding what is best for learners, Regional School District leaders desire to innovate instruction in effort to better prepare learners for an ever-changing world.   Regional School District's new vision, mission, and strategic education plan were enacted by bringing together multiple internal and external stakeholders and collecting feedback on what they need and want for education through a future search and world café process (Weisbord & Janoff, 2000). A future search is the process of bringing together 40 to 80 internal and external stakeholders with the goal of searching to make systemic improvements based on the individual experiences of the stakeholders (Weisbord & Janoff, 2000). A world café (Brown & Isaacs, 2005) is a structured conversation process in which smaller groups discuss and collect information regarding their specific experiences. These data have set the stage for a strategic

plan and the creation of a standards-based education system that is innovative and will prepare Regional School District learners for the ever-changing future.

The achievement data in Regional School District has remained stagnant over the past five years. The current reality is that Regional School District's student achievement in math has dropped below the state average. It is critical for educational practitioners to begin to understand what is causing the math achievement data in Regional School District to drop below the state average.

Research Questions

In this qualitative study, the researcher examined how students experience math instruction. Students reported their perceptions of learning math through a series of focus groups in which individual students discussed their student experiences after a math lesson. These research questions were explored:

- How do fourth graders describe and understand their experience of learning math?
- How do students express their interest and desire to learn math?
- How do different instructional strategies influence student interest and engagement?

Problem Statement

The National Assessment of Educational Progress (NAEP), which assesses fourth graders nationwide, concluded that 50 percent of Maine learners are still at basic or below and have been since 1992 (National Center for Education Statistics, 2013). The Programme for International Student Assessment (PISA) was first administered in 2000 and is repeated every three years; PISA assesses students in math, science, and reading. The purpose of these assessments is to compare students' educational attainment around the world. According to PISA, the United States ranks 27th in math, 17th in reading, and 20th in science out of 34 countries. Do these data

verify that the changes in accountability measures and assessments have dramatically improved student achievement (Organisation for Economic Co-Operation and Development, 2012)?

Maine students are now taught with new instructional strategies that are not yet proven nor documented. As Maine school reform policies continue to endorse, promote, and support standards-based education, it is crucial that educational leaders continue to study how specific instructional strategies linked to standards-based education impact student learning. Maine is leading this initiative, so teachers have minimal support and guidance as they translate Common Core State Standards (National Governors Association Center for Best Practices, 2010) into student-friendly language and report that learning to learners and their families based on specific criteria instead of traditional grades. Furthermore, there are no data that link student engagement and experience with the process of learning through instructional-based strategies, nor are there data that indicate whether the strategies effectively engage, motivate, and promote student learning.

Purpose Statement

The purpose of this study was to document the experiences of fourth-grade learners in a math classroom. The researcher was interested in understanding how fourth graders make sense of their learning experiences in the math classroom and how instructional strategies influence their experience and motivation to learn. Many Maine systems are moving to a standards-based delivery model in an effort to improve student outcomes, with the expectation that all students are believed to be capable of learning and of meeting high expectations. Both advanced and struggling students can learn new things in their own ways and at their own rates. Education in Maine has not drastically improved, according to the previously mentioned NAEP, NECAP, and

PISA achievement data. The purpose of this study was to collect data from the students as the driving force for improving the learning experiences for all.

Introduction to Conceptual Framework

The aforementioned accountability, assessment, and mandate changes related to standards-based instruction and how instructional strategies impact student achievement will be applied through the lens of student motivation and engagement, specifically Deci and Ryan's (1985) theory of self-determination. Their self-determination theory promotes creating conditions of autonomy, competence, and relatedness as a means to fostering motivation. This theory also notes the detrimental impact that failing to provide these conditions can have on motivation. This theory has been applied in social, psychological, and educational contexts. While a direct link between the use of standards and student motivation cannot be made, teachers' understanding of the role of instructional strategies in fostering student motivation is a key part of this study. A qualitative study allows the researcher to converse with the students who are experiencing these changes and to collect and analyze the emerging perspectives from students about their learning experiences. These findings can be used to improve stakeholders' understanding of elementary math learning.

Significance of the Study

Current research about motivation and engagement in 21st-century schools suggests that motivated and engaged learners have a higher level of satisfaction and present more effort and a better attitude toward learning it (Deci & Ryan, 1985). As educators transition to a student-centered, standards-based delivery model, they will benefit from research that further describes student learning and engagement. These findings will describe student perceptions of math learning through specific instructional and technological strategies, as well as perceived

engagement and interest in learning. The findings may portray the conditions that foster student motivation. Students who can identify and articulate what motivates them to enjoy learning and engage with classroom instructional strategies provide information for parents, teachers, and administrators.

Teachers can apply this knowledge as they plan instructional strategies to support students in meeting the learning goals. This knowledge can help teachers tailor their instruction to the individual interests and needs of their students, further encouraging engagement and fostering interest and motivation to learn. This knowledge can be used when providing specific feedback to learners and when reflecting on the effectiveness of their teaching techniques. Administrators can apply this knowledge when planning professional development to ensure continuous improvement and to ensure that the needs of the students are being met. This knowledge can also drive the financial and facility improvements made to the schools. In other words, if integrating technology in the math classroom is important to students, then administrators are called to adjust their budget in effort to provide more teacher professional development and technology in the classroom. Parents and guardians can apply this knowledge when supporting their child with their learning and communicate with the school regarding their child's individual needs and interests.

Operational Definitions

Definitions

The following terms will be referred to throughout the research study, using these operational definitions.

Autonomy: Autonomy is one condition needed for self-determination theory in which the choice a learner makes emanates from one's self (Ryan & Deci, 2000). When teachers afford

learners the opportunity to self-author their learning, it results in greater engagement and learning. Other recommended strategies include providing rationales, using non-controlling language, and providing self-paced learning.

Challenge (Rigor): Challenge is experienced when standards and learning objectives are not too easy or overtly difficult (Schunk, 2001; Skinner, 1995).

Choice: Choice is one strategy recommended to enhance self-determination theory in which learners are provided options. If used correctly, learners have shown an increase in engagement (Ryan & Deci, 2000).

Mindset (Self-Efficacy): A mindset is the beliefs that a learner holds about their ability to accomplish and learn (Dweck, 2006).

Objective: An objective is one instructional strategy that provides specific knowledge of what learners need to know, understand, or be able to do. An objective includes specific information about how learners are performing so that they can improve their performance (Dean, Hubbell, Pitler, & Stone, 2012).

Practice: Practice is one instructional strategy recommended that provides learners the ability to reach the expected level of proficiency for a skill or process (Dean et al., 2012).

Providing feedback: Providing feedback is one instructional strategy that involves providing learners with information relative to how well they are doing regarding a specific learning goal.

Purpose (Rationale): Purpose, or rationale, is one strategy recommended to enhance self-determination theory in which a verbal or written explanation of why the task is worth accomplishing is shared prior to performing a task. When used, learners showed greater task engagement (Assor, Kaplan, & Roth, 2002).

Revolutionary schools: Dr. Heather Driscoll (2014) developed a process of curriculum mapping in which school educators develop a clear scope and sequence that they can commit to ensuring student mastery on specific knowledge or milestones. The curriculum mapping process involves taking inventory of what standards the learners mastered the previous year, committing to specific standards the learners will master, and then working collaboratively to ensure that learners master specific standards (Driscoll, 2014).

Setting goals: This instructional strategy involves identifying and communicating a learning goal or objective regarding a topic being considered in class (Marzano Research Laboratory, 2015).

Standards-based education: Standards-based education is a philosophy of learning in which learners progress through specific standards of what they need to know, understand, and be able to do only by demonstrating proficiency of specific criteria. Standards-based education affords learners an opportunity to progress through standards at their own pace and in their own way (Marzano, 2009).

Western Maine Education Collaborative (WMEC): The WMEC (2014) is a non-profit partnership among eleven western Maine school districts to gather for professional development, with the task of developing a standards-based education system. This partnership is comprised of several Regional School Districts.

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Assumptions

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Since Maine mandated proficiency-based learning in 2011, Regional School District and other Maine school districts have begun to provide professional development for teachers about specific instructional strategies and the major components of standards-based education. Grade-

level teams currently work collaboratively to research and employ instructional strategies that strengthen the learning experiences for all.

The only document available and consistent among all Maine teachers, schools, and districts implementing standards-based education is the Common Core State Standards (National Governors Association Center for Best Practices, 2010), which contain grade-level expectations that learners must master by the end of the school year. Educators are tasked with partitioning these grade-level expectations to create a cohesive and developmental curriculum. The premise for standards-based education is that all professional teachers are empowered to make the decisions essential for effective learning, rather than having a teaching approach prescribed under traditional education models. For this reason, every standard and the criteria for proficiency are different.

Conclusion

Education in Maine has not drastically improved, according to the previously mentioned NAEP, NECAP, and PISA achievement data. Many Maine school systems are moving to a standards-based delivery model in an effort to improve student outcomes with the expectation that all students are believed to be capable of learning and of meeting high expectations.

The heart of standards-based instruction and instructional strategies is student motivation and engagement. When students are enjoying their experiences, it invites the teacher to take more risks and employ differing instructional strategies. When learners are enjoying school, they are more likely to share their learning with their family and friends, who will then begin to have a positive outlook on public education. This research study will bring student voices into the conversation about improving education.

CHAPTER 2

LITERATURE REVIEW

Maine educational reform is focused primarily on implementing a standards-based

delivery model of instruction to ensure student mastery. Educators are faced with the challenge

of grading and reporting student learning in terms of the standards, rather than showing how

students compare to their classmates. Standards-based instruction ensures that every graduating

senior, regardless of gender, ethnicity, socioeconomic status, or disability, can read, write, and

perform math. This chapter establishes the theoretical framework that provides context and

perspective for this study. The researcher selected literature on the topics of standards-based

education, instructional strategies, cognitive and social constructivism, and self-determination

theory, specifically related to the need for relatedness, autonomy, and competence. This chapter

also establishes the theoretical framework that provides context and perspective for this

qualitative study, which investigated fourth-grade students' perceptions of instructional math

strategies in one particular rural setting and how those perceptions impact their interest and

desire to learn.

A Brief History of Standards-Based Reform

Standards-based school reform started with a 1983 report published by the National

Commission on Excellence in Education entitled *A Nation at Risk: The Imperative for*

Educational Reform. This report contributed to the perspective that American schools were

struggling to improve and it triggered a plethora of local, state, and federal reform efforts, such

as The National Assessment of Educational Progress (NAEP), Goals 2000, and No Child Left

Behind (2002). These reform efforts ultimately led to defining national standards for academic

disciplines and assessing school accountability for learners meeting those standards using norm-referenced assessment measures, such as the Maine Education Assessment (MEA), New England Common Assessment Program (NECAP), and Smarter Balanced Assessment Consortium (SBAC, 2010). Currently, these national standards are titled the Common Core State Standards (National Governors Association Center for Best Practices, 2010). The federal government has become increasingly more involved in the education process through policy-making and subsequent funding formulas. In order to meet the requirements of the Common Core State Standards, the Maine State Department of Education (Maine Revised Statutes, 2005a) mandated Chapter 606-B §15671, which outlines the ratios for specific programs and positions, titled Essential Services and Programs. Any district that provides more staff and services than the ratio recommends must seek additional monies from their communities.

Instructional Strategies

Wright, Horn, and Sanders (1997) analyzed the achievement scores of more than 100,000 students across hundreds of schools and concluded:

> The most important factor affecting student learning is the teacher. In addition, the results show wide variation in effectiveness among teachers. The immediate and clear implication of this finding is that seemingly more can be done to improve education by improving the effectiveness of teachers than by any other single factor. Effective teachers appear to be effective with students of all achievement levels, regardless of the level of heterogeneity in their classrooms. If the teacher is ineffective, students under the teacher's tutelage will show inadequate progress academically regardless of how similar or different they are regarding their academic achievement. (p. 63)

Bennett (1986) and Creemers (1994) attempted to identify and articulate effective instructional strategies as a way to demystify teaching. Some recommendations for teachers to employ include a use of experiments, teacher estimation strategies, teacher expectations, effort reinforcement, classroom time management, direct instruction, memorization, questioning, homework, advance organizers, evaluation, feedback, corrective instruction, mastery learning, ability grouping, clarity of presentation, and classroom assessment. These researchers sparked an investment in analyzing the science of teaching.

Hattie (1992) took this research a step further to review the percentile gain that specific instructional strategies has on learning. Hattie recommended that educators employ mastery learning and tutoring (19 percent gain), homework (17 percent gain), and simulation and games (13 percent). Researchers and practitioners in the field of education continue to measure the impact that deliberate learning experiences have on students. Researchers at the Marzano Research Laboratory (2015) have researched the impact that specific instructional strategies have on student achievement gains. The researchers caution that every instructional strategy should not be used in every class nor do they always work. Marzano, Pickering, and Pollock (2001) stated that "teachers should rely on their knowledge of their students, their subject matter, and their situations to identify the most appropriate instructional strategies" (p. 9). However, these empirically based strategies provide an educator the opportunity to reflect on their effectiveness in their classroom.

