UNDERSTANDING MASTERY-ORIENTED MIDDLE GRADES MATHEMATICS TEACHERS IN PERFORMANCE-ORIENTED SCHOOL ENVIRONMENTS

By

TONYA M RHODES

Bachelor of Arts in Film Studies
Columbia University
New York, NY
1994

Master of Science in Teaching, Learning and Leadership
Oklahoma State University
Stillwater, OK
2006

Submitted to the Faculty of the
Graduate College of the
Oklahoma State University
in partial fulfillment of
the requirements for
the Degree of
DOCTOR OF EDUCATION
December, 2022

UNDERSTANDING MASTERY-ORIENTED MIDDLE GRADES MATHEMATICS TEACHERS IN PERFORMANCE-ORIENTED SCHOOL ENVIRONMENTS

Dissertation Approved:

Dr. Jennifer Cribbs

Dissertation Adviser

Dr. Juliana Utley

Dr. Adrienne Sanogo

Dr. Mike Yough

.

ACKNOWLEDGEMENTS

First, I'd like to thank my Lord and savior Jesus Christ for his love patience and encouragement during the entirety of this journey. I would like to thank all my families. My natural family in the form of my wonderful husband Melvin Rhodes and my four beautiful children: Mozelle, Josiah, Naomi, and Gileila for all of love, patience and support you have given me these past five years. You have no idea how much I missed y'all when I had to stay late nights at the library or commute early mornings down to Stillwater on the shuttle bus. I want to thank my sister, Marica Yargee, my nephews Jamal Johnson and Devin Crawford as well for just being who you are and always being there to offer an ear to listen to my struggles. I would also like to thank my church family who has had my back since day one with prayers, snacks, and gifts that kept me going even when I wanted to quit. You always came through with an on-time word of wisdom and love. I wholeheartedly thank you. I want to also include my outstanding Facebook family who always reached out with prayer and encouragement for every posted milestone!

Second, I would like to thank my outstanding and kind advisor, Dr. Jennifer Cribbs. You have been the epitome of a mentor and role model since I arrived on campus that hot August 2017. Thank you so much for your gentle but comprehensive feedback and all the many hours you have invested in me. May the Lord richly bless you, your

entire family, and your research!

Third, I would like to thank entire committee! Dr. Juliana Utley, Dr. Adrienne Sanogo, and Dr. Mike Yough. I have learned so much from each of you that there really isn't enough room to put it all down in this small space. I have become not only a better teacher and researcher but also a better person. I cannot thank each of you enough!

Last, I'd like to end these acknowledgements with a short poem I wrote for this grand occasion.

Not Me

If you had told fifteen-year-old me a teacher I would be
I would have thought you daft as I gasped and then laughed
While I said, "That couldn't be me!"
And if you'd said, further still, a math teacher of high degree
"No way! Stop playing because you can't fool me!"
As sure as the sun rises, I'd protest!
But you'd end it all by saying… and the ones who struggle, you'll love best!

Thank you all so much! Time to dance!

Name: TONYA RHODES

Date of Degree: DECEMBER, 2022

Title of Study: UNDERSTANDING MASTERY-ORIENTED MIDDLE GRADES TEACHERS IN PERFORMANCE-ORIENTED SCHOOL ENVIRONMENTS

Education: MATH EDUCATION

Abstract: In response to a shift to high-stakes assessments, teachers are changing their instruction and approaches away from research-based formal training on best practices teaching in response to the stress and pressure this shift has created (Avalos et al., 2020; Gonzalez et al., 2017; Musoleno & White, 2010). More research is needed on teachers who make the choice to exercise their agency or ability to implement practices in their mathematics classrooms which align with the effective pedagogical methods. Barajas-Lopez and Larnell (2019) described *acts of creative subordination* as an avenue for teachers to push back against formalized curriculum assessments and reassert their power. This explanatory sequential mixed-methods study explored mathematics teaching self-efficacy and perceptions of school goal structure as factors influencing middle grades mathematics teachers' (MGMTs) goal orientations. Quantitative data were collected in Phase 1 through an online survey with MGMTs and was used to select participants for Phase 2 of the study. Qualitative data were collected in Phase 2 through semi-structured interviews with five mastery-oriented middle grades mathematics teachers who perceived their school environment as performance oriented. To understand current MGMTs, a standard regression was conducted. Results indicated that mathematics teaching self-efficacy, education, and teaching experience accounted for 29.1% of the variance in MGMTs mastery goal orientation. Additionally, a second regression model indicated that both perception of performance school goal structure and mastery school goal structure accounted for 35.9% of variance of performance goal orientation. Several key findings emerged from values and structural coding the qualitative data in Phase 2. MGMTs valued their students' effort, autonomy, relationships, and self-efficacy. These values were characterized by practices that reframe mistakes, pushed student autonomy, communicated via verbal feedback, and encouraged students to grow in their learning.

TABLE OF CONTENTS

Chapter Page

Chapter Page

LIST OF TABLES

Table Page

LIST OF FIGURES

Figure Page

CHAPTER I

INTRODUCTION

The National Council of Teachers of Mathematics' (NCTM) guiding principle for assessment states that:

> An excellent mathematics program ensures that assessment is an integral part of instruction, provides evidence of proficiency with important mathematics content and practices, includes a variety of strategies and data sources, and informs feedback to students, instructional decisions, and program improvement (NCTM, 2000, p.89).

Despite the initial justifications for norm-based national testing or "high-stakes testing", this type of assessment has had a negative influence on both teacher- (e.g., limiting curriculum choices) and student-related outcomes (e.g., loss of enjoyment in learning, increased test anxiety) (Jones, 2007; Putwain & Symes, 2011). The National Council of Teachers of Mathematics (NCTM, 2000) indicated that effective teachers must be reflective learners within their field of practice as well as astute users of assessment to adapt their teaching to their students' diverse needs. National norm-based or "high-stakes" testing place mathematics teachers in a strained position. On one hand, teachers want to create classroom environments that nurtures the love of learning, while on the other hand, teachers feel the pressure to regularly measure and to compare students for the sake of data and evaluations of teacher effectiveness (Avalos et al., 2020; Wills & Sandholtz, 2009). While accountability measures have enveloped education since the authorization of No Child Left Behind (NCLB, 2002), the Every Student Success Act (ESSA, 2015) attempted to address concerns regarding these accountability measures through related revisions, such as increasing states' autonomy in decisions affecting how

and when to test their students and eliminating the adequate year progress requirement. However, tension persists between the directives of national professional associations (e.g., NCTM, National Research Council) and government entities with the implementation of accountability measures such as NCLB (2003). This study sought to explore how teachers contended with the pressure from performance-based assessment and accountability measures while maintaining pedagogically-sound and research-based practices that yield successful learning outcomes.

Background of the Problem

Accountability legislation such as NCLB (2003) and ESSA (2015) have resulted in lingering and unintended consequences for teachers and students. Recent research studying the impact of increased levels of accountability and data-driven goals in public schools on teachers and students found that accountability measures have had a significant adverse effect on teachers' retention and stress levels (Gonzalez et al., 2017; Ryan et al., 2017). Concerning student side effects, critical theorists in education research have connected accountability measures with a neoliberalism agenda that promotes competitive and performance-based systems of assessment (Apple, 2017; Barajas-Lopez & Larnell, 2019; Yeh, 2018). Apple (2017) maintained that neoliberalism brought a *marketized* view into public education, which assured that raising the levels of competition would yield greater results despite mounting empirical evidence to the contrary. On one hand, there is a mastery-oriented view of the use of assessments in which …. (e.g., using assessment data to guide instruction and to provide justification for intervention strategies). While on the other, there is a performance-oriented view of assessment data such that … (e.g., using data to promote a comparative and competitive system; Yeh, 2018). These performance-based assessments have contributed to heightening test anxiety and stress in students when high-stakes tests use scores to reflect students' abilities (Jones, 2007). How educators respond to these opposing views of the use of assessments can affect the types of practices used and learning experiences created in mathematics classrooms.

Statement of the Problem

Focus on high-stakes tests has shifted the purpose and role of assessments in public education, which may run counter to statements made by professional teaching associations calling for an increase in cognitive demand, mathematical discourse, and development of deep conceptual understanding in mathematics education (NCTM, 2000, 2014). Teachers are changing their instruction and approaches away from research-based formal training in response to the stress and pressure created due to the implementation of high-stakes testing (Avalos et al., 2020; Gonzalez et al., 2017; Musoleno & White, 2010). Pressure to "teach to the test" causes teachers to deviate from research-based best practices (Avalos et al., 2020). Despite this pressure, more research is needed focusing on teachers who still make a choice to exercise their agency or ability to implement practices in their mathematics classrooms that align with effective pedagogical methods. Barajas-Lopez and Larnell (2019) described *acts of creative subordination* as an avenue for teachers to push back against formalized curriculum assessments and reassert their power. This national problem provided the basis for this study.

Purpose Statement

This study aimed to explore personal (teaching self-efficacy) and environmental (school goal structure) factors influencing mathematics teachers' goal orientations utilizing an explanatory sequential mixed-methods design. The first phase of the study collected quantitative data measuring middle school teachers' self-efficacy, goal orientation, and perceptions of school goal structures. The follow-up second phase of the study collected qualitative data regarding the teachers' perceptions of their schools' goal structure and how teachers created their classroom goals. In the quantitative phase, survey data were gathered from in-service mathematics middle school teachers to determine whether mathematics teaching self-efficacy and perceptions of school goals were predictive of participants' goal orientations. The second qualitative phase was performed as a follow-up to the quantitative findings to provide detailed and rich descriptions of participants who perceived their school goal structure as performance-based yet maintained a mastery-oriented approach to teaching mathematics.

Research Questions

This study explored middle school mathematics teachers' mathematics teaching self-efficacy, goal orientations and perceptions of their school environments. The specific research questions were:

1. What are in-service middle grades mathematics teachers' mathematics teaching self-efficacy, goal orientation, and perceptions of school goal structure?
2. Does in-service middle grades mathematics teachers' mathematics teaching self-efficacy and perceptions of schools' goal structure predict their goal orientation?
3. How do in-service middle grades mathematics teachers maintain their mastery goal orientations while teaching in performance-oriented school environments?

Significance of the Study

The significance of this study rested on offering a deeper understanding of how teachers' perceptions and beliefs inform their instructional decisions (as explored through goal orientation). These decisions affect the type of instruction and subsequent student achievement (Chang, 2015). Personal and environmental factors play an important role in teachers' practice. Personal factors such as personal goal orientation and self-efficacy drive teacher choices (Huang et al., 2007). Sommet and Eliot (2017) argued that studying specific combinations of the goals and the reasons defined as *achievement goal complexes* could help enhance researchers' comprehension of the mechanisms that exist in actual classrooms. Additionally, Cury et al. (2006) found that social cognitive theory and achievement goal theory overlap in their ability to predict teacher behavior in mathematics classrooms. This study provided a current and richer descriptive foundation for that connection by focusing on in-service middle grades mathematics teachers and their classrooms.

Ethical Considerations

In the following section, ethical considerations such as this study's assumptions, delimitations and limitations were discussed. Justifications for study design choices and how ethical concerns were addressed as included as well.

Assumptions

Simon (2011) defined assumptions as notions not within a researcher's control but without which there would be no research. Assumptions should be explicitly explained to make bare the underpinnings of the conceptual framework for the study (Nkwake, 2020). The assumptions that were undertaken in this study were ontological and epistemological in nature. First, I am centered as a realist and constructionist in my world perspective (Crotty, 2015). I assume that the evidence of the goals and the level of confidence in teaching mathematics that in-service teachers possess is discernible, observable, and measurable. I also have an interpretive epistemological view of knowledge, which Crotty (2015) described as knowledge that is created through the interactions between people and their environment. Considering this interpretation, I acknowledge my potential for bias as the primary data collection instrument for the qualitative phase of this study. Therefore, the themes that I uncovered were co-created by myself and the study participants.

Delimitations

Delimitations are the limits that define the breath of a study and acknowledge the possibility of other questions/populations that could have been investigated (Simon, 2011) and help to frame the boundaries of the study. This study focused on aspects of teaching within the classroom teachers can affect such as their teaching self-efficacy, their mathematics teaching efficacy, their goal orientation, and their interactions with their students. The problem was the pressure in-service teachers may feel to focus on testing and performance data rather than increasing students' mathematical knowledge and skills. In-service middle school mathematics teachers comprise a small percentage of the population being studied in the current research that focuses on the overlap between mathematics self-efficacy and achievement goal orientation. This study endeavored to understand the reasons and practices of in-service teachers, mathematics teachers who chose to stay in the profession. For these reasons, potential participants were screened to determine their goal orientation, with those who were mastery-oriented and had perceptions of performance school goal structures being selected. The population for this study was sixth through eighth grade mathematics teachers in Oklahoma and the

surrounding states. A purposive sampling strategy yielded a sample that reflected this as closely as possible, barring an experimental design, current sixth through eighth middle school teachers in the Southwestern region of the United States.

Limitations

Simon (2011) defined limitations as a study's vulnerabilities that are beyond the researcher's control. Limitations are important to state because they can affect the outcomes and generalizability of a study. This study relied on a voluntary response sample from the initial survey implemented to collect a pool of potential participants for the qualitative phase of the study. According to Lohr (2010), this created a risk of bias because only the respondents who feel the most strongly tend to participate, which can skew the responses. Potential bias was addressed by offering gift cards as incentives to increase the number of participants in the quantitative phase of the study, which could also have increased the sample size. Informed consent from all adult participants was sought and obtained. Permissions were also obtained from the researcher's university (See Appendix A). Minimal risk was anticipated for participants since all their responses were confidential and de-identified. Pseudonyms and a participant ID were created to safeguard the participants' confidentiality. These steps also helped reduce the risk for participants, so they were comfortable providing honest responses. Another potential limitation was having mostly female participants in the sample. However, this is still representative of the general classroom teaching population, which is predominantly female (National Center for Education Statistics, 2022). Lastly, there was an overrepresentation of teachers from urban teaching districts because of higher numbers of middle grades teachers to meet the demand of higher student populations in urban areas. Once again, this was representative of the teaching population since larger districts typically had more teachers.

The Subjectivity of the Researcher

Schwandt and co-authors (2007) devised a framework with four main principles grounding ethical considerations for qualitative research – credibility, transferability, dependability, and confirmability. These principles were considered in this study. For example, member checking was

conducted with participants, so they had a chance to review and raise any concerns with the transcriptions of their interviews, which helped to preserve the credibility of my data. I used qualitative and quantitative sources to triangulate the practices and beliefs of my participants to increase the trustworthiness of my results. I included an extensive written record of the coding process and my analysis of themes that I used to ground my interpretation of data. This process upheld the final principles of dependability and confirmability because I made this process transparent and grounded my findings in my data. These guidelines provided numerous checks within this research design to safeguard my trustworthiness as a researcher which was necessary to perform rigorous research (Bloomberg & Volpe, 2019; Patton, 2015; Schwandt et al., 2007).

Walshaw (2008) stated that the researcher's subjectivity arises from the insertion of self into data collection and analysis. Knowledge is co-created between the researcher and the participants. Therefore, the researcher should acknowledge the conflicts and emotions that arise as the researcher positions their self in the ongoing exchange of dialogue between the presented negotiated versions (Walshaw, 2008). In considering my research study, I asked myself "why these questions?" The answer was encapsulated in who I am as a person and as a researcher and how I presented myself to my participants. So much of my success in education has depended on the relationships I had with my former teachers. The everyday interactions with caring teachers validated me as a person of value and, along with the support of my family, gave me the will and courage to forbear and to work hard for my education. Invisibility and a deficiency of voice characterized my existence as southern, lower-middle class, black, female in classroom settings. According to statistics, I was not expected to succeed. However, my teachers afforded me a chance to excel and celebrated my success. My teachers pushed me to seek out opportunities such as attending a magnet school. I felt seen by my teachers because of their efforts to connect with me personally. Later as a public junior high mathematics teacher, I took special care to treat my students with respect, fairness, and kindness. As a former mathematics teacher, I am uniquely situated to uncover the nuances in today's mathematic classrooms. I have felt the same pressures to conform to the generic educational demands passed

down from national and state mandates while still trying to remain true to my core teaching philosophy and professional training on what constituted good teaching and productive learning.

