A PHENOMENOLOGICAL STUDY EXAMINING THE LIVED EXPERIENCES OF MIDDLE SCHOOL STUDENTS WHO HAVE DEMONSTRATED CHALLENGES IN MATH AND THEIR EXPECTATIONS TO IMPROVE THEIR PERFORMANCE

by

Steven Duane Fencl

Liberty University

A Dissertation Presented in Partial Fulfillment

Of the Requirements for the Degree

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APPROVED BY:

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Abstract

The purpose of this phenomenological study was to understand the lived experiences of middle school students who have challenges in math and their expectations of opportunities provided to improve their performance at a middle school in the Spring Valley School District. The theory that guided this study was Vroom's expectancy theory, which argues that the tendency of a person to act in a certain way depends on what the person expects to happen, that it will be favorable to the person, and that the person feels the result will provide a potential gain. The central research question was, "How do middle school students describe their thoughts and emotional experiences about their expected performance in math activities?" Thirteen middle school students were chosen to participate using the maximum variation sampling technique based on a prescreening survey to determine their perceived level of math anxiety, which is inversely related to math self-efficacy. The data collection methods were individual interviews, focus groups, and journal prompts. Moustakas' data analysis methods of horizonalization, reduction and elimination, clustering, textual and structural description of themes, and the synthesis and meaning of the essence guided the data analysis process. From the data analysis, four major themes emerged: (a) emotions related to math performance, (b) motivational factors, (c) test and homework corrections, and (d) the teacher's role. The study's findings were discussed, along with recommendations for the findings, and future research recommendations.

Keywords: valence, instrumentality, expectancy, adverse childhood experience, emotional, reactivity

Copyright Page

Dedication

I dedicate this to my oldest son, Dan, who left for heaven way too early; he was a big fan of my accomplishments. I also dedicate this to my two youngest children, Anna and Matthew, who cheered me on and allowed me to be a positive role model for them. I especially dedicate this to my wife, who endured this process graciously and encouraged me when I wanted to give up. Lastly, I dedicate this to God, who taught me that He loves me and that there is nothing I can do that will ever change that.

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First, I would like to acknowledge Jesus Christ, my Lord, Savior, and friend. The creator of the universe cares about all that involves and interests me. He also blessed me with the talent of teaching, which my wife recognized and encouraged me to become an educator.

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I want to acknowledge the principal of the school where the participants were from. His brilliant mind provided solutions that helped to overcome many difficulties. Without his help, I would have had to seek another district from which to draw participants.

I want to acknowledge my dissertation chair, Dr. Christopher Clark, and my committee member, Dr. Gail Collins, for their extreme patience with me through this process. They have faithfully guided me to a successful conclusion.

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Table of Contents

Abstract 3

Copyright Page 4

Dedication 5

Acknowledgments 6

List of Tables 13

List of Abbreviations 14

CHAPTER ONE: INTRODUCTION 15

Overview 15

Background 15

- Historical Context 17
- Social Context 18
- Theoretical Context 20

Problem Statement 20

Purpose Statement 21

Significance of the Study 22

- Theoretical 22
- Empirical 22
- Practical 23

Research Questions 23

- Central Research Question 24
- Sub-Question One 24
- Sub-Question Two 25

Definitions 25

Summary 26

CHAPTER TWO: LITERATURE REVIEW 27

Overview 27

Theoretical Framework 27

Related Literature 31

History of Education and Testing in America 31

Colonial Education 32

Federal Involvement in The School System 34

The Difficulties with Learning Math 36

Math and the Family 39

Gender Differences 40

Cultural Influences 41

Adverse Childhood Experiences 43

Emotional Issues 44

Physical Issues 45

Math Anxiety 46

Understanding Math Anxiety 47

Measuring Math Anxiety 47

Math Anxiety and the Brain 49

Adolescence and Decision Making 50

Challenges for Educators 54

Summary 61

CHAPTER THREE: METHODS 62
Overview 62
Research Design 62
Research Questions 64
Central Research Question 64
Sub-Question One 64
Sub-Question Two 64
Setting and Participants 64
Site 65
Participants 66
Researcher's Positionality 66
Interpretive Framework 67
Philosophical Assumptions 67
Ontological Assumption 68
Epistemological Assumption 68
Axiological Assumption 68
Recruitment Plan 69
Researcher's Role 70
Procedures 71
Data Collection Plan 71
Individual Interviews 71
Individual Interview Data Analysis Plan 76
Focus Groups 78

Focus Group Data Analysis Plan 80
Journal Prompts 80
Journal Prompts Data Analysis Plan 81
Data Synthesis 82
Epoche 82
Horizonalization 82
Reduction and Elimination 83
Clustering and Thematizing 83
Validation 83
Synthesis of Meaning and Essences 84
Trustworthiness 84
Credibility 85
Transferability 85
Dependability 86
Confirmability 86
Ethical Considerations 87
Permissions 87
Other Participant Protections 87
Summary 88
CHAPTER FOUR: FINDINGS 89
Overview 89
Participants 89
Results 97

Theme Development 98
Emotions Related to Math Performance 100
Motivational Factors 103
Test and Homework Corrections 104
Teacher's Role 106
Teacher-Driven 108
Outlier Data and Findings 109
Research Question Responses 110
Central Research Question 110
Sub-Question One 111
Sub-Question Two 112
Summary 113
CHAPTER FIVE: CONCLUSION 115
Overview 115
Discussion 115
Summary of Thematic Findings 115
Emotional Impact of Math Performance 115
Past Performance and Math Anxiety 116
Teacher Reliance 117
Empirical and Theoretical Implications 119
Empirical Implications 119
Theoretical Implications 122
Implications for Policy or Practice 123

Implications for Policy 124
Implications for Practice 125
Limitations and Delimitations 125
Recommendations for Future Research 126
Conclusion 127
References 128
Appendix A :IRB Approval 165
Appendix B: Recruitment Letter to Parents 166
Appendix C: Prescreening Survey for Math Students 167
Appendix D: Written Permission from The Publisher 168
Appendix E: Email Notification to Parents 169
Appendix F: Parent Consent Form 170
Appendix G: Child Assent to Participate 174
Appendix H: Interview Questions 175
Appendix I: Focus Group Interview Questions 177
Appendix J: Journal Prompts 178
Appendix K: Researcher's Reflexive Journal 179
Appendix L: Audit Trail 181

List of Tables

Table 1. Participant Demographics.....90

Table 2. Theme Development.....98

List of Abbreviations

Abbreviated Math Anxiety Scale (aMAS)

Adverse Childhood Experience (ACE)

Advancement Via Individual Determination (AVID)

Every Student Succeeds Act (ESSA)

Expectancy Value Theory (EVT)

Institutional Review Board (IRB)

National Assessment of Education Progress (NAEP)

National Council of Teachers of Mathematics (NCTM)

National Education Defense Act (NEDA)

No Child Left Behind (NCLB)

Professional Learning Community (PLC)

Science, Technology, Engineering, Mathematics (STEM)

CHAPTER ONE: INTRODUCTION

Overview

The purpose of this phenomenological study is to examine the lived experiences of middle school students who have challenges in math and their expectations of opportunities provided to improve their performance. Many changes have occurred in public education in America. This chapter begins by exploring this phenomenon's historical, social, and theoretical background. These changes have occurred because of world influences, such as the Soviet Union being the first to launch a satellite into space. The problem is that when students struggling in math were given opportunities to improve their math performance, they did not readily take advantage of them, a phenomenon that laid the groundwork for understanding the problem and purpose of this study. This chapter addresses the significance of the study to help teachers understand and interact with these students, introduces the research questions, and defines terms that will be used throughout the research.

Background

Math achievement in public schools is the foremost concern in America; therefore, standardized testing at the elementary, middle, and 10th-grade levels is used to measure teaching effectiveness. Federal leaders spend much time and effort determining why math performance may not meet expectations. Saatcioglu et al. (2021) reported that with governmental influence on standards and testing results, the required skill set might be narrow enough to impair the broader set of skills needed to succeed later in life.

Three factors that may affect this underachievement are race, culture, and childhood trauma. Tichavakunda (2019) described aspects of previous research that involved critical race theory and the effects of racism on education. He also looked closely at habitus and how a

different culture may ascribe meaning differently to a situation, which creates an imbalance and actual advantage for a culture. Gilgoff et al. (2020) expressed that when adverse childhood experiences (ACE) are introduced into a person's life through trauma, these may have a deleterious effect on health, risk-taking, anxiety, and decision-making, including those related to social interactions, which are very important to adolescents.

Math performance is a potential indicator of a country's ability to compete in the modern world (Lopez-Leyva & Rhoades, 2016). Even though math scores have increased in America, according to the National Assessment of Educational Progress (NAEP), since the introduction of No Child Left Behind (NCLB) legislation (Hansen et al., 2018), since 2013, scores have dropped back to 2009 levels. The more accountability the federal government asks for, the more pressure math teachers feel to produce students who excel on standardized tests. This pressure may be exacerbated by the turnover rate of math teachers in all areas, especially in lower-income rural areas, leading to overcrowded classrooms and less experienced teachers (Carver-Thomas & Darling-Hammond, 2019). O'Hara et al. (2022) showed that the classroom environment is established by the teacher, who may also experience math anxiety and affects a student's level of math anxiety. Teachers need to overcome their anxiety to lessen the anxiety of their students.

Domina et al. (2019) described placement tracking as placing students into educational classes based on standardized test results, intending to increase potential learning. However, this practice has increased social inequality by placing achievement labels on students, convincing them they cannot change their status, and reducing expectations from teachers and students for those placed in lower-level classes. Valente and Lourenço (2020) showed that emotional intelligence is valuable for teachers because of the tremendous emotional demand teaching has on the teacher, requiring them to engage with their students in ways beyond mere academic

knowledge.

Historical Context

Peterson (1983) described colonial schools as an extension of the training of the family. The early schools partnered with the community to ensure that future citizens would be productive. In the early 20th century, America's technological superiority was challenged after the Russians placed Sputnik in orbit, prompting the Federal government to increase federal funding for public schools but tie it to school performance (Lauermann, 2014). The National Education Defense Act (NEDA) was passed in 1958, which enacted changes to math education by emphasizing increased thinking skills instead of rote memorization but failed to give clear directions to schools on how to implement the changes (Tröhler, 2016). Following the NEDA, other reforms for education were enacted. The previous century focused on what the community wanted to teach and gave little attention to what the students wanted. Cohen and Mehta (2017) mentioned changes that liberalized the treatment of students, including extracurricular activities and standardized testing.

To reduce the achievement gap, Congress passed the NCLB Act in 2001, which increased the federal government's need for accountability, resulting in a yearly report on education (Simpson et al., 2004). However, education professionals claim it relied too heavily on standardized testing (Heise, n.d.). Because of the pressure applied to teachers to produce proficient test results, many teachers started teaching to the tests, changing their vocabulary and communication to match the verbiage on the tests to keep their jobs (William, 2010). NCLB legislation required schools to report the results for every student and the proficiency needed for all students. The public labeled students, teachers, and administration inferior if they underperformed on these tests, allowing students to transfer from schools that did not perform at

expected levels (Klein, 2020). The Every Student Succeeds Act (ESSA) was enacted in 2015. Mathis and Trujillo (2016) reported that many teachers believed that even though the new law allowed states to set goals and operate testing instead of the federal government, there was still too much testing as states were allowed to employ more tests. The people who regulated the federal programs now controlled the state programs. Standards were still expected to be met, with low-reporting schools being singled out for further remediation. More recently, schools are embracing the changes from ESSA as it allows for accountability to be more than just test scores, such as school safety and climate (Strobach, 2018).

Social Context

Education prepares individuals to be positive contributors to society (Urban et al., 2019). Thus, many school districts emphasize college and career readiness, with math being a significant component of this preparation. Piesch et al. (2020) examined student expectations and career interests and their effect on students' vocational choices, relating their math achievement to potential choices. Teachers can help students develop a growth mindset in math that will influence the student's beliefs and build confidence that will last into adulthood. Shoshani (2021) demonstrated this fact by explaining that the teacher's mindset affects the student's mindset.

Besides a lack of student interest, parents may project their math anxiety onto their children (Szczygieł, 2020). Often, teachers may hear parents stating they were never good at math, so they do not expect their children to do well. Šimunović and Babarović (2020) studied parents' effect on placing stereotypes on specific scientist roles, such as a physicist being primarily a male occupation. González-Pérez et al. (2020) showed that the percentage of females pursuing science, technology, engineering, and mathematics (STEM) education in higher education has increased. However, the number of female participants in STEM careers remains

low due to perceived gender conceptions. Thus, many females go into other career fields due to potential family influences.

In some cases, students may have a positive experience during the school day, but a poor home environment negatively affects their motivation and self-worth. Luter et al. (2017) demonstrated the need to make changes in the community, such as infrastructure improvements and reducing poverty in these underdeveloped neighborhoods. Along with this, Albanese et al. (2019) showed that parental self-worth impacted their children as well, and the recent outside factors, such as COVID-19, caused an increase in negative self-worth.

Hubel et al. (2020) explained that ACEs, which may include child abuse and parents who are incarcerated or have a mental disorder, are very stressful and may have a deleterious effect on children. Sometimes, these effects can continue into adulthood. Attachment issues can be passed from mothers who experienced ACEs to their children, which may cause them to feel detached from teachers (Cooke et al., 2019). These children may also display behaviors because they feel insignificant, hopeless, responsible for the trauma, and experience feelings that they do not belong. They may develop coping skills and mechanisms that can lead to improper social skills and behaviors in the classroom. Educators must establish caring relationships with their students for learning to occur, but teachers may not be aware of the issues until adverse behavior appears (Bartlett & Smith, 2019).

Individuals in all phases of education describe being anxious when it involves their performance in math. Sawyer (2019) explained that math teachers used progressive struggle, allowing students to come to the point of failure; teachers only showed the correct answer and explained why the students could not solve the problem. Unfortunately, failure in education has negative connotations. It can limit creativity and create a fixed mindset mentality, causing

someone to believe they do not have the proper genes to do math (Creely et al., 2021). However, Creely et al. also stated that failure could lead to positive reflections to improve the performance or task during a project, thus producing a positive struggle situation and fostering a growth mindset.

Theoretical Context

Kasprovich (2017) mentioned that understanding the experiences of nurses' who failed their certification exam would give greater insight to teachers and fellow nurses concerning this experience. Hwang et al. (2019) found that "holding a certain mindset about math performance may be particularly detrimental for students who are stereotyped as not being gifted in math" (p. 251). The suggestion was that a fixed mindset could lower one's ability to perform satisfactorily. Understanding how those of authority set expectations in a student's life may lead to greater expectations being set for students.

Vroom's (1964) expectancy theory regarding punishment and reward has been explored in education. Min et al. (2020) explained how inspiring students through punishment or rewards may help them to increase motivation. However, Domina et al. (2019) found that placing students in classes based on past performance tended to lock students into one path with little opportunity to get into a higher-ability track. Tracking students limits what teachers can do to motivate individuals, removing an opportunity for students to express their motivations and lowering their expectations. This study may allow middle school students to share their thoughts and feelings about the importance they place on math.

Problem Statement

The problem is that when students are presented with opportunities to improve their math performance, especially those struggling in math, they do not readily take advantage of them.

Schunk and DiBenedetto (2020) stated that students who feel competent in math will endeavor to perform activities to help them understand it better. They chose to be in places that would help them grow. Students whose expectations are not realized in their math performance begin to believe they will perform poorly at math and, therefore, expect to do poorly even when they can improve their scores, resulting in them not taking advantage of opportunities to increase performance. Research has quantified associations and feelings that lead to social avoidance and anxiety in later life (Sang et al., 2018). Also, Dimosthenous et al. (2020) admitted that home learning influences mindset throughout a child's life, establishing that parents can encourage a fixed mindset in their children regarding math. This may appear as a lack of motivation to the teacher. Lau et al. (2022) identified that the strongest predictor of math anxiety lies with the individual and may be attached to emotions and thought processes, which may need the assistance of an influential adult, concluding that teachers may have the most significant influence on the level of anxiety a student may encounter.

Purpose Statement

The purpose of this phenomenological study was to understand the thoughts and emotional experiences of middle school students in relation to their performance in math and their expectations regarding their abilities to take advantage of opportunities to improve their performance at the Spring Valley School district. At this stage in the research, challenges in math were defined as a fear of math that results in anxiety that can manifest as poor performance in math. Opportunities to improve math performance were defined as assignment corrections allowed by the teacher after extra help and reteaching in a more interactive environment that gives a higher score on an already completed assignment. The theory guiding this study is

Vroom's (1964) expectancy theory, which considers how people's motivation to perform increases with an expectation to do better and perceived importance to the performer.

Significance of the Study

This study may be significant because it gives an opportunity for students to describe their emotions concerning their perceived math expectations. The emotional aspects concerning expectancy may assist teachers in developing strategies to help students improve their student's math self-efficacy. By allowing the students to describe what they experience, this study may provide insight to school officials that would lead to strategies to influence and change perceptions about math.

Theoretical

The expectancy theory (Vroom, 1964) gave insight into how people perform tasks based on the belief that the task is important to the individual and how well they can expect to do on the task. Weber et al. (2020) declared that teachers expect students to want to perform their best on math assignments because teachers believe the information is essential and relevant to the student's success in later life; however, students do not have the same expectations for the work. Clark and Soutter (2022) presented a method that calls on teachers to create a safe environment where students can explore multiple ways of solving a problem without the stigma generally attached to failure, allowing for an atmosphere that encourages failure as a learning tool. This research will explore the difference in expectations between the two groups and the processes students use to determine the importance and set expectations for experiences.

Empirical

Orbach et al. (2019) stated that existing literature had acknowledged that math anxiety and performance issues exist among students, leading to fear and an expectation of failure, which

may lead to situational avoidance. This study may assist students in sharing their voices concerning the emotions they feel and what role authority figures in their lives can play through improved relationship interactions and feedback structure. The results of this study may also provide teachers with a basis to remodel student self-perception. Additionally, teachers who struggle with math anxiety may gain confidence to overcome this feeling and project a positive mindset to the students. Teachers outside of math classes will also apply the findings to their classrooms to improve overall student performance. Administrators will use the information to better influence behavior for more positive outcomes.

Practical

When educators understand middle school students' underlying thoughts and emotions concerning their math performance, they may be able to influence students through planning, empathy, and trust building (Berryman M, 2020). This study can be added to the research because it may help influence how teachers interact with their students during math lessons in real-time, gauging student interactions and making changes for individual students to reduce anxiety. Expectancy theory will guide this study in exploring the expectations of students and explaining why these students display an apparent lack of motivation. Vroom (1964) stated that people must trust those who promise specific outcomes. Exploring students' emotions may give insight into their expectations of these students.

Research Questions

The purpose of this phenomenological study was to understand the thoughts and emotional experiences of middle school students in relation to their performance in math and their expectations regarding their abilities to take advantage of opportunities to improve their performance. The following research questions will guide the study.

Central Research Question

How do middle school students describe their thoughts and emotional experiences in relation to their expected performance in math activities?

Frechette et al. (2020) described how to gain an understanding of a phenomenon while allowing for bracketing of the researcher's preconceived ideas concerning the phenomenon. Creswell and Poth (2018) described this as looking at the experiences of the phenomenon through the eyes of those who experience it. Thus, students' thoughts and emotional experiences may be brought to light, allowing the teacher to provide proper instructions to increase positive expectations. This question may lead to understanding the thoughts as to why students' expectations are as they are.

Sub-Question One

What strategies have middle school math teachers used that encourage students to participate in opportunities to improve their math performance?

Teachers are responsible for offering opportunities for students to improve and should employ effective strategies that encourage participation. Patall et al. (2019) showed that students' motivational levels could change daily due to their seeking of autonomy and agency, which may cause teachers to incorrectly assume a lack of motivation exists and attempt to modify the behavior wrongly. When teachers have misconceptions about why the students have certain expectations involving math, they may not possess the mindfulness to create changes in student behavior. Kondo (2022) expressed that enthusiasm through a culturally relevant atmosphere may lead to relationships that foster learning and participation. It is hoped that the differences between teacher beliefs and actual student emotions will be evident from this question.

Sub-Question Two

What differences exist between the expectations of students who have high self-efficacy regarding their math performance from those whose self-efficacy is lower?

This second sub-question will give insight into students' importance on their math performance. Is it essential in relation to student expectations concerning the rest of their school experience? Mónaco et al. (2019) explained that adolescent students could not separate school performance and social identity because of social norms, age, and gender influence. Psychological costs are significant to adolescents and can influence expectations, so understanding how students place importance on the activity may give teachers more meaningful insight (Madjar et al., 2016). Teachers may use this information to individualize their student approach based on their voiced experiences. This question aims to provide positive support to teachers to manipulate the experience to increase expectancy and optimal experience opportunities.

Definitions

1. *Adverse Childhood Experience (ACE)* – adverse childhood experiences are the experiences of neglect, emotional, physical, or mental abuse, or family irregularities during childhood (Radcliff et al., 2019).
2. *Common Core Standards* – Common core state standards aligned more teaching with college and career readiness (Porter et al., 2011).
3. *Expectancy Theory – behavior* results from conscious choices among alternatives whose purpose is to maximize pleasure and minimize pain. (Vroom, 1964).
4. *Rigor* – Rigor is an environment that promotes high levels of learning and expects high levels of learning (Armstrong, 2017).

5. *Self-Efficacy* – Self-efficacy involves self-assessment and self-regulated learning to give one a belief in his ability to accomplish a task (Panadero et al., 2017).
6. *Tracking*- Tracking places children in math classes based on performance and past activity scores (Domina et al., 2019).