Meta-Analyses of Instructional Strategies

Marzano et al. (2001) discovered the effectiveness of 15 major instructional strategies as a result of a longitudinal study conducted over 5 years and involving nearly 14,300 K-12 learners. Marzano et al.'s (2001) meta-analyses surfaced 15 major instructional strategies:

advance organizers, building vocabulary, effort and recognition, feedback, graphic organizers, homework, identifying similarities and differences, interactive games, nonlinguistic representations, note taking, practice, setting goals and objectives, student discussion and chunking, summarizing and tracking student progress, and the achievement gains associated with implementing these strategies. Marzano et al. (2001) emphasized that not every strategy will work the same way in front of every group of students. Across multiple contexts, tracking student progress through the use of scoring rubrics elicited the largest student achievement percentile gain with 34 percent, followed by setting goals and objectives at 25 percent, and interactive games, identifying similarities and differences, and building vocabulary at 20 percent. Their study showcased specific instructional strategies and their effectiveness in the classroom. Appendix D is a summary of all of the instructional strategies that surfaced from the meta-analyses.

Cognitive and Social Constructivism

How meaning is derived has been researched for decades. Plato documented Socrates introducing inquiry in the 5th century and Dewey modernized inquiry in America. Inquiry is simply the process of finding meaning by solving problems. Constructivism requires that educational practitioners and school leaders know where learners are at a given learning point or stage of development in order for them to derive meaning (Piaget, 1952). It is essential that school leaders understand these theories and how to incorporate them into the classroom and school.

Cognitive Constructivism

Piaget (1952), a well-known French-Swiss developmental psychologist, researched his own children deriving meaning and coined the theory of cognitive constructivism. According to

Piaget, children construct knowledge out of their actions with the environment. Knowledge

construction was separated into four periods of development: the sensorimotor stage (ages 0-2),

pre-operational stage (ages 2-7), concrete operational stage (ages 7-11), and formal operational

stage (ages 11 through adulthood). The sensorimotor stage consists of interacting with the world

through individual senses and physical activity. The pre-operational stage consists of developing

a language that allows knowledge to be classified and described. The concrete operational stage

allows for logical reasoning. Finally, the formal operational stage is when learners begin to use

higher levels of thinking, abstract ideas, and problem-solving skills (Piaget, 1952).

As knowledge deepens within a learner through exploration, observation, and

manipulation, thought structures or schemas are formed (Piaget, 1952). When a learner explores

a new or different idea that does not match their current schema, the learner experiences

disequilibrium. This disequilibrium causes a learner to accommodate or assimilate their current

schemas. Assimilation is the process of constructing a new schema, and accommodation is the

process of changing a pre-existing schema. Meaning is essentially derived through continually

exploring and constructing new knowledge.

Social Constructivism

Vygotsky (1962) was the founding father of social constructivism and believed that

meaning was derived through social interaction, dialogue, and language development. One

major tenet of this theory is the zone of proximal development, which is a child's instructional

level or the zone where optimal learning occurs. Vygotsky used scaffolding in this theory to

illustrate the degree of supports that learning requires to get to the next level of understanding.

Those supports include teachers, peers, or other adults. Scaffolding allows a child to internalize

or make meaning. This theory supports learners socially interacting with new knowledge through working together, which is known as cooperative learning.

Both views of constructivism require the teacher to serve as the facilitator while the learner is responsible for their learning, whether individually or collectively (Piaget, 1952; Vygotsky, 1962). Both forms of constructivism allow learners to acquire meaning by conversing, discussing, and inquiring. Learning occurs when students are challenged, open, and comfortable. Learning takes place when real-world problems are discussed and solved and learners are granted some voice and choice in how and what they learn.

Conceptual Framework: Self-Determination Theory

Every human being contains the innate need for competence, autonomy, and relatedness. Deci and Ryan's (1985) self-determination theory addresses the influence of the presence and absence of these needs on student motivation. Deci and Ryan discovered that certain conditions, such as offering rewards, providing negative feedback, and using controlling language negatively impacted motivation.

Self-Determination Theory

Turner (1995) defined motivation as cognitive engagement, which involves the self-regulation strategies of paying attention, connecting, planning, and monitoring. Gottfried, Fleming, and Gottfried (2001) defined academic motivation as "enjoyment of school learning characterized by a mastery orientation; curiosity; persistence; task-endogeny; and the learning of challenging, difficult and novel tasks" (p. 3). While a direct link between the use of standards and student motivation cannot be made, teachers' understanding of the role of instructional strategies in fostering student motivation is the key part of this study. Even among the

aforementioned changes in education and learning, such as changes in assessments and accountability measures, the motivation behind learning has not changed.

Self-determination theory is defined as the motivation behind the choices learners make without influence (Deci & Ryan, 1985). The SDT is not only a broad theory for framing motivational studies but is also a narrow theory that considers intrinsic and extrinsic sources of motivation and how they influence individual and collective cognitive and social development. The three essential conditions of this theory are humans' innate need for competence (experience mastery), relatedness (connecting mastery to life), and autonomy (connect and obtain mastery in their own way and timeframe). These essential elements are reinforced by the work of many researchers (Bandura, 1982; Cordova & Lepper, 1996; Deci, 1971, 1972; Deci, Connell, & Ryan, 1989; Deci, Koestner, & Ryan, 1999; Deci & Ryan, 1985; Fielding, 2001a, 2001b, 2004a, 2004b; Flowerday & Schraw, 2003; Flowerday, Schraw, & Stevens, 2004), who continue to support providing conditions that foster improving students' mindset and providing opportunities for autonomy, choice, challenge, and purpose in the classroom. These conditions may lead to creating student voice and choice.

The SDT has been applied in the domains of education, business, sport and physical activity, religion, health and medicine, parenting, virtual environments and media, and psychology (Davis, Bagozzi, & Warshaw, 1992; Guiffrida, Lynch, Wall, & Abel, 2013; Guo, Liao, Liao, & Zhang, 2014; Tassell & Flett, 2011; Vlachopoulos, Katartzi, & Kontou, 2013; Weinstein, Deci, & Ryan, 2011). Specifically, the less control, but the more structure the instructor has over the experiences in the learning environment drastically impacts the engagement of the learner. Skinner, Furrer, Marchand, and Kindermann's (2008) self-system

model of motivational development in Appendix C illustrates the influence the teacher has on a child's need for competence, autonomy, and relatedness.

This literature combines decades of historical research outlining the themes of autonomy, challenge, choice, mindset, and purpose that must be present in order for a learner to be motivated. Current research about motivation and engagement in 21st-century schools suggests that motivated and engaged learners have a greater sense of engagement, attitude, satisfaction, and effort. However, the same research does not indicate fourth-grade rural math students' perceptions of specific instructional strategies in a standards-based learning environment and how those instructional strategies influence their learning. Research and students' motivation support the need to collect feedback and data from learners regarding their learning process. This research has outlined several scales, assessments, and instruments that help measure motivation and engagement; however, this data has not determined specific instructional strategies. Several theorists have studied learner motivation through observing learner behaviors and administering instruments related to learner behaviors. Deci and Ryan's (1985) self-determination theory concluded that the three major conditions of autonomy, relatedness, and competence foster motivation. When one of these conditions is missing, it can be detrimental to one's motivation. Autonomy is the choice a learner makes that emanates from one's self (Ryan & Deci, 2000). When teachers afford learners the opportunity to self-author their learning, there is greater engagement and learning (Deci & Vansteenkiste, 2004; Guay, Ratelle, & Chanal, 2008; Marzano, 2003; Marzano, 2011; Reeve, Jang, Carrell, Jeon, & Barch, 2004; Vansteenkiste, Lens, & Deci, 2006). These researchers support teachers' providing rationales, using non-controlling language, and providing self-paced learning. Relatedness is a need to interact and work with others. Competence is experiencing and completing tasks that are difficult.

Five sub-theories of the self-determination theory of motivation. The self-determination theory of motivation can be categorized into five smaller theories. Cognitive evaluation theory (CET) focuses on intrinsic motivation and the impact that rewards and controls have on intrinsic motivation (Deci, Cascio, & Krusell, 1975). Organismic integration theory (OIT) focuses on extrinsic motivation and what causes people to resist, adopt, or invest in goals. Causality orientation theory (COT) focuses on the differences in people's motivation and how that is influenced by environment and regulation. The basic psychological needs theory (BPNT) focuses on specific environments and how they create conditions of autonomy, relatedness, and competence. Lastly, the goal contents theory (GCT) focuses on the differences in people's intrinsic or extrinsic goals and how that impacts one's overall quality of life (Reeve, 2012). The focus of this study will be on basic psychological needs theory.

Basic psychological needs theory. This sub-theory of SDT determines that the needs of autonomy, relatedness, and competence are essential for humans to function. Ryan and Deci (2000) considered the fulfillment of these three needs to be essential in human development and lead to a wide variety of positive outcomes. Ryan and Deci defined autonomy as the need to be self-regulated or independent of one's actions and to be the cause of all behaviors. Ryan and Deci defined relatedness as the need to feel connected and be mutually supportive of others. Ryan and Deci defined competence as the need to interact to the environment with desired outcomes. When educators are able to meet these three needs in their classrooms, students may feel a greater sense of worth that can positively impact self-esteem, motivation, and engagement.

Student Motivation and Engagement

Healy (2004) and Heckman (2005) supported the notion that children are born innately curious, inquisitive, and wanting to learn. Motivation is best summarized as the choices learners

choose to make each and every day. Every decision, action, curriculum, or instructional strategy

that a district, school, administrator, or teacher employs influences student motivation, which

ultimately impacts academic achievement. Through a study of 315 middle-school students,

Reeve (2006) observed that learners exhibiting multiple acts of "agentic engagement," or the

way in which they contribute to the instruction they receive, was a predictor for student

achievement. Some examples of agentic engagement include when learners articulate their

learning preferences, ask questions, seek relevance, seek clarification, or generate options.

Figure 2 adds a fourth level of engagement as the degree to which one contributes to the flow of

the instruction they receive. Students can contribute by asking questions, offering input,

expressing a preference, or communicating their needs. Greater contributions lead to positive

student outcomes.
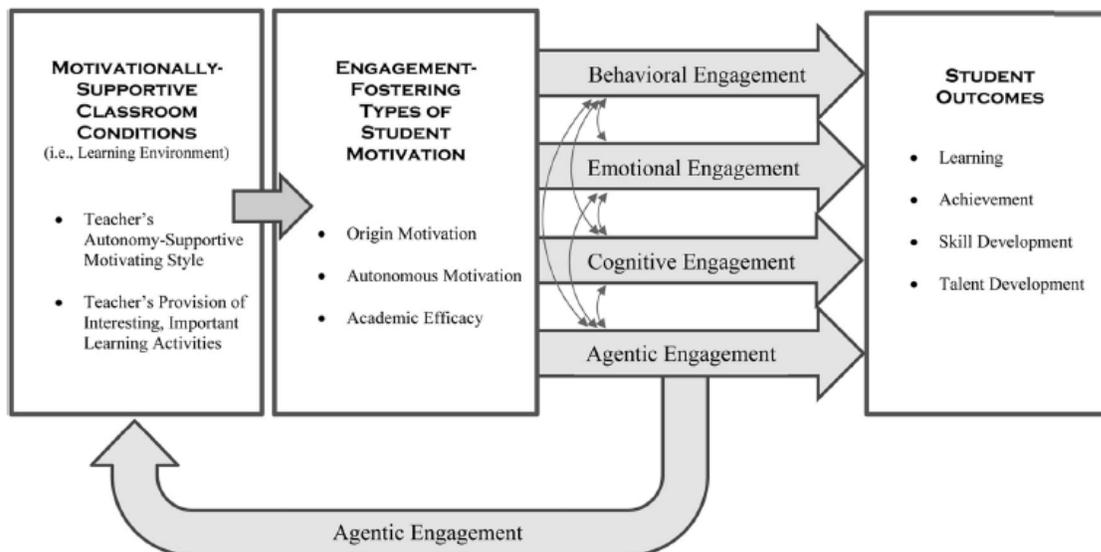
Figure 2. "Agentic engagement" as a catalyst for improving student outcomes. Adapted from "How Students Create Motivationally Supportive Learning Environments for Themselves: The Concept of Agentic Engagement," by J. Reeve, 2013, *Journal of Educational Psychology, 105*(3), p. 580.

Researchers were trained to track the number of acts through the use of the Hit-Steer observation system. This study added an additional domain to behavioral, emotional, and cognitive engagement. Skinner et al. (2008) conducted a four-year longitudinal study of 805 learners in Grades 4 through 7 who demonstrated a loss in engagement and greater disaffection when transitioning to middle school. Skinner and colleagues noted that behaviors of effort, persistence, intensity, concentration, involvement, enthusiasm, interest, satisfaction, and pride signaled motivation. The patterns from this study show that when children find learning activities fun and enjoyable, they will try harder and pay more attention. This study also indicated that learners who start school more motivated maintain their engagement, while learners who start out less motivated tend to become further disengaged over time.

In a 2001 study, Gottfried et al. found a decline in motivation in reading and math and a slight increase in motivation in social studies as learners progressed from ages 9 to 17. The results of the study by Gottfried et al. supported the conclusion that motivation is linked to curriculum and that the subject area of math can have the greatest impact on student motivation. These conclusions support districts expending time and energy to improving math outcomes for all.