However, these connections were not without the risk of subjectivity. For example, I had to be particularly vigilant against negative valuations of settings (i.e., charter schools) that run counter to my beliefs of appropriately funded traditional public schools and negative valuations of teachers who treated the classroom as simply a job, which contradicted my ideology that teaching is a vocation and one of the highest acts of service I could give to society. Carefully monitoring my inner conflicts and emotions through memo writing and self-questioning helped mediate these pitfalls. Some other internal conflicts arose from the negotiation of building politics among teachers, parents, and administrators, which came into play as I reasserted myself back into teacher settings after being absent these last few years. The previous relationships I had formed with my potential participants could have blinded me to some aspects of their descriptions of their interactions with students. Berger (2015) described this aspect of subjectivity as the *insider* perspective, meaning my familiarity with teaching middle school could have desensitized me to the uniqueness of my participants' experiences. The potential subjectivity was addressed further in my research methods, which used an explanatory sequential mixed methods design to investigate the connections among goal orientation, mathematics teaching self-efficacy and mathematics teachers' perceptions of school goal structure in middle school learning environments.

Definition of Terms

Agency: a person's ability to affect and control their environment (Bandura, 2001).

Classroom goal structure: the overall classroom goal orientation created by a teacher's practices and her interactions with students in the mathematics classroom (Ames & Archer, 1988; Kaplan et al., 2002; Pintrich, 2000).

Mastery classroom goal structure: classroom goal structure which emphasizes learning as a process and assessments based on growth (Ames & Archer, 1988).

Mastery goal orientation: the area of goals that relate to gaining knowledge and skill in academic settings and failure is defined as not learning a new concept or skill (Elliot & McGregor, 2001).

Mathematics self-efficacy: a person's belief that she/he can accomplish a mathematical task as well as an expectancy of a successful outcome (Hackett & Betz, 1989).

Mathematics teaching self-efficacy: a teacher's confidence in his/her ability to teach students mathematics and affect student outcomes (Tschannen-Moran & Hoy; 2001; Zee & Koomen, 2016).

Performance approach goal orientation: the area of goals that relate to how a person's ability or competence compares with others and demonstration of a person's competence or ability (Elliot & McGregor, 2001).

Performance avoidance goal orientation: the area of goals that relate to how a person's ability or competence compares with others, and the avoidance of demonstration of a person's incompetence or inability (Elliot & McGregor, 2001).

Performance classroom goal structure emphasizes learning as skill acquisition and assessment based on normative student comparisons (Ames & Archer, 1988).

Personal goal orientation: the reasons as well as the goals learners choose in academic environments (Ames & Archer, 1988; Pintrich, 2000).

Self-efficacy: a person's cognitive assessment of his/her capabilities to plan and to perform actions to obtain certain goals (Bandura, 2012; Bandura & Schunk, 1981).

Teacher student interactions: all social exchanges between teachers and their students in the mathematics classroom (Ashton, 1985; Pianta et al., 2012).

Teaching self-efficacy: a teacher's confidence in his/her ability to teach students as well as his/her confidence that his/her teaching can affect student outcomes (Buss, 2010; Dellinger, 2002; Tschannen-Moran & Hoy; 2001; Zee & Koomen, 2016).

Organization of Summary

Since the authorization of NCLB, the tension between "teaching-to the test" practices and research-based practices of professional teachers has resulted in added stress that has changed teachers' classroom behaviors (Gonzalez et al., 2017; Ryan et al., 2017). Chapter 1 discussed the connection between changes in teacher instructional practices/approaches to teaching and accountability measures (Avalos et al., 2020; Wills & Sandholtz, 2009). Teachers respond to the added stress by changing classroom practices accordingly, aligning to performance-oriented goals (Avalos et al., 2020; Gonzalez et al., 2017; Musoleno & White, 2010). Chapter 1 noted how this study contributed to understanding how mathematics teachers' beliefs and goal orientation are connected based on their school setting, which can extend the fields understanding of the role that high-stakes testing has on teachers' and their practice.

Chapter 2 reviews relevant background research studying personal, behavioral, and environmental factors that influence teachers' approaches. Specifically, three factors were discussed: mathematics teaching self-efficacy, personal goal orientation, and school goal structures. The behavioral and environmental factors were characterized by the teacher-student interactions that were also discussed in relation to mathematics teaching self-efficacy and personal goal orientation. All three factors were shown to significantly influence teachers' practices and therefore warrant an in-depth study of the connections among these factors. It is imperative to understand how these factors contribute to ways teachers were maintaining their mastery goal orientations.

Chapter 3 outlines the methods used in this study, which included the research study design, participant selection, data collection process, instruments, and data analysis. In addition, the reasoning for the research design and the model-building process was detailed in Chapter 3.

Chapter 4 discusses the results of this study in three parts. In the first part, results were organized by research questions 1 and 2, with demographic and multiple regression model findings. The second part of chapter 4 addressed research question 3 and the themes uncovered from careful examinations interview transcriptions. Finally, the last part of chapter 4 investigated and reconciled the findings of this study's quantitative and qualitative phases.

Finally, in chapter 5, significant results were considered in relation to previous research. Implications for teaching practice and the support of in-service and preservice middle grades mathematics teachers were examined. Finally, the limitations of this present study, and possible directions for future areas of research, were detailed as the discussion of the findings concluded.

CHAPTER II

BACKGROUND LITERATURE

Chapter 2 is organized into three sections. The first section outlines an overview of recent literature examining personal factors such as self-efficacy and personal goal orientation along with behavioral and environmental factors such as classroom goal structure and teacher-student interactions in the mathematics classroom. The next section presents the conceptual framework that forms the foundation for this study. The last section discusses the research themes uncovered in previous sections and how this study attempts to address the gaps highlighted in recent research.

Self-Efficacy as a Personal Factor

Research has shown that self-efficacy in mathematics greatly affects career choices and college trajectories because students will avoid careers that are heavily dependent on mathematics when their confidence in mathematics is low (Betz & Hackett, 1986). Secondly, mathematics introduces students to fundamental concepts needed to pursue successful careers in STEM fields (Parker et al., 2014). Lastly, self-efficacy and achievement in mathematics can be gatekeepers to accessing higher education and other educational opportunities (Wilson, 2014). Given the critical importance of self-efficacy in mathematics, this topic has been explored extensively in the field. The following section of the literature review discussed self-efficacy theory as it related to mathematics education starting with a broad overview perspective and narrowing to the domain/task-specific view.

Self-Efficacy

Bandura's (1989) social cognitive theory is the foundation for self-efficacy theory. Bandura theorized that human behavior could be determined by using a tripartite system of interactions between a person, their environment, and their behavior. People carry their beliefs, emotions, attitudes, and dispositions into an environment. The environment is the situation in which a person finds her/himself. The environment could be scaled from a one-on-one interaction in a classroom to an entire middle school or college. Finally, one's behavior encompasses all the outward and observable reactions of the person to the environment. Bandura (1989) described the tripartite system as having bidirectional pathways between the three parts. For example, personal factors could influence behavior and behavior influencing personal factors. According to Social Cognitive Theory, humans' primary mechanism that humans employ is their agency, which is their ability to affect and control their environment.

A person's agency can only be initialized after careful consideration of what is needed to be successful. Self-efficacy theory is based upon a person's belief in their agentic potency-how well a person can affect their behavior and environment (Bandura, 2001). Self-efficacy is defined as a person's cognitive assessment of their capabilities to plan and perform actions to obtain certain goals (Bandura, 2012; Bandura & Schunk, 1981). Self-efficacy has two factors - efficacy expectations and outcome expectations. For example, Bandura (1977) stated that if a person perceives themselves as being self-efficacious, they believe not only that they perform a task (efficacy expectation) but that the outcome will be successful (outcome expectation). As an illustration, a teacher can believe they can teach fractions; however, they may or may not believe that their teaching of fractions will erase all their students' misconceptions. Self-efficacy expectation beliefs (SE) influence choices and can lead to decisions that help or hinder a person in achieving certain goals (Bandura, 2001).

When considering the behavioral factors, Bandura and Locke (2003) argued that according to social cognitive theory, people can preplan behaviors in anticipation of complex

tasks, as well as the ability to react and to readjust after each task as well. In other words, high self-efficacy gives a person the capacity to anticipate successful strategies and adjust after unsuccessful ones. People create these prior adjustments by setting high goals and skill acquisition levels for themselves, which generates a *negative space* that the person moves to fulfill (Bandura & Locke, 2003). Bandura's self-efficacy theory clarified and defined this *negative space* as a place that manifests successful anticipatory strategies. Once a person has tried the task, they make reactionary. These adjustments arise when a person has reflected on what they have done and how successful they were depending on their judgments of their performance. It leads to a new level of self-efficacy, which is greater or lesser than the original state. Then, the process starts all over again because there are new tasks that creates a new negative space, new goals, and a new desire for additional skills. This negative space is created by the changes in a person's goals and expectations as they modify their self-efficacy since self-efficacy is based on a variety of sources.

A person constructs self-efficacy from numerous possible sources: mastery experiences, vicarious experience, social persuasion, and emotional/physiological states (Bandura, 1977; Usher et al., 2019; Usher & Pajares, 2009). Mastery experiences are those past experiences that a person has judged to be successful or unsuccessful. In contrast, vicarious experiences are those experiences in social learning where a person learns by watching another person successfully or unsuccessfully accomplish a given task. Stevens et al. (2013) presented evidence that middle-level mathematics teachers who had taken a higher number of mathematics classes beyond algebra also reported higher levels of self-efficacy than teachers from the same population who had taken fewer classes. That study indicated that teachers with a higher number of mathematics classes beyond algebra were more confident in their ability to solve the mathematical content presented in their professional development courses. As a result of having more mastery experiences, this group of teachers entered professional development courses with higher self-efficacy than their counterparts. On the other hand, vicarious learning could occur as a novice

teacher watches her mentor successfully teach a challenging mathematics lesson. Social persuasion is positive or negative feedback that a person receives while completing a task (e.g., thumbs up or vocal cues from a teacher as they walk around observing students as they work or verbal feedback from a peer who observed their teaching). Finally, the last sources are the physical and emotional states that a person experiences while doing a specific task (e.g., increase in heart rate or sweating a teacher feels when anxiously presenting a lesson while using a new instructional strategy in front of their first period class).

Understanding self-efficacy expectation beliefs is paramount because self-efficacy is predictive of behavior and affect (Bandura, 1982) and achievement (Bandura & Schunk, 1981; Muenks et al., 2018). For instance, Berkant and Baysal (2018) investigated the changes in preservice teachers' academic efficacy and teaching efficacy after attending an intensive alternative training education program which involved pedagogical coursework. Their results suggested that the preservice teachers' academic efficacy decreased while their teaching self-efficacy remained unchanged. Berkant and Baysal (2018) posited that a short training period only increased their knowledge of how difficult the teaching job would be in the future without providing any opportunities to implement their new knowledge. That study provides an excellent example of creating a vicarious learning experience for preservice teachers but without the potent mastery experiences that implementation would have provided. Recall that Bandura and Locke (2003) stated that a person considers his or her perceived cognitive, social, and affective abilities when assessing their self-efficacy for a task, which certainly applies to mathematics teachers as well. In more domain/task-specific language, teachers assess their knowledge, social skills, and ability to regulate their emotional states when assessing their confidence in teaching mathematics. The next subsection will review background literature on the domain and task-specific area of teaching self-efficacy and how teaching self-efficacy has been defined and measured.

Teaching Self-Efficacy

Literature defined teaching self-efficacy as a teacher's confidence in their ability to teach students as well as their confidence that their teaching can affect student outcomes (Buss, 2010; Dellinger, 2002; Tschannen-Moran & Hoy, 2001; Zee & Koomen, 2016). Early in the development of assessments, Armor et al. (1976) created an instrument that defined teaching self-efficacy using two items. The first item measured general teaching efficacy, delineating teachers' confidence in their ability to overcome external factors such as social economic status and students' intellectual capacity. The second item measured personal teaching self-efficacy and defined how confident a teacher felt in their ability to influence student learning and engagement. However, many researchers argued that teaching was comprised of more than just those two factors. Tschannen-Moran and Hoy (2001) argued that the Ohio State Teacher Efficacy Scale (OSTES) or the Teachers' Sense of Efficacy Scale (TSES) was a more valid and reliable instrument because the OSTES expanded the area of domain specific tasks associated with teaching, which in turn allowed teachers to make a more accurate assessment of their teaching capabilities and expected outcomes. Tschannen-Moran and Hoy (2001) utilized three factors to explore teacher self-efficacy: student engagement, instructional strategies, and classroom management. Several additional instruments have been developed to capture the domain and task specificity of teaching. Enochs, Smith and Huinker (2000) developed the Mathematics Teaching Efficacy Beliefs Instrument (MTEBI) by adapting the Science Teaching Efficacy Beliefs Instrument Form A (Riggs, 1988; Riggs & Enochs, 1990) and Form B (Enochs & Riggs, 1990) in order to assess preservice teachers' mathematics teaching self-efficacy. The MTEBI instrument relied on Bandura's (1977) aforementioned factors of efficacy expectations and outcome expectations. A variety of other self-efficacy have been developed that align with the specific interests of researchers (Malinen et al., 2013; McGee & Wang, 2014; Love et al., 2019). Nonetheless, the TSES and the MTEBI remain widely used within the field (Segarra & Julia,

2022; Tassell et al., 2019; Thomson et al., 2017). In the following section, research findings in teaching self-efficacy have been separated into teacher versus student-related outcomes.

Teacher Related Outcomes

Previous research has raised questions about the sources of teaching self-efficacy and its relationship to other domains. Researchers have found that teaching self-efficacy can be developed through successful fieldwork experiences and positive mentorships with experienced teachers (Brinkman, 2019; Charalambous et al., 2008; Hunt-Ruiz & Watson, 2015). Recent research has highlighted positive relationships with teaching self-efficacy in specific subject domains, such as mathematics self-efficacy, among preservice teachers during their preparation programs (Briley, 2012; Brinkman, 2019; Giles et al., 2016). These findings support previous research indicating that increased content knowledge and pedagogical content knowledge increase teaching self-efficacy (Corkin et al., 2015; Morris et al., 2017; Moseley & Utley, 2006; Utley, Moseley, & Bryant, 2005; Zee & Koomen, 2016). Teaching self-efficacy also has positive associations with feelings of autonomy and reflective practices (Noormohammodi, 2014), student-centered teaching (Cao et al., 2018), and the classroom goals adopted by teachers (Skaalvik & Skaalvik, 2017). Tassell et al. (2019) found that in-service elementary mathematics teachers' teaching self-efficacy increased during a three-year professional development program on integrating technology into classroom practices, while teachers in the control group experienced a decline during the same period. That finding indicated that teaching self-efficacy is malleable and could be increased after a period of intervention.

Furthermore, previous research has demonstrated significant relationships between teaching self-efficacy and other constructs in the affective domain, such as beliefs about mathematics (Corkin et al., 2015), anxiety about teaching mathematics (Gresham & Burleigh, 2019; Unlu et al., 2017), positive attitudes towards teaching (Kartal, 2020), teacher burnout (Chesnut & Burley, 2015), teachers' self-esteem (Huang et al., 2007), and teachers' stress (Gonzalez et al., 2017). Kartal (2020) asserted that preservice mathematics and science teachers'

attitudes toward teaching have a positive correlation with efficacy beliefs for student engagement, use of instructional strategies, classroom management, and in teaching with classroom management efficacy beliefs explaining the most variance in their attitudes when year, gender, grade, and department were held controlled. In other words, as preservice teachers' teaching self-efficacy improved, so did their attitudes toward teaching, even when considering other factors that might influence these attitudes. These studies demonstrated the important relationships between teaching self-efficacy and other affective factors.

Student Related Outcomes

Current research has demonstrated numerous effects of mathematics teaching self-efficacy (MTSE) on student outcomes (Cao et al., 2018; Chang, 2015; Wolters & Daughtery, 2007; Zee & Koomen, 2016). Chang (2015) investigated the connections between elementary mathematics teachers' MTSE, their students' mathematics self-efficacy, and their students' math achievement. Chang (2015) reported that students taught by teachers with high MTSE had higher mathematics self-efficacy than those who were in the moderate to low range of MTSE. In addition, Chang (2015) found that MTSE significantly predicted students' mathematics self-efficacy and mathematics achievement. Chang (2015) noted that of the two factors comprising mathematics teaching self-efficacy, personal mathematics teaching efficacy had greater predictive value than the mathematics teaching outcome expectancy.