Summary

Math anxiety is a real phenomenon in the math classroom that may lead to activity avoidance (Orbach et al., 2019). The problem was that when students were presented with opportunities to improve their math performance, especially those struggling in math, they did not readily take advantage of them. Teachers and students are disconnected about the reasons for these differences. This study may allow students to describe their experiences related to their performance in math. This study may also show how teachers can affect the confidence and self-efficacy of the students. Teachers will hopefully better understand why their students do not attempt correction beyond a perceived lack of motivation. This may create positive expectations for the success of their students.

CHAPTER TWO: LITERATURE REVIEW

Overview

Math performance has been a concern for the United States since the Soviet Union placed Sputnik into orbit (Permuth & Dalzell, 2013). Many factors influence the expectations students have for their math achievement. The theoretical framework for this study centers around Vroom's (1964) expectancy theory and its three parts: valence, instrumentality, and expectancy. The related literature will show the many areas that influence math performance, with many outside the teacher's control. These include the history of educational testing in America, the inequalities apparent in the application of standardized tests, the influence of the federal government, and the effect testing has on students' mindset toward math. The difference in math applications for people who use and teach math and the average person will be discussed to show how belief affects actions. The literature will explore the many factors contributing to why people have difficulty learning math and how the expectancy theory can explain why these contributors may affect math performance. Understanding the challenges that can reduce student expectancy will provide insight into what schools face in delivering sound math education.

Theoretical Framework

Vroom's (1964) expectancy theory provides a framework to help understand motivational factors regarding math performance for middle school students. People place value on items that they believe will be of benefit to them. Expectations can affect mindsets, but teachers can change their students' mindsets.

Vroom (1964) attempted to combine the current knowledge surrounding motivation, apply standard terms, and expand on other terms. Vroom surmised that behavior could be motivated when he stated, "Motivational concepts play a major role in most serious efforts to

analyze and explain behavior" (p. 5). Mulder (2020) explained that participants must perceive that the rewards offered are compatible with their goals and ideals. To this end, Vroom identified three key areas concerning his theory: valence, expectancy, and instrumentality.

Individuals determine their preferences among existing outcomes, known as valence (Vroom, 1964). If the individual believes the task will benefit them and they can do it, they are more likely to endeavor to accomplish it; in other words, how much does the person value the expected outcome? Osafo et al. (2021) explained that people should be motivated when they expect the outcome to have positive benefits; leaders who model such expectations can influence the same expectations in others.

Teachers can implement actions that can drive students to raise their expectations. When rewards are offered, the offering party must ensure the reward satisfies the needs of the person to whom it is provided. Lloyd and Mertens (2018) expressed the belief that social context may play a role in how a person sets their expectations concerning their work environment but should be able to be extrapolated to middle school classrooms as well. Future research should focus on the sources and processes students use to value or devalue an activity. It should also explore the cultural factors that drive expectancy and how they imbed the expectations into the individuals (Eccles & Wigfield, 2020).

Vroom (1964) described the expectancy component of the motivation formula as a belief that a particular outcome has the probability of coming about in each situation. Expectancy lies within the person experiencing it and differs from valence in that wanting the outcome is unrelated to its occurrence. Eccles and Wigfield (2020) developed an offshoot of Vrooms' expectancy theory to explore why women were not entering STEM fields of education, entitling this extension as situational expectancy-value theory, which explores expectancy as fluid

depending on the situation. Supatn and Puapradit (2019) showed that people could become more engaged by applying more effort if they believe the extra effort will result in the desired reward. Bellhäuser et al. (2019) stated that this variability could be significant because motivation levels will fluctuate between tasks, and individual students are dependent on what happened the day before. Therefore, the teacher may be able to influence future motivation.

Teachers can directly influence expectancy outcomes based on their point of view regarding students' intelligence, motivation, and diligence. They can be broken into target-based expectancies, which tend to be accurate, and category-based expectancies (stereotypes), which tend to be inaccurate, causing some students to follow these limitations because of teachers' influence over them at school (Trusz, 2017). Fyfe and Brown (2020) showed that teachers could influence student motivation through feedback. Positive feedback can affirm a student's perception of their ability. When teachers expect students to do well, it reflects in their teaching and the help provided to students. Fong and Kremer (2020) supported evidence showing that underachievement develops throughout a person's lifespan, which may begin in adolescence. This is because of social pressures and a growing lack of interest in school. Middle school students have been known to show enjoyment in math but, on a broader level, tend to get bored more frequently than other students; therefore, lessons should be constructed to provide enjoyment and alleviate boredom, but little research in the math domain has been conducted to determine the influence of teachers (Pekrun, 2017). Student engagement involves emotional engagement, which the teacher must facilitate. Students need to be steered away from boredom and into enjoyment (Havik & Westergård, 2020).

Instrumentality is the aspect of Vroom's (1964) expectancy theory that postulates that a person believes their work will be rewarded meaningfully. Prihadi et al. (2017) stated that this

concept is essential because the person exerting the effort must have confidence in their ability to obtain the reward. Individuals must also achieve satisfaction from the result and potential outcome (Graen, 1969). Without these components, expectations from the individual will be low.

For instrumentality to occur for students, the reward of success in math should outweigh the social risk students may take with their good performance. Students believe math is essential for their lives, but they disagree on what aspects they consider important. If students think they will not need a particular topic, they cannot always be expected to perform well in that area (Hannula et al., 2019). Parhiala et al. (2018) examined the role of emotions and expectancy in determining a student's motivation. They relate it to the cost analysis students use to determine their expectations for the subject and its importance. More recently, Camacho-Morles et al. (2021) discussed emotions related to the activity and how enjoyable it is versus outcome-related emotions based on anticipated outcome expectations.

Adolescents factor in the psychological cost associated with an activity, which could include risking social relationships, which are the cornerstone of thought for this age group (Madjar et al., 2016). Jiang et al. (2018) explored the negative aspects of cost evaluation for adolescents when it relates to math activities and found that most motivation analysis research has centered on the positive areas of competence beliefs and student academic outcomes. Still, these areas do not explain the avoidance tendencies of students concerning math activities. This study should allow students to inform teachers of the value of good performance in their eyes and if the work will provide a good return on investment. Dietrich et al. (2017) posited that there needs to be a greater understanding of what exists in adolescents' lives before applying expectancies, values, and costs in different situations.

Related Literature

This section will explain the government's involvement in the public school system in response to outside events and show the difficulties with learning math. Many factors influence math achievement; however, teachers take the brunt of the blame for a lack of achievement (Lauermann, 2014). The goal is to understand the adolescent mind, what influences emotional responses, and what can be learned.

History of Education and Testing in America

Vidal and Silva (2020) believed history should make one more aware of the struggles faced in modern times, giving insight into the disputes and tensions that exist today; therefore, the history of education in the United States is essential to understanding the national emphasis on math learning and growth of standardized math testing. The National Research Council (1989) discussed the idea that while math is no more important a subject than the others, many view it as an indicator of the overall state of education in America and see the potential for losing technical superiority in the world marketplace and playing a vital role in the success of the country.

Standards reform was intended to counteract historical disparities in the school system (Mclaughlin & Shepard, 1995). Thus, standardized testing became popular as a tool to measure student success but had many flaws related to inequalities that exist in society, confirming what was already known, that society is highly divided by socioeconomic status and race (Goyette, 2017). The more schools try to overcome inequality, the more questions arise about how to fix it and if the measuring device used is appropriately implemented and provides valuable results (von Hippel et al., 2018).

Colonial Education

Education in early America was intended to promote literacy and remove class structure (Urban et al., 2019); the new government required a well-educated population. Religious organizations believed education was essential to facilitate an understanding of the Bible, allowing people to self-govern according to Bible tenets. Taylor (2016) expressed that the founders had fears concerning other countries and a mistrust of government by the local communities and states. Each state had its ideas about how the government should be run. Longaker and NetLibrary (2007) stated that America had the fortune to review past experiments in government and apply those that worked, not being bound to any one set of ideas. 9

Urban et al. also stated that the colonies relied on newspapers to promote information for the masses, requiring the ability to read and reason about the information presented. Education bolstered the necessary skill of reading. Through education, the common man could keep the government together and operate properly through vigilance (Long & Ashford, 1976). Early founding fathers found it necessary to train citizens to express ideas and debate them without a falling out, referring to this ability as republican publicity (Longaker & NetLibrary, 2007). Testing was established to ensure the education system met the community's needs and admonished parents of children who did not meet expectations (Vinovskis, 2019).

Maier (1999) explained that colonial leaders held certain viewpoints about who "all men" (p. 873) should include, leaving some out of the equation or reducing their representation, thus beginning the inequalities inherent in education. Landholders were counted among all men as society placed high importance on agriculture and who could produce food for the community (Pole, 1958). Education was meant for the affluent and White person, excluding Black people,

Native Americans, people with low incomes, and women, allowing for at-home education only, extending the inequalities in education into today's educational state (Noltemeyer et al., 2012).

Vinovskis (2019) noted that education continued in the same traditions until after the Civil War. Vinovskis also stated that before the Civil War in the northern states, free African Americans attended segregated schools or learned at church or home. At the same time, in the South, slave owners did not want their slaves to be able to read and write, so after the Civil War, schools became segregated according to race. Anderson (1988) stated that post-Civil War states were hostile to the view that freed slaves deserved an education because the slaves were not landowners and had no importance to society, but freed slaves believed reading and writing was a fundamental right and fought hard to overcome the opposition by working with the political system. Donovan (2018) presented that the Episcopalian church provided education for these freed slaves to overcome the effects of the war. While this effort was a success, it was severely unfunded because of the belief of the church at that time that African Americans were not recognized as full members of the church (Lewis, 1996).

In addition to inequalities concerning race, the age of the child was another matter of grief for school systems, with northern schools, especially Massachusetts, concerned about what age children should start attending school and the use of public funds to pay for education (Kaestle & Vinovskis, 1980). This fundamental change, the conversion from private to public schools, began to take place because parents began relying on schools to instruct their children instead of teaching them at home (Vinovskis, 2019). Boston school leaders bragged about their schools' performance and operations based on participants' comments. Testing was instituted to prove the claims of the Boston schools concerning its performance, which initiated the change from oral exams to written exams; despite favorable comments, the exams provided evidence

that this claim was not valid. This would be the start of standardized testing in education in America (Urban et al., 2019).

Federal Involvement in The School System

Fischel (n.d.) discussed the change from one-room schools in rural areas to the formation of larger school districts in an attempt to overcome the loss of their citizens who were looking for better jobs and housing in larger urban areas. These districts were designed to attract families without children and provide an opportunity for high schools. After World War I, school districts grew, and local funding became more predominant. Thus, an effective means to measure success was needed. Many psychologists believed teacher effectiveness was not a good indicator of student performance, so they enlisted teachers to administer Intelligence exams as a moral obligation to society (Beauvais, 2017). Intelligence testing became the favorite method to measure a person's intelligence but failed to account for the fact that there are many forms of intelligence, and even though this testing does not determine race, social notions concerning the race-dominated scoring of exams (Shepard, 2016). Grodsky et al. (2008) told how the mean scores on standardized testing showed a disparity between students of color, Hispanics, and Whites and used this information to separate students by ability and to divide children by social caste and race.

In 1958, the Soviet Union challenged America's technological superiority by being the first country to place a satellite in orbit (Permuth & Dalzell, 2013). Wang (2008) presented that many Americans who believed that the atomic bomb, which was first perfected in the United States to win World War II, showed they had world superiority in technology had to acknowledge that another country, run by Communists, would gain a technological advantage and present a threat to the safety of the United States. Through claims of national security, the

government enforced a new security state, which caused a mild intellectual war restricting scientific freedom, the scientific community, and the propagation of knowledge (Daniels & Krige, 2018). The nation began viewing young scientific people as a national asset to protect and develop, and so it considered influencing education under the control of local entities through an infusion of money (Terzian, 2008). This effort resulted in the National Education and Defense Act (NEDA) of 1958 (Tröhler, 2016).

In 2001, Congress passed the No Child Left Behind Act (NCLB) to replace the Elementary and Secondary Education Act (ESEA) of 1965, which increased the federal government's power over education. The act aimed to reduce the achievement gap but relied too heavily on standardized testing (Heise, n.d.). William (2010) explained that while standardized exams were implemented to measure the return on investment for a community, the design of such exams caused issues with how the results were interpreted; those who interpreted did so without accounting for the intent the designer had in mind, that the results cannot be attributed to general intelligence only. The results were assumed to be affected only by teacher quality but were influenced by socioeconomic factors as well, demonstrating that a school's socioeconomic class can impact a child's score as much as family status in such areas as school environment, the quality of teachers in the classroom, class size, and the support of the community (Chen et al., 2021). Educators must account for various influences affecting math performance to overcome low math achievement. Often, math teachers are evaluated based solely on standardized testing scores. Boaler (2003) provided evidence that math educators are evaluated based on their students' test scores with little consideration of how these outside influences affect performance.

To shift the federal government's power and authority over the school systems back to the states, the Every Student Succeeds Act (ESSA) was signed into law in 2015. This new law

intended to return the oversight of schools back to the states while the federal government provided monetary support for the programs to reduce the achievement gap for disadvantaged students (Mathis & Trujillo, 2016). Heise (n.d.) commented on how states now had the authority to implement their own standards, causing many states to abandon the common core standards and develop their own. Math teachers who favored the common core standards because the standards foster critical thinking felt overpowered by conservative groups who wanted to cast off the federal standards and produce autonomous standards indicative of that state, requiring new teaching materials' affecting teacher and student morale and motivation (Deemer, 2004). Allen et al. (2018) contended that those who developed these standards did not culturally represent the state's population. Thus, the language in the standards was biased towards the minority, increasing the achievement gap minority students faced, so what was intended to bridge the cultural gap seems to have widened it even more. McCutchen et al. (2016) established that the gap can widen because of the mindsets established through standardized testing. Unfortunately, standardized testing fixes the mindsets of students and teachers, potentially locking them into a negative view of the student's ability to get better at math. Thus, testing can help improve achievement or cause it to worsen over time.

The Difficulties with Learning Math

Math is a language with all the nuances and principles of other languages. Math has its symbols and structure, much like different languages, which can be interpreted in various ways depending on the culture and societal context in which it is used. Math has its own register, much like other languages, making proper language talk in the classroom a necessary element of understanding math (Boaler, 2000). Bourdieu and Nice (1980) outlined that habitus is the established norms a culture uses to produce understanding and that these norms are applied to

each interaction in the community; therefore, when the person enters a foreign community, such as a math class, the norms they know may cause confusion when communicating. An unusual example that shows a significant contrast between language styles would be the struggle deaf students have with solving word problems (Grabauskienė & Zabulionytė, 2018). Math language is so essential to understanding math that Purpura et al. (2020) investigated the introduction of math language in the home for preschoolers. Using math language at home is a strong indicator of being able to use it in school. Their study included measuring non-math literacy in the home as a comparison, showing similarity to using a foreign language at home and having children be fluent in it later. Chinn (2020) described the dual vocabulary in math with examples such as borrow in subtraction, borrow in lending, acute for an angle type, and acute as pain. The toughest word is differences, the answer to a subtraction problem, and difference, where something is not the same. Chinn described in detail the inconsistencies in math language that confuse many learners. Boaler (2000) said that much attention is being given to the use of language in teaching math, especially in the types of questions asked on exams and classroom talk, and attempts to make math work in real-life situations. Mutlu (2019) mentioned that math's abstract nature can make learning difficult, and the hierarchical structure must be understood to work math problems properly. Even now, new evidence has been shown that teaching math and the associated language required is necessary to increase understanding and knowledge in every math classroom (Espinas & Fuchs, 2022). Planas (2018) described the language of math as sophisticated and complex, using symbols, numbers, and words unique to the language, like a foreign language with its idiosyncrasies.

Another difficulty in learning math is the varying interpretations teachers have of concepts. Chinn (2020) discussed the term mastery, its meaning, and how it is demonstrated.

Usually, this is confirmed by showing the steps to complete a larger task. Also, Chinn stated the curriculum only calls for most students to show mastery. Boden et al. (2020) investigated teacher talk because it is deeply embedded in the classroom and is guided by several classroom factors; therefore, much of it is anticipated by the teacher but relies on the current classroom environment to come alive. Also, teachers are the authority and subject matter experts, so their talk guides student talk.

When presented with math problems and topics, many students cannot relate to them because they have no connection to the real world. Without this connection, the work may become dull and unexciting because of a lack of interest and misconceptions that may lead to a perceived disconnect between teacher and student (Hernandez-Martinez & Vos, 2018). Teachers are encouraged to present math using proper terms with the hope of familiarizing students with the use of math terms; however, often, this appears dull to students, so the teacher must become creative to instill math literacy in their students (Irvine, 2019). However, teachers may feel uncomfortable about their math skills and how well they can teach math. Hajovsky et al. (2020) explained how complex teacher and student interactions are, which are further exasperated by a teacher's low assessment of their abilities (low self-efficacy). Because math skills build on each other, with basic skills usually taught directly through instruction, higher-order skills are presented more abstractly. Teachers may become uncomfortable and project this upon their students, lowering their students' achievement in math. Bandura (1993) believed that self-perception of abilities can change based on past performance and current beliefs of skill level. A person blends past performance and current thinking to form a concept of self-efficacy in math, which is how a student rates their math ability.

Math explores the world's beauty and helps people flourish in their lives through order, simplicity, and satisfaction (Su, 2017). Students should experience the joy of solving a puzzle or discovering a concept that may have baffled others. Su emphasized that mathematicians should guide students to look for elegance and beauty in math, with each person identifying their definition of beauty. Glattfelder (2019) described knowledge as the book of nature, with its truth revealed through the symmetry and sensibleness of math; therefore, by understanding how things happen, man learns why things happen, and order comes out of chaos. Beauty and biology have been related mathematically to the irrational number of Phi (ϕ,) which is a ratio that explains the proportions of beauty, such as the distance between the eyes and the distance from the mouth as well as the design of the heart, its working rhythm, all follow this mathematical ratio (Iosa et al., 2018). Ma (2019) discussed the infinity principle—breaking complicated problems into smaller pieces and analyzing them—and how calculus helps to define it. Kessler (2018) stated that he became a mathematician because of the beauty and truth found in math.

Even uncertainty is described through the language of math; the placement of an object in an atom can be predicted to be in a particular area (Kuzmichev & Kuzmichev, 2020).

> What is math should be a philosophical question, a project left for philosophers to create the concepts, the view on reality, and the possibilities that exist, definitions are then developed to use these visions to solve problems which is where the difficulty lies, the reasoning of the concept with the solution. (Otte & Barros, 2015, p. 756)

Math and the Family

Lin et al. (2019) researched how family functioning and cohesion influence math skills and abilities. This family cohesion implies that parents can positively or a negatively affect their children's math ability through either underestimating or overestimating their adolescent's

abilities in math; because of the apparent authority, the child will adhere to this projected image. Parents often struggle with working with their children at home with math assignments because they are not familiar with the process; however, using technical options such as text messages improves the work accomplished (Santana et al., 2019). Xie et al. (2022) related that a parent's fixed mindset can be transferred to their children. This fixed mindset can cause a parent to believe that intelligence is an inborn trait, that you are either born with it or not, causing some to avoid failure and thereby limiting growth in their children. Xie et al. also explained that families tend to believe that boys are more intelligent when it comes to math than girls, even though there has been no evidence to support this claim.

The family can create an environment for math using everyday activities in the home; such things as cooking, games, and using numbers can profoundly impact achievement in the early grades, thus encouraging math speaking and math thinking (Son & Hur, 2020). Silinskas and Kikas (2017) demonstrated that when parents attempt to control the doing of homework instead of supporting their children while they do the work, it can reduce performance due to a lack of intrinsic motivation. Dossi et al. (2021) described how families may guide male children into math and dissuade their female children from the same. Some families may be gender biased and create a general feeling in their families. Parents who are more authoritarian in their parenting style may also increase their children's math anxiety (Macmull & Ashkenazi, 2019).

Gender Differences

The most significant influence families have on math skills involves gender. Eccles et al. (1990) showed that even though parents could not identify whether their beliefs about math skills were based on preconceived perceptions or an actual activity, parents did hold beliefs about their children's math abilities based on gender. Kersey et al. (2018) determined that family and

teacher influence, stereotypes such as girls cannot do the math, and differing exposure based on these stereotypes provides a significant roadblock to deciding if the ability is different based on gender.

Families can set the expected importance of math for their female children, causing them to enter occupations other than STEM, creating a perception that women do not belong in these fields because of family expectations for females (Lee et al., 2020). Smith and Farkas (2023) studied the bias present in gender-specific classes to see if the same gender communicated the same stereotypes helped by others. For females, there was a significant effect on female math ability.

Lopez-Inesta et al. (2020) applied Vroom's (1964) expectancy theory to family influence on family expectations concerning gender. If a child was told by their family what their future expected role was based on being a boy or a girl, expectations were set, which was hard for the individual to overcome. Parent expectations play an essential role in their children's expectations for themselves; thus, when parents overtly or subtly express gender bias, it affects the child's ability (Kremer et al., 2019).

Cultural Influences

Abdulrahim and Orosco (2020) explored how the methods called for to close the achievement gap among culturally diverse students still relied on traditional approaches developed in the country trying to make the changes. They also stated the changes are political and may not benefit learning. In exploring the preparation of new teachers for the math classroom, Mark and Id-Deen (2020) noticed that new teachers brought the idea that culture plays little difference in math. Their training severely lacked attention to this matter, dealing with standard pedagogy with little regard for how culture makes a difference for many students. This

is important because of the change in the cultural makeup of many secondary schools. Another concern is that the achievement gap between the various socioeconomic classes may be growing because of the inequality in standardized testing, which separates students based on test scores, a practice called tracking (Domina et al., 2019).