Martin (2007) constructed a framework highlighting adaptive and maladaptive dimensions that include self-efficacy, mastery orientation, valuing of school, persistence, planning, and task management. After surveying 12,237 twelve-to-fourteen-year-olds using the Motivation and Engagement Scale (MES), the Motivation and Engagement Wheel (Martin, 2007) was created in an effort to further illustrate the findings. This information can be used to design interventions aimed at developing specific motivations, and this model serves as a simple way for students to understand their motivation and for teachers to explain their motivation to

them. The data from the Martin (2007) study broadly confirmed that middle school students seem to reflect a less adaptive pattern of motivation and engagement. Martin also found that boys rated significantly higher in measures of self-handicapping and disengagement and girls scored significantly higher in anxiety. These results invite educators to consider strategies to make learning more engaging for boys and less stressful for girls.

Martin (2007) evaluated motivation and achievement to determine teachers' perceptions of student motivation and engagement. The motivation and engagement wheel (See the motivation and engagement wheel in Appendix B) is used to portray the different adaptive and maladaptive conditions and behaviors observed from a sample of 1,019 teachers. Martin found that primary school teachers reported significantly higher student motivation and engagement than high school teachers. The findings from this study suggested the specific dimensions of mastery orientation, planning, study management, and persistence were most associated with teachers' enjoyment and confidence. Elliot and McGregor's Achievement Goal Questionnaire (AGQ) determines if learners valued learning for mastery or valued learning as compared to their peers (Elliot & McGregor, 2001). A mastery approach focuses on students learning specific standards. A performance approach focuses on students learning as a result of being compared to their peers. In this study, Elliot and McGregor discovered that students with a high mastery approach and a low mastery avoidance approach had high math performance, high enjoyment, and low anxiety and boredom. These conclusions suggest that educators should create an environment that promotes mastering specific standards. Educators should make note that an Elliot and McGregor AGQ study (as cited in Jang & Liu, 2012) found that about one of every five participants (22 percent) made up the most maladaptive cluster, holding low levels of

achievement goals. In other words, this group of learners had low motivation. They were not interested in learning or doing better than others (Elliot & McGregor, 2001).

Furthermore, Jang, Reeve, and Deci (2010) noted that when educators devoted time to learning the interests of their students and embedding those interests into goal setting, relevant and challenging instruction improved intrinsic motivation. This conclusion emphasizes the connection between teachers' instructional styles and the impact that teachers' instructional styles have on student motivation and engagement.

As previously stated, all humans have an innate need to feel connected to the world and the people around them. Lodge (2005) determined that

> it is through engagement with others, through dialogue and other social processes that people come to develop a shared meaning of learning. In all these mutually supporting processes we notice that it is the relationships between the people, the ways in which they communicate, share the construction of knowledge and develop new understandings that create the sustainable learning. (p. 132)

Niemiec and Ryan (2009) agreed that learners have a tendency to want to acquire new knowledge and attain that knowledge through social interactions.

The Need for Relatedness

Students enter Maine schools with different mindsets, based on their opportunities to build self-confidence and self-esteem. Covington (1992) determined that there are three major mindsets. The success-oriented learner responds to learning experiences with optimism and energy. The failure-avoidant learner is driven by fear of failure, and failure-accepting learners have developed learned helplessness and have given up trying. Heider (1958) defined attribution theory as the degree to which learners perceive their ability and whether that perceived ability

can be improved upon. Dweck (2006) determined that motivation is influenced by mindset. A

fixed mindset is the belief that one is born naturally talented and that talent cannot be cultivated.

A growth mindset is the belief that talent is cultivated through perseverance. Dweck concluded

that 40 percent of learners operate with a fixed mindset, 40 percent of learners operate with a

growth mindset, and 20 percent of learners cannot be classified. The way a learner feels about

oneself and their capability around successful task completion greatly impacts motivation. The

way a teacher makes a learner feel before, during, and after the learning process also greatly

influences motivation. Bandura (1982) defined self-efficacy as "judgments of how well one can

execute courses of action required to deal with prospective situations" (p. 122). This concept is

important because the way students feel about themselves and their abilities is directly related to

their performance. Haimowitz, Wormington, and Corpus (2011) linked a decrease in intrinsic

motivation to learners who completed work for validation. Haimowitz and co-authors

recommended that educators foster an environment where children believe that intelligence is

flexible and use schoolwork to seek personal validation as a means to increase their intrinsic

motivation.

The language an educator uses also greatly impacts motivation. Dweck (2006) illustrated

the power of language on a child's mindset, with half the participants receiving the praise

"You're smart" and the other half "You worked really hard." The children who were told they

were smart were not interested in participating in a more challenging puzzle, but the children

who were told they were hard workers were interested in participating in a more challenging

puzzle. In line with this study, educators can devise language that will build in the notion that

intelligence can be strengthened through hard work and effort.

Blackwell, Trzesniewski, and Dweck (2007) surveyed students' transition into seventh grade in order to assess mindsets and its relation to academic achievement. The results demonstrated that over time, learners with a growth mindset outperformed their peers with a fixed mindset.

The Need for Autonomy

Deci and Ryan (2008) determined that autonomy is one of our most basic human needs and that autonomy provides learners the ability to act with freedom and flexibility over time and has a profound impact on student motivation and performance and leads to a greater sense of empowerment. One way to improve motivation is to take into account the learners' perspectives when making decisions in the classroom (Deci & Ryan, 2008). Gillit, Vallerand, and Lafreniere (2012) concluded that intrinsic motivation and autonomy support decreased from age 9 to 12 years old and then stabilized, while Reeve, Bolt, and Cai (1999) and Deci, Schwarz, Sheinman, and Ryan (1981) noted that teachers who allowed autonomy were more motivating to learners, as compared to teachers who were more control oriented. This relationship was established within the first two months of school and remained constant over the remainder of the school year.

Providing learners with more choices around the work they complete and the amount of time they have to complete that work greatly increases intrinsic motivation. Deci, Spiegel, Ryan, Koestner, and Kauffman (1982) emphasized choice of activity as an opportunity to improve student motivation. Guthrie and Davis (2003) determined that choice affects motivation and leads to engagement. They recommended that educators provide opportunities for students to choose specific texts for learning about a required topic, input into instructional decisions or tasks, and construction of rubrics for evaluation of work. Freeley and Hanzelka (2009) documented the data collected from the New Hampshire Department of Education through

extended learning opportunities, in which learners choose a subject or topic they want to learn about and connect that topic to the community. Freeley and Hanzelka determined that dropout rates decreased as a result of extended learning opportunities. These studies illustrate the benefits of offering learners choices in the classroom.

Richardson (2012) defined personal learning as the ability for students to choose their own paths through the curriculum, based on their own individual interests and passions. Richardson believed that when schools provide personal learning, learners will be able to form and answer their own questions, develop patience with uncertainty, learn from failure, and go in depth with concepts that they want to learn about, resulting in students who are more engaged and motivated in their learning. These schools blend the realization that anything can be learned anywhere from anyone (technology) and student interest. Some programs these schools use include Rosetta Stone, Google Docs, and Google Reader, an RSS feed aggregator. This philosophical shift redefines the role of a teacher as more of a facilitator and less of an instructor.

The Need for Competence

Every learning experience a learner has in the classroom should have a purpose or purposes. Marzano (2009) concluded that beginning every lesson articulating student-friendly learning goals accompanied by scales to measure those goals and having learners track their progress greatly improves student motivation. Pink (2009) stated, "It's in our nature to seek purpose. That nature is now being revealed and expressed on a scale that is demographically unprecedented and until recently, scarcely imaginable. The consequences could rejuvenate our businesses and remake our world" (p. 131).

Deci, Eghrari, Patrick, and Leone (1994) noted that even when a learner experiences an uninteresting activity, if they are provided a meaningful rationale, their feelings are validated,

and they have some choice, learners tend to be more motivated. Brophy (2008) suggested that one way to "scaffold student's appreciation for learning" (p. 138) is to help students find value in learning through crafting relevant learning experiences. Jang (2008) discovered that when learners receive instruction around the lesson's hidden value (e.g., why the lesson is worth their effort or how the lesson can be useful to them or there is help in seeing the personal meaning with a lesson), the learners increase their motivation. Jang also noted that having learners participate in rigorous and challenging experiences in the classroom for the sole purpose of learning and improving increased learners' motivation.

Deci and Flaste (1995) shared an experiment created in 1969 in which one group of students solved Soma puzzles for money and the other group solved the Soma puzzles for fun. A Soma puzzle is a group of oddly shaped wooden blocks that form a cube when put together. Those students who solved the Soma puzzles for fun chose to spend more time with them, which improved their competence and performance, while those students who solved the puzzles for money only spent the time allotted to get the money. In another study, Deci et al. (1982) created a sample in which one group of teachers were told, "Your role is to facilitate the students learning how to work with the puzzles" and the other group of teachers were told, "Your role is to ensure the student learns to solve the puzzles." In this study, the first instructor spoke less, was less critical of their learners' progress, gave fewer commands, and allowed more choice and autonomy. Pink (2009) documented an experiment, conducted by Sam Glucksberg in the 1960s, in which two groups were formed and given the same problem to solve. One group was offered incentives to solve the problem and one group was not. The group that was offered incentives took longer to solve the problem. Faircloth and Miller (2011) determined that when learners participate in *high-challenge tasks*, such as extended writing, collaboration, and investing in

assignments over multiple days, learners' motivation switched from extrinsic rewards to intrinsic motivation with an emphasis on learning. Faircloth and Miller noted that standardized assessments from every third-grade classroom improved in language and reading. Skinner et al. (2008) noted that individuals are born with the need to feel a sense of mastery.

Activating the Student Voice From Within

Creating classroom conditions of autonomy, choice, challenge, mindset, and purpose activates the student voice from within and creates a student-centered learning environment. Research has shown that historically, many believed that learners did not have the capacity to voice their learning needs. Kozol (1991) noted that "the voices of children . . . have been missing from the whole discussion of educational reform" (p. 5). Fielding (2004a) noted that there is a

> fundamental point that we need to create public spaces that are jointly and freely egalitarian and within which any member of the school, whatever their age, status, gender, or cultural identity feels able to raise matters of significance to themselves and the community to which they belong. (p. 208)

Cook-Sather (2006) defined student voice as the ability to "connect the sound of students speaking not only with those students experiencing meaningful acknowledged presence, but also with their having the power to influence analyses of, decisions about, and practices in schools" (p. 363). In summary, student voice shifts the power, alters participation dynamics, and leads to student action. Fielding (2004b) suggested a student-as-researcher model which "involves staff and students learning with and from each other and in doing so the traditional roles of teacher and student become less firmly fixed, much more malleable, much more explicitly and joyfully interdependent" (p. 308).

One recommendation to advance student voice are steps depicted on Hart's Ladder of Young People's Participation (1992) (see Appendix C). As learners participate more in the learning process, they become more engaged and involved in the learning process and outcomes. Hart's ladder illustrates a developmental continuum of how young people become more involved in their learning. The bottom steps to the ladder explain that young people are supported through a system of rewards and tokens and that as they grow older, those systems change. Fletcher (2008) adapted this ladder and developed a spiral that promotes organizations and schools to reach a point on a spiral in which all community members equally make decisions and take action. As one travels out of the spiral, it indicates more adult imposed decision making. Another recommendation to advance student voice is to encourage educational practitioners to utilize Fielding's (2001b) model used to evaluate the conditions for student voice. The recommended questions, as shown in Appendix F, allow a school leader and educator to reflect on their capacity to embed student voice into teaching and learning.

Fielding (2001a) created a foundational tool to ensure that student voice is fostered. This tool recommends that educators analyze how students speak and listen, how teachers support knowledge acquisition, and those systems create a classroom community and organizational culture. It is imperative that educational practitioners begin to question and reflect the opportunities for student voice through this model.

Fielding (2004a) noted:

The pressure they [students] and their teachers are under to raise standards and improve performance marginalizes the very educational aspirations that give schooling its justification and its purpose. Student complaints that schools do not care about them as

persons, but only as bearers of results and measureable outcomes are now ubiquitous. (p. 210)

Conclusion

In this chapter, the theoretical framework that provides context and perspective for this study has been established. The researcher selected literature on the topics of standards-based education, instructional strategies, and self-determination theory, specifically related to the need for relatedness, autonomy, and competence.

CHAPTER 3

METHODOLOGY

Purpose of the Research Study

The purpose of this qualitative study was to examine the experiences of fourth-grade learners in a math classroom, how fourth graders express their interest and desire to learn math, and how different instructional strategies influence that interest and desire. Although there is existing published research in the professional literature regarding the impact that specific instructional strategies have on student achievement, there is little research on collecting specific feedback from students regarding these experiences and how they impact learning.

Choice of Methodology

Qualitative Research Design

Merriam (2009) defined research as "a systematic process by which we know more about something than we did before engaging in the process" (p. 4) and qualitative research as "understanding the meaning people have constructed, that is, how people make sense of their world and the experiences they have in the world" (p. 13). Sociologists and anthropologists use this qualitative form of research to ask questions about people's lives and the ways in which they understand their worlds and experiences.