Furthermore, the results of that study showed that MTSE combined with students' mathematics self-efficacy had a greater significant effect than MTSE alone. Therefore, focusing on developing teachers' MTSE can potentially have a more robust return on the development of students' mathematics self-efficacy and subsequent achievement when combined with efforts to increase students' mathematics self-efficacy. However, there is still a need to understand how mathematics teachers navigate the negative space, the area created after reflecting on teaching successes and failures, and connections between their personal teaching self-efficacy and their professed goals for teaching. For instance, this negative space could provide evidence that

mathematics teachers have the teaching self-efficacy to teach fractions. However, perceptions of their school environment might inhibit them from reflecting their instruction aligned to their self-identity. This study could illuminate how mathematics teachers approach that negative space by exploring the potential connection between teacher self-efficacy, goal orientation, and their school environment. The following section discusses personal goal orientation as a personal factor and its influences on teachers and students while also being an environmental factor shaping classrooms and schools.

Achievement Goal Orientation as a Personal Factor

Personal Goal Orientation

According to accumulated research, achievement goal theory concerns the reasons and the behaviors students use to accomplish academic goals (Pintrich, 2000; Kaplan et al., 2002). Recent research scrutinized the framework of achievement goal theory to uncover the motivational processes students create and use to achieve academic agendas. These personal frameworks are referred to as personal goal orientations. According to seminal literature, goal orientations separate into two categories: mastery goal orientation and performance goal orientation (Ames & Archer, 1998; Elliot & McGregor, 2001; Lee et al., 2016; Pintrich, 2000; Schunk et al., 2014). Mastery goal orientation is the area of goals related to gaining knowledge and skill. Mastery goal orientation is related to intrinsic motivation, where learning is the goal and is pursued because learning is valued. Meanwhile, failure is defined as not learning a new concept or skill. On the other hand, performance goal orientation is the area of goals that relate to how a person's ability or competence compares with others. In other words, for a student with a performance goal orientation, failure is defined as not appearing competent in front of their peers. In contrast, success is defined as demonstrating their ability compared to their peers. Researchers have focused on different aspects of goals; therefore, different names have been created for similar categories of goal orientations. For example, Dweck and Leggett (1988) described goal orientation in terms of learning versus performance, while Skaalvik (1997) described goal

orientation as task versus ego-oriented. Finally, Ames (1992) defined goal orientation as mastery versus ability. In all three cases, mastery orientation was aligned with task and learning goals, while performance orientation was aligned with ego, performance, or ability goals. Elliot and McGregor (2001) further delineated an approach or avoidance feature to each goal orientation and posited a 2 x 2 goal orientation framework with four factors – mastery-approach, mastery-avoidance, performance-approach, and performance-avoidance. For the sake of this study, mastery and performance goals will be collapsed to include both avoidance and approach.

A teacher's personal goal orientations are crucial because research evinced its impact on numerous student outcomes. Consequently, the influences of achievement goal theory on achievement, affect, behavior, and cognition of students will be addressed in this section. Previous research has found a positive correlation in interactions between personal mastery goal orientation and achievement (Cleary & Kitsantas, 2017; Elliot & McGregor, 2001; Fadlelmula et al., 2015; Gutman, 2006; Larsen, 2015; Muenks et al., 2018; Nasser-Abu Alhija & Amasha, 2012; Plass et al., 2013; Sekreter & Doghonadze, (2015); Urdan, 2004). For example, Larsen (2015) found that adults who expressed a learning or mastery goal orientation had deeper levels of engagement in the flipped classroom environment as well as the higher levels of achievement by the end of the course while Plass et al. (2013) used goal orientations to predict the level of performance in an online game. Mastery goal orientation is also positively correlated to self-efficacy (Cleary & Kitsantas, 2017; Fadlelmula et al., 2015; Gutman, 2006; Muenks et al., 2018; Nasser-Abu Alhija & Amasha, 2012; Urdan, 2004), positive self-theories or incremental mindset (Dweck & Leggett, 1988; Willingham, 2017), less anxiety towards learning mathematics (Elliot & McGregor, 2001; Federici et al., 2015; Filippello et al., 2018; Skaalvik, 1997), and effective self-regulated learning strategies (Ames & Archer, 1988; Cleary & Kitsantas, 2017; Elliot & McGregor, 2001; Fadlelmula et al., 2015; Federici et al., 2015; Muenks et al., 2018; Nasser-Abu Alhija & Amasha, 2012; Ocak & Yamac, 2013; Urdan, 2004). Goal orientation also has been found to impact students' cognitive strategies (Eliot & McGregor, 2001; Fadlelmula et al., 2015).

In their study, Eliot and McGregor (2001) discovered that mastery goal orientations could positively predict students' use of deep-learning strategies while performance avoidance goal orientations could positively predict students' use of surface-learning strategies and disorganization. As discussed in this section, mastery goal orientation has been shown to positively influence students to develop adaptive learning behaviors while lessening negative dispositions towards mathematics and maladaptive learning strategies.

Environmental and Behavioral Factors

Classroom Goal Structures

In considering goal orientation, one must consider how achievement goal theory is characterized and examined at the classroom level. Classroom goal structures are defined as the overall classroom goal orientation created by a teacher's practices and their interactions with students in the mathematics classroom (Ames & Archer, 1988; Kaplan et al., 2002; Pintrich, 2000; Urdan & Kaplan, 2020). In other words, classroom goal structures represent a complex interaction between the teacher and the students in the math learning environment. The area occupied by the teacher encompasses the teacher's beliefs, self-efficacy, and personal goal orientation. All of this determines how teachers approach teaching (Lauermann & Butler, 2021). Meanwhile, the student side of classroom goal structures encompasses their levels of ability, perceptions, emotions, self-efficacy, and personal goal orientations. The classroom is the area of overlap. This overlap can be described as the teacher-student interactions, which include the day-to-day conversations, feedback, and instruction. Therefore, the classroom is the environment that the teacher creates for themselves and their students. Several studies indicated influences on classrooms' goal structures are: teachers' classroom management styles (Filippello et al., 2018), level of emotional support, teachers' self-efficacy (Ames, 1992; Ewing, 2016; Smart, 2014), and relational goals as defined as the desire to foster caring relationships with students (Butler & Shibaz, 2014).

Another area of the classroom goal structure concerns how the teacher's classroom goal structure influences the students in the learning environment (Fadlelmula et al., 2015; Federici et al., 2015; Gutman, 2006; Nasser-Abu Alhija & Amasha, 2012; Urdan, 2004). Fadlelmula et al. (2015) found that the classroom goal structure adopted by the teacher and perceived by the students correlated highly with the personal goal orientations that students adopted in that classroom. Ames (1992) was more detailed and specific in characterizing teacher behaviors exhibited when creating a mastery versus performance classroom goal structure learning environment. Her research focused on three areas in the classroom environment under the direct influence of teachers: curriculum design, assessment practices, and power-sharing. Some studies affirmed mastery goal structure behaviors such as offering novel and meaningful tasks which emphasize increasing skill or knowledge (Ames, 1992; Ames & Archer, 1988). Steven et al. (2013) reported that mastery classrooms used assessments that stress correcting mistakes and increasing effort. Mastery-oriented teachers offer emotional and instructional support and encourage students to be autonomous and self-regulated (Fadlelmula et al., 2015; Federici et al., 2015; Gutman, 2006; Nasser-Abu Alhija & Amasha, 2012; Urdan, 2004). A subset of studies (see Ewing, 2019; Smart, 2014) assessed students' perceptions of their interactions with their teachers to investigate goal structures. This set of studies found that positive teacher behaviors were positively correlated with students having mastery orientation. It should be noted that conflicting orientations coexist at the classroom level just as they can manifest themselves as multiple goals at the personal level (Ames, 1992; Kunst et al., 2018; Nasser-Abu Alhija & Amasha, 2012; Pintrich, 2000).

School Goal Structures

In continuation of contemplating goal orientations, one must further consider how achievement goal theory is defined and investigated at the school level. School goal structures are defined as the goals enacted and communications conveyed through the procedures and guidelines within a school (Ames & Archer, 1988; Anderman, et al., 2010; Kaplan et al., 2002;

Pintrich, 2000; Wolters et al., 2010). Research has found that school goal structures have a two-factor composition: mastery goal structure and performance goal structure. A low to moderate correlation exists between these two factors (Deemer, 2004; Wolters et al., 2010). Deemer (2004) also found that teachers' perceptions of their school's mastery goal structure related positively to their personal goal orientation and their personal teaching self-efficacy. Several studies (list a few) have explored how schools can adopt a mastery goal structure to support more adaptive student learning outcomes. Recommendations focus on school practices such as:

- Eliminating ability grouping in favor of grouping by student-led topics or interests.
- Providing more high cognitive tasks that encourage problem-solving and unique strategies.
- Offering more choice to students in tasks and class selections.
- Recognizing effort and progress over grades and scores.
- Evaluations and testing used for interventions and instructions instead of rankings (Anderman, et al., 2010; Maehr & Midgley, 1991).

This research study could help describe how mathematics teachers approach the negative space created when teaching in a school climate misaligned with personal goal orientation and classroom goal structures. In addition, it is essential to comprehend how this navigation takes place during the process of creating their classroom goal structures. The final part of this section of the literature review will consider how teacher student interactions are defined as a behavioral factor and in the mathematics classroom.

Teacher-Student Interactions (TSI)

As human beings, relationships consume a large part of our existence. Relationships at work, school, and home shape our views of ourselves and the world. These relationships or interactions become the foundation for our values, beliefs, and identities (Gee, 2000). Consider for a moment our school experiences. Students draw upon their past experiences being a student

in a mathematics classroom to form their beliefs, attitudes, and emotions about mathematics as a subject. The relationship between the mathematics teacher and their students is crucial to the students' experiences in the classroom. These day-to-day interactions have profound and lasting effects on students' mathematics self-efficacy and goal orientation (Filippello et al., 2020; Martin & Rimm – Kaufman, 2015; Smart, 2014; Willingham, 2017). In other words, students' development of their mathematics confidence and approach to mathematics is informed by their experiences in the classroom and will continue to influence them into adulthood (Betz & Hackett, 1986; Hall & Ponton, 2005). These interactions are meaningful because they influence careers and life paths for students (Betz & Hackett, 1986). These interactions are an area of study that is pressing for mathematics classrooms today because of the necessity for students to continue into higher mathematics for various careers. The following paragraphs are divided into two subsections. The first subsection is a discussion surveying the definition of TSI for this study and its conceptualization. The relationships among mathematics self-efficacy, goal orientation, and teacher student interactions (TSI) are explored in the second section.

According to Bandura's social cognitive theory, human behavior could be attributed to an interactive system. This interaction circulated between three domains, the person, their environment, and their behavior (Bandura, 1989). When considering the mathematics teacher as the person, their behavior encompasses the teacher's practices in their classroom. The personal factors are the mathematics teacher's beliefs, attitudes, and approaches to teaching. Finally, the environment is the teacher's classroom climate. Students could also be considered as part of the mathematics teacher's environment. As a result, teacher-student interactions (TSI) could be characterized as the interplay among the teacher with their students in their classroom on the day-to-day basis. Matteson et al. (2011) presented evidence indicating that some teachers see TSI as a way to encourage and motivate students to do well in mathematics. Data from subsequent studies support the supposition that teachers' content knowledge and beliefs are related to their interactions with their students (Bourgeouis & Boberg, 2016; Pianta et al., 2012). Ashton (1985)

also framed teacher interactions by the role a teacher adopts in their classroom. This role indicated whether the teacher's primary interest was on students' social development versus achievement. This interest facilitated specific attitudes and attributions toward students' abilities and lack of achievement. In view of these different considerations, TSI is defined as all social exchanges between teachers and their students in the mathematics classroom for the purpose of this literature review. To operationalize the types of teacher-student interactions (TSI), Allen et al. (2013) described three domains for TSI:

- Emotional support including interactions governing creating connectedness, responding to students' emotions, and considering of students' need for peer interaction and autonomy.
- Instructional support including interactions related to presenting content, engaging students in higher cognitive thinking, and analyzing the level of feedback on students' thinking.
- Organizational support including interactions focused on behavior control, maintaining students' focus, and varying teaching strategies.

The researchers found that all three domains of teacher support were predictive of student achievement, regardless of the content area. In particular, the emotional and instructional support domains accounted for a significant variance in students' academic achievement with 12.8% and 8.9% respectively (Allen et al., 2013).

TSI is essential in middle grades because students undergo drastic developmental changes during these critical years, as well as the shift from task-based instruction to performance–based. (Midgley et al., 1995; Tuominen et al., 2020; Wigfield et al., 1991). As a result, students' perceptions of school and confidence suffer during these transitional years. As a case in point, Rice et al. (2013) observed a decline between elementary school and junior high students' perceptions of the level of support they receive from their mathematics teachers. Studies

have further differentiated the categories of teacher support by investigating the effects of different domains of support on student achievement and other learning outcomes. Several studies have found that emotionally supportive learning environments in which students viewed their teachers as patient, approachable, and understanding increased engagement and achievement (Pianta et al., 2012; Matteson et al., 2011; Smart, 2014; Thornberg et al., 2020). For example, Smart (2014) argued that cooperative teaching behaviors have high predictive value on students' adaption of personal mastery goal orientation, their mathematics self-efficacy and their views and beliefs concerning the value of science. Smart (2014) found that emotional support was particularly important, especially in middle and high school environments because of developmental changes in the student population. This is especially true for special populations such as African Americans (McCoy et al., 2017; Strayhorn, 2015) and graduate students (Lee, 2008),where a positive relationship between the teacher and student increased student persistence.

Recent research focused on the instructional support domain of TSI has yielded significant outcomes (Bjorklund et al., 2018; Ewing, 2016; Wong et al., 2018). Bjorklund et al. (2018) and Ewing (2016) researched the topic of TSI in early childhood mathematics education. They learned that making time for student thinking (Bjorklund et al., 2018) and giving effective feedback in the form of questioning (Ewing, 2016) have a positive impact on student learning and achievement. Bjorklund et al. (2018) argued that this is even the case when the child is engaged in play in a one-on-one social exchange with the teacher and not just during times of traditional teaching. Instructional support in designing engaging tasks within students' upper range of ability improved students' mathematics self-efficacy as well (Margolis & McCabe, 2006).

Finally, in the area of organizational support, several studies have found that effective classroom management and a positive climate in the classroom lead to positive academic outcomes (Cheema & Kitsantas, 2014; Gamlem, 2019; Patrick et al., 2001). Gamlem (2019) reported that a negative climate and behavior management correlated negatively. These findings suggested that teachers who struggled with behavior management generated negative classroom

climates. On the other hand, Gamlem (2019) demonstrated that behavior management and a positive classroom climate had a positive relationship.

TSI and Self-Efficacy

From the viewpoint of teachers, there are important findings concerning the quality of teacher-student interactions. Cao et al. (2018), Ewing (2016), Perera and John (2020) all argued that teaching self-efficacy affects teacher-student interactions. Ewing (2016) examined TSI in one-on-one teaching scenarios. She analyzed six types of interactions – scaffolding, double-bind, illusion of competence, post-question wait-time, questioning and prompting. Scaffolding, post-question wait-time, questioning and prompting were positive influencers during intensive teaching and learning situations.

On the other hand, double-bind, and illusion of competence were reported as having a negative effect on the student's ability to develop mathematical reasoning. Ewing (2016) posited that differences in teachers' level of experience determined how well teachers asked tailored probing questions and confronted students' shallow learning strategies. This by extension, encompassed areas of teachers' teaching self-efficacy in leading and directing conversations about mathematics. Ewing (2016) related teachers' mastery experiences with questioning and actively monitoring student learning as determinants of how well they perform those tasks in real-time.

As for students, Martin and Rimm-Kaufman (2015) found that TSI in 5th-grade mathematics classes that provided emotional support mediated the effects of students who had low mathematics self-efficacy. Additionally, Martin and Rimm-Kaufman (2015) argued that students' perceptions of classroom conflict levels were negatively related to their perceptions of their relationships with their teachers. In other words, how students perceived their relationship with their teacher impacted their perception of their classroom climate. That study proposed that emotional support moderated the effects of low mathematics self-efficacy more than instructional and organizational support. That study underscored the importance of TSI which prioritize

students' social and emotional needs. However, does this apply to older students as well? Cheema and Kitsantas (2014) found that among 9th through 11th- grade mathematics classes, mathematics self-efficacy and students' perceptions of TSI predicted their subsequent mathematics achievement. Conversely, mathematics self-efficacy can also be an antecedent for behavior in TSI. Wood et al. (2015) found that mathematics self-efficacy predicted the level of interaction that Black males had at the college level. Black males with greater mathematic self-efficacy had more interaction with their advisors, which corroborated Skaalvik et al. (2015) findings that emotionally supportive TSI were positively related to students' help-seeking in the classroom.