Xuan et al. (2019) explained that a higher socioeconomic class brings about a more positive attitude and higher expectations, while those who may not be as high on the economic scale often rely on outside influences, such as teachers, to raise their expectations. Xu et al. (2019) linked demographic values to homework and related work expectations. Demographics play a large part in the expectations of middle school students.

Ability grouping often places students in low-ability classes based on exams, which frequently follow social class and race lines and directly influence the ability, beliefs, and perception projection teachers place on these students, causing the students to lose motivation because they are trapped in this ability group without the opportunity to get into higher performing groups (Oakes, 1990). In recent years, the trend is that teachers of higher-ability classes have higher expectations and are more student-centered. In comparison, teachers of the lower ability classes provide teacher-centered instruction and have low expectations for these students, thus trapping students in this cycle (Mayer et al., 2018). Ngo and Velasquez (2020) discussed tracking and the limited mobility it allows for students to move into a higher track after proving competence, referring to this as a math trap, which is a situation that is hard for students to escape; using the criteria that a trap existed when the highest level of math taken in college was lower than the level of math taken in high school.

Parental involvement in school is necessary for children to succeed in their educational achievements. Tan et al. (2019) described the different socio-economic levels that influence how

parents get involved in the school system, but it comes down to overt or subtle ways of participation. Subtly, the parents may just talk about the importance of education and have high expectations for their children in school. More direct methods may include supervising homework, monitoring learning, providing learning opportunities at home, engaging with teachers, and monitoring their child's grades. Interestingly, parental involvement in math may hurt performance because parents feel they lack the skills to help their children and work to ensure the homework is complete instead of correct (Jay et al., 2018).

Adverse Childhood Experiences

Boullier and Blair (2018) defined an adverse childhood experience (ACE) "as potentially traumatic events that can have negative lasting effects on health and well-being. This includes maltreatment and abuse as well as living in an environment that is harmful to their development" (p. 132). Honsinger and Brown (2018) reported that trauma is prevalent in the United States, with over half a million children affected by neglect and all manner of abuse. Teachers should be trained in the effects of this trauma and its impact on the expectations of the students.

Students who are exposed to stress react in different ways because they are individuals and have varying responses, and the type of stress influences behaviors that are either internalized or out in the open; an example is violence in the home, which can lead the adolescent to violence in school (Kuhlman et al., 2018). Without proper interventions, these students may face reduced resiliency that severely impacts their expectations for success (Watters et al., 2021).

There is a direct correlation between ACEs and improper behavior in school children, which often leads to teachers misinterpreting this as a lack of control on the child's part.

However, there may be underlying mental or physical issues (van der Feltz-Cornelis et al., 2019). The following section will explore the emotional and physical results of ACEs.

Emotional Issues

Physical behaviors can mask underlying emotional issues in children exposed to ACEs, but adults' assumptions can often mitigate an appropriate response to the emotional need. Kumar and Multani (2020) described a young girl who ate to cover her tears, but the eating was an emotional response manifested physically, with the girl commenting that there were more tears than food. The behavior of eating helped her to overcome deeper feelings and emotions and was not an indication of her inability to control her appetite. Daines et al. (2021) demonstrated that human development has connected events throughout a person's life. These include separation from family members, neglect, abuse, violence, and a lack of resources, which may manifest later as behavior or medical issues.

Additionally, Danese (2020) described cognitive and bonding issues that may result from ACEs that need to be addressed by adult influencers. They showed that a lack of bonding with a caregiver, which is usually the case where the abuse involves affection and nurturing, may lead to attachment issues, causing inappropriate behavior and feelings of loneliness and isolation, which teachers may misinterpret as behavior and motivation issues. Williams et al. (2019) stated that traumatized children become fearful of adults they should trust, which can complicate expectations because of a lack of trust.

Negative mood regulation can lead to lower expectations in students because of a feeling that circumstances lie outside the control of the individual. Kaur and Mearns (2021) described this as Alexithymia, a difficulty in recognizing a person's own emotions. With low self-control, expectations typically follow the same path. Children exposed to ACEs may develop coping

skills and other survival mechanisms that help them maintain some semblance of control in their lives. Still, to overcome the exposure to childhood trauma and prevent maladaptive behaviors from passing on to the children of the students, intervention is needed early and aggressively (Zeynel & Uzer, 2020).

Toof et al. (2020) demonstrated that attachment to a caregiver in early life can influence a child well into adulthood; however, in trauma-exposed children, this attachment is breached, and the child may display symptoms from this in school. Because expectancy implies an expectation in the person providing the reward, many children may hold lower expectations because of a lack of trust. Lies Van Assche et al. (2020) explained that when faced with a threat, most people attach themselves to an important person in their life, which is a normal and healthy response. They expect the past to reflect their faith in the individual, but when no attachment exists, the expectation is one of regret and lack of trust.

Physical Issues

As far back as 2016, trauma has been so pervasive in children that many schools are implementing programs to make teachers aware of the situation and the need to minimize more trauma based on outdated teaching methods (Overstreet & Chafouleas, 2016). According to Jonson-Reid and Wideman (2017), over half of the children have experienced ACEs, with 200 in 1,000 being neglected and 400 in 1,000 children being assaulted in their homes. Finkelhor et al. (2022) mentioned an increase in childhood health conditions, with over 80% of adults in the United States saying childhood concerns are worsening. Rasmussen et al. (2020) went as far as to show that “Youth who experience adverse childhood experiences are from two to 44 times more likely to “get into fights, perpetrate dating violence, carry a weapon, bully, harm themselves, have suicidal ideation or attempt suicide” (p. 7).

Iacona and Johnson (2018) described how everyday stress promotes an increase in cortisol, which the body uses to promote a response to protect the individual, but the body signals the adrenal glands to stop producing cortisol when the stress returns to a normal level; however, in abuse victims, the stress never leaves. Sroykham and Wongsawat (2019) showed that continuous elevations in cortisol levels can damage the hippocampus and cause the hypothalamic-pituitary-adrenal axis (HPA), the amygdala, and the frontal lobe to atrophy, which can cause self-control and behavior issues. Roberts (2015) went as far as to connect these brain issues with heart rate, digestion, and other body functions that appear physical but are more related to emotions.

Huffman et al. (2023) described how the brain, specifically volume, decreases in the hippocampus, amygdala, and other parts of the brain. Post-traumatic stress may manifest because of these volume decreases. Adverse childhood experiences during adolescence affect the development of more grey matter, which increases the decision-making ability and self-regulation adults experience upon maturity. Children exposed to ACEs were less engaged than children who had not experienced ACEs because of health issues and increased absenteeism. These affect math performance and need to be addressed in ongoing discussions with professionals (Crouch et al., 2019).

Math Anxiety

Cipora et al. (n.d.) attempted to define math anxiety and show its prevalence in the United States. The problem with defining math anxiety is that many of the definitions are ambiguous and can be interpreted to yield a wide variety of results. As for prevalence, the same problem arises, usually centered around how math anxiety affects the individual's math performance, with reports showing anywhere from 2% to 68%. There is no doubt that math

anxiety is a real issue in education. Demedts et al. (2022) described math anxiety as a fear of performing math that can affect math learning, especially during adolescence.

Important adults in a child's life can negatively affect math performance (Szczygieł, 2020). Schaeffer et al. (2018) concluded that many elementary teachers experience a high level of math anxiety, which may transfer to the students in their classes. They also claimed that the primary caregiver, usually the mother, also transfers their math anxiety to their younger children.

Understanding Math Anxiety

Demedts et al. (2022) talked about two types of math anxiety, one being trait anxiety, which is a general fear of doing math, and the other being state anxiety, which is more related to a specific problem presented in a math setting. This is a situational anxiety that may relieve itself later. Additionally, adolescents who experience high academic stress, which is associated with math anxiety, are extremely likely to experience severe depression that can cloud judgment (Xu et al., 2019). Sister Mary Fides Gough (1954) gave an insight into what may cause some math anxiety. Math builds on itself every unit and year, and each step must be mastered to succeed in the next step; however, because of illnesses that strike many students in the early years, a good portion of the instruction could be missed. Santibañez and Guarino (2021) reviewed absenteeism during the COVID-19 school shutdown and showed a negative correlation between performance and absence. Math depends on order because it builds on itself. This order was interrupted.

Measuring Math Anxiety

A method to reliably measure math anxiety was needed because of its relative importance to research in this area; thus, in 1972, the Math Anxiety Rating Scale (MARS) was developed (Richardson & Suinn, 1972). Since then, many other assessment tools have been designed to measure math anxiety, shortening the assessment tool to make it more user-friendly but still

obtain accurate results, relying on self-reporting from the individual participant, and measuring the level of the anxiety (Cipora et al., 2019). Along with self-reporting assessments, physical exams have been performed to determine what happens physiologically to an individual who experiences math anxiety. Ramirez et al. (2018) experimented with signals sent to the dorsolateral prefrontal cortex because this is where the main brain functions occur relating to math anxiety. The conclusion is that the brain function was associated with the level of anxiety the participant claimed to have and not to ability. These tools and studies showed that math anxiety exists but did not delve into why the participant experienced the anxiety to begin with.

Ölmez and Cohen (2018) measured math anxiety using a method that helped identify math anxiety levels in middle school students, showing those with low and high math anxiety. Their recommendation for future study would be to study the effects in other populations; therefore, looking at this phenomenon in a rural classroom may help generalize the data. They also stated that this data would be valuable to help teachers design classrooms with this knowledge of individual students and their needs.

Maloney and Retanal (2020) measured cognition using a Likert scale and cognitive reflection using a cognitive reflection activity. They determined those individuals who exhibit a high level of math anxiety experience less enjoyment when involved in demanding cognitive activities and spend less time thinking about these activities, desiring to complete the tasks quickly so that they could move on to easier work, diminishing creativity. Kleibeuker et al. (2016) showed creativity to be linked to cognition in two ways: divergent thinking, which allows an individual to produce novel ideas and solutions, and insight. Creativity is rooted in executive functions and can significantly influence mood state. These mood shifts are essential to understanding the creativity an individual is engaged in at the time (Khalil et al., 2019).

Math Anxiety and the Brain

Klados et al. (2019) concluded that math anxiety does not affect the retrieval of basic information from long-term memory but significantly effects working memory and the retrieval of more complex computational information. The lack of the ability to retrieve this new information greatly enhances math anxiety. Working memory is important because this is where the brain stores information and is manipulated; this is only a temporary storage place in the brain, according to Passolunghi et al. (2018). They posit that math anxiety can cause a longer response time to solving math problems, which may exceed the time limit that the working memory can store at any given time.

Justicia-Galiano et al. (2017) explored the idea of trait anxiety leading to math anxiety; in other words, a leaning towards anxiety to life's complications may predispose some to experience math anxiety, concluding that working memory can be used to counteract math anxiety when the teacher implements lessons to do so. When the material is stored correctly in the brain, math anxiety decreases. Middle school teachers can build confidence in students through challenging projects and assignments but may jump in to help too soon without giving the students a chance to struggle through the problem and develop their problem-solving skills; in this case, patience is a virtue (Beesley et al., 2018). In other research, Kleibeuker et al. (2016) emphasized the importance of training the adolescent mind because of the flexibility in the brain and the connections being developed.

Bandura et al. (1999) discussed the reciprocity associated with stressors and self-efficacy, stating that low assessment of abilities may lead to stress, while high-stress situations could cause one to reduce their belief in their ability to handle the situation. Ahmed et al. (2012) backed this finding using a three-wave longitudinal study, showing a strong reciprocal

relationship between math anxiety and self-efficacy. The common consensus was that high self-efficacy would be a positive influence on stressors and help regulate brain chemical output that suppresses the stress; however, recent literature has shown this not always to be accurate; there are instances in which High self-efficacy has a deleterious effect, because of the covariates that can also play a part (Schönfeld et al., 2017). Teachers and significant adults also contribute to increased math anxiety in students; teachers may spread myths related to math and how one has to be born with the ability to do math, displaying a less than positive mindset towards math ability. At the same time, parents can instill attitudes towards math based on their personal experience related to math (Luttenberger et al., 2018).

Adolescence and Decision Making

Adolescence is a highly confusing time for humans as they progress towards maturity. Puberty occurs during the early adolescent phase, but not at the same time or speed for everyone, leading to problems in behaviors, emotions, cognition, and social identity (Lerner & Steinberg, 2004). Fear acquisition is a natural phenomenon that occurs during puberty and is related to the stage of puberty more than the age of the adolescent. Increased amygdala activity may be the prime driving force for this response. Adolescents are more aware of fear related to harmful situations but do not display a safe reaction to increased safety. The most significant change for this time of life is the leaving of parental interactions and the drift towards peer interactions, often spending more time with peers than parents, becoming involved with negative interactions, which can impact decision-making (Purpura et al., 2020). An especially tough time for adolescents was during the COVID-19 pandemic that led to isolation and the increased stress brought about by isolation, leading to decreased physical activity (Rawat et al., 2021). May and Witherspoon (2019) showed that parental education beliefs and behaviors can influence a young

person's educational expectations. They also revealed that based on expectancy-value theory, feedback concerning these expectations occurs through academic achievement. Yeager et al. (2021) declared stress avoidance is not beneficial for the adolescent mind. The change from adolescence to adulthood is very stressful, but it is necessary for healthy growth into adulthood. Academic achievement, in turn, can predict if the adolescent develops high or low expectations. So, a battle may emerge concerning parental approval and peer acceptance.

Adolescence is a time of poor emotional control. Still, because the maturation rate varies widely, some can better temper their reactivity to stressful setbacks and challenges. Researchers may attempt to identify links between stressors and anger to better help young people understand and control maladaptive behaviors (Modecki et al., 2018). To be successful, those employing the techniques of guiding adolescents need to understand the normal development of regulation throughout the development of teenagers because ages 12 to 15 show a reduction in problem-solving skills and an increase in distractions and forgetting abilities.

Many studies have addressed emotional responses to daily stressors rather than emotional reactivity to the stress. How the individual's emotions change because of the input; therefore, there is a need to unravel the relations between maladaptive behavior and emotional reactivity (Uink et al., 2018). To reinforce this finding, Chiang et al. (2023) discovered that continual parental conflicts increased negative emotional reactivity, which could lead to poor cognitive processing and an increase in assertive behavior. M. Wang et al. (2021) also mentioned the need to collect data beyond self-reporting, potentially using teachers and school data. In addition, M. Wang et al. (2021) described how adolescents may attribute their failure due to these stressors to a lack of intelligence instead of effort. If they approach the situation as a lack of effort, then many will attempt to do better and improve their abilities. If young people believe intelligence

causes them to perform poorly, they will not try to improve because they expect no effort to produce a better result.

Even when students understand the value of a subject such as math, for an adolescent, there are often negative consequences of doing a task that can take away time from other activities. These students perform a type of cost analysis (Jiang et al., 2018). The most significant consideration is that of their peers, with this cost being the critical variable in math performance for middle school students. Students value interactions with their friends more than applying the time to engage in math. Simpson and Che (2016) conducted a phenomenological exploration of male and female students in same-sex math classes and asked the students' feelings about the class; the main themes that developed centered around relationships, who was in the class, and how each person could interact with the others; interestingly there was no mention on how it helped their math ability. To go along with this, Lan (2023) reinforced the finding that adolescents seek autonomy by looking to their peers for social approval and role models. Wang et al. (2021) addressed motivation using the expectancy value theory and certain motivational beliefs: that the individual is good at math; math is useful, interesting, and important to the individual student; and math is worth the effort.

Adolescents experience an increase in metacognition and self-regulation during this developmental time. They can perform abstract reasoning, which is a significant component of math. Wang et al. (2021) found a hopeful message for math teachers working with adolescents. Adolescents need self-control to remain engaged and motivated. A creative teacher can boost math engagement, thus eliminating boring lessons using technology and other options such as project-based learning or group discussions. This allows the adolescent to explore the material in their own way, which is the goal.

Because of the plasticity in a young person's brain, their way of thinking may change from day to day, causing adults to question the young person's ability to make decisions, leaving these adults to judge these young children based on their peer interactions, which can have a deleterious effect on the adolescent and cause withdrawal (Foulkes & Blakemore, 2018). This is a perfect age to help instill a growth mindset. Zhang et al. (2022) established that there is not a clear link between grit and a growth mindset because there may be other factors outside of these that can present problems during the formative years of a human; most importantly, during adolescence, stress can cause self-esteem and school engagement to decrease. As previously mentioned, students who believe they lack the ability to do math need to change from a fixed mindset to a growth mindset (Wang et al., 2021). With a growth mindset, students believe they will succeed if they put in a better effort. To change this mindset, role models, teachers, and parents can help students frame failure as an opportunity to learn. This would be a great example of future research that will help understand how adolescents process their performance in math.

A struggle for teachers is to answer the question of when will I use this in my life, often asked by adolescents who want to know the importance of this subject for their situation. And while this seems to the teacher as a challenge to their authority, it is merely a question of importance for the student. Thus, the teacher must attempt to explain the importance of math to their students, who may not see it as a benefit in their situation, on an individual basis (Matthews, 2018). Because social standing is important to this age group, being cool is more important than learning at times, which also can result in a false assumption that the student lacks motivation, requiring the teacher to understand this age group and design lessons and classes with this aspect in mind; stretching the emotional intelligence of educators to explore all avenues of motivational theory (North et al., 2018). Teachers need to adopt an approach that

nurtures student engagement because students' energy and motivational levels fluctuate daily, which is normal and leads to the establishment of agency and autonomy for the teenager (Patall et al., 2019).

Challenges for Educators

A hidden aspect of the curriculum drives education, often leaving schools at the mercy of politicians and outside influencers and placing a burden on the school staff to interpret the expectations and deliver the intended message to the students (Cotton et al., 2013). Many school districts experience tremendous pressure from parents and teachers to provide a textbook for students without realizing the total extent of the curriculum, which goes beyond the textbook. The Gates Foundation conducted a three-year study to evaluate classroom textbooks, concluding that the chosen curriculum has little effect on student learning; the more critical factor is whether the teacher is trained to use the curriculum to gain maximum learning (Barnum, 2019). Barakat et al. (n.d.) reiterated the importance of teachers, especially regarding technological advances and use in the classroom. They stated that no matter how good the textbook can be or how the curriculum aligns with the current pedagogy and standards, the teacher is still the limiting factor in how well the lesson is received and understood. To improve teachers, schools must include intensive training for educators to apply updated methods in the classroom. Troyer (2019) observed the use of designed text to increase literacy and discovered that teachers who used the curriculum verbatim, without extending the vocabulary and descriptions of key topics, had lower reading gains when compared to teachers who had the practical knowledge to extend the material, making it more appropriate for the students to understand. The challenge presented to educators, usually by the school district itself, is that the curriculum is expected to be followed

with fidelity because these districts have spent money to purchase the materials and must show their constituents how the expenditure is worthwhile and cost-effective.

Teacher quality must be at the forefront of any efforts to increase learning in the math classroom. Class size has been a popular notion among the community to improve the performance of math students; fewer students in a class would allow the teacher to focus on a more compact area of need to influence more students. Evidence of the effects of such a program in California showed little gain initially because to reduce class size, less experienced and more incompletely certified teachers had to be hired to fill the gap, lowering the quality of the math experience (Jepsen & Rivkin, 2009). However, in more recent times, after the program had been in place for a while, the negatives from the teachers had little effect, and the school system experienced gains in math scores (Mathis, 2017). Kedagni et al. (2021) explained that reduced class size appears to be the least cost-effective method to increase math ability. Still, a causal effect is hard to determine because the locations and affluence of the school play a significant part in the research: a small private school can afford to have smaller classrooms. As previously mentioned, most school districts require strict adherence to the curriculum delivery and content. Chimbi and Jita (2021) demonstrated that smaller class sizes lead to curriculum fidelity, so class sizes still influence how teachers teach the class and how well students learn the subject. Related to this, Ekmekci and Serrano (2022) solidified the call for teachers with a solid knowledge of math practices to help students conceptualize the math process. For in-service teachers, they stressed providing opportunities for teachers to build content knowledge and focus on meaningful math applications.

Educational equity is another challenge that schools may face that influences math performance and may lead to motivational differences in students. Ideally, education is supposed

to level the playing field and give all people an equal opportunity for success. Still, schools in disadvantaged areas face challenges that reduce equity, such as teacher quality and retention (Burroughs et al., 2019). Moskowitz (2022) discussed how White voters overturned a vote to build a Black elementary school in an all-Black neighborhood. Equity does not always come down to race issues, but it can. The guiding premises for equality centered around integration and community control. Moskowitz also showed that parents and the community must get involved to empower underrepresented people to make their concerns known, ensuring their children are included in the school's policies.

Educational equity also extends to the cultural makeup of the students and teachers. One area that has been researched and implemented in some schools is culturally relevant education (CRE), which integrates various cultures into the educational landscape, expanding the discussion beyond the subject matter, which presents the challenge that some schools have teachers who are not from the same culture of the students, severely limiting the intended result (Jagers et al., 2019). Campbell (2021) delved into the changes implemented in Canada because of past indiscretions with minority people. These changes included a curriculum that enabled all cultures to have a rich learning experience based on a broad spectrum of experiences.

Xenofontos (2019) described the need for schools to include teachers as effective evaluators of new programs and to be change agents to drive progress in the right direction; the best way to accomplish this is through appropriate professional development. School-based Professional Learning Communities (PLC) are an effective form of professional development as teachers can work together to share ideas and strategies and provide an encouraging environment for growth for teachers; however, this activity takes time from the classroom and must be supported by the administration through scheduling of such things as common preparation times

and substitutes for a full day or half-day workshops (Chauraya & Brodie, 2018). Tahir et al. (2022) stated that instilling a learning culture begins with administrators providing time for quality professional learning communities. Professional development creates teachers who are more satisfied in their work and thus provide better instruction (Sancar et al., 2021). Birenbaum and Nasser-Abu Alhija (2020) stated teachers can use professional development to develop a curiosity about how math can be taught, with this curiosity spurring discussions that can increase the curiosity and motivation of the students.