Interpretive research constructs reality based on multiple interpretations of a single experience. Creswell (2007) defined constructivism as:

Individuals seek understanding of the world in which they live and work. They develop subjective meanings of their experiences. . . . These meanings are varied and multiple, leading the researcher to look for the complexity of views. . . . Often these subjective meanings are negotiated socially and historically. In other words, they are not simply

imprinted on individuals but are formed through interaction with others and through
historical and cultural norms that operate in individuals' lives. (pp. 20-21)

Focus Group Design

The researcher was interested in understanding how fourth graders make sense of their
learning experiences in the math classroom. The researcher reviewed selected research to seek
relationships among student motivation, instructional strategies, and standards-based education.
For this study, the researcher interviewed learners in three focus groups to gather their
descriptions of learning math concepts in two classrooms where teachers structure math learning
using instructional strategies within a standards-based curriculum. This process allowed the
researcher to *listen to* and *speak for* students, as opposed to *speaking about* students (Fielding,
2001a). This research is based on decades of motivation theory, consideration of instructional
strategies and approaches, and emergent recommendations about standards-based education.

The purpose of this qualitative study was to determine how specific instructional
strategies influence learning in a fourth-grade math classroom. Data was collected from
participants by conducting three focus groups after math lessons. Krueger (2008) and Stewart,
Shamdasani, and Rook (2006) defined a focus group as an interview on a topic with a group of
people who have knowledge of a topic. As Patton (2002) explained:

Unlike a series of one-on-one interviews, in a focus group participants get to hear each
other's responses and to make additional comments beyond their own original responses
as they hear what other people have to say. However, participants need not agree with
each other or reach any kind of consensus. Nor is it necessary for people to disagree.
The object is to get high-quality data in a social context where people can consider their
own views in the context of the views of others. (p. 386)

Research Questions

In this study, the researcher examined student perceptions about how specific instructional strategies impact math learning. The following research questions were explored.

- How do fourth graders describe and understand their experience of learning math?

- How do students express their interest and desire to learn math?

- How do different instructional strategies influence student interest and engagement?

Research Setting

The Regional School District (pre-kindergarten through Grade 12) is comprised of 1,750 learners and 322 staff between three elementary schools, one middle school, and one high school. The Regional Elementary School is a rural school with approximately 277 learners in grades pre-kindergarten to Grade 6 (Patrie, 2014). The Regional Elementary School provides programs and services for learners performing at each echelon level, from gifted and talented services to special education services. The school also is a Title I school based on the percentage of economically disadvantaged students who qualify for free and reduced lunch (Maine Department of Education Data Warehouse, 2013). More information on the demographics of Regional School District is provided in Appendix G. Regional School District, as well as every school in Maine, is tasked with implementing a standards-based system of teaching and learning by 2018.

Participants/Sample

The fourth-grade class at the school has 40 learners and two teachers (Patrie, 2014). The two teachers have daily common planning time and professional development time to map the curriculum, establish expectations, and create a plan for tracking and teaching to proficiency.

The teachers at the fourth-grade level participate in the assessment and accountability system and are expected to deliver a proficiency-based system of teaching and learning (Patrie, 2014).

Merriam (2009) recommended a small group of six to ten participants. This size of sample provided ample opportunities for learners to build upon the ideas and experiences discussed. This size of focus group also provided a safe environment and removed any expectation that the study is built upon that one particular child sharing all of his or her thoughts and experiences. The researcher used the aforementioned criteria to select three focus groups of five participants each to discuss the students' perceptions of learning instructional strategies in a standards-based learning environment. The goal of these interviews was to uncover and interpret these meanings.

The focus groups were comprised of 15 participants obtained through purposeful sampling. Merriam (2009) recommended purposeful sampling as a strategy to be used to include people who know the most about the topic. Merriam stated, "purposeful sampling is based on the assumption that the investigator wants to discover, understand, gain insight and therefore must select a sample from which the most can be learned" (p. 77). According to Creswell (2007), purposeful sampling, or criterion sampling works well when all participants studied had a shared experience. Patton (1990, 2002) has provided a thorough discussion of purposeful sampling:

> The logic and power of purposeful sampling lie in selecting information-rich cases for study in depth. Information-rich cases are those from which one can learn a great deal about issues of central importance to the purpose of the inquiry, thus the term purposeful sampling. Studying information-rich cases yields insights and in-depth understanding, rather than empirical generalizations (Patton, 2002, p. 230).

Beyond purposeful sampling is the method of criterion sampling, which involves selecting "all cases that meet some predetermined criterion of importance" (Patton, 2002, p. 238). For the purposes of this study, the criterion included: the participant was a fourth grader, was present the day of the lesson, had received parental permission to participate in the study, and was interested in sharing their experience after math class. One key means of collecting participants was by asking teachers for referrals. Every fourth grader was invited to participate in the study through mailing a formal consent form. Of those 40, fifteen families consented to their child participating in the study. Once the fifteen consent forms were collected, the groups were purposefully created through the help of the teachers with an expectation of having a more gender and interpersonal skill balance. See Appendix H for the Consent Information Sheet. Any student who did not have parental consent could not participate in the study. This collected feedback can be used to strengthen instructional practices in a standards-based learning environment.

<div align="center">**Data Collection and Analysis**</div>

Data Collection

The researcher interviewed students in the focus groups regarding their perceptions of their math learning relative to specific instructional strategies in a standards-based learning environment during three periods of time: December, February, and April. Appendix I contains a sample of possible questions to help gather data while strengthening the communication process. All of the selected questions were chosen because they are open ended and require more than a single response. These questions also helped the researcher begin to understand what the student does during a math lesson and what the teacher does during a math lesson.

After the students began to respond, the conversation flowed depending on what the students

wanted to talk about.

Data Analysis

The analysis of the data involved identifying recurring patterns that characterize the

experience. The goal was to assess and reflect on how specific instructional strategies in a

standards-based education strengthen student learning.

The data analysis process centered on the careful listening, reading, and uncovering of

themes which emerged during the interview processes, leading to "the development of

descriptions to arrive at the essence of the experiences" (Creswell, 2007, p. 236). The data

analysis steps included transcription and journaling, followed by reading and coding, which Hein

and Austin (2001) described as "immersion in the data, which normally requires the researcher to

read the transcript several times to develop an overall sense of the participant's experience" (p.

6).

The researcher audio and video recorded the focus group interviews and analyzed them

for common themes after each cycle. The audio recordings of the focus groups were

professionally transcribed. The confidentiality of participants was ensured by removing all

identifiers prior to data analysis, removing participants' names from any artifact, transcript, or

publication resulting from this study. The use of identifiers was necessary; however, specific

statements and comments were collected and placed in this study. Also, the participants were

notified of this researcher's intended use of collected information and only the researcher had

access to all data collected. Finally, data were maintained on the researcher's personal computer

and only audio and video recordings of the focus groups took place. Upon the researcher's

completion of the doctoral program and after the doctoral degree is awarded, all video and audio files will be deleted.

Delimitations of the Research Study

This study focused on a purposeful sample of fourth graders in one particular rural Maine school, in one district and in one state. This study cannot be replicated because it is based on student experiences of math instruction in two classrooms. Three cycles of focus groups comprised of five students each will not be generalized, although recurring themes or patterns aggregated from the data may be useful for similar schools and programs.

The participants in this study were generally familiar and comfortable with the researcher, as they had observed the researcher multiple times throughout the course of the study and of the school year. The researcher currently serves as the building administrator; therefore, there are occasions where the building administrator is present in the classroom during instruction, in the lunchroom, on the playground, and at various events throughout the school. The size of the purposeful sample was large enough to reduce pressure to answer questions in a certain way. The opportunity for any student or parent to have their child opt out also reduced pressure that might be caused by expectations to participate in the study.

Throughout the year, the researcher spent time in classrooms, pre-kindergarten through Grade 6, conversing with learners regarding their experiences of learning multiple content areas in multiple ways. These experiences created presuppositions by the researcher that there is value in offering open-ended questions to students to delve deeper into the experiences and understanding of young learners. Typically, learners shared what they were working on, why it mattered, and whether it was helping them to understand a concept or strategy better.

Conclusion

Although schools are not required to adopt standards-based education until 2018, the goal is that student achievement will improve. The researcher believes that it will take a longitudinal study to determine if achievement of instructional strategies in a standards-based learning environment increases, which is beyond the scope of this study.

CHAPTER 4

RESULTS

The purpose of this qualitative study was to document how fourth graders make sense of their learning experiences in the math classroom and how instructional strategies influence their experience and motivation to learn. This study addressed three research questions: How do fourth graders describe and understand their experience of learning math? How do students express their interest and desire to learn math? How do different instructional strategies influence student interest and engagement?

This chapter summarizes the responses to the researcher's questions; the results are then discussed, with recommendations and implications following in Chapter 5. The results were derived from administering three 45-minute focus group interviews with five fourth-grade students in each group over a 3-month period. Overall, three major themes with connected elements emerged out of the data analysis process. The three major analysis techniques employed included structural coding, descriptive coding, and in vivo coding.

Summary of Participants

The criteria for inclusion in the study included the following: the participant was a fourth grader, present the day of the lesson, had received parental permission to participate in the study, and was interested in sharing their experience after math class. Any student who did not have parental consent could not participate in the study. The 15 participants were comprised of 10 boys and five girls. The participants in the study included three students with individualized education plans (IEPs) and two students eligible for free or reduced lunch. A summary of the participants in all three focus groups is illustrated in Table 1.

Table 1

Summary of Participants

Group #	Participants	Gender
1	Student A	F
1	Student B	M
1	Student C	M
1	Student D	M
1	Student E	F
2	Student F	F
2	Student G	M
2	Student H	M
2	Student I	M
2	Student J	F
3	Student K	M
3	Student L	F
3	Student M	M
3	Student N	M
3	Student O	M

The primary data source for this study was transcriptions of focus groups. Prior to the audio- and video-recorded focused interviews, the researcher actively observed the math classroom instruction. Actively observing the lesson strengthened the focus group interviews and the researcher's ability to ask clarifying questions. After the audio- and video-recorded

focused interviews, the researcher listened and highlighted concepts that were shared or discussed among multiple participants. After multiple readings of interview transcripts, statements were manually coded and ideas were grouped and categorized based on major and minor themes, first through in vivo coding, in which statements were extracted verbatim from transcripts where learners related their experiences learning in a fourth-grade math classroom. These quotations were carefully selected based on the research-related questions about how fourth graders describe and understand their experience of learning math, how students express their interest and desire to learn math, and how different instructional strategies influence student interest and engagement.

Those statements were then categorized into sub-themes or connected elements, based on frequency and similarities. Those connected elements were then grouped into three major themes, which aligned specifically to the Deci and Ryan (1985) theory of self-determination, which promotes creating conditions of autonomy, competence, and relatedness as a means of fostering motivation. Although the frequency and similarities of certain codes were greater than others, they are discussed and mentioned in no particular order.

Tables 3 and 4 show each main theme with its corresponding connected elements and a brief summary or description of the connected element. The statements provided by the participants added descriptive material about their individual experience as a fourth-grade learner in a math classroom. This produced rich data for analysis.

Emergent Themes From the Data Analysis

Three themes and nine connected elements emerged from this analysis. Table 3 shows each main theme with its corresponding connected elements and the specific statements derived from the participants. Although the frequency and distribution of certain codes were greater than others, they were presented in the order of the need for relatedness, autonomy, and competence. In simpler terms, Table 3 summarizes a thematic analysis of what the student does during a math lesson. Table 3 outlines nine specific connected elements aligned to the three specific needs of the theory of self-determination.

During the focus groups, the participants spoke about different instructional strategies and from those statements surfaced six specific instructional strategies. These six instructional strategies were then aligned with the connected elements and main themes. Table 3 outlines six specific instructional strategies aligned to the three specific needs of the theory of self-determination. Table 3 summarizes a thematic analysis of what teaching technique the teacher chooses to use during a math lesson.

Table 2

Summary of Main Themes and Connected Elements of What the Student Does During a Math Lesson

Main Theme (Structural Coding)	Connected Elements (Descriptive Coding)	Summary of What the Student Does During a Math Lesson
1. Relatedness	a) Cooperative Learning b) Real-World Application c) Degree of Supports	a) An opportunity for students to learn together with someone else or a small group. b) An opportunity for students to relate what they are learning to their everyday and future lives. c) The decision to access the teacher or a friend for assistance.
2. Autonomy	a) Independence b) Repairing Understanding c) Degree of Attention	a) An opportunity for students to work on their own. b) An opportunity for students to access support when they are working on their own. c) The degree of attention a student requires to work alone.
3. Competence	a) Effort b) Zone of Proximal Development c) Perseverance	a) An opportunity for students to do work. b) The difference between what students can accomplish alone or with help. c) An opportunity to solve challenging problems without giving up.