TSI and Goal Orientation Theory

Kaplan et al. (2002) theorized that when teachers' instructional practices coincide with their goal orientation, it affects how teachers interact with students. For example, Kaplan et al. (2002) reasoned that mastery goal-oriented teachers would manifest certain practices such as seeing a mistake as a learning opportunity, expecting students to be active learners, and emphasizing understanding why something is correct over just being correct. Certain behaviors that teachers exhibit through interactions with their students create their classroom goal structures, including goals that center around developing relationships with their students (Butler, 2007; Butler & Shibaz, 2014; Retelsdorf, et al., 2010). Research has also shown that teacher interactions that support student autonomy by giving students more choices and offering self-paced instruction while lessening perceived psychological control predicted students having a mastery goal orientation (Filippello et al., 2018). Additionally, a non-controlling teaching style helped students to develop positive dispositions and autonomous approach to academics (Reeves, 2009). Some studies explored TSI in conjunction with other conceptual frameworks, such as growth mindset (Dwerk & Leggett, 1988). For example, Willingham's (2017) qualitative study found that the case study teacher expressed a mastery-oriented approach to teaching when interviewed and believed she could grow her mathematical teaching skills. The case study teacher practiced various forms of support while being observed:

- She made room for and valued student thinking.
- She developed specific goals that are related to instructional strategies, such as modeling problem-solving strategies for her students.
- She exhibited flexibility to adjust her instructions to accommodate her struggling students.
- She used students' assessments to evaluate how well she was reaching her teaching goals.

The growth mindset of the case study teacher characterized many common features of teachers who emphasize the importance of their interactions with students as a source of motivation to improve their teaching (Willingham, 2017).

Conceptual Framework

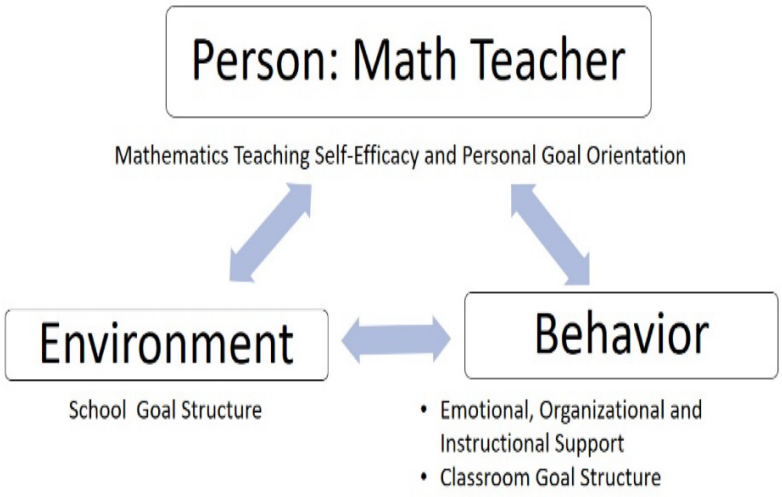
Bandura (1989) conceptualized through social cognitive theory that human behavior was motivated by a continuous interaction model. Implicit in the conceptual framework of social cognitive theory is the assumption that human beings create goals using their agency while interacting with their environment (Bandura, 2001). Herein lies a fundamental connection between self-efficacy theory and achievement goal theory- the importance of goals. Bandura and Schunk (1981) characterized goals into two groups. Proximal goals were goals that were within one's range of current behaviors and strategies, while distal goals were beyond that range and are perceived as out of reach. The defining characteristic of a goal rests upon how far into the future an individual perceives that goal. Children who created and attained proximal goals had higher interest in mathematics and intrinsic motivation to learn than children with distal or no goals (Bandura & Schunk, 1981). Achievement goal theory focuses on goals in academic settings and defined personal goal orientation as the reasons as well as the goals learners choose in academic environments (Ames & Archer, 1988; Pintrich, 2000). Personal goal orientation for teachers is characterized by how a teacher views learning, how a teacher creates their teaching goals, how a

teacher creates learning goals for their students, and how a teacher creates their classroom goal structure (Ames & Archer, 1988, Elliot & McGregor, 2001; Kaplan et al., 2002; Sommet & Elliot, 2017). The goals that teachers create for their teaching reflect their goals for teaching and learning their profession. In short, personal goal orientation gives teaching self-efficacy its legs. Teaching self-efficacy and personal goal orientation are well-suited concepts to explain the idiosyncrasies enmeshed in this study's natural phenomenon – the mathematics classroom. Bandura's social cognitive theory applied to the mathematics teacher denotes:

- The person as the mathematics teacher with personal factors such as mathematics teaching self-efficacy and personal goal orientation.
- The environment as the mathematics classroom with characteristics such as classroom climate and classroom goal structure.
- The behavior as teacher student interactions across various domains.

Figure 2.1

Current Study's Social Cognitive Theory Conceptual Framework



Agency, a person's ability to affect and control their environment (Bandura, 2001), provides the connection between goal orientation theory and self-efficacy theory. The core of self-efficacy is the idea that individuals move towards a goal. They have planned this goal based on their perceived ability, and their belief that they can change their circumstances (Bandura, 1977a; Bandura, 1989). Self-efficacy is also self-regulated, which means self-correction occurs along the way. Bandura (1977a) argued that learners modify their goals and expectations as the interaction system continually restarts. Studying teaching self-efficacy could not only help determine a teacher's goals, but when in conjunction with a teacher's personal goal orientation, could help determine a teacher's classroom goals for their students. According to Ames and Archer (1988), these classroom goals affect instructional strategies, interactions with students, and curriculum. These goals become part of the mathematics student's and teacher's environment – the classroom. This environment becomes the basis for students to create judgments of their own self-efficacy and goal orientations towards mathematics. Achievement goal theory and self-efficacy theory could provide a mechanism to frame the gap between teachers' ideal classroom goals and their actual performance (Urdan & Kaplan, 2020), which is sometimes hindered by the effects of performance-oriented school environments and high-stakes assessments (Avalos et al., 2020; Gonzalez et al., 2017; Musoleno & White, 2010).

Recurrent Themes in the Background Literature

The following subsections discuss themes found in the literature, usually merged across both teacher and student outcomes.

Student Outcomes

The main themes found in student outcomes were achievement (Allen et al., 2013; Cleary & Kitsantas, 2017; Elliot & McGregor, 2001; Fadlelmula et al., 2015; Gutman, 2006; Larsen, 2015; Muenks et al., 2018; Nasser-Abu Alhija & Amasha, 2012; Plass et al., 2013; Sekreter & Doghonadze (2015); Urdan, 2004), teachers' influence on students' mathematics self-efficacy or personal goal orientations (Fadlelmula et al., 2015; Federici et al., 2015; Gutman, 2006; Nasser-

Abu Alhija & Amasha, 2012; Smart, 2014; Urdan, 2004) as well as the importance of teacher student interactions and influence on students' affective domain (Reeve, 2009). Students' perceptions of their teachers' classroom management styles and autonomy-supportive practices colored how students approach learning and how student judged their abilities in mathematics classrooms (Filippello et al., 2018). Students who perceived their mathematics classrooms as mastery oriented, autonomy and emotionally supportive experienced higher levels of achievement, retention in SMED related classes/majors, formed adaptive learning strategies such as seeking help/guidance (Martin & Rimm-Kaufman, 2015; Skaalvik et al., 2015; Wood et al., 2015) and positive dispositions towards their teachers and mathematics in general (Filippello et al, 2018).

Teacher Outcomes

Similarly, the main themes around teacher outcomes were teacher practices (Ames, 1992; Butler & Shibaz, 2014; Ewing, 2016; Filippello et al., 2018; Kaplan, 2002; Smart, 2014), the importance of teacher-student interactions (Allen et al., 2013; Filippello et al., 2018), and influence on teachers' affective domain (Gonzalez et al., 2017; Gresham & Burleigh, 2019; Kartal, 2020; Unlu et al., 2017). Teachers who self-reported higher TSE and/or a mastery orientation also displayed more reflective and student-centered teaching practices (Cao et al., 2018; Noormohammodi, 2014). In addition, these teachers also had a more malleable view of their teaching self-efficacy (Tassell et al., 2019) which in turn reflected in higher self-esteem and help-seeking behavior (Huang et al., 2007), less burn-out (Chesnut & Burley, 2015).

Summary of Reviewed Literature

Although previous studies have examined mathematics teaching self-efficacy, personal goal orientation and student-teacher interactions separately or in dual comparisons, few have studied all three in relation to each other. Firstly, particular attention should be placed on secondary mathematics in-service teachers since a great deal of research has already focused on preservice mathematics teachers and in-service elementary teachers. Middle grades mathematics

students often experience a decline in interest and achievement, which makes this student population important to mathematics educators interested in sustaining students' interest through secondary mathematics and college (Midgley et al., 1995; Vedder-Weiss & Fortus, 2018; Wigfield et al., 1991). This study will address a gap in the literature by describing the current goals of in-service middle grades mathematics teachers as well as the intersection among teaching self-efficacy, goal orientations, teachers' classroom goal structures within their classrooms and their perceptions of their schools' goal structure. Secondly, there is a need for more qualitative studies in which methods such as interviews are used to delve deeper into quantitative measures collected as it relates to MTSE, personal goal orientation, and how both are indicated through teachers' approach to teaching mathematics. Lastly, this study could provide a rich basis for interpreting as Barajas-Lopez and Larnell (2019) described the acts of creative subordination, which mastery-oriented teachers might be employing to affect student achievement as well as their reasons for choosing mastery-oriented goals over performance-oriented classroom goals despite working in schools they perceive as being performance-oriented. Therefore, this study will seek to discover the answers to the following questions:

1. What are the mathematics teaching self-efficacy, goal orientation, and perceptions of school goal structure of in-service middle grades mathematics teachers?
2. Does mathematics teaching self-efficacy and teachers' perceptions of schools' goal structure predict goal orientation?
3. How do in-service middle grades mathematics teachers maintain their mastery goal orientations while teaching in performance-oriented school environments?

CHAPTER III

METHOD

The purpose of this chapter is to describe the mixed-methods study utilized to examine the experiences of mastery-oriented middle grades mathematics teachers in performance-oriented school environments and to explore the personal and environmental factors that influence middle-grade mathematics teachers' (MGMTs) goal orientations. Chapter 3 outlines this study's methods, including the study design, participants, data collection, instruments, and data analysis. In addition, a rationale for the research design and model-building process is detailed in this chapter. To investigate the aforementioned factors and experiences of mastery-oriented middle grades mathematics teachers in performance-based school environments, the following research questions are posited:

1. What are in-service middle grades mathematics teachers' mathematics teaching self-efficacy, goal orientation, and perceptions of school goal structure?
2. Does in-service middle grades mathematics teachers' mathematics teaching self-efficacy and perceptions of schools' goal structure predict their goal orientation?
3. How do in-service middle grades mathematics teachers maintain their mastery goal orientations while teaching in performance-oriented school environments?

Research Design

This mixed-methods research design combined the strength of qualitative and quantitative approaches (Creswell & Creswell, 2017; Wu, 2011). Plano-Clark (2019) defined

an explanatory sequential mixed methods design as a study in which qualitative data is collected after quantitative data and is utilized to help clarify the quantitative results; thus, this study was conducted in two phases. Phase 1 addressed Research Questions 1 and 2. The quantitative phase (Phase 1) of the study examined the personal mathematics teaching efficacy (PMTE), goal orientation (as expressed through their approaches to teaching), and the perceptions of middle grades mathematics teachers (MGMT).

Phase 1 also focused on the potential ability of those perceptions and MGMTs personal mathematics teaching efficacy (PMTE) to predict MGMT goal orientation (as expressed through their approaches to teaching mathematics). An important aspect of mixed methods research is meaningful integration, defined as the linking of qualitative and quantitative data in order to connect these two perspectives (Plano-Clark, 2019; Plano-Clark & Ivankova, 2016). In this study, there are three points of integration. The first point is between Phase I and Phase 2. Since this is an explanatory sequential mixed methods design, survey data from Phase 1 is used to determine potential interview candidates for Phase 2 in addition to addressing the aligned research questions.

Phase 2 sought to clarify the results from Phase 1, highlight the experiences of middle-grade mathematics teachers (MGMTs), and address Research Question 3, which explores how MGMTs are maintaining their mastery-oriented approach to teaching while in performance-based school environments. The study placed more emphasis on the quantitative phase by using a larger data sample, supported by a smaller qualitative phase involving a much smaller number of interview participants; however, results from both phases were analyzed to address research question 3 in this study at the second point of integration (Creswell et al., 2008; Plano-Clark & Ivankova, 2016). Results are shared that connect MGMTs' mathematics teaching self-efficacy, perceptions of school goal structure and their goal orientations with their values and practices in their classrooms. The last point of integration will occur in the discussion section in Chapter 5 where the conceptual framework, which combines social cognitive theory and achievement goal

theory is revisited. Integration of results is a vital component of mixed methods design, which allows the researcher to explore a wider variety of questions and to contribute more understanding to existing research and theory (Buchholtz, 2019).

Participants

Participants were recruited for Phase 1 of the study via email invitation (see Appendix B) to middle-grades mathematics teachers identified through the state's department of education database, a comprehensive listing of teacher along with their schools and districts (see Table 3.1). A Facebook page was also created to assist in recruiting participants. This page provided essential information for teachers recruited through purposeful sampling (Lohr, 2010; Taylor et al., 2015).

Table 3.1

Statistics of Participants Demographic

Category	Frequency (*n*)	Percent (%)
Gender		
Female	63	78.8
Male	13	16.3
Non-Binary	1	1.3
Missing	3	3.8
Ethnicity		
Hispanic	5	6.3
Non-Hispanic	72	90.0
Missing	3	3.8
Race		
White	60	75.0
Black/White	1	1.3
Native American and White	3	3.8
Native Hawaiian/Pacific Islander and White	1	1.3
Black	2	2.5
Native American or Alaska Native	7	8.8
Other	3	3.8
Missing	3	3.8

Initially, 101 participants were recruited in Phase 1 as recommended by literature to satisfy the assumptions for a proper sample size of twenty participants for each of this study's three predictor variables (personal mathematics teaching efficacy, perceptions of mastery goal structure and perceptions of performance goal structure) (VanVoorhis & Morgan, 2007). From

this initial sample, 21 participants were removed due to incomplete surveys (less than 50% of items complete), leaving 80 participants in the final sample (see Table 3.1). While the final sample had some diversity in gender, race, and ethnicity, much of the sample population was white and female. However, this is representative of the teacher population (National Center for Education Statistics, 2022). Informed consent was given by all participants (see Appendix C).

In order to better understand how teachers maintained a mastery orientation in a performance-oriented learning environment, Phase 2 of the study involved inviting a sub-sample of teachers to participate in follow-up interviews via a follow-up email (see Appendix D). Five teachers were purposively selected from a subset of Phase 1 participants. The following criteria based on survey responses from Phase 1 were used: (1) mastery approach to teaching, (2) any level of mathematics teaching self-efficacy, (3) taught at least one mathematics class, and (4) perceived a performance school goal structure for students. The initial cut-off scores were 3.5 on a 5-point scale. However, because there was a limited participation pool, the cut-off was lowered to 3.25 to find teachers willing to participate and fit the criteria. This criterion was used to find special cases where MGMTs' responses indicated that they held a mastery approach to teaching despite perceiving their school setting as being performance-based. (see Table 3.2). According to Patton (2015), five to eight teachers were a reasonable number of interviews given issues such as the restraints on resources and ensuring the timely completion of the study. Pseudonyms were used in reporting results for Phase 2 of the study.

Cases

Andy is a 6th-grade mathematics teacher for an online school with a master's degree in mathematics education. He is in his late thirties and began his teaching career as a substitute teacher. He has over ten years of teaching experience, which includes college level, traditional brick and mortar school, and virtual school setting – where he is currently in his third year.

Denise is a traditionally dual-certified special education mathematics teacher in her early thirties. She is a first-year special education mathematics teacher with nine years' experience

teaching other subjects, such as music at the elementary level. She currently teaches 8th-grade mathematics face-to-face in an urban school district.

Barbara is a traditionally certified teacher in her early fifties who teaches 7th through 12th-grade mathematics face-to-face in a small rural school. She has been teaching at her present school for about 4 years but has a total of twenty-eight years of teaching experience.