Montrieux et al. (2017) declared teachers are the driving force in the successful 21st-century classroom but must overcome challenges and educational programs designed by those outside of education. While there appears to be an increase in student achievement in the early grades when there is frequent standardized testing, most likely because it exposes the students to the testing format on a more frequent basis and increases the amount of time spent on math, this effect wears off by the third grade (Im et al., 2020). The National Assessment of Education Progress (NAEP) showed that the average elementary school student receives between five and seven hours of math instruction per week, down from 65% in 2005; therefore, the challenge for teachers is to increase scores with less time spent in the classroom. An example of this challenge for middle school teachers is that the average weekly exposure to math was between 3 and 4.9 hours in that same period (The Nation's Report Card, n.d.). Samuel and Warner (2021) recommended that teachers investigate their students' math histories and provide interventions to undo these negative experiences. This is an excellent thought and should be applied, but time is limited, thus new ideas need to be prioritized to make learning better. Teachers have accepted the challenge of changing their teaching to benefit children; however, these changes take time.

In addition to time constraints, elementary teachers feel less confident teaching math because of their elevated anxiety towards math. Artemenko et al. (2021) intimated that preservice elementary school teachers may have higher math anxiety levels than teachers going into other fields. In addition to this finding, Schaeffer et al. (2021) determined that since most elementary teachers are female, they may display their own gender bias about math anxiety. So, teachers may impede math learning. In their research to determine the math anxiety levels of elementary teachers after five years, Gresham (2018) discovered that many teachers had requested a move to lower elementary grades to relieve their anxiety and reach a more comfortable level of math; only those teachers who actively sought to better their math skills reduced their anxiety. Also, secondary math teachers, often considered to be math experts because of more specific math training, can feel math anxiety. Uddin (2022) explored the lack of training to teach math in the preparation of elementary teachers. Their finding was that the mentor teachers did not require their student teachers to teach math, mostly because of their own math anxiety. This feeling of math anxiety in teachers has been shown to increase the math anxiety of elementary students. It does carry over into middle school, where math anxiety may grow even more prevalent.

Teachers must foster a learning environment that makes it safe for students to fail. Soncini et al. (2021) mentioned an error is when the results of a student's actions do not meet the student's or teacher's expectations. This is the critical learning point; how the situation is handled can lead to the student having positive or negative feelings towards failure. Socini went on to say that the role of the teacher is to foster an environment that allows for an analysis of what happened, provide effective feedback, and accomplish the goal set before the student. Teachers need to learn and practice mindfulness. Horesh and Gordon (2018) explained that

mindfulness promotes curiosity and removes a judgmental approach to students. Even in something as simplistic as life skills education, the difference in thinking between stakeholders varies significantly, so stakeholders may not understand the reasoning of adolescents who are not small adults. They think differently (Shek et al., 2020).

Understanding culture is necessary for successful learning to happen in the math classroom. An example this author has seen is describing a goal. Depending on the cultural makeup of the student, this can apply to American football or soccer. Mark and Id-Deen (2020) showed teachers may have limited ability to enact a lesson that applies culturally relevant pedagogy, causing the teacher to come up against roadblocks such as cultural diversity, the inability for the teacher to see achievement differences in groups, and theory-to-application gaps. Related to this, emotional intelligence could be a group construct that enhances learning in the classroom. D'Amico and Geraci (2023) explored meta-emotional intelligence by combining measurements from different methods of emotional intelligence data. The important takeaway from their research is the insight teachers can gain that would promote awareness wrong estimation of adolescent abilities and guide them to more positive attitudes.

St-Amand et al. (2023) discovered humor in the classroom can increase a sense of belonging and increase school engagement and emotional well-being. The use of humor may need to be planned and inserted into a lesson, but teachers can look for spontaneous moments, even allowing students to participate. An important consideration is that humor must never be degrading, should be all-inclusive, and can include more than a joke.

Emotional intelligence and humor are important aspects affecting the emotional makeup of a classroom. Pierson et al. (2023) explained that emotional interaction in a classroom should guide the teacher in presenting the day's lesson. This might mean adapting the lesson depending

on each class. Emotional intelligence is the understanding of those with whom one interacts. Adjusting for differing emotions requires a sense of understanding of students beyond physical attributes. Teacher–student relationships that are positive and can give the students one adult who cares about them can reduce classroom behaviors and teacher stress (Evans et al., 2019).

Sintema (2020) conducted a qualitative study to determine the effects of the pandemic and lockdown on STEM education using teacher feedback from interviews. While this information is essential and provides insight into how teachers will change their preparation for lessons, little thought is given to what effect the shutdown will have on student mental health. Khirwadkar et al. (2020) imagined the dynamics of the new teaching environment and the community because of the reduced time teachers and students are together to explore the more abstract areas of math.

Increased screen time may increase anxiety, depression, and stress. Malheiros et al. (2021) postulated that time alone at home in self-isolation meant more screen time for school children, except for those with significant parental influence. Positive parental influence led to reading or exercise, which decreased the stress level of these children. When schools started with in-person classes, many students felt the loss of screen time and the associated emotions that go along with that. Children were also exposed to several other aspects that increased their anxiety during the pandemic. Ma et al. (2021) described these aspects as fear of contracting the disease from exposure, lack of interaction with other children their same age, and a potential loss of income because of parents' inability to work. Also, online education's content and quality were another stress point for these children. Schools are seeing an increase in the anxiety of the students as schools attempt to have in-person classes.

Summary

Math education has become vital in America because of the technology and skills needed in the 21st-century job market. Understanding the history of education in America may help enlighten modern-day educators about the existing conflicts and inequalities. To overcome these inequalities, standardized testing implemented to reduce the achievement widened the gap, resulting in the federal government getting involved to rectify the situation. The federal government's involvement has led to several policy changes that have further created controversy in math education. The existing research has shown a disparity between teachers and middle school students in terms of motivation problems because of their different opinions on the importance of math. Many influences outside of the classroom affect math achievement, such as family involvement, gender differences, societal influences, and adverse childhood experiences. The time of life plays a significant role for these young people's concerns and cost importance. Math anxiety can lead to lowered expectations because of previous math experiences, with role models significantly increasing math anxiety in students. Teachers are vital to the overall learning in the classroom; therefore, teachers must understand how complex learning is and need to account for this when judging student motivation (Chew & Cerbin, 2021). I hope to bring the voices of these students to fill the literature gap of how they feel and what truly guides them to make the decisions not to perform as well. This may give teachers a clearer picture of what can be done to increase positive expectations in their classroom.

CHAPTER THREE: METHODS

Overview

The purpose of this phenomenological study was to understand the thoughts and emotional experiences of middle school students in relation to their performance in math and their expectations regarding their abilities to take advantage of opportunities to improve their performance. The chapter begins with the research design, a transcendental phenomenological design using Moustakas' (1994) data analysis method. Following the research design are the research questions, the setting, and the participants. Researcher positionality is explored, providing insight into the interpretive framework, philosophical assumptions affecting the study, and my role in data collection. The Procedures section explains how permission is obtained and the recruitment plan. Data collection includes a discussion of individual interviews, focus groups, journal prompts, and the process of synthesizing all data. The final section explains the study's trustworthiness, focusing on credibility, transferability, dependability, confirmability, and ethical considerations.

Research Design

Lincoln and Guba (1985) explained that reality is constructed according to the individual and how naturalistic inquiry (qualitative analysis) challenges what experts think they know. Patton (2015) defined "the first contribution of qualitative inquiry, then, is illuminating meanings and how humans engage in meaning-making" (p. 6). Qualitative inquiry contributes to research by clarifying meanings, shedding light on how humans decide to make meaning, and helping the researcher make meaning of the phenomenon described by the group or individual (Patton, 2015). Creswell and Poth (2018) further described qualitative research as research that happens in a natural setting, with the researcher attempting to make meaning of the occurrence.

I used phenomenological design for this study. This allowed for the exploration of the essence of an occurrence by making meaning of people's experiences in natural situations (Moustakas, 1994). Adams and van Manen (2017) detailed how phenomenology causes us to wonder about, think about, and draw closer to the human meaning given to experiences. Edmund Husserl (1913) introduced phenomenology to study the experiences and descriptions of people's senses. Phenomenology explores the reality people conceive concerning their circumstances. Moustakas (1994) explained that phenomenology attempts to provide a complete picture of the phenomenon being studied through the voice and experience of the participant in that phenomenon.

Moustakas (1994) specified transcendental phenomenology as the way to uncover meaning and not impose the researcher's meaning on a circumstance. The process by which this happens is through epoche. Epoche requires the researcher to reflect on their personal feelings and preconceived ideas that may skew the results to the desired meaning of the researcher and not the participants. I used a researcher's reflective journal to document my biases throughout the study. İnan-Kaya and Rubie-Davies (2022) explored implicit and explicit bias among teachers in the classroom and how these biases affect student outcomes. Implicitly, teachers may hold biases against certain racial groups or backgrounds. These biases can potentially influence student–teacher interactions in verbal and non-verbal ways. Because I was culturally different from my students, phenomenology allowed them to present their reality, which increased the understanding of what happened in the classroom.

Moustakas (1994) described intentionality as a critical component of transcendental phenomenology. Many described intentionality as the connection between the world and the individual. Intentionality can be broken into noema, which is how one perceives things, and

noesis, the evidence one uses to justify their reaction (Moustakas, 1994). To perceive the emotions, the participant's statements were used to attempt to construct the phenomenon.

I used transcendental phenomenology to understand what the students experience after their performance on a math activity. I removed the ideas that influenced me to make my determination instead of being open to the participants' reasoning. This was a transcendental phenomenology study because it permits the researcher to set aside his own biases and preconceived ideas about the cause and build a set of themes that genuinely describe the phenomenon (Creswell & Poth, 2018). I attempted to report the essential, unvarying qualities of the phenomenon as its meaning surfaces from within the participants' descriptions.

Research Questions

These research questions attempted to understand the lived experiences of middle school students who may or may not attempt to improve their math performance.

Central Research Question

How do middle school students describe their thoughts and emotional experiences in relation to their expected performance on math activities?

Sub-Question One

What strategies have middle school math teachers used that encourage students to participate in opportunities to improve their math performance?

Sub-Question Two

What differences exist between the expectations of students who have high self-efficacy regarding their math performance from those whose self-efficacy is lower?

Setting and Participants

The setting and participants were crucial in defining the scope and sequence of a study.

Cypress (2018) determined that a site must be chosen so that data collection is not flawed. Selecting the right participants was vital to the study's success. Waltz et al. (2019) discussed the importance of participants being familiar with what is being studied. Finding participants familiar with math anxiety is beneficial to a complete study.

Site

The site for this study was a middle school in the Spring Valley School District, a rural school district in Idaho located close to a major urban area. This middle school comprised Grades 6–8, with an average enrollment of 227 students. The racial breakdown was 61% White, 35% Hispanic, and 5% of two or more races. The percentage of students who received free and reduced-price lunches was 57%, an indication of the socioeconomic level of the school. Math standardized scores were below the state average of 27% proficiency. This school was devoted to helping the underserved; therefore, this site was chosen for the study.

The school site had one principal. There were 16 full-time certified teachers, 12 females and four males. One counselor and two paraprofessionals were also employed. The predominant racial makeup of the teachers was White.

This site was chosen because school leadership embraces programs that enhance teaching and learning. Also, the superintendent desired to improve their teaching by increasing awareness of why students do not take advantage of opportunities to improve their grades. In discussions with teachers in other subjects, there was a willingness to participate in applying the data to their classrooms. With trauma training, teachers were taught to identify and help students who struggle emotionally. Thus, the school stressed relationships with students as the foundation for learning.

Participants

The type of purposeful sampling was maximum variation sampling. Patton (2015) described maximum variation sampling as "purposefully picking a wide range of cases to get a variation on dimensions of interest" (p. 267). A prescreening survey of the modified abbreviated Math Anxiety Scale (aMAS) was used to identify the math anxiety level of participant candidates. The purpose of using this scale was to identify students and their self-perceived level of math anxiety. Carey et al. (2017) showed that this scale was particularly effective for ages eight to 13, giving a good indication of math anxiety. The responses from each individual were determined to allow for the participants to be grouped into three levels: low math anxiety, moderate math anxiety, and high math anxiety. The total number of participants was 13, who were of middle school age and had had opportunities to improve their performance in math opportunities. These participants were one sixth grader who was 11 years old and female. Six were in the seventh grade, and one of the females in eighth-grade math. These participants were two males who were 13 years old and four females who were 12 years old. The six remaining participants were eighth-grade students, three females, and three males, who were all 13 years old.

Researcher's Positionality

My desire to conduct this study came from observing students not taking advantage of opportunities to improve their grades after not performing as expected on a math activity. Students who made up the activity often scored lower than the previous attempt. Also, many students regularly commented that they have never been good at math. They believed that success in math only comes from ability and not hard work and perseverance, which may indicate that many math students may have a fixed mindset regarding their math ability. In the

past school year, as a middle school math teacher, I focused on getting the students to reflect on their work and work habits and prove that hard work may improve math activity scores.

Interpretive Framework

I believe there are absolute truths, but the paradigm that I used to conduct the study was social constructivism. Creswell and Poth (2018) described social constructivism as trying to make meaning from the world around us. Students construct their reality based on their experiences. Students may be influenced in their academic performance by many sources outside of the control of the school and teachers, which profoundly affects their confidence. This lack of confidence may be deep-seated in the individual and may require patience and understanding from the teacher to overcome this obstacle. For this reason, many middle school teachers work to instill positive values and knowledge of the subject matter. Students encounter problems that stem from many sources, and all too often, they bring these problems to school with them. Teachers must break down these barriers through patience, understanding, and setting proper expectations.

Philosophical Assumptions

Povedano-Diaz et al. (2019) provided a connection that adolescents need with adults they consider valuable, such as parents and teachers. These connections made through discussions were meaningful because they show the difference in thinking between adults and adolescents. Bleiker et al. (2019) stated the importance philosophical assumptions in guiding a researcher to a particular type of qualitative study. The following paragraphs addressed the three philosophical assumptions: ontological, epistemological, and axiological.

Ontological Assumption

Bleiker et al. (2019) described ontology as the philosophical starting point to find explanations that may be true, a potential cause and effect, or a way of understanding concepts or ideas. God's truth is absolute, keeping the universe orderly and functioning according to His plan. Lincoln and Guba (1985) identified that a constructivist point of view establishes that there may be multiple realities. The realities exist in the minds of the participants based on their personal life experiences. This fact guided my research ontologically.

Epistemological Assumption

While ontology can describe what one can know, epistemology describes ways of knowing (Berryman D., 2019). The knowledge was obtained from a source many might consider immature and unstable: middle school adolescents. However, the knowledge gained from middle schoolers was necessary so that the adults in their lives could influence them more positively, leading to better mathematics performance. The goal was to produce an understanding of the emotions of the participants who had opportunities to improve their grades through redo opportunities but failed to do so.

Axiological Assumption

Lincoln and Guba (1985) described several corollaries of a qualitative study performed with a naturalistic bent. The main corollary is that the primary researcher, the human instrument, always brought personal values to the study. This problem investigated was personal because of my interactions with the students and my value in finding a solution and helping these students. Axiological assumptions are based on the values brought to the study. What value this research will bring to the table is understanding students' emotions concerning their expectations regarding opportunities to improve their math grades.

Recruitment Plan

Once approved by the Institutional Review Board (IRB), data collection was started. The school's principal sent out introductory emails to students asking for their participation. I attended registration to hand out information and recruit additional potential. The parents of potential students received a recruitment letter (see Appendix B), and those students who agreed to participate were given a copy of the Abbreviated Math Anxiety Scale (aMAS) to complete. Carey et al. (2017) described an adapted aMAS scale (see Appendix C). Permission was obtained by the authors to use the scale (see Appendix D). After the scale was completed, the participants were grouped into one of three levels: low math anxiety, middle math anxiety, and high math anxiety. After completing the aMAS, participants were ranked to achieve a balance in all groups.

The recruitment letter explained the study, gave a short biography of myself, and explained the tasks in the study and the potential time considerations. After reviewing the prescreening survey, I notified via email (see Appendix E) the parents of the students who were selected to invite them to participate in the study. This notification email contained a link to the parent consent form (see Appendix F) that I asked the parents to sign since the participants will be minors. The students were then sent assent forms (see Appendix G) to express their willingness to participate.

To protect the participants' identities, pseudonyms were assigned to each participant prior to collecting data. I was the only person who knew which person had what pseudonym. Maximum variation sampling was used to reduce the number of participants to 13. This ensured that that there was a good variety of participants who shed light on the phenomenon.

Researcher's Role

Saldaña and Omasta (2016) stated that qualitative research demands creativity, flexibility, and perseverance to create meaning from the data collected. Patton (2015) declared that the researcher is the human instrument because the data is analyzed through his experiences and perceptions. As the human instrument in this study, I delineated my relationship with participants, setting aside any biases influencing my data analysis. Ortlipp (2015) explained that a reflective journal does not control bias but allows the reader to scrutinize those existing biases and whether they influence data collection. To help me recognize my biases during data collection, I used a researcher's reflexive journal (see Appendix K) to record thoughts and experiences during the study. Because I, as the researcher, was not employed by the district, I had no direct authority over any students. In discussions with other middle school teacher colleagues, it became apparent that students were not taking advantage of opportunities to improve their grades.

The research was conducted with confidentiality, as all participants were assigned a pseudonym. Transcendental phenomenology allowed me to listen to the students' voices and construct reality through their eyes. Lincoln and Guba (1985) explained that naturalistic inquiry develops themes and knowledge from various sources, but all must be accounted for when reaching a conclusion. As the primary instrument, I conducted individual interviews and focus groups and reviewed the journal prompts. I developed the themes based on triangulation with the individual interviews, the focus groups, and the participant journals, which Moustakas (1994) described as "thematic portrayal" (p. 131).

Procedures

Before beginning the recruitment of participants for this study, I sought permission from the school district and Liberty University's IRB. Laterza et al. (2016) stated that permission from the institution where the research was conducted is of primary importance, but the process can vary from site to site. The institution needed to be sure that the research would not interfere with its operations and bring harm to it.

Data Collection Plan

Patton (2015) disclosed that qualitative inquiry collects data from various sources, including individual interviews, focus groups, and journal prompts. Vogl et al. (2019) stated that triangulation of data can build trustworthiness in qualitative research because it compares different data sources to determine themes and patterns that are consistent and true to the participants' intended meaning. The data was collected using individual interviews, focus groups, and journal prompts.

Individual Interviews

In phenomenology, individual interviews are designed to provide a personal description of the phenomenon through terms that bring about a rich, thick description of the lived experience (Patton, 2015). Creswell and Poth (2018) described the in-depth individual interview as the primary process of collecting data from individuals. Interviewers ask open-ended questions that will allow the participant to express openly how they experience a situation. The individual interviews were conducted one-on-one in the office meeting room during the school day to ensure confidentiality and to allow for open answers without fear of ridicule. The individual interviews were audio recorded and conducted according to the individual interview guide (see Appendix H), and then transcribed using a transcription service. Preliminary codes

were discovered from the transcripts after the participants reviewed them for accuracy. This member checking increased trustworthiness. A subject expert reviewed these individual interview questions.

Individual Interview Questions (Appendix H)

1. Please describe the emotions you feel when you succeed in a math activity. (CRQ)
2. Describe how you decide when you will participate in an academic-related opportunity used to recover from your performance on a math activity. (SQ1)
3. What methods do you use to determine which math activities you will do and which you will not do? (SQ2)
4. When you are working on an activity, what determines how much energy and effort you devote to it? (SQ2)
5. Please describe the emotions you feel when your performance on a math activity was not what you expected. (TF, CRQ)
6. Considering your performance on a math activity, who bears more responsibility, the teacher or you? Please explain why you believe this way. (SQ2)
7. After having participated in activities designed to improve your performance, do you feel as if the effort was worth it? Explain. (SQ2)
8. Reflecting back on your thoughts regarding mathematics self-efficacy, do you believe teachers can help you improve that? If so, then how? If not, then why? (SQ1)
9. How often does your math teacher offer opportunities to improve your performance? (SQ1)
10. Describe the methods teachers employ to inform you of the opportunities to improve your performance on a math activity? Describe your preferred method. (SQ1)
11. How does your teacher expect the opportunity to be completed? (SQ1)

12. How do you celebrate the successful completion of your math assignments with a passing grade? (CRQ)
13. How do your expectations influence the steps you can take to do your best on a math activity? (SQ2)
14. Self-efficacy means that you believe you have the skills needed to accomplish an activity. How would you describe your self-efficacy regarding the successful completion of a math activity? (SQ2)

Questions 1 through 5 explored the aspect of valence in Vroom's (1964) expectancy theory. Vroom stated that valence is how people orient their expectations with the outcome; in other words, is the outcome valuable to them? If the individual sees no benefit, the activity will not motivate them.

Question 1 explored what a middle school student feels emotionally about success. There may not be value for the student if there is no positive emotional expression with success.

Question 2 related to the opposite end of the emotional spectrum by asking if the student does not score as expected and if they believe the new outcome will be important. The purpose of this question was to examine the difference in emotions between the participants' regular school activity success and math activity success.

Questions 3 and 4 related to the amount of work a student was willing to spend on an activity and proved important to understand the different emotions of these students regarding math. Understanding these different emotions uncovered influential factors for success and any potential motivational tools teachers may use to provide a more positive experience for students. Parhiala et al. (2018) explained how psychological cost is a key determinant for this age group in

terms of the instrumentality aspect of expectancy. Eccles and Wigfield (2020) postulated that research should focus on the social and psychological factors influencing expected outcomes.