Table 3

Summary of Main Themes and Connected Elements of What Techniques the Teacher Chooses to Use During a Math Lesson

Main Theme (Structural Coding)	Connected Elements (Descriptive Coding)	[Instructional Strategies]	Summary of What Techniques the Teacher Chooses to Use During a Math Lesson
1. Relatedness	c) Degree of Supports	Modeling & Demonstrating	a) When the teacher goes over a math problem step by step, either linguistically or non-linguistically.
1. Relatedness	b) Real-World Application	Hands-On Tools	a) When the teacher provides tools to assist in the learning process, such as calculators, protractors, or fraction cards.
2. Autonomy	a) Independence	Visual Graphic	a) When the teacher draws a picture to represent a math concept.
2. Autonomy	a) Independence	Beginning the lesson with a student-friendly goal	a) When the teacher begins the lesson stating the learning goal of the day.
3.Competence	a) Effort	Homework	a) When the teacher provides an opportunity for a learner to deepen their understanding at home.
3.Competence	b) Zone of Proximal Development	Review	a) When the teacher begins the lesson by revisiting previously learned concepts.

Thematic Analysis of What Students Do During a Math Lesson

This section outlines nine connected elements aligned to the theory of self-determination. These connected elements were derived from the specific statements the participants provided during each of the focus groups. It is noted that each of these connected elements was mentioned during each and every focus group interview.

Theme 1: Relatedness

One major theme that emerged from the data analysis of what the students do during a math lesson was relatedness. The participants in each of the three focus groups discussed in depth the importance of working with others, working with their teacher, knowing when it was appropriate to access their teacher or their peers, and how math relates to their future and everyday lives.

Within the theme of relatedness, three connected elements emerged. The first connected element was cooperative learning, the second connected element was real-world application, and the third connected element to emerge was degree of supports.

Connected element 1a: Cooperative learning. During the focus group interviews, the participants were asked how they solved difficult math problems. Participants in every focus group expressed the value in talking with their peers when working independently or the need to work with others when confronted with a challenge in the math lesson. Individual participants articulated the need to work with others to tackle math concepts and recalled specific examples of times when working with others supported their understanding. One participant explained, "I get excited for myself and for other people when we figure out a difficult math problem" and another participant stated, "It's easier and it helps when you don't know the answer, sometimes they do. If both of you don't know the answer, you can work together instead of doing it by

yourself. It can also help you remember stuff." Another participant stated, "I get help if my friend is on the same page and already done with the problem I am stuck on. I can get more information about the problem."

The quotes portray the value students place on working collaboratively as a means to better understand, know, and be able to understand mathematics, specifically related to solving problems. In other words, one option students prefer to use when they are faced with challenging math problems is to work with someone or a group. The students preferred having the option to work with a group or someone else when they needed to.

Connected element 1b: Real-world application. When participants in every focus group were asked why they thought they were learning the concept in the lesson, several participants articulated the real-world applicability of math class and how important math was to their future success. One participant stated, "I need to pay more attention in math class because I know that what I am learning will be used in real life" and another participant stated, "I see my mom and dad using real-world math everyday when they go shopping, count change and measure furniture." Another participant stated, "It's going to help you with your everyday life" and another participant articulated, "Math is important for shopping. If you want to buy something and you give them a $20, you want to make sure you get the correct change back."

These quotes symbolize the importance that students place on math for their future. This is partly because of their family and partly because of the types of math problems they are asked to solve. Overall, the participants in the focus groups understand the importance of math for their future. According to the participants, this realization impacted their attention and perseverance levels.

Connected element 1c: Degree of supports. When participants in every focus group were asked how they learned the concept in the lesson, participants discussed the influence of asking peers for help, asking their teacher for help, and deciding which one to choose. One participant stated, "Most of the work you do independently and in math, we work together. All the students and the teacher work together" and another participant stated, "Working in groups is easier for me because there's more people I can ask for help so I am not always waiting for the teacher to help me." One participant stated, "I get help if my friend is on the same page and already done with the problem I am stuck on. I can get more information about the problem" and another voiced, "I wish we could work in groups more. I really like having other friends that can come over and help me if I get stuck."

These quotes represent the choices fourth-grade learners make when they are solving complex problems in mathematics class. Availability and accessibility of resources dictate which choice works best. Additionally, the participants understand the exact points in math class when they are working independently and need help as well as how that help influences their understanding.

Theme 2: Autonomy

A second theme that emerged from the data analysis was autonomy. The participants in each of the three focus groups discussed in depth and detail the influence that working independently has on solving problems and how important paying attention is when working independently.

Within the theme of autonomy, three connected elements emerged. The first connected element was independence, the second connected element was repairing understanding, and the third connected element to emerge was degree of attention.

Connected element 2a: Independence. When participants in every focus group were asked what they did to learn the math concept, several participants discussed the influence that working independently had on their understanding of specific math concepts. One participant stated, "I like it because we can figure things out on our own and the teacher doesn't always have to tell us the answer when we didn't figure it out ourselves." Another participant declared, "We worked with protractors. The teacher came around and helped us, but most of us figured it out by ourselves." Two other participants stated, "Today, I didn't raise my hand today, but raising my hand helps me" and "When you raise your hand, the teacher comes over and helps you. I like to raise my hand and signal when I need help."

These statements capture the value students place on working independently when solving complex problems in math class. Specifically, students prefer to try to demonstrate their math skills on their own first, before seeking assistance from the classroom teachers and others. When needing assistance, students prefer having choices on how to get help and who to get help from.

Connected element 2b: Repairing understanding. Every focus group discussed the choices learners make when needing to repair their understanding. When the participants were asked how they overcame the challenges of the lesson, one participant responded, "I ask for help when I don't really understand some problems and I want to understand them more." Another stated, "When I don't get something, I raise my hand and she [the teacher] gives us a little bit of the details so we can figure it out." Two other participants clarified, "If I needed help I would raise my hand" and "I learn the most from making mistakes."

These statements portray how fourth graders repair their understanding. These statements demonstrate that students have options when they need help and they prefer to receive

just enough help to figure it out on their own. The participants felt that making mistakes was acceptable and expected in math class and that it was a way to deepen their understanding.

Connected element 2c: Degree of attention. When participants in every focus group were asked how math was different than their other classes, the participants discussed the degree of focus and thinking that is required during math class. One participant stated, "If I don't understand something in Math, I don't move my head at all, I don't listen to anybody except for the teacher." Another shared, "When I'm learning new information, I need to pay more attention than when it's something I already know. This is because if I'm not paying attention, I might miss a direction in the problem."

Statements such as these indicate the degree of attention that is specifically required to learn new information in math class. Every focus group declared that math was their most challenging class and that it requires the most attention. Additionally, the participants felt a greater satisfaction when they solved problems on their own.

Collectively, these statements portray the manner in which autonomy is used in math class and how it influences learning. Autonomy allows learners the freedom to make their own choices related to how they learn the math concepts, with a greater emphasis on solving problems alone first before relying on additional supports. The participants understand the relationship between their degree of attention and their understanding of the math concepts. The participants were discouraged when others distracted them in math class because of how valuable paying attention is. The participants also realized that some learners who were not paying attention in math could not complete their work independently.

Theme 3: Competence

The third theme that emerged from the data analysis was competence. The participants in every focus group discussed the need to be appropriately challenged, the implications for when they are not challenged, and how they go about persisting through problems they encounter in math class.

Within the theme of competence, three connected elements emerged. The first connected element was effort, the second connected element was zone of proximal development, and the third connected element to emerge was perseverance.

Connected element 3a: Effort. When the participants in the focus groups were asked what made math different from other subjects, every focus group discussed the regular challenges they experienced in math class. One of the participants stated, "I always like being challenged. In second grade, we got math books and I was in a challenging group. We did third grade work in second grade. I did a couple of pages each night. I love being challenged and I work hard at math and I think it's fun when it's challenging." Another participant affirmed, "I really really like it when it's challenging. Last year, my friend and I used to challenge each other because we weren't being challenged." Two more participants admitted, "In science, the teacher usually does most of the work writing on the board and telling us the answer, but in math, we are equally working on solving problems" and "My parents think I don't like math because I talk about how hard it is, but that is not true." Finally, "There is a lot harder problems in math then there is in science, reading, writing and spelling."

These statements reinforce the value that students place on feeling challenged in their learning and the impact that feeling challenged has on their overall outlook of themselves as a learner. Learners prefer to be challenged and can clearly articulate the difference between a

challenging lesson and a lesson that is not challenging. Even more important is their ability to seek out their own challenges when they are not feeling challenged.

Connected element 3b: Zone of proximal development. When the participants in the focus groups were asked how they overcame challenges in math class, every focus group shared the degree of attention math class requires when it is challenging and the implications of their attention level when it is not challenging. Each focus group also shared the realization that math concepts get gradually harder as the learner progresses through school. Two participants expressed, "If it's too easy, I notice I do not pay as good of attention. I find myself rushing my work" and "I like it when it's a little challenge, but when it's really really hard, I don't really like it." Another fourth grader added, "Math class gets harder and harder every year. In third grade, we only added and subtracted fractions. Now we are comparing fractions and multiplying fractions. Next year we will learn how to divide fractions."

These statements demonstrate the direct relationship that challenge has on attention. Learners prefer to be challenged and they are aware of their change in attention when math class is not challenging enough. The participants are also very aware when the concept is not challenging.

Connected element 3c: Perseverance. When the participants in the focus groups were asked how they overcame the challenges they encountered in math class, every focus group discussed the value of making mistakes and the feeling acquired when solving a challenging problem. One participant indicated, "When you don't know the problem, and you end up solving it you get a really good feeling. When you get stuck and then you get it, you're like Hooray!" Another participant shared, "I get a really good feeling when I finally figure out a problem that I was stuck on." One participant indicated, "When we're doing division, when we did the repeat

step, I got confused, and I looked on the board and I saw that I was putting the number in the wrong place."

These statements portray the feelings of solving a difficult problem as well as the benefits of learning from mistakes. The participants were able to articulate the connection between effort and challenge, meaning that they were less apt to try as hard if the problems were not challenging enough.

<div align="center">

Thematic Analysis of What Techniques Teachers Use During a Math Lesson

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This section outlines six connected elements aligned to the theory of self-determination. These connected elements were derived from the specific statements the participants provided during each of the focus groups. It is noted that each of these connected elements was mentioned during each and every focus group interview.

Theme 1: Relatedness

One theme that emerged from the data analysis of what teachers do during a math lesson was relatedness. The participants in the focus groups shared what their teacher did to help them understand the math concept and how what the teacher did influences their learning. These descriptions were coded to specific instructional strategies.

Within the theme of relatedness, two connected elements emerged. The first connected element was real-world application through hands-on tools, and the second connected element to emerge was degree of supports through modeling and demonstration.

Connected element 1a: Real-world application through hands-on tools. When the participants in the focus groups were asked what made math class different from the other classes they were taking, participants in every focus group discussed the influence that manipulatives and tools had on their learning as well as the real-world application math has on

their future. Two participants indicated, "In math, you use different materials. It helps us learn.

My favorite math tool is a calculator. You can do impossible questions on a calculator" and "In

math, you use fraction cards. We started practicing them in class and for homework and we

started getting better at them. Now, fractions are much easier for me." Another participant

remarked, "The multiplication table on my desk helps me if I get stuck when multiplying or

dividing" and another articulated, "Instead of always just writing down on paper the answers to

problems, it would be nice to have an iPad or a computer to use during math class."

These statements connect the impact when a teacher provides tools and manipulatives for

learning and how that influences interest in math. There is a connection between tools and

interest. Additionally, the participants were able to express tools they wish were more available

for them and why those tools are beneficial.

Connected element 1b: Degree of supports through modeling and demonstration.

When the participants in the focus groups were specifically asked what the teacher did to help

them understand the math concept, participants in every focus group mentioned the influence

that modeling and demonstrating math problems had on their learning. Some participants stated,

"The teacher wrote the problem on the board. They showed us how to do it. They came around

and asked if anyone needed help. They would line the protractor up and asked if we saw how we

got the answer. The teacher showed us the steps to it" and "When the teacher writes the steps on

the board, I can visualize math problems instead of thinking about them in my head." Another

stated, "Demonstrations help me because even though I read the instructions, sometimes they

don't help enough. Demonstrations are helpful just in case the directions aren't enough." One

more participant shared, "My teacher goes over the problems that we struggled with to help us

understand the problem better."

These statements portray the influence that models and demonstrations have on learning. Learners require visuals and steps to support their learning, and students are able to articulate the impact that models and demonstrations have on their learning.

Theme 2: Autonomy

The second theme that emerged from the data analysis was autonomy. The participants in the focus groups shared what their teacher did to help them understand the math concept and how what the teacher did influences their learning.

The participants' descriptions were coded to specific instructional strategies. The connected element that emerged was independence through student-friendly goals and visual graphics.

Connected element 2a: Independence through student-friendly goals and visual graphics. When the participants in the focus groups were specifically asked what the teacher did to help them understand the math concept, every focus group mentioned that posting and articulating student-friendly goals at the beginning of the lesson as well as visual graphics influenced their learning. Two fourth-grade participants shared, "She [the teacher] wrote out the steps and made a saying Dirty Monkeys Smell Bad. It means divide, multiply, subtract, and bring down" and "When the teacher writes out the steps, I can write the steps down on paper and then I can do those steps with the problem." Other participants shared, "If I'm stuck, I can look at the steps that were written on the board" and "Using the pictures on the fractions cards helps me understand fractions. They are like a bar graph." In regards to starting the lesson with a student-friendly goal, one participant shared, "It helps us know what standards we're working on and it helps us know what we're going to be working on" and "It helps us figure out how we're doing on our grades."