Jeannie is a traditionally certified teacher in her early twenties. She is certified to teach advanced mathematics but is currently teaching a blended instruction 6th-grade class. She has been teaching at her current small rural school for two years.

The last interviewee, *Melissa*, is a traditionally certified teacher in her late fifties. She had spent half of her twenty-eight years teaching in another state before transferring to a small rural school in the current state in which she teaches. She is currently teaching a blended 6th through 8th mathematics class.

Table 3.2

Statistics of Interviewees Demographics

Interviewee	Race	Gender	Education Level	Teaching Exp., yrs	MAGO	PGS	Certifications
Andy	White	Male	Masters	10	3.50	3.50	Middle School and High School Mathematics
Denise	White	Female	Bachelors	10	4.75	3.83	Vocal/General Music K-12 Mild/Moderate, Severe/Propound/ Multiple Disabilities
Barbara	White	Female	Masters + 15 credits	28	3.50	3.5	Advanced Mathematics and ELL
Jeannie	White	Female	Bachelors	1	3.25	3.83	Advanced, Intermediate, and Middle Level Mathematics
Melissa	White	Female	Masters + 15 credits	28	4.25	3.33	Intermediate and High school Mathematics

Note: MAGO = mastery goal orientation (scale of 1 to 5), PGS = perception of performance school goal structure (scale of 1 to 5).

Data Collection

Data were collected during Phase 1 via a web-based survey format using Qualtrics. The timeline for data collection (see Table 3.3) included additional solicitation of responses until an acceptable sample size was reached. Each participant gave informed consent before beginning the online survey. The survey collected demographics, personal goal orientation, perceptions of school goal structure and mathematics teaching self-efficacy (See Appendix E). For Phase 2, interview data was collected via Zoom, a web-based conference call program. All interviewees gave verbal consent prior to recording video and audio of each participant.

Demographics

The teacher demographic items included in the survey were gender, age, race, ethnicity, education level, current/past teaching delivery method, and years of teaching experience (See Appendix E). This information allowed for a detailed description of the participant sample. Screening questions such as what grade level you teach and do you teach mathematics were included as well. In addition, years teaching mathematics and level of education served as control variables in some analyses as discussed in the analysis section.

Instruments

Midgley et al. (2000) developed the Pattern of Adaptive Learning Scales (PALS), which is a collection of scales grounded in achievement goal theory to assess teachers' personal goal orientation as well as their perceptions of their school goal structures. Additionally, the various subscales of the PALS can be utilized in combination with one another or as individual scales (Midgley et al., 2000). The PALS includes four subscales, including mastery approaches to instruction (mastery goal orientation), performance approaches to instruction (performance goal orientation), perceptions of the school goal structure for students (mastery goal structure), and perceptions of the school goal structure for students (performance goal structure; see Appendix E). The survey began with a prompt directing participants to reflect on their mathematics instruction when responding to items. Survey items used a 5-point Likert scale with responses

ranging from strongly disagree (1) to strongly agree (5). Additional detail about each of the sub-scales of the PALS is provided in the subsequent paragraphs.

Mastery and Performance Approaches to Teaching Scales. Mastery goal orientation is the area of goals that relate to gaining knowledge and skill in academic settings (Elliot & McGregor, 2001). Conversely, performance-approach goal orientation is the area of goals that relate to how a person's ability or competence compares with others and the demonstration of a person's competence or ability (Elliot & McGregor, 2001). To measure the goal orientation of teachers, the survey used the two approaches to instruction scales. The mastery approaches to instruction scale had three items, which previous research reporting a Cronbach's alpha reliability of .69 (Midgley et al., 2000). The alpha coefficient found in this study was $\alpha = .69$, consistent with prior research. Minimum to maximum scores were 1-5. Sample items include:

- *"I make a special effort to recognize students' individual progress, even if they are below grade level."*
- *"During class, I often provide several different activities so that students can choose from them."*

The performance approaches to teaching scale had four items, which previous research reported a Cronbach's alpha reliability of .69 (Midgley et al., 2000). The alpha coefficient found in this study was $\alpha = .62$, relatively consistent with prior research. Minimum to maximum scores were 1-5. Sample items include:

- *"I point out those students who do well as a model for the other students."*
- *"I help students understand how their performance compares to others."*

Perceptions of Mastery and Performance Goal Structure for Students Scales. Mastery goal structure was defined as an emphasis on learning as a process and assessments based on growth, while performance goal structure emphasizes learning as skill acquisition and assessment

based on normative student comparisons (Ames & Archer, 1988). This structure could exist at the classroom or school level in learning environments. To measure teachers' perceptions of school goal structure for their students, the study used the perception of school goal structure for student scales. The mastery goal structure for student subscale had seven items, which previous research reporting a Cronbach's alpha reliability of .81 (Midgley et al., 2000). The alpha coefficient found in this study was $\alpha = .76$, which was relatively consistent with prior research. Minimum to maximum scores were 1-5. Sample items include:

- *"The importance of trying hard is really stressed to students."*
- *"Students are told that making mistakes is OK as long as they are learning and improving."*

The performance goal structure for students' subscale had six items with previous research reporting a Cronbach's alpha reliability of .70. The alpha coefficient found in this study was $\alpha = .77$ (Midgley et al., 2000), which was relatively consistent with prior research. Minimum to maximum scores were 1-5. Sample items include:

- *"Grades and test scores are not talked about a lot."*
- *"Students hear a lot about the importance of making the honor roll or being recognized at honor assemblies."*

Personal Mathematics Teaching Efficacy Scale. As mentioned earlier, Enochs et al. (2000) developed the Mathematics Teaching Efficacy Beliefs Instrument (MTEBI) by adapting the Science Teaching Efficacy Beliefs Instrument Form B (Enochs & Riggs, 1990 to measure preservice teachers' mathematics teaching self-efficacy. To have more subject specificity, the MTEBI was employed to measure teachers' mathematics teaching self-efficacy (MTSE). Mathematics teaching self-efficacy (MTSE) is a teacher's confidence in his/her ability to teach students mathematics and affect student outcomes (Tschannen-Moran & Hoy; 2001; Zee &

Koomen, 2016; see Appendix E). To measure teachers' mathematics teaching self-efficacy, the study employed the personal mathematics teaching efficacy scale (PMTE). This scale had 12 items on a 5-point Likert scale, with previous research reporting a Cronbach's alpha reliability of .88 (Enochs & Hunker, 2000). The alpha coefficient found in this study was $\alpha = .86$, consistent with prior. This scale was altered to reflect language for in-service mathematics teachers by removing the future tense. Furthermore, Bandura (2012) indicated that "I can" statements were evidence of a declaration of efficacy, while "I will" statements communicate intention. "I can" statements were utilized in the altered PMTE subscale test items. Minimum and maximum scores were 1-5. Sample items include:

- *I can continually find better ways to teach mathematics.*
- *Even if I try very hard, I cannot teach mathematics as well as I can most subjects.* (Reverse coded)

Interviews

Bloomberg and Volpe (2019) argued that interviews offer a rich description of participants' lived experiences using the participants' own words and expressions as the main source of qualitative data. Participants were asked to participate in a semi-structured interview containing questions related to Research Question 3 (How do in-service middle grades mathematics teachers maintain their mastery goal orientations while teaching in performance-oriented school environments? (see Appendix F). The researcher utilized guidelines for qualitative interviewing to formulate the interview questions to focus on values, behaviors, and descriptions of MGMTs' teaching experiences (Patton, 2015, Taylor et al., 2015). Sample interview questions included:

- *Tell me about your personal goals for your math classroom.*
- *Share with me some of the reasons, you chose those goals.*

- *Have you ever experienced times of conflict between your personal teaching goals and these directives? Could you describe some of these conflicts for me?*

The semi-structured design allowed for follow-up questions in the moment and to put the participants more at ease. In-depth interviews were held with the five teachers selected from Phase 1 of the study based on criteria previously discussed. Interview field notes were taken during the questioning of each participant, which highlights participants reactions and specific comments. Interviews were one-on-one and lasted 45 to 60 minutes. In addition, interviews were recorded via Zoom to yield accurate verbatim transcriptions.

Data Analysis

Missing Data Analysis

In Phase 1, descriptive statistics were used to investigate the percentage of missing data. For this study, missing case items accounted for less than 5% of total items, which was within the acceptable range to use mean replacement (Hair et al., 2019; Raymond & Roberts, 1987). Furthermore, a paired sample t-test found no significant difference between the data sets when the missing values were replaced with zero or with the means (Tabachnick & Fidell, 2018). Single mean imputation was employed for any missing values during the later regression analysis (Musil, 2002; Schafer & Graham, 2002; Sterner, 2011).

Research Questions

Research Question 1 (What are the mathematics teaching self-efficacy, goal orientation, and perceptions of school goal structure of in-service middle grades mathematics teachers (MGMT)?) was addressed through descriptive statistics including the mean, standard deviation, and range of in-service MGMT's mathematics teaching self-efficacy, perceptions of school goal structure, and goal orientations scores.

Research Question 2 (Does mathematics teaching self-efficacy and teachers' perceptions of schools' goal structure predict goal orientation?)

Factor Analysis

The researcher found it important to employ exploratory factor analysis to justify the variables included in the subsequent multiple regression models (Field, 2018; Knekta et al., 2019) and to ensure the items loaded the same as in previous research. As the EFA was conducted as a validity check for this study, not as part of instrument development, the steps involved in the analysis were less involved than they might have been otherwise. This analysis included checking factor loadings, reviewing the scree plot, and the Kaiser criterion (eigenvalue > 1).

Because the PALS subscales measuring instructional practices were use with a population of MGMTs unique to this study and because the MTEBI PMTE subscale was modified, this study confirmed the factor structure using principal axis factor analysis with as recommended by Field (2018) through an exploratory factor analysis (EFA). Therefore, the number of factors was determined by the criteria such as a visual scree test, and the Kaiser criterion (eigenvalue > 1) (see all EFA results in Appendix G). Appendix G provides the scree plots for approaches to teaching subscales and the perceptions of school goal structure subscales and factor loadings. After EFA analysis, item 10 on the MAGO subscale and item 7 on the MTEBI PMTE were removed because of poor loadings of less than .40 (Field, 2018; Yong & Pearce, 2013) as shown in Appendix G. The rest of the items loaded as expected and reflected similar results as previous research (Cetinkaya & Erbas,2011; Wolters & Daugherty,.2007; Wolters et al., 2010).

Multiple Regression

Prior to conducting the multiple regression analyses, a correlation test among the independent, control and dependent variables was done. Assumptions were also checked prior to conducting the regression. Two separate regression models were tested that aligned with the research questions for this study. Both models were built with personal mathematics teaching

self-efficacy (PMTE), mastery goal structure (MGS), and performance goal structure (PGS) as the independent variables while teaching experience and education level were entered as control variables. The dependent variable in Model 1 was mastery approach goal orientation (MAGO), and the dependent variable in Model 2 was performance approach goal orientation (PAGO). As noted previously, mastery and performance goal orientation can coexist at the classroom level just as they can manifest themselves as multiple goals at the personal level since these orientations are separate distinct factors (Ames, 1992; Kunst et al., 2018; Nasser-Abu Alhija & Amasha, 2012; Pintrich, 2000). Control variables such as education level and years of experience were included in the model as well since teachers' teaching self-efficacy grows in relation to these variables (Corkin et al., 2015; Morris et al., 2017; Stevens et al., 2013; Wolters & Daugherty, 2007; Zee & Koomen, 2016).

Research Question 3 (How do in-service middle grades mathematics teachers maintain their mastery goal orientations while teaching in performance-oriented school environments?) Finally, to address Research Question 3, the researcher used qualitative data, through interviews, to explore how in-service middle grades mathematics teachers maintained their mastery goal orientations while teaching in performance-oriented school environments. The researcher intended to study special cases where MGMTs were resisting against neoliberal policies centered around accountability measures. These MGMTs provided as Apple (2017) described "…examples of lasting interruptive strategies…" (p. 151). The interviewees were what Patton (2015) described as examples of a positive deviance case study, which exemplified a person that had "solved a problem where the norm in the area is for the problem to remain unsolved" (p. 279-280). Therefore, participants were selected through purposeful sampling of MGMT who expressed having a mastery-oriented approach to teaching yet perceived that they taught within a performance goal structured school environment.

The study used a cyclical coding process that typified the revolving reflective nature of ongoing analysis and synthesis that is common in qualitative data analysis (Saldaña, 2016). For

the first cycle of coding, the study employed open coding to examine deeply the raw qualitative data, to memo initial noticings and to document comparisons and contrasts. The second cycle of coding utilized structural coding because this type of coding, Saldaña (2016) argued, best suited the interview transcriptions analysis, and related codes to the research question. This study also used values coding to highlight the participants' beliefs and values about their classrooms. These initial codes were collapsed into a list to uncover larger categories in which to group multiple codes. Finally, the analysis revealed the overarching themes. Connections and themes were grounded in the data by using interview transcriptions and interview field notes. The interview data was transcribed verbatim using Zoom software, a video conferencing program, which preserved the credibility of the data. Transcriptions were reviewed by the researcher and the participant for accuracy. To address trustworthiness, interview participants were allowed to perform member checks, which allowed participants to authenticate the meanings captured in the interview and to ensure that their verbal representation upheld their dignity as participants (Berger, 2015; Bloomberg & Volpe, 2019; Oliver et al., 2005; Patton, 2015; Plano-Clark & Ivankova, 2015; Saldana, 2016). Member checks helped maintain credibility through transparency and equitable practices with interviewees (see Table 3.3 for a summary of data collection and analysis).

Table 3.3

Summary of Data Collection and Analysis

	Research Questions	Data Sources	Data Analysis	Timeline
Phase 1	Question 1 *What are the mathematics teaching self-efficacy, goal orientation, and perceptions of school goal structure of in-service middle grades mathematics teachers?*	PALS subscales MTEBI – PMTE subscale	Descriptive Statistics i.e., means and standard deviations	IRB approval, collection, and analysis for phase 1 - approximately 24 weeks. (May 25th, 2021 to November 9th, 2021)
Phase 1	Question 2	PALS subscales	Correlation test such as	IRB approval, collection, and analysis for phase 1 -

	Research Questions	Data Sources	Data Analysis	Timeline
	Does mathematics teaching self-efficacy and teachers' perceptions of schools' goal structure predict goal orientation?	MTEBI – PMTE subscale	Pearson's r, effect size and Multiple regression	approximately 24 weeks. (May 25th, 2021 to November 9th, 2021)
Phase 2	Question 3 *How do in-service middle grades mathematics teachers maintain their mastery goal orientations while teaching in performance-oriented school environments?*	Interviews with 5 teacher participants	Open coding followed by structural and values coding	After phase 1 completion, collection, and analysis for phase 2 - approximately 8 weeks (October 12th, 2021, to November 30th, 2021).

Summary

Chapter 3 outlined the methodology of this study. The mixed model research study design exploited the strength of both quantitative and qualitative research to examine the experiences of mastery-oriented middle grades mathematics teachers in performance-oriented school environments (Creswell & Creswell, 2017; Wu, 2011). To investigate mastery-oriented middle grades mathematics teachers in performance-based school environments, the following research questions were posited:

1. What are the mathematics teaching self-efficacy, goal orientation, and perceptions of school goal structure of in-service middle grades mathematics teachers?
2. Does mathematics teaching self-efficacy and teachers' perceptions of schools' goal structure predict goal orientation?
3. How do in-service middle grades mathematics teachers maintain their mastery goal orientations while teaching in performance-oriented school environments?

In Phase 1, data were collected in this study via a web-based program that collected demographic information as well as the personal mathematics teaching efficacy, goal orientations, and perceptions of school goal structures of MGMTs. Chapter 3 explained the missing data analysis as well as the exploratory factor analysis in detail. The multiple regression

model-building process was also detailed. Personal mathematics teaching self-efficacy (PMTE) and perceptions of school goal structures for students (MGS and PGS) were defined as independent variables with teaching experience and education level as controls. Two models were tested. Mastery goal orientation (MAGO) was the dependent variable in the first model while performance goal orientation (PAGO) was the outcome variable in the second model tested. For Phase 2, the interviews were transcribed and recorded using Zoom, a video conferencing web-based program with informed consent by the participants obtained during the survey. The transcriptions were coded using structural and values coding methods in cycles of ongoing synthesis and analysis (Saldaña, 2016).