Question 5 explored the internal thoughts of the participant when the results of a math activity were not as expected. This could be good or bad. The literature outlined that some students may believe effort plays a part, while some may believe it is purely intelligence.

Questions 6 through 8 explored the expectancy aspect of Vroom's theory. This aspect involved the participant believing that the desired outcome can be achieved through the required amount of work or that the goal is achievable. Questions 6 through 8 helped to understand the value attached to certain math activities and whether the participant can initiate plans to recover from low achievement. If no plan exists, this may be due to a lack of belief in ability or because there has never been an attempt to recover from low achievement. There are many causes for math difficulties. Uink et al. (2018) explained that exploring resiliency and the ability to overcome math-related academic stressors would be a vital study. These questions also provided insight into the emotional response to these students' failure in other classes and whether math is unique or part of the bigger picture. The expectation level of the students was also gauged through these questions. Preparation or lack of preparation can be an indicator of the expectancy process of the expectancy-value formula (Özaslan & Özaslan, 2022).

Questions 6 and 7 were designed to show how the students respond to the teacher, how the assignment can be redone, and on whom the students place the biggest burden. The literature showed that many things, such as an undeveloped brain because of age or trauma, can cause blame to be placed externally on the individual (North et al., 2018). Questions 6 and 7 were designed to gain an understanding of the expectations students have of teachers and what responsibility students accept concerning their math grades.

Question 8 turned the reflective mirror onto the participant and asked whether they felt their effort was worth the outcome. This question led the researcher to discover how each student viewed the outcome, depending on whether it was above or below expectations. This question provided information on the aftereffects of daily math activity on the individual's mood state. Adolescents weigh the cost of succeeding versus the acceptance of their peers (Jiang et al., 2018).

Questions 9 through 11 explored the instrumentality aspect of Vroom's (1964) expectancy theory. Instrumentality lends itself to the belief that those offering the reward are reliable and acting in the individual's best interest. If teachers were not offering rewards that can improve performance, the students may not have the motivation to take advantage of the opportunity.

Question 9 asked whether teachers provide an opportunity to improve students' performance. If opportunities were not offered, students may have begun to doubt the teacher's sincerity.

Question 10 sought to understand how the teacher informs the class about improvement opportunities. Was there a regular place in the classroom where information was given? Was there a time limit set on when the assignment must be completed? Were there multiple sources to find out what needs to be done?

Question 11 determined if the opportunity for improvement calls for reflection on what was not done correctly or if the opportunity is a retaking of the test after reteaching. When thought is put into this by the teacher, the correction takes on more meaning by having the students explore their wrong answers and thinking.

Questions 12 through 14 delved into the instrumentality portion of Vroom's expectancy formula (Vroom, 1964). Instrumentality involves a person's belief that the person making the promise can make the promise come true. Teachers are the most influential tool in the 21st-century classroom. When teachers intervene in the classroom, anxiety levels decrease, and students report feeling more confident (Samuel & Warner, 2021). These questions identified the validity of the perceived placement of blame and its effect on expectations. Will teachers be able to manipulate courses and expectations to be effective or influence motivation?

Question 12 explored whether and how students allow themselves to celebrate. This could unlock how the student feels about success, whether it was effort or luck, and do responsible adults in their life influence positive thoughts. Families are a major contributor to success in the classroom.

Question 13 gauged the participants' perception of the level of their math skills. Arji et al. (2019) explained how math fear can create barriers and cause students to expect failure. Kearney and Garfield (2019) declared that when teachers teach math as much as possible to the individual needs of each student, building competency instead of just answering a question without understanding, students' perceived math skills grow.

Question 14 answered the question of how students assign importance to their work. Eccles and Wigfield (2020) stated that future research should explore how students assign importance to one project over another; the importance is imperative for positive expectations. Positive self-efficacy creates higher expectations and may be influenced by outside sources.

Individual Interview Data Analysis Plan

The data from the individual interviews was transcribed using an online transcription service before the analysis began. The transcripts were checked by the participants (member

checking) for accuracy and then used to produce preliminary codes. The first step in Moustakas' (1994) data analysis is horizonalization, which lists all relevant expressions and groups them accordingly. Moustakas next described reduction and elimination and applied two questions to the data: Does the data have significance for that moment, and is it understandable?

I wrote my thoughts throughout the dissertation process to record my biases in a reflexive journal (see Appendix K). I reviewed the transcripts of all participants and used Word and Excel to gather all responses to each interview question. Each response was identified and evaluated for the preliminary codes. I then used reduction and elimination to gather repetitive data and group the key words into codes. I identified material that was irrelevant to the research questions but provided some insight into how the participants showed the difference between math teachers and the other subject teachers. Finally, by synthesizing the meaning and essence of the data, I discovered themes that described the participants' voices .

Epoche. Moustakas (1994) touted epoche as the beginning of the analysis process. The transcendental part of this design required me to bracket personal biases in an effort to remove their influence from the outcome. Dörfler and Stierand (2021) implied that bracketing does not mean only objectivity; it allows the researcher to be subjective based on their personal experiences, which will be recorded in the reflexive journal (see Appendix K).

Horizonalization. Moustakas described horizonalization as an interaction between the researcher and the participant in which the researcher ascribes equal value to each participant's statement, thus encouraging positive interaction between both parties. All information was given equal placement among the data (Hourigan & Edgar, 2020). Horizonalization involved giving equal meaning to all information gathered.

Reduction and Elimination. Reduction and elimination involve looking for repetition in the data and eliminating material irrelevant to the research questions. As so much data can be collected, there may be duplication of themes and ideas, along with some irrelevant to the research questions (Liu et al., 2015). The data gathered was reviewed in light of two questions, as Moustakas (1994) explained. The first question is whether the expression "contain[s] a moment of the experience as necessary and sufficient constituent for understanding it?" (Moustakas, 1994, p. 120). In other words, is the experience relevant to what is being sought? The second question is, "Is it possible to abstract and label it?" (p. 121). These expressions form the preliminary codes. After all of the data was collected and synthesized, these preliminary codes were evaluated again using horizonalization, reduction, and elimination.

Focus Groups

Patton (2015) declared that focus groups can help confirm patterns and themes from other collection methods. Focus groups involved interviewing but with more than one participant at a time. Flynn et al. (2018) explained that the interplay among participants can deepen the meaning of statements made during individual interviews. Participants can compare experiences and construct a more detailed explanation. There were two focus groups to allow each participant to be involved in one, depending on their schedule. According to the focus group interview question guide, they were conducted in the same office meeting room during the school day (see Appendix I). The goal of the focus groups was to go deeper into common experiences. The focus groups concluded with a discussion about how the students will complete their journals.

Focus Group Questions (Appendix I)

1. Describe the thoughts regarding your emotions when you perform as expected versus when your performance does not meet your expectations. (CRQ)
2. Sometimes, our expectations regarding a math activity affect our actual performance. Describe how your expectations have influenced you during a math activity. (CRQ)
3. Describe your relationship with your math teacher as compared to your other teachers? (SQ1)
4. How does your relationship with your math teacher affect your decision to participate or not participate in opportunities in a math activity to improve your score? (SQ1)
5. Describe how relevant you believe math to be in your life. (SQ2)
6. Describe your thoughts regarding your math ability. Do you believe your ability can change? If so, by what means, and if not, why? (SQ2)

Questions 1 and 2 had an axiological bent to allow the participants to bring their own personal value. The purpose was to overcome this researcher's potential biases and bring the viewpoint of the person experiencing the phenomenon. Modecki et al. (2018) described the importance of learning about the stressors adolescents face during this time of life. The questions helped explore whether students believe they can affect the outcome or if it is predetermined. Do students possess a growth mindset?

Questions 3 and 4 were designed to establish the participant's relationship with those who provide feedback and have authority over them during the school day. The instrumentality aspect of expectancy requires the participant to believe that the person offering the reward will follow through as promised. These questions gave insight into feedback and rewards teachers outside of math offer and whether participants are more willing to accept these. If there was more trust with other teachers, what do math teachers need to overcome this lack of trust?

Question 5 attempted to determine how the participants believe they will use math in their lives. Are their expectations low because they believe the material to be irrelevant? Do elements in their lives lead to this feeling of not being useful?

Question 6 extended Question 5 into how the participants felt they could control their math ability. Can it be changed, and if so, who can influence it? Since teachers have a major influence, could they overcome other influences that provide a negative example?

Focus Group Data Analysis Plan

Flynn et al. (2018) expressed that focus groups allow for interaction among participants that enrich the collected information that may not otherwise come out in individual interviews. The focus group information was transcribed to include the talk-overs and breaks, and member checked to ensure accuracy. This data was analyzed using the same process as the individual interview data, which is Moustakas' (1994) method using horizonalization, reduction, and elimination to identify the preliminary codes and compare them to the codes from the interviews and journal prompts.

Journal Prompts

Journaling can be an excellent tool for communication between participants and researchers and provide data that can be used to establish trustworthiness through triangulation (Janesick, 1999). Journal prompts were used to record students' thoughts after the day's math activities. Journal prompts were emailed to the students four times over two weeks via the student's assigned school email address using Google Forms. This was done until two weeks' worth of data had been recorded in the journals. These began after the focus groups were completed. A $10 gift card to Dutch Bros Coffee was awarded after the student had submitted the completed journal to encourage participants to be faithful in completing all three data

collection methods. An email prompt was four times for the participants to record their thoughts according to the following prompts (see Appendix J):

1. Thinking of today's math activity, describe your expectations concerning your performance. (CRQ)
2. Thinking of today's math activity, describe how you prepared for it. (SQ1)
3. Thinking of a recent math activity, describe the opportunities offered to improve your score. (SQ1)
4. Did you take advantage of these opportunities/ Why or why not?

Question 1 revealed the emotional reactivity students faced related to the emotions of living or not living up to expectations. Khalil et al. (2019) mentioned mood state as an important motivation for adolescents, along with Uink et al. (2018), describing the need to understand emotional reactivity and how teenagers react throughout the day to emotional stressors. The student's emotional state may guide teachers to give feedback that enhances positive emotions.

Question 2 focused on the motivation level of the participants. An important aspect of the expectancy theory is that the person must believe that they possess the necessary skills to successfully complete the task. If the student prepares for the task, they may possess the expectation that they can accomplish the task successfully.

Questions 3 and 4 explored how opportunities are presented to the participant and whether the opportunities were taken advantage of. Exploring why or why not may enlighten how the participant views the reality of improvement. What aspects create this expectation?

Journal Prompts Data Analysis Plan

Jacelon and Imperio (2005) explained that solicited journals help guide data collection by acting as an observation tool for researchers. The participants' journals were analyzed similarly

to Moustakas's (1994) design for interviews. Horizonalization, reduction, and elimination were used to help form the preliminary codes that were used later to develop the themes.

Data Synthesis

The three data sources needed to be combined to form the total picture of the phenomenon. Synthesizing the data required careful analysis and constant check-back and interaction to produce results that tell the story through the eyes of the participants. Moustakas' (1994) procedures were used to accomplish this.

Epoche

Moustakas (1994) touted epoche as the beginning of the analysis process. The transcendental part of this design required me to bracket personal biases to remove their influence from the outcome. Dörfler and Stierand (202) implied that bracketing not only means objectivity, but also allows the researcher to be subjective based on their personal experiences, which were recorded in the reflexive journal (see Appendix K).

Horizonalization

Moustakas (1994) described horizonalization as an interaction between the researcher and the participant in which the researcher ascribes equal value to each participant's statement, thus encouraging a positive interaction between both parties. All information was given equal placement among the data (Hourigan & Edgar, 2020). Horizonalization was used to review all interviews, and focus group transcripts were processed manually using code charts and tables to produce preliminary codes as the data from these two data collection methods were synthesized. Also, the journal entries were compared to these codes and manually inserted into the appropriate code group. For this process, each expression had an equal meaning. The analysis proceeded to the phase of elimination and reduction.

Reduction and Elimination

I reviewed the data by considering two questions, as Moustakas explained. The first question is whether the expression "contain a moment of the experience as necessary and sufficient constituent for understanding it" (Moustakas, 1994, p. 121). In other words, is the experience relevant to what is being sought? The second question is, "Is it possible to abstract and label it?" (p. 121). The expression should be able to be pulled away while giving a glimpse into the expression. Redundant information is either eliminated or regrouped according to different criteria at this stage. To accomplish this, I read the transcripts and journal data together to unlock the themes the data presents. I attempted to see the data from another vantage point each time I read them. As I reread the data, repeated data was reduced, and only the data that could answer the two questions was organized and kept.

Clustering and Thematizing

Data descriptions, patterns, and themes were identified that gave thematic meaning to the experience of the phenomenon. This was the stage of data analysis where I attempted to find meaning from the data using a variety of methods (Moustakas, 1994). I completed this using imaginative variation and phenomenological reflection. Turley et al. (2016) described imaginative variation as a mental experiment designed to look at the event from as many angles as possible, imagining the event in different ways.

Validation

Moustakas (1994) stated that this step was to compare the invariant constituents to the total and complete record of all participants. Invariant constituents are the "horizons that remain" (p. 122) after reduction and elimination. If any cluster or theme did not relate to the experience,

they were noted and kept as potential outlier data. The participants played a vital role in establishing validation.

Synthesis of Meaning and Essences

Moustakas (1994) stated that the last three steps of data analysis involve synthesizing the textural and conceptual descriptions into the phenomenon's essence. Textural descriptions are those that describe the event, while conceptual descriptions are those that attempt to bring meaning to the data. Using relevant and validated themes, the individual textural description for each theme was constructed. Themes emerged from the analysis of all data sources, and the participants' individual responses were used to support the themes in the next chapter. I included a table in Chapter Four that showed the final codes and how the codes helped develop the themes. Following this, each theme's structural and textural description was constructed, which was synthesized into a total description of the meaning and essence of the whole study (Moustakas, 1994, p. 121). This is where the essence of the event was captured. Dahlberg (2006) described essence as the eventual voice of a phenomenon derived from the data.

Trustworthiness

Qualitative studies rely on data that was produced by the researcher. Lincoln and Guba (1985) stated that trustworthiness helps a researcher:

> persuade his or her audiences (including self) that the finding of an inquiry are worth paying attention to, worth taking account of? What arguments can be mounted, what criteria invoked, what questions asked, that would be persuasive on this issue. (p. 290)

Creswell and Poth (2018) described the need for qualitative researchers to explain how trustworthiness will be demonstrated in the research. To establish trustworthiness, credibility, transferability, dependability, and confirmability were used.

Credibility

Lincoln and Guba (1985) presented three steps that are highly likely to increase credibility. Creswell and Poth (2018) explained triangulation as testing one source against another, looking for patterns in thought and behavior. Information discovered should be verified by at least one other source (Lincoln & Guba, 1985). To accomplish triangulation, each source was manually coded using Microsoft Word and transferred to an Excel or Google Sheets spreadsheet. The spreadsheets were divided using journal dates or question numbers. Codes were developed and compiled for each data source, and the themes and subthemes were developed from these codes. Chapter Four provided evidence of triangulation, as the themes were discussed using the participants' pseudonyms along with the sources of each data notation. Lincoln and Guba (1985) also mentioned prolonged engagement to increase credibility. Prolonged engagement minimizes distortions that can occur during data collection and builds trust due to frequent engagement. This included visits to the school, getting to know the administrative team and the math teachers, and frequent communication through emails with the participants. Lastly, to help ensure credibility, I used member checking to verify data. Lincoln and Guba (1985) described this phase as allowing the person providing the information to scrutinize what is being reported and verify its accuracy. The participants were contacted and presented with the transcripts. They confirmed the accuracy of them.

Transferability

Lincoln and Guba (1985) discussed the idea of transferability as providing enough of a description from the originator of the study that another researcher might have enough information to apply it to their own work. The originator of the work cannot ensure that their work is transferable but must provide enough information and description to make such

extrapolations possible. To accomplish this, I used thick descriptions for the data sources. Patton (2015) described thick description as a form to ensure the transferability of the study. Lincoln and Guba (1985) described thick description as providing sufficient descriptions to allow another researcher to determine whether the study may be transferable to their situation. Freeman (2014) stated that this type of description provides detail in such a matter that leads to the cultural understanding of complex phenomena. An audit trail (see Appendix L) showing the dates that each activity was accomplished was established so that another researcher could potentially replicate my process.

Dependability

Lincoln and Guba (1985) stated that peer debriefing should be involved to establish dependability in naturalistic inquiry. This helped provide insight to the researcher, which ensured an open and objective mind. I employed two colleagues to assist with an inquiry audit before collecting data. They reviewed my data collection methods and offered recommendations based on their experiences in conducting research. Both individuals had completed their doctorate program and have PhDs. Their recommendations included paying attention to participants' body language and using it to dig deeper into the questioning. They also recommended opening with a get-to-know-you session for the focus group before asking the focus group questions. After data collection, they reviewed my Excel spreadsheets and code process and gave hints on color coding for elimination and reduction.

Confirmability

My motivation for conducting this study was to determine why students do not take advantage of opportunities presented to them to improve their grades. I brought many biases into this research that I needed to account for to ensure the data reflects the students' thoughts despite

my biases. Lincoln and Guba (1985) mentioned a confirmability audit is necessary to ensure confirmability. This involves an audit trail that delineates the timeline and procedures used in conducting the research. This included an audit trail (recorded in Appendix L). I also used a researcher's reflexive journal (see Appendix K) to document my feelings during this study.

Ethical Considerations

Research should not cause harm or breach the identities of the participants. To protect the institution and school, permission from the site and IRB was obtained before beginning data collection. This included assuring the site that the regular operations would have minimal interference from the study.

Permissions

I acquired a signed letter on official district letterhead from the superintendent of the district granting permission to conduct the study. I placed this letter temporarily in Appendix A; it was later replaced with the IRB approval letter in my final dissertation to preserve the confidentiality of the school district (see Appendix A). After I acquired IRB approval, I conducted a pilot study using two people who were not included as participants. This allowed me to practice my data collection and modify any questions, as necessary. I conducted the pilot study similarly to the research study but with students outside my research district. The completion date for the pilot study was recorded on the audit trail. After completing the pilot study, I began to recruit my participants.

Other Participant Protections

Middle school math students were given the opportunity to participate in the study immediately after IRB approval. I had authority over the students. Students were more at ease with the researcher because of their familiarity with the site, thus promoting confidentiality. The

data was collected and transcribed using identifiers known only to me. The identity of the site and students were protected using pseudonyms to protect their confidentiality. I was the only one with access to the information. The participants were given a copy of the permission form they signed, which clearly outlined the procedure to opt out of the research.

Data was protected using a secure data storage system, keeping it in the system for three years after the completion of the study, at which time the file will be deleted from the storage system. This system was password protected. The location of the information was limited to the researcher's computer, and permission is required to share files.

Summary

Chapter Three presented an in-depth explanation of the methods used to gather the thoughts and experiences of the 13 participants. This chapter explored the use of a transcendental phenomenological design and the role of the researcher in collecting and analyzing the data through individual interviews, focus groups, and journal prompts. The methods of Moustakas were used to analyze the data through the process of horizonalization, reduction and elimination, clustering and thematizing validation, and synthesis of meaning and essences, which include textural and structural descriptions of individual and collective experiences. The participants were chosen using maximum variation sampling to ensure the participants could provide in-depth data concerning the research problem. Finally, the trustworthiness and ethical considerations of the study were presented, including obtaining site permission, IRB approval, and the steps taken to ensure the confidentiality of the participants.

CHAPTER FOUR: FINDINGS

Overview

The purpose of this phenomenological study was to understand the lived experiences of middle school students who have challenges in math and their expectations of opportunities provided to improve their performance at a middle school in the Spring Valley School District. Thirteen participants from the Spring Valley School district (a pseudonym) were selected to participate. The confidentiality of all participants was protected using pseudonyms. The chapter presents a brief overview of all participants, a presentation of the themes, any outlier data and findings, and concise answers to the research questions.

Participants

Thirteen participants were selected to provide a solid representation of three different math anxiety levels based on their scores on the Abbreviated Math Anxiety Scale (aMAS). Six participants scored between 9–18 and were rated as having a low level of math anxiety. Four participants scored between 19–35 and were rated as having a moderate level of math anxiety. Three participants received scores between 36–45 and were rated as having a high level of math anxiety. The responses represented a good cross-section of the different levels. Those who were higher on the math anxiety scale were more eager to discuss their math struggles. All participants completed individual interviews, participated in a focus group based on their grade level, and completed a participant journal for two weeks, with two prompts per week.

The participants were honest with their responses. Some students went into more detail, and all started to open up as the interviews proceeded. At the end of the questions, I reviewed them with each participant to allow for any additional information. Table 1 displays the information breakdown of each participant.

Table 1

Student Participants

Pseudonym	Gender	Grade Level	Math anxiety Score
Vanessa	Female	7	16
Allison	Female	7	13
Beth	Female	7	16
Carla	Female	8	17
Davis	Male	8	15
Johnny	Male	7	15
Samantha	Female	7	22
Alexia	Female	6	18
Cole	Male	7	20
Ryan	Male	8	23
Ashley	Female	8	44
Brenda	Female	8	37
Jackson	Male	8	30

Vanessa

Vanessa is a seventh-grade student taking eighth-grade math who ranked low on the math anxiety scale. She has been in advanced math since fifth grade. Vanessa participates in three sports, and was adamant that marching band is a sport. Vanessa feels happy when she succeeds at math because it means she understands the material, even if it is at a higher level than her peers. She decides to participate in correction opportunities based on how poorly she initially performed. To choose math activities, she picks easier problems if less confident and harder ones if more comfortable with the topic. Vanessa devotes more effort to fun activities and less to

unenjoyable ones. When performing poorly, she feels disappointed but analyzes mistakes to improve. Responsibility depends on whether she was taught the material. Retaking tests is worthwhile if her grade improves substantially. Vanessa believes teacher instruction boosts math self-efficacy. Vanessa celebrates by telling her dad about difficult assignments she has mastered. Her high expectations of excelling at math is in anticipation of her getting into Yale; therefore, she takes advanced math classes. Self-efficacy varies based on topic difficulty. Overall, Vanessa has a growth mindset and perseveres through challenges while utilizing available resources. Vanessa desires to attend an Ivy League school.