These statements portray the influence that visual graphics and starting each lesson with a student-friendly goal has on learning math. The participants understand why teachers provide visuals and begin lessons with a student-friendly goal.

Theme 3: Competence

The third theme that emerged from the data analysis was competence. The participants in the focus groups shared what their teacher did to help them understand the math concept and that they recognize that what the teacher did influences their learning. These descriptions were coded to specific instructional strategies.

Within the theme of competence, two connected elements emerged. The first connected element was effort through homework, and the second connected element was zone of proximal development through review.

Connected element 3a: Effort through homework. When the participants were specifically asked what the teacher did to help them understand the math concept, every focus group mentioned that homework influenced their learning. Some statements about homework include "It refreshes my memory. The teacher reviewed our homework and it gives us a head start and our parents did different math when they were kids. It helps us do our math and our parents probably wouldn't know it because they did different stuff."

These statements portray the influence that homework has on their ability to independently and successfully work from home. The participants know why they have homework and what they need to be successful at their homework. The students are able to relate being able to complete their homework with their family supports.

Connected element 3b: Zone of proximal development through review. When the participants were specifically asked what the teacher did to help them understand the math

concept, every focus group mentioned the influence that reviewing had on their learning. Some statements include: "They reviewed and talked to us about all the angles and how much they are. The reflex, obtuse, acute, and straight angle" and "My teacher reviews the homework with us. We do a couple together, like five. Then, when we go home to do it, we can do the rest on our own."

These statements portray the influence that reviewing concepts has on student learning. Students understand why teachers begin their lesson reviewing concepts they previously learned and how that helps them with their new learning.

Based on the themes and connected elements, four major findings emerged:

1. Students prefer learning that is problem-solving oriented.

2. Students prefer learning to be purposeful and future focused.

3. Students prefer voice and choice in how they learn and whom they learn with, but with teacher guidance.

4. Students require relatedness, autonomy, and competence when learning.

<div align="center">**Summary**</div>

In this chapter, the researcher described the results and findings of understanding how fourth graders make sense of their learning experiences in the math classroom and how instructional strategies influence their experience and motivation to learn. The emergence of themes through structural, descriptive, and in vivo coding methods was described and explored. The final chapter presents interpretations, conclusions, implications, and recommendations.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

The purpose of this qualitative study was to document how fourth-grade learners make sense of their learning experiences in the math classroom and how instructional strategies influenced their experience and motivation to learn. This study addressed three research questions: How do fourth graders describe and understand their experience of learning math? How do students express their interest and desire to learn math? How do different instructional strategies influence student interest and engagement?

In this chapter, the researcher first presents interpretations and offers conclusions based upon the in-depth analysis of the findings. Implications for theory and practice, contributions to the literature, and limitations of the study are also discussed. The chapter concludes with recommendations for future research.

Review of Research Study

Many educational initiatives and changes are sweeping the classrooms across the nation and in Maine. The biggest changes revolve around accountability and the assessment measures used to measure school success. Maine has adopted a new teacher evaluation system, in which a specific percentage of improved student outcomes are used to measure teacher success. Maine has also adopted a letter-grade system of grading based on percentage of student outcome growth on specific subgroups of students. Those subgroups include students who are economically disadvantaged or students who are identified for special education. Maine also has adopted a new proficiency-based diploma that requires that every Maine student graduate by proving that they have met specific standards and criteria.

This study addressed the research questions of how fourth graders describe and understand their experience of learning math, how they express their interest and desire to learn math, and how different instructional strategies influence their interest and engagement. The primary objective of this study was to collect data from the students as the driving force for improving the learning experiences for all. The objective was to better understand the voice of the fourth grader through the framework of Deci and Ryan's (1985) self-determination theory and the need for autonomy, relatedness, and competence. Based upon analysis of this data, findings and conclusions were identified by the researcher, as discussed in the next section. Based on the themes and connected elements, three major findings emerged.

The researcher examined how students experience math instruction through the lens of student motivation and engagement, specifically Deci and Ryan's (1985) theory of self-determination. This theory promotes creating the conditions of autonomy, competence, and relatedness as a means to fostering motivation. The foundation of self-determination theory states that human beings are engaged when we are acting on our own free will on tasks that are meaningful and purposeful (Deci & Ryan, 1985). Essentially, this theory is grounded on the idea that every individual has the basic human needs to improve his or her abilities and competencies, to act and think freely, and to connect with others and the environment. Deci and Ryan referred to those needs as competence, relatedness, and autonomy. Researchers have applied this theory in education, health care, psychology, and business (Davis et al., 1992; Guiffrida et al., 2013; Guo et al., 2014; Tassell & Flett, 2011; Vlachopoulos et al., 2013; Weinstein et al., 2011).

Through analyzing transcripts using structural coding, descriptive coding, and in vivo coding, the themes and connected elements emerged. To review, the three major themes aligned with the self-determination theory and the need for autonomy, relatedness, and competence. The

connected elements included cooperative learning, real-world application, degree of supports, independence, repairing understanding, degree of attention, effort, zone of proximal development, and perseverance. It was determined that students prefer working alone first, but when they require assistance, they prefer being able to choose between working with a peer or in small groups. It was determined that math requires more attention because of the rigor and the amount of new information they are processing. Finally, the rigor and degree of new information impact their effort and ability to overcome challenging obstacles.

Conclusions

These conclusions reflect students' beliefs about what they were learning in math class, how math was different from other subjects, what the teacher did to help them understand the math concept, and how they overcame challenges when the content was hard.

Based on the findings in this research study, four conclusions were drawn:

1. Students prefer learning that is problem-solving oriented.

2. Students prefer learning to be purposeful and future focused.

3. Students prefer voice and choice in how they learn.

4. Students require relatedness, autonomy, and competence when learning.

Students Prefer Learning That Is Problem-Solving Oriented

The National Research Council (2012) noted that "young children are capable of surprisingly sophisticated thinking and reasoning in science, mathematics, and other domains" (p. 161).

The participants in each of the three focus groups articulated their preference for math and the difference between math and other subjects because of the rigor and amount of new information they were learning. The participants indicated that one major difference between

math and other subjects was the number of challenging problems they were being expected to solve. The participants then expanded their thinking on the tools and strategies they use and preferences for tackling math problems. During the focus groups, the participants spent a great deal of time emphasizing the sub connected elements and the major underpinnings of self-determination theory. Powerful dialogue ensued with each of the focus groups related to their need for autonomy, relatedness and competence. Specifically, participants in every focus group discussed the implications that challenge has on their interest in learning. Participants in every focus group discussed the ways they tackle challenging math problems, which includes their choice to work alone, with their peers and/or their teachers. The participants had a lot to share about the specific instructional strategies teachers employ to help them better understand, know and be able to do complete specific math concepts. In conclusion, the depth and breadth of the dynamics of teaching and learning were brought to the surface with the emphasis on the components of the self-determination theory (SDT). In fact, the components of SDT brought the learner to life and provided the participants an avenue to express their learning needs and interests and how those needs and interests impact teaching and learning.

Students Prefer Learning to Be Purposeful and Future Focused

Doyle (2008) noted, "Learners of all ages are more motivated when they can see the usefulness of what they are learning and when they can use that information to do something that has an impact on others—especially their local community" (p. 42).

The participants in every focus group discussed the value that math has on their future, both through their current everyday experiences and based on experiences they have witnessed with their family. The participants could also describe that math concepts build on each other

and the value is in working hard and paying attention now as a means to better understanding new material they will be exposed to in the future.

Students Prefer Voice and Choice in How They Learn

Absolum (2012) noted,

We all want students who have high expectations of themselves as learners; students who feel confident about their capacity to learn, who set high goals for their learning, and who work for themselves to construct enjoyable, challenging learning pathways to their futures. (p. 16)

The participants during every focus group talked about what they experienced in a typical math lesson. The participants shared the choices they made when coming across a difficult math problem and what the teacher did to help them better understand the material. The participants noted the value in demonstrations, visual graphics, starting the lesson with a student-friendly goal, reviewing material, and practicing the material at home for homework. The students also noted the options they had or wished they had when they were working independently, such as working with a person, a small group, or using technology.

Students Require Relatedness, Autonomy, and Competence When Learning

Ryan and Deci (2000) found that people have the need for relatedness, autonomy, and competence. The participants in each of the three focus groups talked about these major themes and how it supported their learning process. Specifically, the participants indicated the preference to work independently first, followed by seeking assistance from a peer, small group, or teacher. The participants were very aware that math concepts build on each other and are relative and important to their future. Finally, the participants talked about their preference for

challenging work and that math was the only subject that they felt challenged in, based on the amount of problem solving and new information they were being exposed to.

Implications for Practice

How do these findings align with the scope of reform that schools across the nation and Maine are facing? Although not generalizable, given the small population and sample size of this study, the findings and interpretations of this study point to the importance and value that educational leaders, practitioners, and teachers must place on collecting feedback from their students about how they think and learn in math class. This feedback must be used to change the school culture and organization as a whole. With that being said, there are four implications of this study that contribute to the scholarly and practical dialogue on student motivation, instructional strategies, and change initiatives in Maine and across the nation. In addition to the scholarly and practical contributions, this study can aid in implementing new policies on teaching and learning mathematics as well as the entire structure schools use to enact curricular and teaching policies and practices.

Learners as Change Agents

Rudduck, Chaplain, and Wallace (1996) advocated, "What pupils say about teaching, learning, and schooling is not only worth listening to but provides an important—perhaps the most important—foundation for thinking about ways of improving schools" (p. 116).

The participants in this study were able to articulate what they needed from their teacher and from themselves to be a successful learner. The participants noted their need for demonstrations, visuals, tools, and a purpose for their learning, and the ability to work alone, with someone, or with others, reflecting their need for relatedness, connectedness, and autonomy. The participants noted that some concepts require more attention than others and

math concepts gradually build on each other or get progressively harder. The participants were able to articulate the importance and value of math instruction on their future.

If schools are going to meet the social, emotional, and academic needs of every student, educational leaders and teachers are going to need to begin the change process with the students. If teachers and educational leaders are not considering the students who are going to experience the changes, they may not be successful. The following section outlines strategies for schools to use to become more student-centered.

Educators Should Build a Problem-Solving-Based Instructional Model

According to participants, factors that separated math from the other subjects in class included the amount of thinking, attention, and time spent on solving real-world problems. The participants in every focus group noted that math class required a careful degree of attention in order to learn the new information they were being presented with. In fact, participants from every focus group noted that math was the only subject that required them to think. This can be interpreted that it was the only subject that was challenging for them and where they were being asked to answer or perform higher-order thinking skills.

If schools are going to infuse more problem solving into their instructional model across multiple subjects, teachers and educational leaders need to be provided time to develop essential questions for units of study in which students work alone and with partners to solve those essential questions. This may require that students spend time outside of school learning the content and spend more time in school solving complex problems with support and guidance.

If schools are going to adopt a more rigorous and more robust math curriculum, teachers and educational leaders will need to be given time to research and pilot different math options with the expectation that students are going to be involved in the final selection process.

Learners Only Know What Has Been Shown to Them

The results of this study indicated that students are very aware of their needs for relatedness, autonomy, and competence when it comes to how they learn and what they need to be successful students. Participants in this study were only able to share what they needed but were not getting because they had been given that support in the past. In order for students to articulate their needs, they need to be afforded opportunities to experience different learning structures. For example, the participants indicated a desire to experience flexibly grouping models in flexible learning spaces. The participants were aware that they needed this experience because they had been given it in the past and were able to articulate how it supported them in their learning. The participants also indicated that technology was an engaging and supportive tool that they needed more of in the math classroom.

In order for students to experience different learning structures, teachers need to have the time and resources to visit other alternative and high-performing schools to observe different learning models and structures that are in place. This opportunity would allow educational leaders and teachers an opportunity to bring back to their school best practices that are being implemented in other schools.

Schools Need Student Leadership Teams

Learners need to have opportunities to share their learning preferences. One approach to soliciting students' feedback is for school leaders to develop and create student leadership teams where students have an opportunity to share their voice and choice in instructional design.

The participants in this study were able to successfully articulate what they needed to be successful students in the math classroom. Some of those needs include having options on what they learn, whom they learn with, and how they are able to demonstrate what they know,

understand, and are able to do, demonstrating their need for autonomy, relatedness, and competence.

When the researcher observed the math lesson and pulled the focus group at the end of the math lesson, all of the students, including those not in the formal study, wanted to participate and asked why they were not being included in the focus group. The participants must have returned from the focus groups and shared with classmates how they were afforded an opportunity to voice their needs related to learning math.

Limitations of the Research Study

The following limitations were associated with this study:

1. The study was limited by boundary and scope. This study was conducted with a small group of 15 fourth graders in one small Maine rural school district and in one small Maine rural school. Sampling more students in more schools would have strengthened this qualitative study.

2. This study was limited by gender, subgroups, and parental consent. The criteria for this study required the participant to be a fourth grader, present, with parental consent, and interested in participating in the focus group. These criteria limited the number of participants and their gender, economic status, or identification for special education status. Specifically, only five female participants participated; two economically disadvantaged and three students with IEPs participated. Sampling more students from more criteria as well as separating out their coding responses would have strengthened this qualitative study.