CHAPTER IV

RESULTS

Although previous studies have examined mathematics teaching self-efficacy, personal goal orientation, and school goal structure separately or in dual comparisons, few have studied all three in relation to each other. This explanatory sequential mixed-methods study aimed to explore the personal (teaching self-efficacy and personal goal orientation) and environmental (school goal structure) factors influencing mathematics teachers' goal orientations. Moreover, this study also examined teachers' perceptions of their schools' goal structure and how teachers created their classroom goals. To address this purpose, this study proposed the following research questions:

1. What are the mathematics teaching self-efficacy, goal orientation, and perceptions of school goal structure of in-service middle grades mathematics teachers?
2. Does mathematics teaching self-efficacy and teachers' perceptions of schools' goal structure predict goal orientation?
3. How do in-service middle grades mathematics teachers maintain their mastery goal orientations while teaching in performance-oriented school environments?

The quantitative results from Phase 1 of the mixed methods study included Research Question 1 and Research Question 2. Phase 2 of the study was qualitative and addressed Research Question 3. The presentation of results in this chapter are organized by research question, with

the integration of both phases of this sequential explanatory mixed methods study along with a summary of all findings being presented in the last part of the chapter.

Research Question 1: What are the mathematics teaching self-efficacy, goal orientation, and perceptions of school goal structure of in-service middle-grades mathematics teachers?

Descriptive Statistics and Correlations

The means and standard deviations for all independent, dependent and control variables included in the model as well as minimum to maximum scores are reported in Table 4.1.

Table 4.1

Means, Standard Deviations with Minimums and Maximums

	Mean	Std. Dev	Minimum/Maximum
Master Goal Orientation	3.68	.71	1 -5
Performance Goal Orientation	2.28	.64	1 - 5
Perception of Performance School Structure	3.91	.57	1 - 5
Perception of Mastery School Structure	2.75	.71	1 - 5
Personal Teaching Self-Efficacy	4.19	.73	1 - 5
Education Level	2.14	1.67	1 = Bachelors, 2 = Bachelors plus 15, 3 = Masters, 4 = Masters plus 15, 5 = Doctorate
Years of Teaching Experience	11.68	9.07	1 - 37

Participants seem to report mastery goal orientation scores (M = 3.68, SD = .71) and performance goal orientation scores (M = 2.28, SD = .64). In addition, participants also reported their perception of mastery school goal structure (M = 3.91, SD = .57) and theirs levels of perception of performance school goal structure (M = 2.75, SD = .71). The middle-grade mathematics teachers (MGMTs) surveyed had a relatively high level of mathematics teaching

self-efficacy (M = 4.19, SD = .73). Participants also reported a mean education level that was beyond obtaining only a bachelor's degree (M = 2.14, SD = 1.67) as well as a mean number of years teaching experience (M = 11.68, SD = 9.07) which indicated that the average teacher was experienced (Gatbonton, 2008).

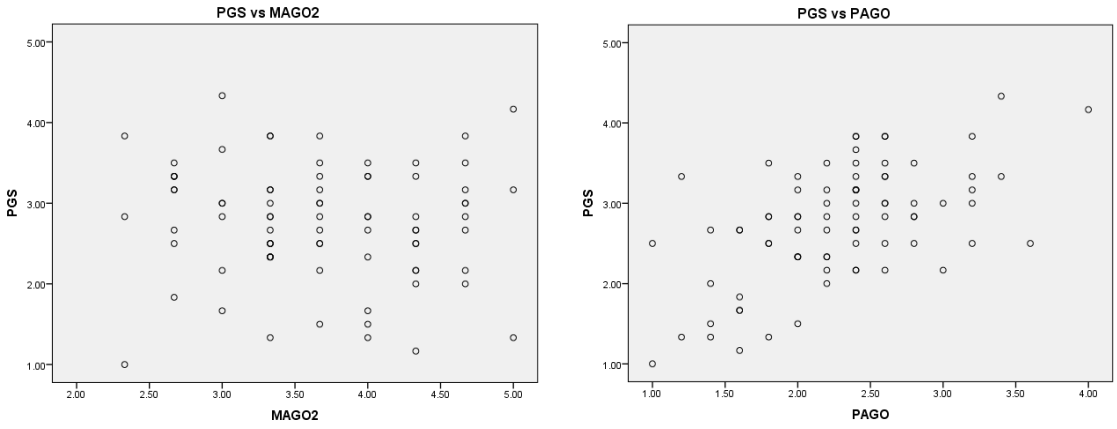
Research Question 2: Does mathematics teaching self-efficacy and teachers' perceptions of schools' goal structure predict goal orientation?

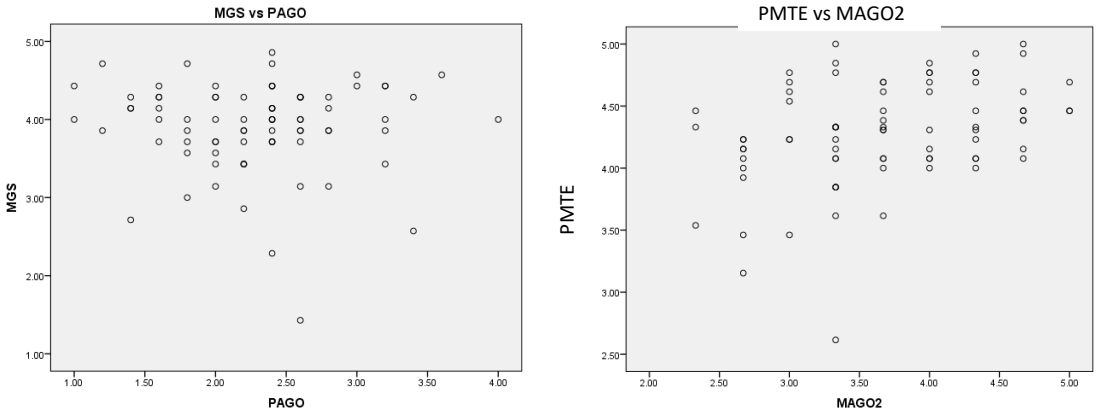
Assumptions Testing for Multiple Regression Models

Assumptions were assessed prior to beginning multiple regression analysis. First, the assumptions of a linear relationship between the independent and dependent variables were tested. Scatterplots showed a relatively linear relationship between the independent variables – perceptions of performance school goal structure, perceptions of mastery school goal structure, mathematics teaching self-efficacy, and the dependent variables mastery goal orientation and performance goal orientation, respectively (see Figure 2).

Figure 4.1

Scatterplots between Independent and Dependent Variables

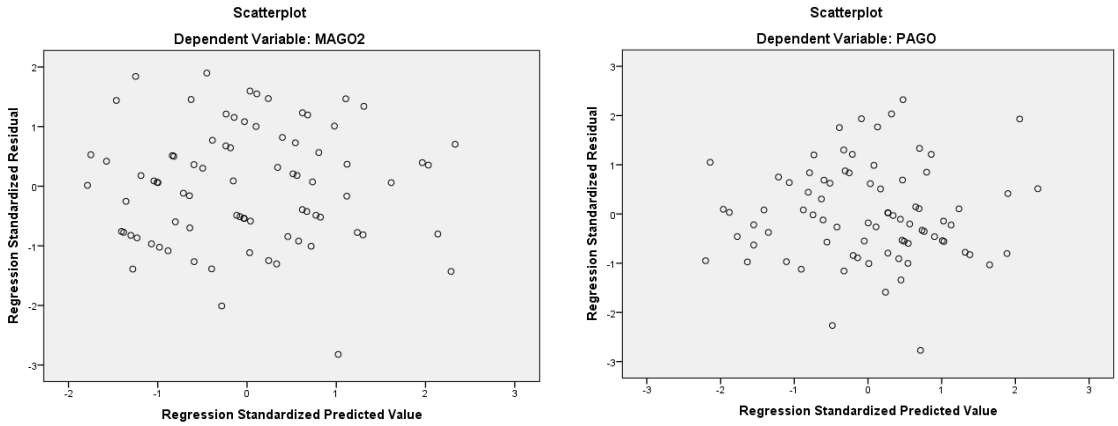




Next, the assumption for homoscedasticity, which tests for equal variance among the dependent variables, was met by examining the residual scatter plots for both models (Tabachnick & Fidell, 2018) (see Figure 3).

Figure 4.2

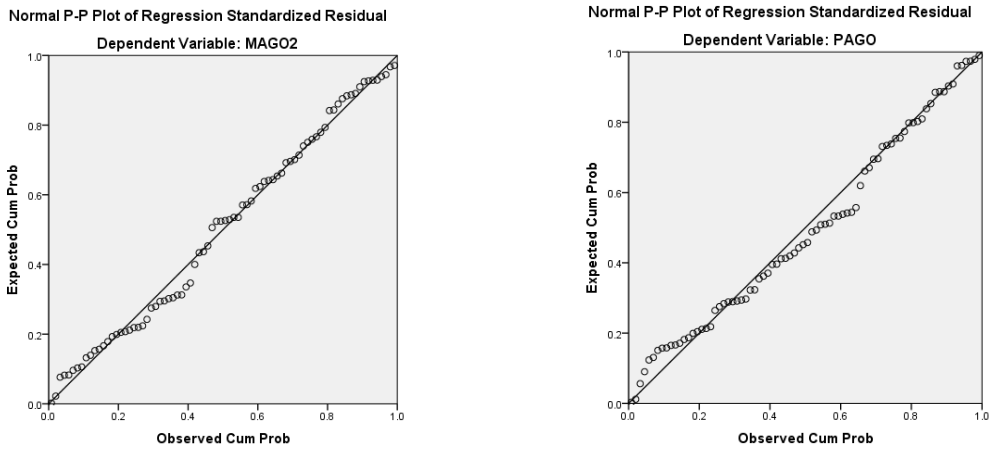
Residual Scatter Plots for Model 1 and Model 2



The normality was also met by evidence found in the normal p-plot graph for both models (Tabachnick & Fidell, 2018) (see Figure 4).

Figure 4.3

Normal P-Plots for Model 1 and Model 2



The independence of the values of the residuals was established based on the Durbin-Watson = 2.12 and 2.26 for model 1 and model 2 respectively. This test measures the level of correlation among the residuals which indicated the goodness of the fit for the model (Kelly & Bolin, 2013; Ngo & La Puente, 2012). Finally, there were no influential cases or outliers found influencing either model from examining the residual scatter plots as well.

Correlations

A correlation test was done prior to performing standard regression. Pearson *r* correlations amongst the variables included in both regression models are shown in Table 4.2.

Table 4.2

Correlations amongst Variables

	MAGO	PGS	MGS	PAGO	PMTE	Education	TE
MAGO	1	-.07	.23*	.11	.37**	.30**	-.10
PGS		1	-.37**	.57**	-.23*	.03	.00
MGS			1	-.03	.54**	.10	.19
PAGO				1	-.15	.06	-.04
PMTE					1	.01	.19
ED						1	.25*
TE							1

Note: *Significant at the 0.05 level. **significant at the 0.01 level. *Note:* MAGO = mastery goal orientation; PAGO = performance goal orientation; PGS = perception of performance school structure; MGS = perception of mastery school goal structure; PMTE = personal mathematics teaching efficacy; ED = education level and TE = years of teaching experience.

Mastery goal orientation has a significant, small positive correlation (Fields, 2018) with perceptions of mastery school goal structure ($r(78) = .23$, $p = .042$), mathematics teaching self-efficacy ($r(78) = .37$, $p = .001$), and education level ($r(78) = .30$, $p = .007$). For Model 2, perceptions of performance school goal structures had a significant, moderately negative correlation with perceptions of mastery goal structure ($r(78) = -.37$, $p = .001$) and a significant, small negative correlation with mathematics teaching self-efficacy ($r(78) = -.23$, $p = .045$). Perceptions of performance school goal structure had a strong positive correlation with performance goal orientation $r(78) = .57$, $p < .001$. Perceptions of mastery school goal structure had a significant, strong positive correlation with mathematics teaching self-efficacy $r(78) = .54$, $p < .001$. Education level and teaching experience (TE) shared a significant, small positive correlation $r(78) = .25$, $p = .02$. Both perceptions of performance goal structure $r(78) = .03$ and perceptions of mastery school goal structure $r(78) = .10$ were not significantly correlated with education. In addition, both perceptions of performance goal structure $r(78) = .00$ and perceptions

of mastery school goal structure $r(78) = .19$ were not significantly correlated with teaching experience.

Standard Multiple Regression Models

A standard multiple regression was administered with goal orientation as the dependent variable and mastery school goal structure, performance school goal structure, and mathematics teaching self-efficacy as the independent variables (Model 1). Teaching experience and education level served as control variables. This analysis was chosen to see whether mathematics teaching self-efficacy and teachers' perceptions of their schools' goal structure predict goal orientation. Each model was entered as a standard multiple regression. In other words, all the independent variables were entered simultaneously. Then non-significant predictors were removed one at a time (Fields, 2018; Hair et al., 2019). The final models contained only significant predictors. Table 4.3 shows the results of the full model with all non-significant variables, and Table 4.4 shows the final model predicting mastery goal orientation (MAGO) with only significant variables included. There was no multicollinearity among the variables (high levels of correlations amongst the independent variables), as all VIF scores were below 10 and scores for tolerance were all above 0.2 in both model 1 and model 2 (Hair et al., 2019; Patton, 2015).

Table 4.3

Full Initial Model 1 Predicting Mastery Goal Orientation (MAGO)

Coefficients								
	Unstandardized Coefficients	Standardized Coefficients			95.0% Confidence Interval for B		Collinearity Statistics	
Model	Std. Error	Beta	*t*	Sig.	Lower Bound	Upper Bound	Toler-ance	VIF
1 (Constant)	.88		.32	.75	-1.47	2.04		
PGS	.11	.03	.26	.79	-.18	.24	.85	1.18
MGS	.15	.04	.32	.75	-.26	.36	.62	1.60
MTSE	.20	.40	3.44	.00	.29	1.07	.70	1.44
Education	.06	.36	3.58	.00	.10	.34	.93	1.08
TE	.01	-.28	-2.65	.01	-.04	-.01	.89	1.12

Note: Dependent Variable: MAGO

Table 4.4

Final Model 1 Predicting Mastery Goal Orientation (MAGO)

Coefficients								
	Unstandardized Coefficients	Standardized Coefficients			95.0% Confidence Interval for B		Collinearity Statistics	
Model	Std. Error	Beta	*t*	Sig.	Lower Bound	Upper Bound	Toler-ance	VIF
1 (Constant)	.71		.62	.54	-.98	1.86		
MTSE	.17	.42	4.24	.00*	.37	1.03	.96	1.04
Education	.06	.37	3.68	.00*	.10	.34	.93	1.07
TE	.01	-.27	-2.66	.01**	-.04	-.01	.90	1.11

Note: Dependent Variable: MAGO, *p < .01, **p <.00

The standard regression utilized in model 1 showed that personal mathematics teaching efficacy, education level, and years of teaching experience accounted for 29.1% of the variance in middle grades mathematics teachers' mastery goal orientation ($F(3, 76) = 10.40$, $p < .001$, $R^2 = .29$, R^2 adjusted = .26). Furthermore, analysis showed that only one independent variable was statistically significant in the model, which was mathematics teaching self-efficacy (MTSE) ($\beta = .42$, $t(76) = 4.24$, $p < .001$). Both of the control variables were statistically significant, education level (ED) ($\beta = .37$, $t(76) = 3.68$, $p < .001$) and years of teaching experience (TE) ($\beta = -.27$, $t(76) = -2.66$, $p = .009$). A follow-up analysis revealed medium effect sizes Cohen's $f^2_{PMTE} = .20$ and Cohen's $f^2_{ED} = .15$, but a small effect size for years of teaching experience with Cohen's $f^2_{TE} = .08$ (Cohen, 1988; Hair et al., 2019; Field, 2018).

In order to test whether mastery school goal structure, performance school goal structure, and mathematics teaching self-efficacy predicted performance goal orientation, a second model was tested, as shown in Tables 4.5 and 4.6. This model included performance goal orientation as the dependent variable and mastery school goal structure, performance school goal structure and mathematics teaching self-efficacy as the independent variables. The same controls were used as in the first model (education level and teaching experience).