Allison

Allison ranked low on the math anxiety scale and feels proud and happy when she succeeds at math, however, her effort depends on her mood. When she is happy, she gets all her work done, but when upset, she is less productive. Allison takes responsibility for completing her assignments by seeking a teacher's help when she does not understand. Allison wants to be a veterinarian or shelter worker and uses incentives such as outdoor games offered by the school and ice cream celebrations with her parents. She wants to meet her parents' expectations of a high GPA. Allison is confident in her math skills but believes she can still improve. Her career goals motivate her math effort since math skills will help with medicine ratios. Allison believes her math abilities are pretty good but can improve with hard work, which gives her confidence to achieve her dream job.

Beth

Beth is a seventh grader who also ranked low on the math anxiety scale. She is very confident in her skills and takes a matter-of-fact approach to her math studies. She knows that she needs good grades, and doing retakes is how to accomplish that. She has struggled when a

math assignment is first graded but then makes the effort to improve her grade. She expects to be a nurse after school and knows she needs math to accomplish that. She feels relieved and accomplished when succeeding at a difficult math problem. His teacher requires corrections for scores below 80% to improve grades, so she completes them. Beth tries her best in all activities to get good grades and learn. When material is difficult, she may hesitate to ask for help initially but pushes through by finding someone who can explain it well. When getting lower-than-expected grades, Beth feels confused about what she did wrong and goes back to identify mistakes. She takes more responsibility than the teacher for his performance. Beth finds corrections worthwhile to improve her score. She believes teachers can build confidence and improve self-efficacy. Her teacher offers corrections after every test, which Beth prefers to hear verbally in class. Completing them promptly is expected. Beth celebrates success by telling parents and friends. Her future expectations motivate effort in math. If she expects to do well, she tries harder. Self-efficacy depends on previous experience with the material.

Carla

Carla is an eighth grader who scored low on the math anxiety scale. Carla feels happy and excited when she succeeds at a math activity. She does well in math overall and finds most math activities easy to complete. If an activity is challenging, Carla may choose not to complete it. Her effort and energy devoted to math depends on how she feels that day. When Carla does poorly on math assessments that she expected to do well on, she feels unsatisfied or disappointed. She takes responsibility for her performance and will review what she did wrong. Carla takes advantage of opportunities to redo assignments and improve her grades. She finds the effort worth it to increase her scores. To celebrate success, Carla tells her friends and parents she did well. Her parents expect her to excel in math. Carla is interested in studying business and

owning her own company. Her math skills will help her earn good grades, scholarships, and college admission. Carla believes she has strong math skills and self-efficacy. She is more interested in math than some of her peers.

Davis

Davis ranked low on the math anxiety scale and feels happy when succeeding in math. He puts in full effort regardless of difficulty or if the overall grade is not good. Davis was more likely to redo easier assignments. When Davis does not do well, it comes to him as a surprise, and he wants to know what was missed. Davis takes primary responsibility for his performance but recognizes that teachers have some responsibility, too. Davis celebrates by telling parents and friends. His expectation after school is to get a good job. He believes doing well in math will help with that goal. He rates his math anxiety as low and math efficacy as pretty good. Davis is in the eighth grade and loves to play basketball.

Johnny

Johnny is a seventh-grade student who scored low on the math anxiety scale. He expressed positive emotions when succeeding at math. Johnny is disappointed when he does not perform as expected on a math assignment but realizes it is often due to a lack of effort on his part. He takes personal responsibility for his performance, believing retake opportunities can demonstrate that he can perform well, as he has the perception that math ability equates to being "smart." When doing math activities that improve his grade, Johnny stated he likes to focus on easier assignments first and then work on the harder assignments. Johnny appreciates teacher support in building understanding and confidence, and the availability of opportunities to improve his math grades. Johnny likes sharing success with parents, friends, and aspires to play

college and professional football. Johnny has a general confidence in math ability despite occasional frustration.

Samantha

Samantha is a seventh grader who ranked as moderate on the math anxiety scale. She feels happy and relieved when succeeding at math activities. She will redo tests or homework if her current grade needs improvement, but not if she already has a B or A. To determine effort in activities, Samantha stated that easy assignments require less energy, while hard ones require more, often requiring her to ask classmates for help. When expectations are not met on an assignment, Samantha feels disappointed but will try again. She believes she bears more responsibility than the teacher for her performance and sees the effort as worthwhile for improving grades. Samantha celebrates success by telling her parents, who reward her with food or other treats. Her expectation of rewards motivates Samantha to do her best. She wants to improve at math to become an archaeologist. Samantha has confidence in her abilities but knows there are areas for growth. The teacher and classmates help build Samantha's skills and efficacy.

Alexia

Alexia is soft-spoken and rated in the moderate range on the math anxiety scale. Alexia said she feels happy when she succeeds in math. She participates in retakes and corrections depending on her grade. She always puts full effort into math activities regardless of how tired she is. When she does not do well on an activity, she feels sad but does not think negatively about herself. She takes responsibility for her performance, believing effort leads to good grades. Alexia finds value in retakes and corrections to improve her grades and skills. The teacher helps build confidence by explaining concepts until understood. Alexia stated she gets opportunities for retakes and corrections on every assignment. The teacher reminds the class once after

assessments. For corrections, students redo problems missed. Homework under 60% must be redone; over 60% is optional. Alexia celebrates success by telling her mother, who checks PowerSchool (the school's grade recording system) and is proud. Alexia does not want to let her mother down, motivating her to do well. She believes she has good math skills from elementary school. Alexia believes that her math score reflects her knowledge of the subject and not the type of person she is. She is very comfortable in her own skin.

Cole

Cole rated in the moderate range for math anxiety on the math anxiety scale. He is a seventh-grade student who rates his math self-efficacy at nine out of 10 on a scale of one to 10. Cole has a goal of playing in the NBA and realizes he needs good grades to accomplish this. Overall, Cole expressed the positive emotions of excitement and accomplishment related to performing well in math. Cole has a willingness to work hard and redo work as he believes he is responsible for his performance. He displays confidence in his math abilities despite a few gaps. He relies on both internal and external expectations to push his best effort. Redo opportunities are plentiful and worthwhile to him. His efficacy seems tied to performing well rather than simply understanding concepts. Teacher and parent support validate his efforts.

Ryan

Ryan is an eighth-grade student who scored in the moderate range for math anxiety on the math anxiety scale. Ryan indicated that he feels confident in his math abilities, achieves high grades, and takes advantage of redo opportunities, due to expectations and encouragement from his parents and teacher. However, Ryan depends on his teacher as his main influence on redoing math activities. When succeeding in math, Ryan feels happy, and when he does poorly, he thinks about what he did wrong and how to improve. His expectations after middle school are to attend

high school and eventually work with his father, motivating him to keep his math grades up. Ryan shared that when his grade gets below 80%, he gets some math anxiety but feels confident in his math ability. Ryan identifies his teachers as being more responsible for test scores because they can more readily see what he is getting incorrect. Ryan likes the reminders he gets from his math teacher to do tests and homework corrections.

Ashley

Ashley scored high on the math anxiety scale. She shared that she finds eighth grade harder than seventh, with new concepts like division and more complex multiplication. She rates her math skills low, around 0–20%, and experiences high math anxiety. She scored high on the math anxiety scale. When given opportunities to improve grades, she only does it if the original grade was moderately high. Ashley does not complete corrections for low grades because she feels she has failed at math already. She believes the teacher bears responsibility for her learning and provides examples of how her teacher scaffolds instruction by giving her harder problems to build confidence. Ashley celebrates high math grades by telling friends, doing a dance, and being taken out by her parents. She aspires to be a forensic photographer, and her parents want her to go to college, which motivates her to do better in math. She feels her teacher has helped improve her self-efficacy from 5% to 30%. Although she lives outside of the school boundaries, Ashley attends this school because of behavior issues in her previous school.

Brenda

Brenda is in the eighth grade and scored high on the abbreviated math anxiety scale. Brenda shared that she struggles with math—often becoming distracted and unfocused during class—which leads to poor performance. Brenda stated that even though she tries, she has difficulty understanding the concepts. Brenda lacks confidence in her math abilities, causing her

to expect to do poorly; she does not set goals. This negative self-perception hinders her success. When she does succeed, she feels happy yet surprised. Brenda takes responsibility for her performance but can also assign a percentage of the blame to her teachers. She is offered corrections and retakes consistently but often opts out if the work is too challenging. Despite multiple chances, Brenda rarely improves her grades. She celebrates success with friends but does not share struggles with her parents. Brenda believes teachers cannot impact her self-efficacy. Her participation in sports motivates her effort in school.

Jackson

Jackson said he feels good emotions like happiness when he succeeds at math, and he decides to do retakes on assignments if he scores below an eight out of 10. He completes math homework that is easy but may skip harder problems. If he does not understand an assignment, he will not devote much energy to it. When his grade is lower than expected, he feels he needs to try again. He takes responsibility for his performance because if he does not do the work, he will not get a good grade. He aims for Bs so his parents will not bother him about grades. He rates his math skills as not very good, which sometimes prevents him from completing difficult math problems. Jackson likes to play football and devotes his math efforts to maintaining his grade just good enough to not be disqualified from playing. He does not think highly of his math skills and struggles on tests. He expects to do poorly on math tests but will redo all assignments. Jackson scored high on the math anxiety scale.

Results

After collecting data, I carefully read the transcripts from the individual interviews, focus groups, and journal prompts responses. All the participants' quotes given in this manuscript, including grammatical errors in speech and writing, are presented verbatim to depict their voices

accurately. From this review, overarching themes and subthemes developed and are presented in this section.

Theme Development

The first theme was emotions related to math performance, with the subthemes of: when the participants expected to do well, when they expected to do poorly, and sharing success. The second theme was motivational factors, with the subthemes of teacher-driven, family, and post school goals. The third theme was test and homework corrections, which included teacher consistency and communication subthemes. The final theme was the teacher's role, with the subthemes of overcoming negative stereotypes and building self-efficacy. Table 2 provides the Codes and Themes from Data. Following Table 2 is a detailed discussion of themes and their respective subthemes.

Table 2

Codes and Themes from Data

Themes	Subthemes	Participant quotes
Emotions related to Math performance	When expected to do well	Confused, disappointed, what did they do wrong, surprised, sad, how did I make these mistakes, oh man, I have to try this again, like all of a like excited when you did well. And then disappointed when you do bad, I thought I was doing everything well and then I failed, makes you feel good when you do well.
	When expected to do poorly	Don't expect to get good grades normally, I thought I was going to fail, proud of myself, I don't have to retake it, math skills are zero percent, my expectations aren't that high.

	Sharing successes	Get excited, ice cream with parents, she would usually like just tell me to make my choice, I smile and tell my friends, no, they don't really care, I don't do good on a test, I don't really celebrate. I just feel happy, well, I want to go to Yale.
Motivational Factors	Family	Parents won't get me in trouble, my parents take me out to go get ice cream, Not really do anything. They just say good job, Yes because I need to keep my grades up for fun activities, sports, and home life, so I don't get into trouble at home.
	Goals for post high school	Hopefully go to the NFL, school counselor, So I don't really set goals, math teacher wants us to be able to succeed, if you're the outfield, on a scale of 1 to 10, probably like a 7, Like get a good job that pays good, go to Yale.
Test and homework corrections	Consistency	Yeah, I think sometimes like in advisory, we redo the problem and let me circle it with a highlighter, most of the time whenever we finish a test they'll go up to your desk or the table that you sit at, Homework retakes you can retake it every You can take it as long.
	Communication	beginning of the school year and it's in like the syllabus, and then tells us like every day, oh, yeah, she's like um you guys could do test corrections but don't forget you have to highlight the answers, um so after every test we do she offers all the kids to do corrections.
Teachers Role	Overcome negative stereotype	No. And I had no choice but to go there, I'm never going to use it, No. I'm going to be a history teacher. I don't need it, um, so I think a lot of

	people use math, but they probably don't think about it every day. I will but I won't need it.
Build self-efficacy	No. No. Yeah. No, no, you can't change it. You just got to do better yes. Cause like they can like challenge us, like maybe explain to you better like say the classmates get it and you don't really get it, But the math teacher wants us to be able to succeed and turn in our work on time.
Teacher Driven	And you need a higher grade to play that spot Yeah, I failed math so many times, Cause like they can like challenge us, Then I would understand it more, so I'd be happier doing math, No. I think it's based off of yourself, not your teachers, reminders, she'll ask me if I want to do corrections, incentives from school admin.

Emotions Related to Math Performance

A theme developed concerning emotions related to math performance. These emotions determine the effort put into correcting their math grade and may potentially affect the mood the students are in for the day. In her interview, Carla described her effort related to how she felt that day: "Probably how my day's going, how much energy I have any particular day." When asked if her effort was related to the activity or how she felt that day, Carla stated that it was based on "how I feel the day of the activity." Alexia, in her interview, described her emotional investment involving doing corrections as, "I don't really know. I just try my best to do it even if I'm tired. I just try to do it and try to understand it." Four of the 13 participants mentioned that their effort

depends on how they felt on the day of the activity. Emotions involving math performance can be related to how the participant views their math teacher. Ryan mentioned, during the focus group, an experience he has had with a math teacher: “You go to class and the teacher doesn’t like you and you know they don’t.” Anxiety is a normal emotion for middle school students and affects how they prepare for the day’s math assignment. Samantha described her preparation, in her journal prompt, as “breath in, breath out, and do what you can.” Four of the 13 participants mentioned the same preparation technique. Emotions have a profound effect on math performance but can also be divided into the following three subthemes.

Expected to do Well. Negative emotions were prevalent when participants expected to do well but the results did not match their expectations. These emotions ranged from surprise to disappointment. During the focus group, Davis expressed surprise when he did not do as well as expected: “You might be like, be surprised and like want to know what you missed.” Four other participants mentioned they were surprised as well; and similarly to Davis wanted to know what they got wrong. Two participants mentioned they were disappointed. In her individual interview, Allison stated, “I feel disappointed in myself, when I think I got a lot of them right, but then I didn’t.This is just like ‘how did I make these mistakes and how did I do to get them wrong?’” Generally, though, those who performed below their expectations wanted to improve their grades on the activity. Samantha, who responded that she was disappointed, mentioned in her journal prompt that she took advantage of the opportunity to improve her grade, “Yes, because that could help me improve.” Four of the 13 participants mentioned the same sentiment

in their journal prompts.

Expected to do Poorly. The emotions were more positive when the participants performed well on a math activity, particularly when they thought they had done poorly on the assignment. In his individual interview, Cole described his emotions as:

> Like really excited, really excited, the one time, like they get the activity, and like, they complete it, like, really good, well, and they got the highest grade on it and, well, like they have so many emotions going through but the biggest emotion there is excitement.

Five of the 13 participants described similar emotions when doing well. Oftentimes, past performance causes middle school students to expect the worst on math assignments. Ashley mentioned she was happy when she did well "because I thought I was going to fail, my math skills are like zero percent, like I can't. I give it like a zero percent to 20 percent." Four of the 13 participants were also happy because they normally did poorly. All the participants expressed happiness or excitement when they did well on their math activities.

Sharing Successes. Another subtheme that developed from the theme related to emotions related to math performance was that middle school students wanted to share their successes with others who are important to them. Some had parents who were excited for them and spent time in celebration with them. Samantha shared, from her individual interview, "My dad makes this one ramen. It's so good. It has chicken, cilantro, like egg. It's so good. Especially with that Texas Pete hot sauce." Seven of the 13 participants like to celebrate with their parents because of the enthusiasm they showed for the effort. Three of the 13 liked to celebrate with themselves.

In her individual interview, Beth stated, "It's not really like a big deal, but I'm proud of myself because I overcame that difficult[y]." She believed it was not a big deal because she expected success. The remaining participants liked to share with their friends, usually because

their parents were not interested. Carla expressed,"I smile and tell my friends about it, and they get really proud about it because they know I don't do well in math." Sharing successes is important to middle school students and they should all be encouraged to have an outlet for this.

Motivational Factors

In middle school, motivational factors play a big part in encouraging students to take advantage of opportunities to improve their grades. These motivational factors can be divided into intrinsic and extrinsic motivational paths. Intrinsic comes from within an individual, while extrinsic comes from forces outside the individual. As for internal motivation, Vanessa mentioned in her individual interview, "Well I set a really high standard for myself which isn't always good, but it helps me do better on things." Three of the other 13 participants shared the same sentiment. They wanted to improve their grades to have a higher GPA. The rest of the participants were motivated to do well based on external motivational factors. In his individual interview, Cole stated:

> Yeah, if you like in an activity, say like basketball, wrestling and football, and, like, you have a low grade and you need a higher grade to play that sport. Yeah, then you have to decide to do it. I'll give up like this, but that's how I decide.

The participants could be motivated to take advantage of opportunities through various motivational factors that were teacher-driven, family related, and after school goals.

Family. Families influence motivation through either positive or negative reinforcement. Participants described positive things their family does to motivate them. Allison gets to go out when she celebrates with her parents: "If I get, like, a good grade on most of my grades and my parents take me out to go get ice cream." Six of the 13 participants described the sentiment that their parents are happy for them when they do well and reward them in different ways. Six other participants mentioned that their parents may not think as highly of them if they do not have good grades. Brenda

was the only participant to express that her family did not care how she did:

> No, they don't really care. They don't. I'm sorry, I mean my dad, he's not there. So, I don't really tell him much. My mom is busy when I tell her about my day and all that, but she doesn't really mind it.

Families can affect the motivation of middle school students by providing an incentive—either a reward or consequence—for their students to do as well as they can on a math activity.

Goals for Post High School. Another subtheme for the theme of motivational factors was the participants' goals for life after they finish high school. Allison, in her individual interview, stated that her post high school goal was, "So, after high school, I wanted to go to some colleges so I can be able to be a veterinarian and take care of animals." Four of the 13 participants had the same after high school goal of attending college. A job after school was also a reason for participants to do well. Davis, in his individual interview, stated he wanted: "Like, get a good job that pays good, yes." In the focus group, five of the 13 participants believed doing well in math would lead to good jobs after school. Five of the participants believed math could lead to them having a career in professional sports. Johnny stated, in his individual interview, that he wanted to, " Go to college, play football, then hopefully, hopefully, go to the NFL." For many participants, what they wanted to do after school was a positive source of motivation.

Test and Homework Corrections

In this community, the math teachers believe in test corrections and retakes to help the students get a better grasp of the material. Each participant described how the teacher provided opportunities for grade improvement., In her journal prompt, Beth described the daily opportunities to improve her grade as, "We have an opportunity to do test corrections or even just corrections in general and we will be able to gain up to half of those points." Six of the 13

participants gave a similar response. Four of the 13 participants stated that they did not need to improve their grades based on the teachers' requirements. The teachers had provided criteria for the participants to determine when math activities needed to be redone. Allison described in her individual interview when she does retakes. She stated:

> For homework, if we get 84% or less in its retakes, it depends on how many points the assignment's worth so that I could finish it and redo it. Some of them, some problems are worth like three points depending on the assignment.

Four participants were not sure if they were going to take the time. The teachers gave the participants various ways that they could improve their grades.

Consistency. Teachers' consistency in offering opportunities to improve math performance led to more participants benefitting from the retakes and corrections. This is the first subtheme associated with corrections and retakes. The students knew to expect there to be a chance to get better grades. In his individual interview, Johnny explained, "If you don't get an 80 or higher you have to do test corrections." Six of the 13 participants expressed a specific percentage required for corrections and retakes. While the process of doing retakes and corrections varied for each teacher, the opportunity was still there. Vanesa stated, in her focus group response, "that the correct answer had to be highlighted, and then the problem redone to show the new answer." A total of six of the 13 participants mentioned highlighting as their teacher-preferred method of corrections. Another area of consistency was that the teachers had

specific procedures to identify when activities could be redone and expressed those procedures regularly. Davis provided, in his individual interview:

> She'll, like, after the test, she'll like let the class know when we, like, put our name on the whiteboard in like a certain spot that says test corrections and whatever real-life time we can come in and do the test.

The method of letting students know when and how math activities can be corrected varied by the teacher; 10 of the 13 participants described the procedure teachers used to let them know about test and homework corrections. The important thing was that there was consistency in the procedure.

Communication. Teachers had several ways of communicating correction opportunities for their classes. To begin with, many teachers mentioned the procedure in advance in their syllabus. This gave information to both students and parents. When asked about how the teacher communicated the information, Jackson, in his individual interview, replied, "She had a similar syllabus at the beginning the year that she told us." Six of the 13 participants mentioned the syllabus as being the original method by which the policy was communicated. The preferred method of communication was reminders after the test. Cole, in his individual interview, stated that he preferred "just telling me directly because I find it easier that way." Beth, in her journal prompt, was told after her test that she "was able to get half points on every question I got right in corrections." Seven out of the 13 participants mentioned in their journal responses that they had good opportunities to improve their grades. The teachers did not assume the students knew the procedure, but constantly provided the communication needed to keep the participants informed of the correction opportunities.