3. This study was influenced by the use of a focus group. Other participants and their responses influenced students in the focus groups. In other words, some students may

have agreed with specific statements and questions because of the nature of the group. Individually interviewing students would have changed the experience and data collected.

4. This study may have been influenced by the researcher, who carries a dual role as researcher and as the principal of the school. Some students may have felt compelled to respond a certain way because of the dual role of the researcher.

5. This study was influenced by the content of the lesson. The very first question the researcher asked the participants was about what they were learning about in math. The participants may respond to subsequent questions differently based on the concepts they were working on. In other words, how the student learned the concepts and what the teacher did to help them was based on the concept they were learning. Some of the specific student needs and instructional strategies would not be applicable for other math concepts.

6. This study was influenced by the participants' individual experiences and was influenced by the experiences they had already had in their schooling. Students, at this level, do not know what they do not know. They were only able to articulate their responses based on what they had been exposed to recently or in the past.

7. This study was influenced by the age of the participants. Fourth graders may not have the capacity to respond at the same level of depth and degree as other students at higher grade levels might. The focus groups occurred in 45-minute intervals due to the stamina and schedule of the participants. Within that time, it was difficult for the researcher to dig deeper on every theme the participants provided.

Recommendations for Future Research

The findings and conclusions offered in this study imply that additional empirical research is needed as it relates to being student centered when making instructional and policy decisions. This research study aids in filling in that gap. As the field of education continues to change, there is a need for educational leaders, teachers, and practitioners to focus on the students that are the product of those changes.

The participants in every focus group indicated the need for technology as a means to support the learning process. Research is needed on how technology influences student motivation and how it influences the specific tenets of Deci and Ryan's (1985) self-determination theory.

The participants in every focus group shared their appreciation when learning is challenging and that challenging learning requires greater attention and varied degrees of supports. Research is needed on the influence that flipped classrooms have on the need for autonomy, relatedness, and competence.

Conclusion

Education and classrooms across the nation and Maine will continue to grow and develop. Within these changes lies the value and importance in seeking guidance and feedback from the learners who will experience these changes. The insight gained from this study allows the researcher to consider the needs of the learner before making any school-wide curricular changes and to directly assess the impact of any school-wide changes by reaching out to the students. In doing so, the feedback collected from the students will increase the motivation and sense of urgency for teachers to change their practices.

The researcher conducted a study and reviewed evidence and suggests that school leaders and educators must create classrooms with the conditions of autonomy, competence, and relatedness as a means to improve student motivation and student performance. One approach to create these conditions in schools and classrooms is by encouraging school leaders and educators to consider their student audience when making instructional decisions in their classrooms and learning environments. One direct approach is to engage in deep and reflective conversations with learners about how they learn and what they need to be successful.

As Bransford, Brown, and Cocking noted (2000), "In order for learners to gain insight into their learning and their understanding, frequent feedback is critical: students need to monitor their learning and actively evaluate their strategies and their current levels of understanding" (p. 78). While the present research cannot resolve every rural public school problem regarding student engagement, motivation, and instructional strategies, the hope is that this research study will enrich the professional literature by providing resources for future educators and school leaders who strive to create motivating and engaging learning communities as a means to improving student outcomes.

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APPENDIX A

REGIONAL SCHOOL DISTRICT ACCOUNTABILITY DATA

The three elementary schools in Regional School District provide the largest instructional blocks in the areas of reading, writing, and mathematics. Student achievement data on standardized assessments in these content areas are used to determine the overall effectiveness of the elementary schools in Regional School District. The No Child Left Behind (NCLB, 2002) law under the Elementary and Secondary Education Act (ESEA) expects all schools to meet adequate yearly progress (AYP) targets to reach 100 percent proficiency by 2014 in all content areas. In Maine, AYP was determined based on the percentage of learners proficient on the Maine Education Assessment (MEA) until 2011, when it changed to the New England Common Assessment Program (NECAP) until 2014, when it changed to the Smarter Balanced Assessment.

The reading program is built on the gradual release of responsibility framework through the daily 5 and CAFÉ framework (Boushey & Moser, 2014). The components of the daily 5 include read to self, listen to reading, read to someone, work on writing, and word work. The expectation is that K-6 readers filter through these experiences during their 90-minute reading block. The CAFÉ framework provides readers with explicit strategies in comprehension, accuracy, fluency, and expanding their vocabulary. The K-6 60-minute writing workshop curricular framework begins with a short mini-lesson or read aloud, followed by conferring, independent and guided practice, and ends with an opportunity for the learners to share their writing (Fletcher & Portalupi, 2001). The K-6 60-minute Regional School District Math program is built on the University of Chicago math program entitled Everyday Math, which is a

spiral program that combines practicing known information through games and experiences while introducing new information through problem solving and collaboration (Center for Elementary Mathematics and Science Education, 2015). A spiral program repeatedly cycles through concepts to provide learners ample opportunities for practice and application. For example, each Everyday Math unit provides learners with opportunities to practice computation, geometry, measurement, and graphing. Learners may be practicing concepts that they do not yet have to fully master.

In 2011, as noted, Regional School District had met almost every NCLB AYP target (Maine Department of Education Data Warehouse, 2014). The Regional School District as a whole was above the expected targets in all student achievement targets except the percentage meeting proficiency at the high school level. The Regional School District is above the graduation and attendance rates. The Regional School District expends less per student than the state in all aspects except for Special Education services. In 2012, Maine applied for and was granted a waiver from NCLB because the likelihood of states to meet the target was almost impossible.

Regional Elementary School Longitudinal Percentage of Students Proficient and Above

Regional Elementary School Longitudinal Percentage of Students Proficient and Above		
	Math	Literacy
2009	70%	75%
2010	64%	63%
2011	67%	67%
2012	67%	75%
2013	68%	71%

(Maine Department of Education Data Warehouse, 2014)

Regional School District 2011 NCLB AYP Achievement Data

Student Achievement			
Measure	**AYP Target**	**Status**	
Mathematics			
Percent Tested (MHSA-2012-13)	100.0	95	⬆
Percent Tested (NECAP-2013-14)	99.1	95	⬆
% Meets or Higher (MHSA-2012-13)	47.3	43	⬆
% Proficient or Higher (NECAP-2013-14)	67.4	60	⬆
Reading			
Percent Tested (MHSA-2012-13)	100.0	95	⬆
Percent Tested (NECAP-2013-14)	99.1	95	⬆
% Meets or Higher (MHSA-2012-13)	47.3	64	⬇
% Proficient or Higher (NECAP-2013-14)	72.0	66	⬆

Staffing			
Measure		**Goal**	**Status**
% of Teacher with Masters Degree or Higher (Staff-2013-14):		31.5	N/A
FTE Count of Teachers (Staff-2013-14):		146.2	N/A
FTE Count of Administrators (Staff-2013-14):		9.6	N/A

Non-Academic Measures			
Measure	**Target**	**Status**	
AYP Targets			
Annual Student Dropout Rate (Dropout-2012-13):	4.1	N/A	
Fed. 4 Year Cohort Graduation Rate (Graduation-2012-13):	84.7	75	⬆
Student Attendance Rate (Attendance-2012-13):	95.1	90	⬆

Finance		
Measure	**Budget**	**State Avg.**
Per Pupil Expenditures:		
Regular Instruction:	4,128	4,713
Special Education:	1,800	1,754
School Administration:	598	605
Debt Service:	685	781
Facilities:	1,092	1,297
* Total for all measures(Not just those above):	10,460	11,583

(Maine Department of Education Data Warehouse, 2014)

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Regional School District Longitudinal MEA or NECAP Math Achievement Data

Organization Name	School Year	Number Tested	Percent by Achievement level			
			Substantially Below Proficient	Partially Proficient	Proficient	Proficient with Distinction
Regional School District	2013-2014	389	19.5	20.3	47.8	12.3
Regional School District	2012-2013	361	17.7	22.2	48.5	11.6
Regional School District	2011-2012	727	15.7	20.6	44.8	18.8
Regional School District	2010-2011	745	16	20.8	45.5	15.7
Regional School District	2009-2010	763	15.1	20.8	45.6	18.5
State	2013-2014	78,210	19.1	20.8	43	17.1
State	2012-2013	76,753	18.1	20.1	44.1	17.7
State	2011-2012	80,949	17.3	19.6	44.4	18.7
State	2010-2011	81,740	17.9	21.6	43.7	16.8
State	2009-2010	82,686	17.9	20.6	44.8	16.7

(Maine Department of Education Data Warehouse, 2014)

APPENDIX B

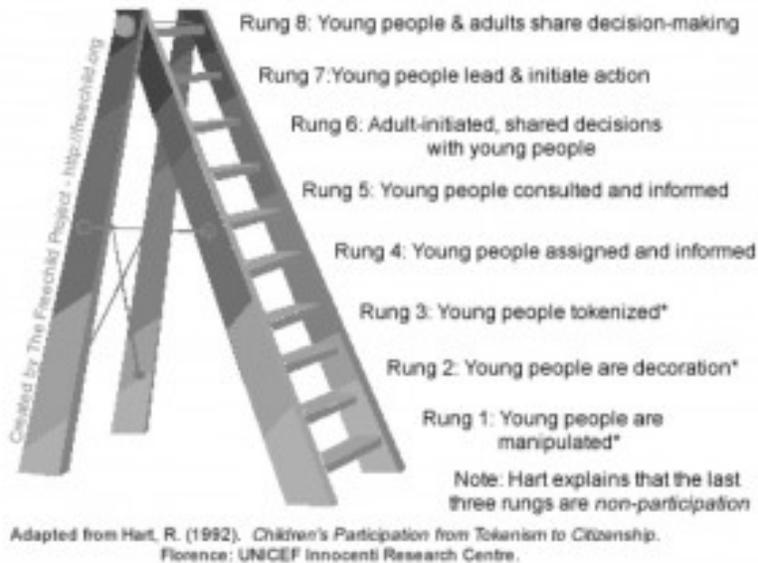MARTIN'S MOTIVATION AND ENGAGEMENT WHEEL
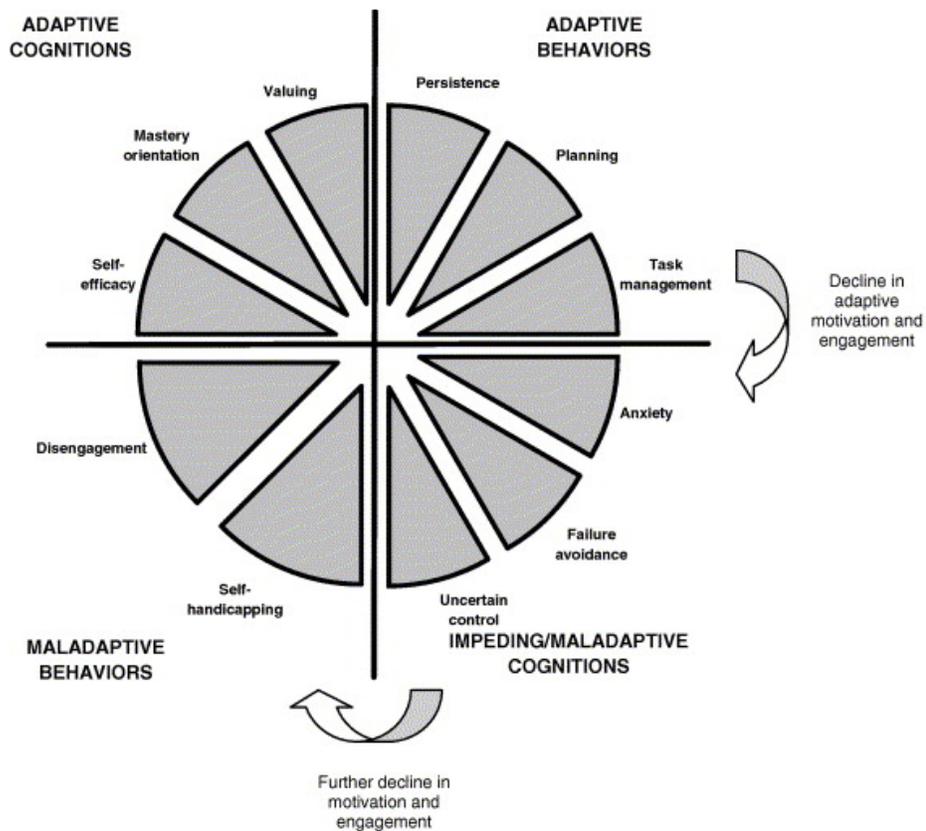
Figure 3. Martin's Motivation and Engagement Wheel. Adapted from "Examining a

Multidimensional Model of Student Motivation and Engagement Using a Construct Validation

Approach," by A. J. Martin, 2007, *British Journal of Educational Psychology, 77*(2), p. 414.