Table 4.5
Full Initial Model 2 Predicting Performance Goal Orientation (PAGO)

Coefficients								
	Unstandardized Coefficients	Standardized Coefficients			95.0% Confidence Interval for B		Collinearity Statistics	
Model	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound	Tolerance	VIF
2(Constant)	.70		.75	.46	-.87	1.92		
PGS	.08	.65	6.52	.00	.38	.71	.85	1.18
MGS	.12	.31	2.68	.01	.08	.57	.62	1.60
MTSE	.16	-.16	-1.48	.14	-.54	.08	.70	1.44

Education	.05	.03	.30	.77	-.08	.11	.93	1.08
TE	.01	-.08	-.77	.44	-.02	.01	.89	1.12

Note: Dependent Variable: PAGO

Table 4.6

Final Model 2 Predicting Performance Goal Orientation (PAGO)

Coefficients								
	Unstandardized Coefficients	Standardized Coefficients			95.0% Confidence Interval for B		Collinearity Statistics	
Model	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound	Tolerance	VIF
2 (Constant)	.54		-.15	.88	-1.16	.99		
PGS	.08	.65	6.55	.00*	.38	.71	.86	1.16
MGS	.10	.21	2.14	.04*	.02	.43	.86	1.16

Note: Dependent Variable: PAGO

The standard regression utilized in model 2 showed that perceptions of performance school goal structure and mastery school goal structure accounted for 35.9% of the variance in middle grades mathematics teachers' performance goal orientation ($F(2, 77) = 21.53$, $p < .001$, $R^2 = .36$, $R^2_{adjusted} = .34$). Furthermore, analysis showed that two independent variables were statistically significant. They were perceptions of performance school goal structure (PGS) ($\beta = .65$, $t(77) = 6.55$, $p < .001$) and perception of mastery school goal structure (MGS) ($\beta = .21$, $t(77) = 2.14$, $p = .036$). Post-hoc analysis revealed a large effect size for perceptions of performance school goal structure with a Cohen's $f^2_{PGS} = .56$, but a small effect for perceptions of mastery school goal structure with a Cohen's $f^2_{ED} = .04$ (Cohen, 1988; Hair et al. 2019; Field, 2018).

Research Question 3: How do in-service middle grades mathematics teachers maintain their mastery goal orientations while teaching in performance-oriented school environments?

The following sections discussed the various themes uncovered using both values and structural coding. Four main themes emerged from values coding the field notes, analytic memos and interviews of middle-grade mathematics teachers (MGMTs). Saldaña (2016) defined values coding as implementing codes to data that express opinions, attitudes, and beliefs. These four themes were collapsed from an initial list of 39 codes. MGMTs valued:

- Students' effort and hard work.
- Students' autonomy and personal responsibility.
- Relationships with their students and their communities.
- Students' self-efficacy and positive dispositions towards math.

Value Codes

Students' effort and hard work. This first values theme comprised overarching principles, describing the consensus amongst all of MGMT's belief systems. Declarations (i.e. "education is important for everybody," "I want us to do our best," "we do celebrate that hard-earned success. We celebrate that") were coded as high valuation of education, hard work, and student success. MGMTs expressed repeatedly that they wanted their students to work hard and to be successful in life.

Students' autonomy and personal responsibility. The second values theme consisted of declarations where teachers valued providing opportunities for their students to become more autonomous and responsible. The interviewees employed phrases like "we're just so afraid of giving them autonomy that we won't do it" (Denise) and "So I had everybody write down like a goal they have for this year" (Jeannie) or "You know your grade is your responsibility" (Andy) to

state that they believed that students had the capacity to take on the responsibility for their learning. Two teachers saw autonomy as a means to allow students to try out new things and to make mistakes.

> That's baloney and I think it's just because adults are like, we feel all the responsibility for taking care of them and we're so afraid that if something goes wrong, we are going to get in trouble for it. But if we can just relax and let the kids make some mistakes because they have to make mistakes to learn. We can't prevent them from making mistakes. (Denise)

> It's the time to make the free mistakes, kind of like you know when you're a teenager that's the time to make mistakes, because you're still safe and you're at home. So, I thought it was, you know, they're learning their personal responsibility of, if I don't turn in my work, I failed my classes. (Jeannie)

Relationships with students and their communities. The third values theme focused on MGMTs valuing their relationships with their students and communities. I defined this theme as the middle-grade mathematics teachers (MGMTs) expressing ideals that demonstrated the value they placed on meeting students' emotional and developmental needs. Additionally, this theme included practices that built connections between the teachers, their community stakeholders, and their students. Within this theme were two categories pertaining to educators' values and practices: offering empathy and changing students' dispositions toward mathematics. Each category will be discussed in detail in the following sections.

Offering empathy. The first category was being empathetic. This category included instances where the interviewees conveyed empathy towards their students and tried to connect with them by sharing how they experienced mathematics at young ages or by stating they understood how the hormonal and physical changes their students encountered impacted them in the classroom. Andy and Jeannie used themselves as examples of student success despite having struggled with mathematics when they were in the 6th grade.

> I mean you can do it, I mean, I just tell them, you know, I give them confidence. I'm not here to be… to get on to you or anything I'm just here as your teacher to help you get

> through what you need to. I understand what it was to be the student and now here, I am the teacher and, I just say Hey I mean I've been in your shoes I know how it feels, you know, if you don't understand something or if it's hard to ask questions or if you need help, you know? (Andy)

Denise and Jeannie explicitly noted that developmental changes in middle school need to be addressed. Denise affirmed the need by explicitly stating her belief:

> I think the biggest the number one biggest challenge is that middle school, in particular those kids are not getting social emotional learning it's not happening. Their social issues, their self-confidence issues, their sex issues are not being addressed and so those kids are thinking about those things all day which makes my job of teaching them unrelated things infinitely more difficult.

Building relationships with students. Finally, this category included conversations where the educators repeatedly talked about wanting to build relationships with their students and how it was important to them. Teachers commented that they were "bizarrely invested" (Barbra), that they "got to reach out to them [students]" (Andy), that they "really liked kids" (Denise), and that, as Jeannie declared, "I want to learn some more about them [students] and tell them [students] some about me." Two of the teachers also described how their relationships developed as the result of "looping" multiple years with the same group of students and how some former students returned to voice their appreciation of their education.

> My group because I'm in such a small school I loop up six seventh and eighth. So, I have the same class for three years if they stay with me through algebra and so that helps a lot to. Just being with them so long and them knowing what I expect and expectations. I think in that respect they're pretty fortunate to you know, be able to you know, have that opportunity to loop up. (Melissa)

Melissa also shared a practice from her classroom where she has her older 8th-grade students write letters to her new students to give the new students advice on how to be successful in her class. Although she didn't share much about the older students' conversations, Melissa did mention that those older students noticed a change in their respect towards mathematics. Barbara also attributed the deep personal connections she created with each of her students to looping and

to the fact that she was the only mathematics teacher. A couple of educators especially valued giving back to their community. Andy stated that "you know, I had teachers invest in me, so I want to just give it back you to others" while Melissa shared that her reason for becoming a teacher-leader was:

> I think that we don't give enough realistic training to new teachers, I think they're thrown to the wolves when they first come in. If they're lucky, they'll get somebody appear or a school that does have instructional coach that can help but I think, having to have figured out a lot of it on my own. I do feel the need or the responsibility to pass on certain things you know to new teachers, you know advice, or whatever you want to call it.

Students' self-efficacy and positive dispositions towards math. The last values theme characterized instances when the teachers agreed that they needed to help change students' dispositions towards mathematics and their view of themselves as mathematics students. Statements such as "[I] don't want math to be scary" (Jeannie), "But I just want us not to be closed minded and say like this is hard. I can't do this" (Jeannie), "I want them to learn the math I teach, but not at the price of confidence in mathematics" (Barbara) and "so make it [mathematics], you know halfway fun, you know or relevant" (Melissa) illustrated the MGMTs desire to change how students felt about mathematics and their capabilities. Furthermore, Melissa offered a more detailed description of students' initial dispositions.

> I don't know sometimes they come to me, and you know they don't like math or they're not good at math or whatever, but they haven't really even gotten into math you know, so I tried to change that perception a little bit.

Three MGMTs also discussed their ideas about mathematics using metaphorical language when trying to change how students viewed mathematics. Jeannie stated that "to me, math is just kind of a mindset and an almost language". Meanwhile, Melissa labeled her students' dispositions as "math is always that crutch that they're like, you know, they either, like it or don't like it". However, Barbara went even further in her account. Barbara indicated that her school was

considered a “trauma-school” because of its history of weather disasters such as flooding and rolling blackouts. She shared that:

> We've had just this tremendous trauma and I want to set the grounds for my kids to be successful and to see an escape and to see education as their way out from that and I want them to see that education is power.

Barbara saw mathematics as a tool to empower her students to overcome their past.

Meanwhile, structural coding related how MGMTs maintained and demonstrated their mastery goal orientations. In addition, MGMTs’ ideas and practices, which illustrated their goal orientations (Ames, 1992; Ames & Archer, 1988), teaching self-efficacy (Zee & Koomen, 2016), and perceptions of their school goal structures (Anderman, e al, 2010; Deemer, 2004), were also used to identify four themes revealed through structural coding. Saldaña (2016) characterized structural coding as the application of content-specific labeling of data that relates back to specific research questions. These four themes were collapsed from 18 codes. MGMTs discussed the following practices in their interviews:

- Reframing mistakes as learning opportunities**.**
- Pushing student autonomy and self-regulation.
- Communicating high valuation of students’ effort.
- Encouraging students to grow and to value their learning.

Structural Codes

Reframing mistakes. The first structural theme was the practice of reframing mistakes as opportunities “to learn from others because I mean everybody makes mistakes and I’ve made mistakes on new math problems” (Andy) and as a necessary part of learning. Mistakes were also valued and seen as part of growth. Denise elaborated by stating:

> But if we can just relax and let the kids make some mistakes, because they have to make mistakes to learn, we can't prevent them from making mistakes. We have to let them make mistakes, and then we have to teach them how to recover from the mistake and grow, because if we are not teaching them how to recover from mistakes, we are doing a disservice to them as humans and a disservice to our future society.

Pushing student autonomy and self-regulation. The second structural theme was the practice of pushing students to be more autonomous. Jeannie stated that "So I had everybody write down like a goal, they have for this year, in general, and then the goal that they have for math class, and I shared mine too."

Barbara presented her students with opportunities to be more autonomous by teaching them how to monitor their success in her class. She described how:

> So, every Monday, they check their grade and they put it on a little graph, and we look at our slope. Is our grade going up? Is our grade going down? and I try and use that to empower them. Okay, your grade went down. Why? What can you do about it?

She depicted a procedure she used in her classroom to help her students engage in a time of weekly self-reflection. She questioned her students and prompted them to find solutions. Her intention was "to empower them".

Communicating high valuation of students' effort. The third structural theme was the practice of communicating their high valuation of students' effort. This theme included MGMTs' articulated views and practices through which they encouraged and praised their students when their learners put forth the effort to grow in their understanding of mathematics. Bounded within this theme, there are two categories that classified the teachers' practices: use of verbal feedback and use of formative assessment. Each category will be discussed in detail in the following sections.

Use of Verbal Feedback

This category included instances where teachers illustrated this emphasis by giving frequent verbal feedback. The conversation was a widespread element in how MGMTs interacted

with their students during all stages of their learning. Teachers admonished students by saying, "this is why we work hard, because no matter what hard work, leads to success" (Barbara) to express how highly they valued student effort. Jeannie advised her sixth graders "that it's better to turn something, and it's at least partially done, then the whole thing. Like if you understood part of it at least do that part, turn it in, so I can grade it." Phrases such as "get better, get stronger, get smarter" (Barbara) and "I tried to let them know how good they're doing all the time" (Jeannie) indicated that the MGMTs communicated how much they valued their students' efforts. Verbal feedback was sometimes used to encourage students when learning difficult topics to offer positive feedback on students' efforts. For instance, Denise described a time she was working with a student who was struggling with one-step equations with fractions.

> When the variables were in different places it just threw him off, and so I sat with them and we did example after example after example after example and he was like this, I just can't I just can't do this, and I said Steve if you think, you can, or you think you can't you're right. His eyes got real big and he thought about it for a minute, and he sat with it, and I said dude you're working your butt off, I can see that you're really trying, and if you don't get it today that's okay, and he left and he came back the next day, and he said, I want to try again. (Denise)

Use of Formative Assessment. This category included statements where MGMTs also used verbal feedback as a formative assessment. Sometimes teachers said, "their [students] ability to explain concepts back-to-back to me" (Denise) and using resources like in-time polling "to make sure that they [students] are getting what I'm doing" (Andy) helped MGMTs gauge their students' level of understanding before moving onto another topic. Other teachers stated that:

> If I had two maybe three of them sitting down, then we could go, step by step, and get feedback, they would ask questions that was another great indicator for me if they were asking the right questions, then I knew, because the deeper level of questioning, let me know that they were understanding. (Denise)

> I don't want them to feel like Oh, you did this wrong and wrong and this wrong. I want to tell them how they can do things better in like a specific actionable like plan and that their shortcoming academically says really nothing about them as a person, as long as they are actually trying. (Jeannie)

Teachers still believed that verbal feedback was necessary even when more conventional formative assessments such as grade checks, exit tickets, and individual education plans were applied in tandem.

Encouraging students to grow and value learning. The final structural theme was encouraging students to grow and value their learning. This theme included statements that described what MGMTs thought a teacher's goal should entail and the interviewed MGMTs' personal classroom goals. When asked what a mathematics teacher's goal should be, the MGMTs' statements revealed that they believed that goals in a mathematics classroom should be "to think critically, problem solving, thinking of different ways" (Jeannie). Melissa explained that:

> I think the main goal in math classroom is to teach them how to think not necessarily to follow steps. You know, understand the whole concept in the whole big picture and then also hopefully to allow the students, a sense of exploration, you know where they want to figure out things.

When probed about their personal teaching goals for their classrooms, MGMTs revealed their student-centered focus with statements such as "you know, trying to make sure that they like math" (Melissa), and:

> Well, I think a teacher's goal in general is to help a child figure out who they are, what their strengths and weaknesses are and how to use their strengths and work with their weaknesses, to be their best version of themselves in a functional society. I think that's our goal is teachers is to help those kids grow and become the best version of themselves. (Denise).

MGMTs provided further evidence of their student-centered classrooms when asked what they would advocate to change. They stated desires such as "all the parents to be at least a little bit concerned or knowledgeable of what their kid is doing in school" (Jeannie), "give me a little bit more time" (Melissa), "get multiple full-time trauma trained therapists in every middle school" (Denise), and changes in class size, although Barbara wanted more kids.

> I'm a little selfish, I want to teach them all, so I don't want to say smaller class sizes, unless I get both those classes. I'd rather have extra adults in the room because, then I know those kids are still getting a high-quality education. And uhm, I love my job, and I do it well and I don't sit behind my desk and let my kids sit there and work silently and there are other teachers in our building that do, and I don't want my babies in their classroom. I want them in my classroom, so you know just give me. Give me adults in my classroom. (Barbara)

All these statements suggested that these teachers would advocate for changes that directly benefitted their students. A summative statement would be when Barbara said, "Well, I guess I don't entirely understand the question because my students are my personal goals." The MGMTs' statements revealed that they believed that goals in a mathematics classroom should share a focus on the students' developmental and emotional needs. Moreover, their accounts indicated that they engaged in practices focused on students' developmental and emotional needs. The interviewees also made assertions such as "I love where I'm working", "and "I decided I love teaching. I love teaching and I love mathematics" when the MGMTs discussed their personal goals for their classroom and their students.

> So, within my math classroom specifically with mathematics, I just want to show them that they're capable human beings and I love math, and so I love using math to do that, I want to see their test scores come up. (Barbara)

> Yeah, I just think it's important that they kind of give it a chance, and you know realize that it's actually pretty easy once you get the hang of it and you know just enjoy it, you know because it's the math and reading that are your two most important skills, in my opinion, so they need to be good at it. (Melissa)

The importance of the pursuit of understanding over just knowing procedures was another value underscored in their exchanges. Participants used statements like "as long as you understand the concept", "I don't want them to regurgitate a procedure", and finally, "if I wanted you to get all the answers, I could print out an answer key." Teachers revealed that they repeatedly shared these viewpoints with their learners through verbal messages such as the examples above. Denise encapsulated her views by saying:

> So, they have a firm grasp and understanding of the concept of when you have a few apples and you add some more apples to it, you have a larger group of apples that's fine we don't have to have the semantics down. As long as you understand the concept so then my job teaching pre-algebra is to help them transfer that concept into bigger concept, the specific numbers, I think, are unimportant for my special ED kids specifically because most of them have problem with calculation anyway. I tried to focus more on the deeper understanding.

Table 4.7 provides an overview of the definitions of the themes and the subthemes as well as reference quotes.