Teacher's Role

Teachers play a significant role in students developing a mindset that makes them want to get good grades. Teachers provided positive feedback when the students did well to encourage a feeling of accomplishment for the participants. Alexia, during the focus group, believed "the math teacher wants us to be able to succeed and turn in our work on time." Seven of the 13 participants believed the teachers had their best interests in mind. When the participants did not perform as expected, the teacher was quick to provide a remedy to improve the grade for the participant. In his journal prompt, Davis explained, "I got to check my work or ask the teacher to go over my answers." Five of the 13 participants felt comfortable enough to ask the teacher to help them correct their work.

Overcome Negative Stereotype

The first subtheme related to this theme is that teachers had to overcome the stereotype of math relevance after completing high school, the "when am I ever going to use this?" syndrome. In the focus group, Carla said, "No. I'm gonna be a history teacher. I don't need it." During the focus group, five of the 13 participants presented the same idea. Ashley mentioned during the focus group, that "Um, so I think a lot of people use math, but they probably don't think about it every day." People may not realize when they are using math. Teachers help students envision the relevance of math outside of the school setting.

Build Self-Efficacy

Building self-efficacy was the second subtheme in this category. One participant believed that the teacher could not change how she felt about his math acuity. Brenda stated, in her individual interview, "No, no, you can't change it. You just got to do better." She was the only

one who felt a person's belief in their math ability could be changed by the teacher. On the other end of the spectrum, Vanessa expressed:

> Um, if I didn't think I was very good at math and then my teacher like helped me, like through the problems, and helped me understand it. Then I would understand it more, so I'd be happier doing math.

Cole was asked, during his individual interview, if he believed teachers could help improve self-efficacy and he responded by saying, "Actually, yes. Cause like they can like challenge us and then if we don't get it, like, they can talk to us, like, what we did wrong and, like, what we're confused on." He liked how the teachers took the time to challenge students to overcome their performance and improve their math ability and confidence. Davis agreed with Cole and described, in his individual interview:

> Yeah, you could, like, go see them and they can, like, teach you the stuff you didn't understand. It's like yeah, because if you didn't know something, and they like teach you it. Then, when it comes down that you'll have more confidence because the teacher taught you it.

Four of the remaining participants believed the teacher could help them become more confident in math.

Teacher-Driven

Teachers have a substantial role in motivating students to do their best. Ashley mentioned, in her journal prompt,"I wanted to do better." For the journal prompts, all participants wanted to make their grades better. It appears that the teacher's interaction with the students can improve a student's self-confidence in math. Cole talked about how his teachers motivated him; he talked about his teachers in his individual interview: " teachers can, like, challenge us and then if we don't get it,

they can talk to us, like, what we did wrong and, like, what we're confused on." Eleven other participants believed that teachers could make a difference in math self-efficacy and improve motivation. Brenda was the only participant who believed teachers could not improve math confidence. "No. I think it's based off of yourself, not your teachers." Teachers were also consistent in requiring corrections and establishing expectations. Carla, in her individual interview, detailed how corrections were to be done. "Usually on, like, study, like, advisory. Well, however long the, well, you can go the two days but if you have [a] free period you can go then." Six of the 13 participants mentioned the aadvisory period as a time for corrections and retakes to be completed. Advisory happens every day right before lunchtime for all students, lasting for 20 minutes. Teachers motivate students through a variety of ways.

Outlier Data and Findings

The data analysis provided a finding that did not align neatly with the research questions. This finding was revealed during the horizonalization phase of the data analysis. Some of the participants talked about there being differences between the math teachers and their other teachers. Beth stated that her math teacher was always in "teacher mode." It always felt like the whole time was devoted to teaching math without there being a time where the teacher relaxed and talked about non-math-related topics. Beth felt she was always being observed by her math teacher. During the focus group, after being asked about how the relationship with the math teacher affects the desire to do corrections, Ryan stated "There are certain times when it can affect it or when it doesn't. I don't know because sometimes my teacher makes me nervous." The main description was that their math teachers seemed more matter of fact. Seven of the 13 participants expressed similar observations about their math teacher.

In contrast, during a focus group, several participants described how their non-math teachers seemed more personable than their math teachers. Johnny mentioned:

> But, like, Miss Little, she like has jokes and stuff. Oh yeah, like, Mr. Bridges is like, he like puts on baseball sometimes when we're working. But on music? Yeah. Oh yeah, Miss Ott plays music that is just like instrumental, like violin or piano.

Five of the 13 participants described their non-math teachers as allowing time for non-subject work during class. When asked whether other teachers affect their desire to do corrections, Alexia in her focus group stated, "We don't have corrections." The other participants reiterated this fact. So, math teachers seem more matter of fact in their teaching and are the only teachers to offer corrections for grades. Middle school students value relationships with adults who are important in their lives. These students may perceive a less authoritarian environment as a more personable one and subconsciously desire to please those in this setting more readily.

Research Question Responses

The accounts from the participants provided four major themes and 10 subthemes. These themes and subthemes emerged from the three data sources of individual interviews, focus groups, and participant journals. These themes guided me in answering the central research question and two sub-questions.

Central Research Question

The central research question asked, "How do middle school students describe their thoughts and emotional experiences in relation to their expected performance on math activities?" This question was answered in two parts. The first part was how they felt when they did better than expected on a math activity. Samantha described her emotions from her individual interview as, "pretty happy because I thought I was going to fail." Eight of the 13

participants described feeling happy about their success. Five of the 13 participants described excitement as their emotion. Johnny stated he was “excited that I don’t have to retake it.”

At the other end was how the participants felt when they did not do as well as they expected. Allison stated, “I’d be, like, a little bit upset.” Carla, in her individual interview, mentioned she would be “unsatisfied, not happy, sad.” Four of the remaining participants also described sadness as their main emotion.

The participants also described the emotions they felt concerning how they wanted to celebrate. Many wanted to share their success with their parents. Allison enjoys going with her parents for ice cream. “If I get like a good grade on most of my grades and my parents take me out to go get ice cream.” Four of the 13 participants enjoyed celebrating with their parents. Three of the 13 participants enjoyed celebrating with their friends.

Sub-Question One

Sub-question One asked, “What strategies have middle school math teachers used that encourage students to participate in opportunities to improve their math performance?” From the participants’ information, the main strategies were teacher consistency and communication. The main theme involved was expectations for test and homework corrections. The participants knew it was expected for them to engage in the opportunities to improve their grades. From his journal entry, Davis mentioned, “The recent math activity with the offer to improve my score is if you don’t like your score, you can always retake it.” He said this matter of fact and with the expectation that he would do the corrections if needed. In her interview Beth explained,

> Um, so after every test we do, she offers all the kids a chance to do corrections and then the next day you get the tests back, and you get the results, and then you can work on those corrections.

Seven of the 13 participants described the same sentiment about how the teacher communicates the opportunity to improve math grades. Consistency was another strategy teachers used to encourage students to participate in these opportunities. There was never a question about when and how to do the corrections. Carla explained when the corrections could be done: “Usually on advisory. Well, you can go the two days but if you have free period, you can go then.” Teachers and administration had a set time for corrections, which was daily during advisory period, for the 20 minutes prior to lunch. Five of the 13 participants described that the time for corrections was during advisory. This procedure encouraged the participants as it was interactive with the teacher. Vanessa explained, during her individual interview, that teachers “helped me, like, through the problems and helped me understand it then I would understand it more, so I’d be happier doing math.” Six of the 13 participants explained that their teachers helped them understand math better by having them do the test corrections.

Sub-Question Two

Sub-question Two asked, “What differences exist between the expectations of students who have high self-efficacy regarding their math performance from those whose self-efficacy is lower?” The aMAS broke the participants into three groups. Six participants were in the low math anxiety level, four were in the moderate range, and three were in the high-end range of math anxiety. Brenda was in the high end of math anxiety and, in her individual interview, and when she was asked about self -efficacy, she responded, “I don't really have math expectations because math isn’t, I don’t really like math and I normally don’t do good in that okay. So, I don’t really set goals and that’s anything like that.” Jackson wanted to avoid being in trouble with his parents, while Ashley was not sure if she wanted to go to college. The goals were more immediate for those who scored high on the math anxiety scale. This included avoiding parental

consequences, maintaining privileges, and getting a job out of high school instead of planning for college. Four of the 13 participants who scored in the moderate range of the math anxiety scale described getting a good job as important to them. Six of the 13 participants who had low math anxiety had dreams of going to college. Vanessa stated in her individual interview, “I want to go to Yale, I set high expectations for myself.”

The participants also talked about who bears responsibility for the results of an activity. Cole believed he bore the responsibility of his grades and expressed this, in his individual interview, how this could happen, “because if you don't pay attention. at all and like just talk to your friends. That would be based on you cause you don't know what to do.” Nine out of the 13 participants expressed that they were at fault when they did poorly. In comparison, three of the 13 who scored high on the math anxiety scale believed it was the teachers’ fault that they did poorly. Allison, in her individual interview, described why she thought it was the teacher’s fault, “I think it would be the teacher because they have to spend more time to try to help us figure it out.”

Summary

This chapter provided descriptions of the participants who took part in this research study and, using data analysis, the results have been presented. Data was collected from individual interviews, focus groups, and participant journals. This data yielded four themes and 10 subthemes. The four major themes are emotions related to math performance, motivational factors, test and homework corrections, and the teacher’s role. The answer relating to the central question and the two sub-questions were provided in this chapter. For the Central Research Question, pre-existing beliefs of ability, based on past performance, determine what emotions students felt concerning their current math performance on a math activity. For Sub-question

One, the role of the teacher providing help for students to increase their math skills and thus their self-efficacy beliefs were essential for motivation for students. For Sub-question Two, the difference in perception of ability and self-efficacy is evident based on the self-rating of math anxiety.

CHAPTER FIVE: CONCLUSION

Overview

The purpose of this phenomenological study was to understand the lived experiences of middle school students who have challenges in math and their expectations of opportunities provided to improve their performance at a middle school in the Spring Valley School District. A transcendental phenomenological approach was used. Collecting data using individual interviews, focus groups, and journal prompts yielded results that included four themes and 10 subthemes. This chapter provides a discussion of the findings, the implications for policy and practice, empirical and theoretical implications, limitations and delimitations, and recommendations for future research.

Discussion

Transcendental phenomenology provided a platform for the participants to describe their personal experiences in their own voice. The data analysis involved individual interviews, focus groups, and journal prompts to produce four themes and 10 subthemes. Within this discussion, the following sections are given: summary of thematic findings, empirical and theoretical implications that were presented in Chapter Two, implications for policy and practice, limitations and delimitations, and recommendations for future research.

Summary of Thematic Findings

This section presents a summary of the themes that developed from the data. These themes demonstrate the lived experiences of the participants. The summaries included are: the emotional impact of math performance, past performance and math anxiety, and teacher reliance.

Emotional Impact of Math Performance

Through data analysis, the participants revealed how math affects their emotions and

impacts their energy and effort on math assignments. This category was divided into two basic emotions, the first being happy and surprised when the participants succeeded in a math activity. Nine of the 13 participants expressed this emotion when they succeeded. The three remaining participants had a more subdued reaction to the success. These three had high math anxiety and expected failure, which tainted their reactions to success. The participants felt relieved that the assignment was over and they could move on and not worry about having to redo the math assignment. When succeeding, it was evident that this produced positive emotions in the participants.

The second emotion discussed by the participants was surprise and disappointment when they did not do as well as they expected to on a math activity. This differed from the success question in that it asked the participants to analyze how they felt in comparison to their self-perceived math ability. The six participants who had low math anxiety wanted to understand what they got wrong and correct their mistakes to learn the subject better and improve their grades. The three participants who had high math anxiety expressed sadness but had little interest in improving their grades. They did the corrections, though, because it was expected of them.

Past Performance and Math Anxiety

The participants also discussed how they based their self-efficacy on their past math performance. As mentioned in Chapter Three, self-efficacy is inversely related to math anxiety. The higher the math anxiety, the lower a person rated their math ability. Seven of the 13 participants rated their math anxiety as moderate to high. These seven mentioned that their performance in math is mostly attributed to their teacher, but they also believed the teacher can help them do better over time. They wanted the teacher to describe things in terms that the participants could understand and to keep working with them until they

understood better and felt better about their abilities. These seven students required several successes to start changing how they rated their math abilities.

Six of the 13 participants rated their math anxiety as low, and generally rated their math self-efficacy as high. These participants responded to doing poorly on a math activity with shock and surprise. They wanted to know what they did wrong and make corrections as quickly as possible. The opportunity to make these corrections needed to be immediately following the assignment. The longer the gap, the more anxiety the participants felt.

Teacher Reliance

The last discussion involved the reliance that participants had on their teachers. In her interview, Allison explained that the teacher bore the most responsibility for how she did. "I think it would be the teacher because they have to spend more time to try to help us figure it out because, in the morning, Mrs. Jones sometimes helps us with our homework if we don't understand it." Five of the 13 participants believed teachers had the most responsibility. Five other participants believed the student bore the most responsibility, but all agreed that the teachers should work with them as a team to improve their grades. In the focus group, Carla explained she believed that both bore equal responsibility when she shared:

> Because I should be it well on both sides it should probably be because like I could go up and ask the teacher but if I'm too scared to then it's on me. But if the teacher didn't really explain it that well then, it's on the teacher because then I wouldn't know how to do it.

Samantha, in her individual interview, believed the teachers wanted her to have better grades and so they provided the opportunities for improvement regularly. "Because that's just leading me towards a better grade so then I can pass get my degree and be whatever I want to be." The student had the goal, and the teacher provided the opportunity to achieve that goal.

The participants relied heavily on the teacher emphasizing the availability of test and homework corrections. Brenda described in her journal prompt that the teacher often offered the opportunity to make corrections:

> The recent math activity with the offer to improve my score is if you don't like your score, you can always retake it or do corrections, which I did do because I failed and I need to keep my grades up for sports.

The teachers always provided opportunities for students to improve their grades, and this was based on reaching a certain percentage, usually lower than 80%. The method of communicating the opportunity varied among teachers, but the participants were aware of when and how to do the corrections. Six of the 13 participants relied on these teacher interactions to complete test retakes. Concerning math self-efficacy, the participants believed that working with the teachers helped the participants improve their confidence. Ashley believed teachers want her to believe in herself by stating, "They will improve on it by either giving me something that's like way harder. Like if it's multiple occasions, not the multiplication I do, and they give me like a hard one, they help me through it." Seven of the participants believed teachers wanted them to gain confidence through providing extra help. Teachers need to take an active role with their students to improve math ability in middle school students. Seven of the participants believed teachers wanted them to gain confidence through providing extra help. Carla, in her individual interview, showed how her teacher provided extra help to do the corrections when she stated, "They would, like, guide you, and they would be how to do it and like feel comfortable doing it." Allison, in her individual interview, believed her teachers helped show their interest in her work by the extra attention and time to make sure she understood the concepts. She stated:

> Yeah, they do because they help me like for all the math teachers that I've had, if I don't understand a subject, they'll go back with me at a different time like at lunch or at recess to help me go over it and help me, like show me how to do it, right?

When teachers took more time to help the participants, this improved their self-efficacy concerning math.

Empirical and Theoretical Implications

This section describes the empirical and theoretical implications of this study. The empirical discussion shows how the findings aligned with the literature presented in the literature review in Chapter Two. Theoretically, the three aspects of Vroom's (1964) expectancy theory: expectancy, valence, and instrumentality, were well represented in the themes discovered during this research. These discoveries will be discussed in the following sections.

Empirical Implications

One of the significant aspects of this study was that teachers may be able to remodel student self-perceptions of their math skills. One driving factor for this study was that teachers often believe lack of effort is due to lack of motivation. Orbach et al. (2019) declared that existing literature had acknowledged that math anxiety and performance issues exist among students, leading to fear and an expectation of failure, which may lead to situational avoidance.

Students' Lived Experiences. The first theme discussed how the participant's emotions fluctuate depending on their performance in math. The participants declared that they felt happy when performing well but sad or disappointed when their performance was not as expected. There have been many factors that cause these participants to doubt their skills, which all seem to center around math anxiety. Santibañez and Guarino (2021) reviewed the absenteeism that occurred during the COVID-19 school shutdown and showed a negative correlation between

performance and being absent from the classroom. Math depends on order because it builds on itself. This order was interrupted. Participants described a fear of doing poorly when participating in math activities related to past performance.

The descriptions from the participants emphasized that they want to do well but may struggle with certain math situations. As previously mentioned, students want their teachers to express math in clear terms that relate math to the real world and have terms explained to them to provide consistency. Demedts et al. (2022) talked about two types of math anxiety, one being trait anxiety, which is a general fear of doing math, and state anxiety, which is more related to a specific problem presented in a math setting. In preparing for the day's math activity, those participants who showed a high level of math anxiety on their scale had more apprehension about the upcoming activity, as evidenced by their preparation techniques. Students who reported their math anxiety as high also expressed that they were less diligent in their preparations for the daily math activity.

The last part of this theme was participant celebration. Many participants enjoyed celebrating their success with their families even if only one parent was available in the home. Even though some literature has described how families may put different pressures on their children based on gender, there was no evidence of that in the participant data of this study. Lin et al. (2019) stated family cohesion influences the expectations of their children, and it showed in the participants' anticipation of the rewards the family gave them when they succeeded.

Teachers Make a Difference. The second theme discussed motivational factors with a subtheme of teacher-driven. The math teachers tended to focus more on math rather than allowing students to have free time discussing topics unrelated to math. All middle school students take the state standardized exam, and this is always before the last topic in the scope and

sequence can be completed. The teachers must operate with a strict sense of urgency compared to teachers who do not have standardized testing in their subject matter. Planas (2018) described the language of math as complex; the teachers demonstrated seriousness about the subject. The literature showed the formality in which math should be taught, including language and relating the problems to the real world.

The participants did not mention curriculum. This is in line with what Barnum (2019) concluded from the study by the Gates Foundation concerning curriculum and how teachers are more important than the books used to teach math. The teachers offered similar but differing ways for students to improve their math grades on activities. Along with this, class size was not considered. This was a small rural school, but there was no mention of the size of the class by the participants. The teachers fostered a learning environment that allowed for failure because the opportunity to improve was always present. Soncini et al. (2021) mentioned an error is when the results of a student's actions do not meet the expectations of the student or teacher. When this happened, a quick turnaround was in place to correct the below-expected performance. The procedures established by the teachers gave immediate feedback for expectations because the students' names were written on the board, or teachers asked about retakes as the assignments were handed back. The opportunity for corrections occurred the next day.

Building Confidence. The data reflected the ability of the teachers to increase confidence in the participants concerning their math skills. To begin with, each participant had a goal they wanted to accomplish after high school, whether it was college or a career. The boys often had more fantasy dreams than girls, but there appears to be a program or plan that gives the students insight into how math would benefit them. Some participants explained that they did not

understand when math would be used for their chosen goal, but the expectation for all students was to make the corrections, so this policy encouraged a growth mindset.

The expectation to do corrections was independent of ability. A score was set—such as 80%—and corrections were to be done below this score. Justicia-Galiano et al. (2017) defined trait anxiety as a general fear of doing math and can cause some people to shut down when it comes to performance in math activities. By encouraging corrections, the teachers allowed students to explore their failures, challenge themselves to struggle with the problem, scaffold answers, and thus build the participants' confidence. The participants often explained how teachers gave them work that bolstered their confidence.

Theoretical Implications

In Chapter Two, Vroom's (1964) expectancy theory provided a framework to help understand motivational factors regarding math performance for middle school students. The participants voiced that they believed that teachers could change the participant's mindset if the participant had faith in the teachers. Vroom surmised that behavior could be motivated when he stated, "motivational concepts play a major role in most serious efforts to analyze and explain behavior" (p. 5). Mulder (2020) further explained that participants must perceive that the rewards offered are compatible with their goals and ideals. Because of this, Vroom identified three key areas concerning his theory: valence, expectancy, and instrumentality.

The findings in this study demonstrated valence, which is the belief that the task will benefit the individual, as evidenced in the participants' belief that correcting their assignments and getting better grades can benefit them now and in future endeavors. All of the participants demonstrated various reasons for correcting their assignments. However, all of them demonstrated they were motivated by external rewards. The study showed that four participants

corrected their scores because of the policy of grade-checking for sports. If their grades were failing, they could not participate. They wanted to participate, so they made the corrections. Four other participants wanted to get into a good college, and good grades would benefit that end. The remaining participants wanted the rewards set forth by their parents.

The data also evidenced expectancy, which states that there is a strong belief that a particular outcome will occur. The outcome was that if corrections were completed then the grade would improve. While no data showed how the grades improved, the consensus among the participants was that their grades did improve when the effort was put into doing the work. No participant said their grade did not get better.

The teachers confirmed the third part of Vroom's theory, which is instrumentality. There was a general acknowledgment that all teachers offered the opportunity to improve on the participant's grade. All participants described how the teacher presented the opportunity and how they expected it to be completed. Fyfe and Brown (2020) showed that teachers could influence student motivation through positive feedback that can affirm a student's perception of their ability. When teachers expect students to do well, it shows up in their teaching and the help provided to students.

Implications for Policy or Practice

This section compares the participants' explanations and experiences to the existing literature presented in Chapter Two and provides information that adds to the existing literature. Hernandez-Martinez and Vos (2018) described an apparent disconnect from math because it has no real-world connection. The participants described their reasons for taking advantage of the opportunity to improve their scores. The findings from this study presented themes involving motivation and expectations, family roles, and teacher responsibility.

Implications for Policy

The first implication is that statewide training on the effects of math anxiety on all secondary students should be included in the teacher recertification process. As stated in the literature review in Chapter Two, there is a reduction in actual daily class time to work on math in middle school as compared to actual daily math time in elementary school. Secondary math teachers are subject matter experts and know the math material and how to do the work. Still, they may not understand how the students feel about their ability to do math because of math anxiety caused by past poor performance. Secondary math teachers are considered subject matter experts; they understand the material well but often struggle to teach the material in ways that secondary students can understand and master math. Klados et al. (2019) mentioned that working memory is affected by math anxiety, and therefore, the more the complex computation is, the less it will get stored away. Helping students with memory would be very beneficial, including policy changes related to notetaking in the classroom and extra math classes to reinforce already presented material.