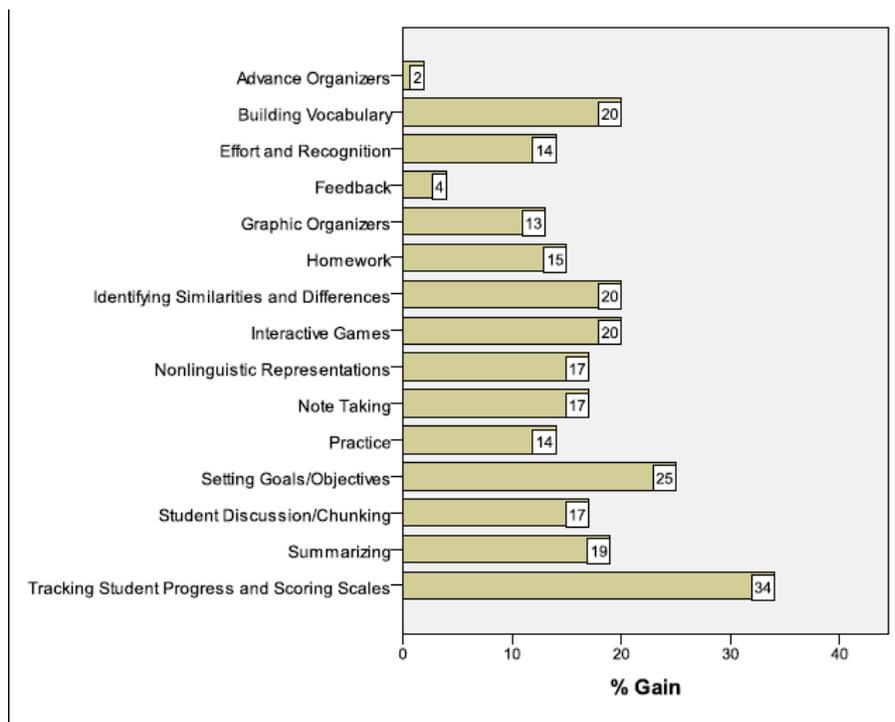APPENDIX C

ROGER HART'S LADDER OF YOUNG PEOPLE'S PARTICIPATION

Roger Hart's Ladder of Young People's Participation

Rung 8: Young people & adults share decision-making

Rung 7: Young people lead & initiate action

Rung 6: Adult-initiated, shared decisions with young people

Rung 5: Young people consulted and informed

Rung 4: Young people assigned and informed

Rung 3: Young people tokenized*

Rung 2: Young people are decoration*

Rung 1: Young people are manipulated*

Note: Hart explains that the last three rungs are non-participation

Created by The Freechild Project - http://freechild.org

Adapted from Hart, R. (1992). *Children's Participation from Tokenism to Citizenship*. Florence: UNICEF Innocenti Research Centre.

Figure 4. Hart's Ladder of Young People's Participation. Adapted from "Children's Participation From Tokenism to Citizenship," by R. Hart, 1992, UNICEF Innocenti Research Centre.

APPENDIX D

META-ANALYSES OF INSTRUCTIONAL STRATEGIES

Figure 5. Marzano's meta-analyses of achievement gains with instructional strategies. Adapted from "The Art and Science of Teaching," by R. J. Marzano, 2007, Alexandria, VA: ASCD.

APPENDIX E

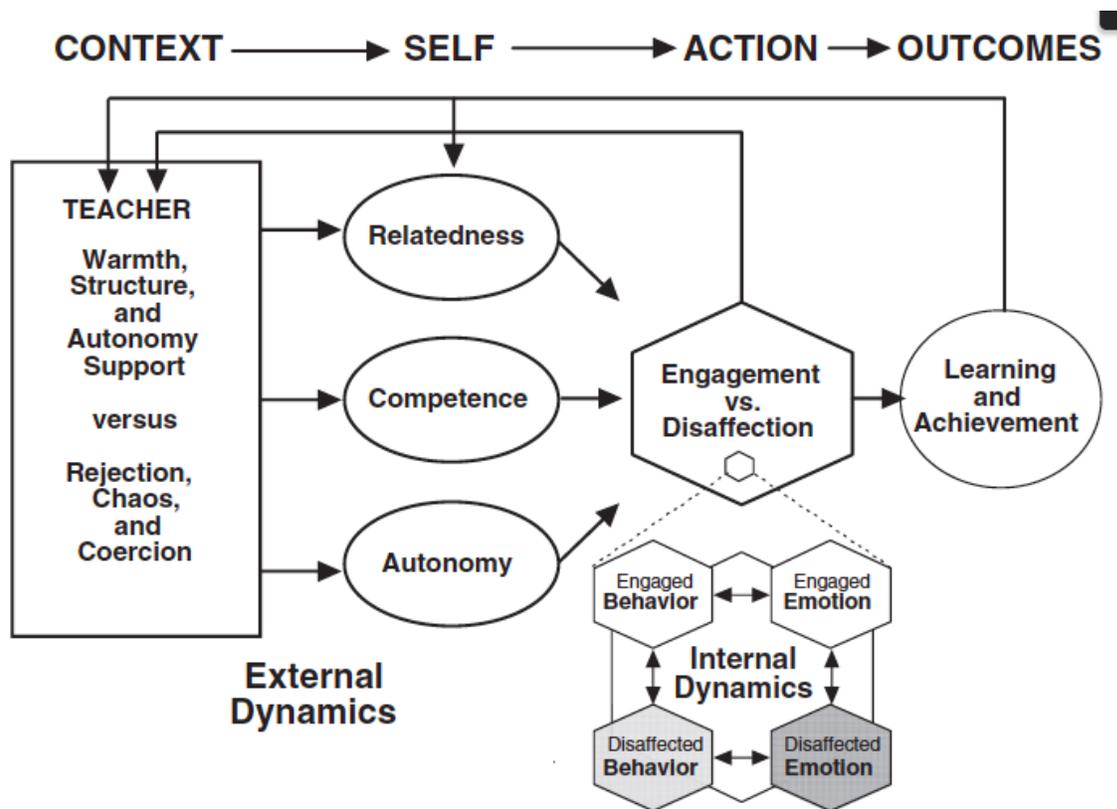SKINNER'S SELF-SYSTEM MODEL OF MOTIVATIONAL DEVELOPMENT

Figure 6. Skinner's self-system model of motivational development. Adapted from "Engagement and Disaffection in the Classroom: Part of a Larger Motivational Dynamic?" by E. Skinner, C. Furrer, G. Marchand, & T. Kindermann, 2008, *Journal of Educational Psychology, 100*(4), p. 768.

APPENDIX F

FIELDING'S EVALUATING THE CONDITIONS FOR STUDENT VOICE

Speaking	• Who is allowed to speak? • To whom are they allowed to speak? • What language is encouraged / allowed?
Listening	• Who is listening? • Why are they listening? • How are they listening?
Skills	• Are the skills of dialogue encouraged and supported through training or other appropriate means? • Are those skills understood, developed and practised within the context of democratic values and dispositions? • Are those skills themselves transformed by those values and dispositions?
Attitudes & Dispositions	• How do those involved regard each other? • To what degree are the principle of equal value and the dispositions of care felt recipirocally and demonstrated through the reality of daily encounter?
Systems	• How often does dialogue and encounter in which student voice is centrally important occur? • Who decides? • How do the systems enshrining the value and necessity of student voice mesh with or relate to other organisational arrangements (particularly those involving adults)?
Organisational Culture	• Do the cultural norms and values of the school proclaim the centrality of student voice within the context of education as a shared responsibility and shared achievement? • Do the practices, traditions and routine daily encounters demonstrate values supportive of student voice?
Spaces and the Making of Meaning	• Where are the public spaces (physical and metaphorical) . in which these encounters might take place? • Who controls them? • What values shape their being and their use?
Action The Future	• Do we need new structures? • Do we need new ways of relating to each other?

Figure 7. Fielding's evaluating the conditions for student voice. Adapted from "Students as Radical Agents of Change," by M. Fielding, 2001, *Journal of Educational Change, 2*(2), 123-141.

APPENDIX G

ECONOMICALLY DISADVANTAGED AND SPECIAL EDUCATION POPULATIONS

To fully understand the challenges of this area, we must discuss the socioeconomic and special education populations. The United States Department of Agriculture (USDA, 2014) Food and Nutrition Service (FNS) program determines the federal guidelines for families eligible for free and reduced lunch. The federal poverty level for a family of four is less than $23,850 per year and would qualify for free lunch, and families of four earning less than $44,123 per year qualify for reduced lunch. The Regional School District 2013-2014 Free and Reduced Lunch population chart presents the eligibility percentage of each of the schools; note that it varies: Regional Community School at 42.8 percent, Regional Middle School at 36 percent, Regional Consolidated School at 35 percent, Regional High School at 32 percent, and Regional Elementary School at 51 percent. Schools that are deemed Title I receive additional subsidy from the federal government. Regional Middle School and Regional Elementary School were just awarded a provisional II grant that provides all students universal free food (breakfast and lunch) based on their free and reduced lunch percentages.

Regional School District Free and Reduced Lunch Population Chart

School Name	School Year	Percent Eligible for Free/Reduced Lunch
Regional Middle School	2013-2014	36%
Regional Elementary School	2013-2014	51%
Regional Consolidated School	2013-2014	35%
Regional Community School	2013-2014	42.8%
Regional High School	2013-2014	32%

(Maine Department of Education Data Warehouse, 2013)

Special Education

Maine Revised Statute (2005b) 20-A §7006, or child find, requires that every public

school district that receives federal funds to provide early intervention services or a free and

appropriate public education (FAPE) to learners through age 20 must provide special education

and related services to all eligible children and their families. The nine major categories of

eligibility include autism, emotional disturbance, hearing impairment, intellectually delayed,

other health impaired, multiple disabilities, speech and language, specific learning disability, and

traumatic brain injury. Approximately 17 percent, or 301 students in Regional School District

(2013) are identified as needing special education services. The largest category for eligibility is

specific learning disability, followed by students with multiple disabilities. Eligible students

may require specific accommodations and modifications to support their learning experiences

(Regional School District, 2013).

2013-2014 Regional School District Special Education Demographics

	Autism	*ED*	*Hearing*	*ID*	*Multiple*	*OHI*	*SL*	*SLD*	*TBI*	
Regional School District	*24*	*29*	*2*	*7*	*55*	*46*	*53*	*84*	*1*	*301*

*(*Maine Department of Education Data Warehouse, 2013)

APPENDIX H

CONSENT INFORMATION SHEET

Please read this document and ask any questions you may have before agreeing to be part of this study. You will also have the opportunity to ask any questions about the study at anytime throughout the study. The researcher is Ryan W. Patrie, who is a doctoral student at the Educational Leadership department at the University of

New England. This study fulfills the requirements for completing the

doctoral thesis and will be used to improve instructional practices in the Regional School District. The doctoral thesis is being conducted under the direction of Dr. Michelle Collay.

Background Information:

   This researcher intends to examine how students experience math instruction. The purpose of this qualitative study is to determine how specific instructional strategies influence learning in a fourth-grade math classroom. Students will report their perceptions of learning math through a series of focus groups in which individual students discuss their student experiences after a math lesson.

Through document analysis, video recording, and focus groups, this researcher will identify recurring patterns that characterize the experience.

Procedure:

Focus groups will be created through purposeful sampling, in which the teachers will recommend a group of 6-10 students to discuss a series of interview questions. Interview transcripts will be printed for analysis. Parents have the right to ask any questions about the study at anytime throughout the study.

Risks or benefits of being in the Study:

There are no foreseen risks, nor are there any benefits to participating in this study.

Confidentiality:

Any personal information that may reveal your child's identity will be kept secret or anonymous, such as their name, gender or subgroup, etc. Any information collected during this study will be kept in a locked box for a period of five (5) years and the researcher will be the only person with access to this information.

Voluntary Nature of the Study:

Parents have the ultimate right to deny participating in this study or to withdraw from this study after you have agreed to participate at any time of your choice during the study. Your child has the right not to answer any questions posed by the researcher that they do not want to give any answer or response.

Contacts and Questions:

Parents and students may ask any questions you have at any point throughout the research study. If you have any questions later, please feel free to contact Ryan W. Patrie at 956-2544 or by email at rpatrie@une.edu. If you wish to talk to someone other than the researcher, please feel free to call Dr. Michelle Collay at mcollay@une.edu or the Research Subjects' Advocate Suzan Nelson by e-mail at snelson@sjcme.edu.

APPENDIX I

INSTRUMENTATION SAMPLE REFLECTION QUESTIONS FOR LEARNERS

- What did you do in math class?

- Tell me about what you learned in math class today.

- Describe your math lesson from today. What did you learn?

- What did the teacher do in math class?

- What did you do first . . . next . . . last?

- What did the teacher do first . . . next . . . last?

- Describe some of the activities you participated in.

- Describe what you liked the most.

- Why was it so fun?

- What did you write in math class?

- Describe the math problems you wrote about.

- Describe the math problems the teacher wrote about.

- What did the teacher write in math class?

- Who did you talk to in math class?

- What did you talk about in math class?

- What do you think were the goals today in math?

- What did the teacher talk about in math class?

- What did the teacher show you in math class?

- How did the teacher show it to you in math class?

- What did you enjoy about math class today?

- How is math class the same or different from some of your other classes?

- Can you describe a math concept from today that was unclear to you and that you now understand?

- Do you have any new questions about math?