Another implication for policy would be to include math anxiety as a potential accommodation consideration for either a 504 workup or an Individual Education Plan (IEP). As math anxiety has been shown to affect how the brain stores math material, this should be a consideration for testing for potential processing deficits. Math processing deficits are already tested for, but there is no direct test for anxiety. Modecki et al. (2018) mentioned that researchers need to identify links between stressors and anger in young people to understand and help control behavior issues stemming from this deficiency. Adolescence is a tough time mentally for many, and the changes in the body could lead to mental deficits that appear as processing efforts that have not previously occurred.

The last policy implication would be at the district level and this would be the requirement that all math teachers offer opportunities for improvement, and that this practice be standardized throughout the district. The data showed strong evidence to support consistency in the policy. The participants knew there was an expectation that opportunities would be offered to improve grades and that students were expected to take advantage of them.

Implications for Practice

This study showed that providing a set time in the math calendar to provide opportunities to improve scores was a significant finding for this school; it may also be beneficial in other schools. Xenofontos (2019) explained that the best place for change is through professional development, and the ideal area for professional development is the professional learning community (PLC). In my current school district, math teachers came together to identify the essential standards for each math grade level and course. This may be an option for other school districts. Once this is completed, the middle school and high schools, as a group, could build a pacing guide to cover the standards and allow for student corrections and retakes. The curriculum would have to be reviewed and adjusted to the essential standards.

It may also be helpful to allow teachers to be creative in establishing procedures in their classrooms. The end goal would be the same for each class in the school, but teacher creativity would be allowed and encouraged. Patall et al. (2019) established that teachers should be allowed to account for the daily fluctuations in student motivation levels with an approach that nurtures agency and autonomy for the student.

Limitations and Delimitations

This study incurred limitations. The first was the available pool of potential participants. Initially, permission was attempted in a larger district, but this permission was denied. A smaller

rural district did permit me to complete the study. The limitation here is that the smaller district has only one middle school. The single school has a limiting effect on the generalizability of the study. Another limitation was the lack of contact with the students. All communication had to go through the principal, who limited interactions with the students during days off. The participants were obtained during registration for the next year when they came to the school. Setting up times for interviews and focus groups required meeting the participants during the school day because of after-school activities and the school being on a four-day week.

The delimitations for this study included the boundaries established for the participants. The participants were to be middle school students between the ages of 11 and 14. This excluded those students who may have been held back. Also, the participants had to attend this school and currently have a math class. This ensured that the results would be related to these teachers and not others from a different school or rely on old information from other math classes.

Recommendations for Future Research

Considering the study's findings, limitations, and delimitations placed on the study, I recommend the following ideas for future research. The first recommendation would be to perform the same analysis for a larger school district with multiple middle schools. This would broaden the participant pool and could provide a comparison among schools, as well. Teachers could also be added to this study to gain their perspective. Some items that could be included would be a review of the correction program in each school and obtaining teachers' input as to how they apply the program. This could include the district gaining an outside perspective, in cooperation with another district or parents on the buy-in and quality of existing programs. I recommend a quantitative aspect to this study, which should be more of a mixed-methods type study. Quantitative data would be collected from the grade book to show before-and-after grades

and measure the increase in grades to demonstrate the effectiveness of the program. An instrumental case study could be conducted to determine how the system of grade checks for sports and incentives for grades helped with student engagement.

Conclusion

Through this study, I discovered that math anxiety is a common predicament for middle school students. No participant rated themselves as having zero math anxiety, but the levels of math anxiety varied among them. One insight I discovered was that students do not lack motivation because of laziness or a lack of work ethic; they lack motivation because of past math performance. Those who ranked high in math anxiety pointed to their past failures as the reason for not wanting to do math. When discussing correction opportunities and how they prepared for the day's math activity, many participants describe their anxiety levels based on how they have done in previous math classes. The most effective way to overcome this past performance anxiety is through consistent and effective teacher interventions. The participants described the methods their teachers used to get them to do corrections, thus improving their understanding of math. Consistency in time, place, and procedure prompted the students to make the corrections. The teachers performed reteaching and confidence building through scaffolding of assignments, thus building the participants' confidence. The participants showed confidence in their teachers' ability to help them understand math better and realize why this subject is important. Districts, schools, and teachers should implement opportunities to improve math scores as a matter of policy.

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Appendix A :IRB Approval

LIBERTY UNIVERSITY.
INSTITUTIONAL REVIEW BOARD

January 30, 2023

Steven Fencl
Christopher Clark

Re: IRB Approval - IRB-FY22-23-559 A PHENOMENOLOGICAL STUDY EXAMINING THE LIVED EXPERIENCES OF MIDDLE SCHOOL STUDENTS WHO HAVE DEMONSTRATED CHALLENGES IN MATH AND THEIR EXPECTATIONS TO IMPROVE THEIR PERFORMANCE

Dear Steven Fencl, Christopher Clark,

We are pleased to inform you that your study has been approved by the Liberty University Institutional Review Board (IRB). This approval is extended to you for one year from the following date: January 30, 2023. If you need to make changes to the methodology as it pertains to human subjects, you must submit a modification to the IRB. Modifications can be completed through your Cayuse IRB account.

Your study falls under the expedited review category (45 CFR 46.110), which is applicable to specific, minimal risk studies and minor changes to approved studies for the following reason(s):

7. Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies.

Your stamped consent form(s) and final versions of your study documents can be found under the Attachments tab within the Submission Details section of your study on Cayuse IRB. Your stamped consent form(s) should be copied and used to gain the consent of your research participants. If you plan to provide your consent information electronically, the contents of the attached consent document(s) should be made available without alteration.

Thank you for your cooperation with the IRB, and we wish you well with your research project.

Sincerely,

G. Michele Baker, MA, CIP
Administrative Chair of Institutional Research
Research Ethics Office

Appendix B: Recruitment Letter to Parents

Dear Parent or Guardian:

As a graduate student in the School of Education at Liberty University, I am conducting research as part of the requirements for a Doctor of Education degree. The purpose of my research is to describe the thoughts and emotions of middle school students who have challenges in math and taking advantage of opportunities to improve performance. I am writing to invite eligible students to join my study.

Participants must be middle school student, ages 11-14, enrolled in a math class, and have had opportunities to improve their performance in math during their middle school time. Participants, if willing, will be asked to participate in an individual interview (45 minutes), take part in one of three focus groups with other middle school math students (45 minutes), and respond to 4 journal prompts 4 times over a two-week period that will detail how they report their emotions and thoughts concerning that day's math activities and any opportunities for them to improve their math grade (10-15 minutes each time). Names and other identifying information will be requested as part of this study, but the selected participants will be assigned a pseudonym.

To participate, please respond to this email. I will send you a link to a survey for your child to complete. The survey is only designed to assist me in finding a varied group of participants and will not be included in the study. You will be notified of your child's selection for this study.

A parental consent document, and potentially a child assent document depending on the age of your student, will be emailed to you if your child is selected. The consent documents contain additional information about my research. If you choose to participate, you will need to sign the parental consent document, and potentially the child assent document, and return it to me prior to participating in the study.

Participants will be compensated with a $10 gift card to Dutch Bros.

Sincerely,

Steven Fencl
Researcher

Appendix C: Prescreening Survey for Math Students

"Removed to comply with copyright"

Carey, E., Hill, F., Devine, A., & Szűcs, D. (2017). The modified abbreviated math anxiety scale: A valid and reliable instrument for use with children. *Frontiers in Psychology*, *8*. https://doi.org/10.3389/fpsyg.2017.00011

Appendix D: Written Permission from The Publisher

[EXTERNAL EMAIL: Do not click any links or open attachments unless you know the sender and trust the content.

Dear Steven

Please feel free to use the scale, it is in the supplementary materials of the validation paper. We do not have established cut-offs for maths anxiety but you can use it to identify people who have higher levels than others. Please cite the validation paper on any of your research outputs.

Best wishes with your research.

Kind regards,
Emma

Hello,
My Name is Steven Fencl and I am a doctrinal candidate at liberty university.
I would Like permission to use your scale to help me identify participants for my dissertation.
If you could guide me in the right direction, I would greatly appreciate it.
Thank you so very much.

Appendix E: Email Notification to Parents

Email to parents of students accepted into the study:

Thank you for responding to the prescreening survey for the study entitled A phenomenological study examining the lived experiences of middle school students who have demonstrated challenges in math and their expectations to improve their performance. I am pleased to announce that your child has been selected for the study. Please review and sign the attached parent consent form and student assent form and return them to me via email attachment or send with your child to their teacher within two weeks.

Sincerely,

Steven Fencl

Email to parents of students not accepted into the study:

Thank you for responding to the prescreening survey for the study entitled A phenomenological study examining the lived experiences of middle school students who have demonstrated challenges in math and their expectations to improve their performance. I regretfully must inform you that your child has not been selected for this study at this time. Thank you for your time.

Sincerely,

Steven Fencl

Appendix F: Parent Consent Form

Parental Consent

Title of the Project: A Phenomenological Study Examining the Lived Experiences of Middle School Students Who Have Demonstrated Challenges in Math and Their Expectations to Improve Their Performance

Principal Investigator: Steven Fencl, Doctoral Student, Liberty University

Invitation to be Part of a Research Study

Your student is invited to participate in a research study. Participants must be in middle school, be between the ages of 11 and 14, have had the opportunity to improve their math grades anytime during middle school. Taking part in this research project is voluntary.

Please take time to read this entire form and ask questions before deciding whether to allow your student to take part in this research project.

What is the study about and why are we doing it?

The purpose of this study is to understand why students may or may not take opportunities to increase their math performance when given the opportunity to. It is designed to allow teachers and staff to understand the emotions these students face and how teachers can help the students be successful.

What will participants be asked to do in this study?

If you agree to allow your student to be in this study, I will ask him or her to do the following things:

1. Participate in an individual interview that should take about 45 minutes. I would like to audio tape your student as he/she completes the interview to make sure that I accurately remember all the information. The interview will be conducted in person.
2. Participate in one of three focus groups with other middle school math students that should take 45 minutes. Each group will include up to 5 participants who have not previously participated. I would like to audio tape your student as he/she completes the focus group to make sure that we remember accurately all the information. The focus group will be conducted in person.
3. Respond to 4 journal prompts, with 4 responses over a two-week period, which detail their emotions and thoughts concerning that day's math activities and any opportunities for them to improve their math grade. This should take a total of 10-15 minutes to complete each time (40-60 minutes total). The responses to all 4 questions should be returned by email each time they are completed.
4. Check the transcriptions of their interview and their part of the focus group for accuracy. This should take about 15 minutes.

How could participants or others benefit from this study?

Participants should not expect to receive any direct benefits from taking part in this study. However, your student may benefit from taking part in a collaborative conversation with other middle school math students to understand their thoughts and emotions in relation to their expectations concerning math performance.

Benefits to society may include a better understanding of the factors that affect a student's motivation to improve their grade in math.

What risks might participants experience from being in this study?

The risks involved in this study are minimal, which means they are equal to the risks your student would encounter in everyday life.

I may become privy to information that triggers the mandatory reporting requirements for student abuse, student neglect, elder abuse, or intent to harm self or others. By law, as a teacher, I am a mandatory reporter.

How will personal information be protected?

The records of this study will be kept private. Published reports will not include any information that will make it possible to identify a subject. Research records will be stored securely, and only the researcher, faculty sponsor, and methodologist will have access to the records.

- Participant responses will be kept confidential through the use of pseudonyms. Interviews and focus groups will be conducted in a location where others will not easily overhear the conversation.

- Data will be stored on a password-locked computer and may be used in future presentations. After three years, all electronic records will be deleted.
- Interviews/focus groups will be recorded and transcribed. Recordings will be stored on a password-locked computer for three years and then erased. Only the researcher will have access to these recordings.
- Confidentiality cannot be guaranteed in focus group settings. While discouraged, other members of the focus group may share what was discussed with people outside of the group.

How will participants be compensated for being part of the study?

Participants will be compensated for participating in this study. They will receive a $10.00 Dutch Bros. gift card for completing all of the tasks listed above. The card will be handed to the parents of participants.

Is study participation voluntary?

Participation in this study is voluntary. Your decision whether or not to allow your student to participate will not affect yours or his or her current or future relations with Liberty University. If you decide to allow your student to participate, she or he is free to not answer any question or withdraw at any time without affecting those relationships.

What should be done if a participant wishes to withdraw from the study?

If you choose to withdraw your student from the study/your student chooses to withdraw from the study, please contact the researcher at the email address/phone number included in the next paragraph. Should you choose to withdraw him/her, or should your student choose to withdraw, data collected from your student, apart from focus group data, will be destroyed immediately and will not be included in this study. Focus group data will not be destroyed, but your student's contributions to the focus group will not be included in the study if you choose to withdraw him/ her from this study, or if your student chooses to withdraw.

Whom do you contact if you have questions or concerns about the study?

The researcher conducting this study is Steven Fencl. You may ask any questions you have now. If you have questions later, **you are encouraged** to contact him at [redacted] or [redacted]. You may also contact the researcher's faculty sponsor, Dr. Christopher Clark, at [redacted].

Whom do you contact if you have questions about rights as a research participant?

If you have any questions or concerns regarding this study and would like to talk to someone other than the researcher, **you are encouraged** to contact the Institutional Review Board, 1971 University Blvd., Green Hall Ste. 2845, Lynchburg, VA 24515, or email at irb@liberty.edu.

Disclaimer: The Institutional Review Board (IRB) is tasked with ensuring that human subjects research will be conducted in an ethical manner as defined and required by federal regulations. The

topics covered and viewpoints expressed or alluded to by student and faculty researchers are those of the researchers and do not necessarily reflect the official policies or positions of Liberty University.

Your Consent

By signing this document, you are agreeing to allow your student to be in this study. Make sure you understand what the study is about before you sign. You will be given a copy of this document for your records. The researcher will keep a copy of the study records. If you have any questions about the study after you sign this document, you can contact the study team using the information provided above.

I have read and understood the above information. I have asked questions and have received answers. I consent to allowing my student to participate in the study.

☐ The researcher has my permission to audio-record my student as part of his/her participation in this study.

_____
Printed Student's Name

_____
Parent's Signature Date

_____
Minor's Signature Date

Appendix G: Child Assent to Participate

What is the name of the study and who is doing the study?

The name of the study is A Phenomenological Study Examining the Lived Experiences of Middle School Students Who Have Demonstrated Challenges in Math and Their Expectations to Improve Their Performance, and the person doing the study is Steven Fencl.

Why is Steven Fencl doing this study?

Steven Fencl wants to know why students do not always take advantage of opportunities to get a better math score.

Why am I being asked to be in this study?

You are being asked to be in this study because you are a middle school student, between the ages of 11 and 14, who has had the opportunity to improve math grades anytime during middle school.

If I decide to be in the study, what will happen and how long will it take?

If you decide to be in this study, you will be asked to participate in an individual interview, which would take about 45 minutes, participate in a focus group, which will take about 45 minutes, respond to 4 journal prompts over a two-week period, which will take about 40-60 minutes total, and review transcriptions of your interview and focus group for accuracy which would take about 15 minutes.

Do I have to be in this study?

No, you do not have to be in this study. If you want to be in this study, then tell the researcher. If you don't want to, it's OK to say no. The researcher will not be angry. You can say yes now and change your mind later. It's up to you.

What if I have a question?

You can ask questions any time. You can ask now. You can ask later. You can talk to the researcher. If you do not understand something, please ask the researcher to explain it to you again.

Signing your name below means that you want to be in the study.

_____

Signature of Child/Witness Date

Steven Fencl
[redacted]
Christopher Clark
[redacted]
Liberty University Institutional Review Board
1971 University Blvd, Green Hall 2845, Lynchburg, VA 24515
irb@liberty.edu

Appendix H: Interview Questions

Standardized Interview Questions

1. Please describe the emotions you feel when you succeed in a math activity. (CRQ)
2. Describe how you decide on when you will participate in an academic related opportunity used to recover from your performance on a math activity. (SQ1)
3. What methods do you use to determine which math activities you will do and which you will not do? (SQ2)
4. When you are working on an activity, what determines how much energy and effort you devote to it? (SQ2)
5. Please describe the emotions you feel when your performance on a math activity was not what you expected. (TF, CRQ)
6. Considering your performance on a math activity, who bears more responsibility, the teacher or you? Please explain why you believe this way. (SQ2)
7. After having participated in activities designed to improve your performance, do you feel as if the effort was worth it? Explain. (SQ2)
8. Reflecting back on your thoughts regarding mathematics self-efficacy, do you believe teachers can help you improve that? If so, then how? If not, then why? (SQ1)
9. How often does your math teacher offer opportunities to improve your performance? (SQ1)
10. Describe the methods teachers employ to inform you of the opportunities to improve your performance on a math activity. Describe your preferred method. (SQ1)
11. How does your teacher expect the opportunity to be completed? (SQ1)

12. How do you celebrate the successful completion of your math assignments with a passing grade? (CRQ)
13. How do your expectations influence the steps you can take to do your best on a math activity? (SQ2)
14. Self-efficacy means that you believe you have the skills needed to accomplish an activity. How would you describe your self-efficacy regarding the successful completion of a math activity? (SQ2)

Appendix I: Focus Group Interview Questions

1. Describe the thoughts regarding your emotions when you perform as expected versus when your performance does not meet your expectations. (CRQ)
2. Sometimes our expectations regarding a math activity affect our actual performance. Describe how your expectations have influenced you during a math activity. (CRQ)
3. Describe your relationship with your math teacher as compared to your other teachers. (SQ1)
4. How does your relationship with your math teacher affect your decision to participate, or not participate, in opportunities in a math activity to improve your score? (SQ1)
5. Describe how relevant you believe math to be in your life. (SQ2)
6. Describe your thoughts regarding your math ability. Do you believe your ability can change? If so, by what means, and if not, why? (SQ2)

Appendix J: Journal Prompts

Instructions: During the next two weeks you will receive four journal prompts, at the end of selected days Please spend 10 to 15 minutes answering the following journal prompts. Please write your thoughts as accurately and detailed as possible.

1. Thinking of today's math activity, describe your expectations concerning your performance. (CRQ)
2. Thinking of today's math activity, describe how you prepared for it. (SQ1)
3. Thinking of a recent math activity, describe the opportunities offered to improve your score. (SQ1)
4. Did you take advantage of these opportunities/ Why or why not?

Link to Google form.

https://docs.google.com/forms/d/e/1FAIpQLScfY16fApZN_laQwGQ1GamIG0wXx1EgXjRRagZNf1hW4TzMOg/viewform

Appendix K: Researcher's Reflexive Journal

Date	Entries
8/11/2020	My bias has leaned towards students who are bad at math are that way because of their own doings. I have learned that there are many factors involved.
7/29/2022	I taught summer school this year and after encounters with two students, I believed they were lazy and not wanting to do the work. Then they told me their stories and I understood why they were the way they are.
9/29/2022	Being in a new school with a different cultural makeup has not changed the attitude of the students. In fact, it may be worse. The school is in an impoverished area, and this may be the cause.
10/19/2022	During parent teacher conferences, students who were in advanced math classes had parents who encouraged them in math. The other eighth-grade math teacher noted comments from parents of lower performing students included how they were not good at math and did not see how this would be useful later on.
12/15/2022	The IRB review wants me to give recruitment letters to the staff at the school and have them send them out because of FERPA. I pray that this does not overly stress the staff and cause a negativity towards the research.
2/1/2023	I find myself reverting to believing the students are lacking motivation and have to be careful of my attitude. These are my own students as I have not obtained school board approval to begin collecting data.

4/15/2023	Have completed my pilot study and am concerned with how the participants will respond. I need to be clear on the confidentiality of the answers and that I am not looking for the right answer.
6/30/2023	I am teaching summer school again. I found out that teacher expectations will not always come to fruition. Expectations need to be set by the teacher.
10/15 2023	Participants needed additional guidance on what questions were asked. Need to simplify them for middle school students. Maybe provide questions in advance.
10/18/2023	After commencing data collection, I believe all of the participants want to do well, even if they believe they are not good at math
10/19/2023	No matter the family dynamic, middle school students want their parents to approve of them. They put up a good façade if their parents don't. "I don't care."
11/10/2023	There seems to be an established policy in this school that corrections in math are expected by admin and teachers. There also seems to be support for student thinking about goals after high school.
1/3/2024	I would like to have seen data showing how the grades changed for the participants. They mentioned when they needed to do retakes but were they successful.
1/14/2024	These students all wanted to do well but just needed guidance. I wonder if math anxiety should be included on the list of items that would require special education services.

Appendix L: Audit Trail

Date	Entries
6/20/2022	School district permission obtained
8/22/2022	Obtained permission to use prescreening tool
11/18/2022	Proposal successfully defended
11/20/2022	First IRB submission
12/15/2022	IRB edits
1/30/2023	IRB approval
5/1/2023	Applied to another school district to conduct research during their summer school. Permission was not granted.
8/2-8/3 2023	Attending participating school's registration to recruit participants. I was able to recruit 17
8/7/2023	Sent emails to those who wanted more information.
10/18,25/2023	Conducted interviews and focus group studies on location
11/1/2023	Transcribed interviews and focus groups using Notta AI- sent transcripts for participants to review
11/15/2023	Reviewed transcripts were returned, and analysis begins
11/13/2023	Journal prompts began using google forms
12/10/2023	Completed journal prompts all data is collected
12/1/2023	Completed transcription redesign for each participant, dividing researcher comments from participant comments
12/2/23023	Began using Word and Excel to codify the transcripts

12/30/2023	Completed theme analysis