Table 4.7

Values Coding Qualitative Analysis Themes and Sample Quotes

Four Themes from Values Coding Qualitative Analysis	
Students' effort and hard work is defined as the overarching values which describing MGMTs' overall value system.	• "education is important for everybody" (Andy) • "I want us to do our best" (Jeannie) • "we do celebrate that hard earned success. We celebrate that." (Barbara)
Students' autonomy and personal responsibility defined as declarations where teachers valued providing opportunities for their students to become more autonomous and responsible.	• "That's baloney and I think it's just because adults are like, we feel all the responsibility for taking care of them and we're so afraid that if something goes wrong, we are going to get in trouble for it. But if we can just relax and let the kids make some mistakes because they have to make mistakes to learn. We can't prevent them from making mistakes" (Denise) • "It's the time to make the free mistakes, kind of like you know when you're a teenager that's the time to make mistakes, because you're still safe and you're at home. So, I thought it was, you know, they're learning their personal responsibility of, if I don't turn in my work, I failed my classes." (Jeannie)
Relationships with their students and their communities defined as MGMTs valuing their relationships with their students and their communities.	Offering Empathy • "I mean you can do it, I mean, I just tell them, you know, I give them confidence. I'm not here to be… to get on to you or anything I'm just here as your teacher to help you get through what you need to. I understand what it was to be the student and now here, I am the teacher and, I just say Hey I mean I've been in your shoes I know how it feels, you know, if you don't understand something or if it's hard to ask questions or if you need help, you know? "(Andy) Building Relationships with Their Students • "bizarrely invested" (Barbara) • "got to reach out to them [students]" (Andy) • "I want to learn some more about them [students] and tell them [students] some about me." (Jeannie)
Students' self-efficacy and positive dispositions towards math defined as instances when the teachers expressed that they needed to help change students' dispositions towards mathematics and students' view of themselves as mathematics students.	• "[I] don't want math to be scary" (Jeannie) • "so make it [mathematics], you know halfway fun, you know or relevant" (Melissa) • "We've had just this tremendous trauma and I want to set the grounds for my kids to be successful and to see an escape and to see education as their way out from that and I want them to see that education is power." (Barbara)

Reframing mistakes as learning opportunities characterized the practice of using mistakes as necessary part of growth and learning.	• "But if we can just relax and let the kids make some mistakes, because they have to make mistakes to learn, we can't prevent them from making mistakes. We have to let them make mistakes, and then we have to teach them how to recover from the mistake and grow, because if we are not teaching them how to recover from mistakes, we are doing a disservice to them as humans and a disservice to our future society." (Denise) • "to learn from others because I mean everybody makes mistakes and I've made mistakes on new math problems" (Andy)
Pushing student autonomy and self-regulation demonstrated the practice of pushing students to monitor their learning and to self-reflect.	• "So, every Monday, they check their grade and they put it on a little graph, and we look at our slope. Is our grade going up? Is our grade going down? and I try and use that to empower them. Okay, your grade went down. Why? What can you do about it?" (Barbara)
Communicating high valuation of students' effort showed was the practice that showed how teacher demonstrated that they valued effort.	Use of Verbal Feedback • 'this is why we work hard, because no matter what hard work, leads to success" (Barbara) • "that it's better to turn something, and it's at least partially done, then the whole thing. Like if you understood part of it at least do that part, turn it in, so I can grade it." (Jeannie) • "And some things you just have to practice and work on over and over and over until you understand it." (Jeannie) Use of Formal Assessment • "If I had two maybe three of them sitting down, then we could go, step by step, and get feedback, they would ask questions that was another great indicator for me if they were asking the right questions, then I knew, because the deeper level of questioning, let me know that they were understanding" (Denise) • "I don't want them to feel like Oh, you did this wrong and wrong and this wrong. I want to tell them how they can do things better in like a specific actionable like plan" (Jeannie)
Encouraging students to grow and to value their learning exhibited the practice of creating goals for their classroom and their personal goals.	• "to think critically, problem solving, thinking of different ways." (Jeannie) • "Well, I think a teacher's goal in general is to help a child figure out who they are, what their strengths and weaknesses are and how to use their strengths and work with their weaknesses, to be their best version of themselves in a functional society. I think that's our goal is teachers is to help those kids grow and become the best version of themselves." (Denise)

Table 4.8

Structural Coding Qualitative Analysis Themes and Sample Quotes

Four Themes from Structural Coding Qualitative Analysis	
Reframing mistakes as learning opportunities characterized the practice of using mistakes as necessary part of growth and learning.	• "But if we can just relax and let the kids make some mistakes, because they have to make mistakes to learn, we can't prevent them from making mistakes. We have to let them make mistakes, and then we have to teach them how to recover from the mistake and grow, because if we are not teaching them how to recover from mistakes, we are doing a disservice to them as humans and a disservice to our future society." (Denise) • "to learn from others because I mean everybody makes mistakes and I've made mistakes on new math problems" (Andy)
Pushing student autonomy and self-regulation demonstrated the practice of pushing students to monitor their learning and to self-reflect.	• "So, every Monday, they check their grade and they put it on a little graph, and we look at our slope. Is our grade going up? Is our grade going down? and I try and use that to empower them. Okay, your grade went down. Why? What can you do about it?" (Barbara)
Communicating high valuation of students' effort showed was the practice that showed how teacher demonstrated that they valued effort.	Use of Verbal Feedback • 'this is why we work hard, because no matter what hard work, leads to success" (Barbara) • "that it's better to turn something, and it's at least partially done, then the whole thing. Like if you understood part of it at least do that part, turn it in, so I can grade it." (Jeannie) • "And some things you just have to practice and work on over and over and over until you understand it." (Jeannie) Use of Formal Assessment • "If I had two maybe three of them sitting down, then we could go, step by step, and get feedback, they would ask questions that was another great indicator for me if they were asking the right questions, then I knew, because the deeper level of questioning, let me know that they were understanding" (Denise) • "I don't want them to feel like Oh, you did this wrong and wrong and this wrong. I want to tell them how they can do things better in like a specific actionable like plan" (Jeannie)
Encouraging students to grow and to value their learning exhibited the practice of creating goals for their classroom and their personal goals.	• "to think critically, problem solving, thinking of different ways." (Jeannie?) • "Well, I think a teacher's goal in general is to help a child figure out who they are, what their strengths and weaknesses are and how to use their strengths and work with their weaknesses, to be their best version of themselves in a functional society. I think that's our goal is teachers is to help those kids grow and become the best version of themselves." (Denise)

Integration between Quantitative and Qualitative Phases of the Study

To integrate the results of the quantitative and qualitative phases of the study, quotes that align with the variables used in both full regression models for predicting goal orientation are shown in Table 4.9. The sample quotes provide a greater depth of understanding concerning the interviewees' mathematics teaching self-efficacy, goal orientation, and perceptions of their school's goal structure. The interviewees were purposefully selected because of their mastery approach to teaching and their perception of a performance goal structure for their learning environments. Furthermore, some quotes underline the orthogonal nature of goal orientation since it is possible for a teacher to have both orientations simultaneously. Finally, the last two themes emerged from this integration process. The first integration theme encompassed MGMTs' professional development and performance in their classrooms. The second integration theme centered on the exercise of autonomy in their classrooms.

Professional Development and Performance in Their Classrooms

The first integration theme is comprised of two subthemes: (1) being open and willing to learn new things and (2) demonstration of autonomy.

Being open and willing to learn new things. The first subtheme described the practice of MGMTs seeking help while being open and willing to learn new things. MGMTs demonstrated a desire to improve their teaching by describing experiences when they sought help to make sense of school and state-level directives. Some teachers "leaned really heavily on my fellow math teachers" or sought out help from administration because they "had [a] department head, they were kind of the person, you could go and ask," especially in first years in the teaching profession. Teachers also expressed a desire to improve their teaching, or that improvement should be a teacher's personal goal.

> You have to want to try and be receptive to trying things that either do or don't work you can't be afraid, if you know something doesn't work you just throw it out, then you know

> or whatever, but a lot of teachers get stuck in a rut and they don't want to try something new or they're like well I have success this way, but yet they still don't want to try something new. (Melissa)

The second subtheme was that MGMTs wanted executable feedback from their administrators to change their teaching practices. For example, Jeannie especially desired feedback on her teaching from her principal because her stated goal was to improve her teaching during the current school year and become better than the last year. She stated that

> Yeah, like I'm like yeah, this is a nice thought you're telling me, but how does that apply specifically to what I'm doing in the classroom? What specifically can I change? It's taking all this meta stuff and making it real.

Jeannie modeled the same desire she stated she had for her students. She wanted feedback she could put into action, the same kind of feedback she strove to give her students consistently.

Demonstration of Autonomy

The second integration theme implicated practices and ideas surrounding the demonstration of their autonomy, which was expressed primarily in two areas: priorities and their classroom goals.

Priorities. Teachers expressed that they exercised their autonomy primarily in approaching their decisions on what to teach, how to teach, and when to teach the published standards for their state. Four out of the five teachers expressed that they believed the standards needed to be broken down rather than used in their current dense form. Some teachers broke down the standards into smaller sub-standards to better understand each concept their students needed to understand. Other teachers used scaffolding to prepare students with crucial skills before teaching the standards as dictated. Educators used phrases such as “it wasn't very realistic” and “they ask a lot of things in one standard.” Teachers prioritized concepts as needed based on their formative assessment of students’ learning.

Classroom goals. When confronted with state directives and standards, teachers would try their best to teach them; however, Barbara stated:

> I'm always going to err on the side of setting my students up for success and because I spent a week on equation review. I might not get all my algebra one standards covered, but I would rather leave some standards uncovered then push them too quickly and have them understand half of some standards. Especially something as foundational as solving equations. I need that firm foundation of that so that's how I will always err on the side of my students' confidence and foundation.

Teachers used their autonomy to create classroom goals centered around the needs of their students. They deliberately slowed their teaching pace by adding time to teach critical scaffolded and/or reteaching concepts. Their autonomy allowed them room to make choices that benefited their students. The MGMTs wanted their students to be successful, which translated into making changes to their teaching timelines. Teachers felt that they were free to enact changes to suit the needs of their students because they were either the only math teacher in that area or because of their years of experience. Denise summarized her view when she stated:

> I don't know if that's a struggle, because on the one hand, I feel like if we had well educated confident teachers, they could come in, without a map and it wouldn't matter and they could teach the kids the concepts, because they had a clear and certain understanding of it, but we don't have well prepared teachers coming into the classroom, so we need a certain definite map that says do xyz this way. But that's all there for teachers who are certified and well train and so there's I feel like there's this real dichotomy amongst teaching philosophy as to whether you should be told what to do, or you shouldn't be told what to do.

Her perspective was that well trained and confident teachers wouldn't need as many directives as teachers who entered the classroom as either inexperienced or uncertified.

Table 4.9

Quotes Aligned to Variables in the Regression Models

Personal Mathematics Teaching Efficacy	• When I first started, I suspected that kids were actually interested in learning. And the rebuttal that I found was, yes, but it [interest in learning] gets killed so early that by the time they come to middle school either they're interested or they're not. And I think, to some degree that's true, but I also think it's [interest in learning] not irreversible. (Denise) • One thing I'm good at is, you know, kind of squashing the negative self-talk. (Jeannie) • And uhm, I love my job, and I do it well and I don't sit behind my desk and let my kids sit there and work silently and there are other teachers in our building that do, (Barbara)
Mastery Goal Orientation	• And they know as an extension because I've told them ahead of time, you will have to write your own word problem because I want them to extend it I don't want them to just regurgitate a procedure. (Barbara) • You have to want to try and be receptive to trying things that either do or don't work you can't be afraid, if you know something doesn't work you just throw it out, then you know or whatever, but a lot of teachers get stuck in a rut and they don't want to try something new or they're like well I have success this way, but yet they still don't want to try something new. (Melissa) • "I'm trying to just always figure out stuff that is helping to reach the students." (Andy)
Performance Goal Orientation	• "I want my kids to you know the saying scores open doors which, I believe, to some extent I don't believe scores define you, but I believe scores will open some doors." (Barbara) • "It makes me feel like I'm being seen as incompetent." (Jeannie)
Perception of Performance Goal Structure	• "And that I want them to pass the ACT. I want them to pass their state test, so I do make sure that I'm teaching those standards and that's pretty much I think the only directive that's come down." (Barbara) • "I got evaluated right before fall break and then she finally talked to me about it this Tuesday morning and I got absolutely eviscerated she got onto me for every single little thing I do wrong.' (Jeannie) • "Well, I mean one thing that we go through observations and stuff with the administration every now and then, and I mean it counts towards my evaluation and stuff. I mean, me and other teachers, that I work with we get evaluated." (Andy) • "I mean we got to teach so many standards throughout the year before they start doing state testing and stuff. I mean, that's a lot of pressure on us and stuff." (Andy)

	• "There their social issues, their self-confidence issues, their sex issues are not being addressed and so those kids are thinking about those things all day which makes my job of teaching them unrelated things infinitely more difficult. I would love to teach them math but that's not going to happen and that's a big part of why I didn't teach this year is because I cannot, in good conscience sign a contract saying that I will teach state math curriculum this year, because I know I can't. I can't. I can't do a good job of it." (Denise)
Education	• "Straight out of college, went to college and started teaching right out of college so." (Melissa) • "A lot of my work experience has always been special ED oriented, and so, when I graduated, I got double certified in my college." (Denise) • Well, I have my I have my masters in math ED." (Andy) • "I went to and graduated from high school, went to college got my bachelor's and started teaching." (Barbara) • "I went to[school name] University in [city name]. Yeah, and my degree is actually in math." (Jeannie)
Teaching Experience	• "I taught high school for one year and then I taught at the college level for [ ] state college. I worked for them for eight years as an adjunct." (Andy) • "I did not have another special ED math teacher, so as far as like modifying my lab class curriculum, I was on my own. I had to go to the Internet. I had to make stuff up. I had which you know I've been teaching at that point, I had been teaching for nine years, so it wasn't terribly difficult." (Denise) • "I don't know how much my survey said but I taught for 23 years in [state name]." (Barbara) • "I'd probably have to think back to when I was a younger teacher, I mean right now it's pretty normal and pretty easy to do those kinds of things for me." (Melissa)
Perceptions of Mastery Goal Structure	• "That's the only directive I think I've had here in [state name]. It has been pretty awesome letting me just teach." (Barbara) • "I mean it it's given me more flexibility on doing stuff outside the classroom." (Andy)

Summary

This explanatory sequential mixed-methods study aimed to explore the personal (teaching self-efficacy and personal goal orientation) and environmental (school goal structure) factors influencing mathematics teachers' goal orientations. Moreover, this study also examined teachers' perceptions of their schools' goal structure and how teachers created their classroom goals. Quantitative analysis revealed several key findings. Participants self-reported a higher level

of mastery goal orientation than performance goal orientation, as well as a higher level of perceptions of mastery school goal structure than perceptions of performance school goal structure. The MGMTs had relatively high mathematics teaching self-efficacy. Findings showed that mastery goal orientation positively correlated with perceptions of mastery school goal structure, mathematics teaching self-efficacy and education level.

Moreover, performance goal orientation had a strong positive correlation with perceptions of school goal structure yet a negative correlation with perceptions of mastery school goal structure and mathematics teaching self-efficacy. Perceptions of mastery school goal structure strongly correlated with mathematics teaching self-efficacy. Lastly, education level and teaching experience shared a small positive correlation. The standard regression in model 1 showed that mathematics teaching self-efficacy (PMTE), education level (ED), and years of teaching experience (TE) significantly predicted MGMTs' mastery goal orientation. Also, the standard regression in model 2 showed that perceptions of performance school goal structure (PGS) and perception of mastery school goal structure (MGS) significantly predicted MGMTs' performance goal orientation.

Qualitative analysis of the five interviews with MGMTs with mastery goal orientation but perceived a performance goal school structure also yielded meaningful findings. Values coding revealed four values that MGMTs expressed. MGMTs valued their students' effort and hard work, their students' autonomy and personal responsibility, their relationships with their students and their communities, as well as their students' self-confidence in doing mathematics and the development of positive dispositions toward math. Structural coding related four practices of MGMTs to the research questions. These practices were reframing mistakes as learning opportunities, pushing students to be more autonomous and self-regulated, communicating their high valuation of students' effort through their interactions with students and encouraging students to grow and value their learning. After integrating the results from both phases, several

interview quotes aligned with the independent variables chosen for the regression models. Two more themes emerged from this process. The first integration theme characterized MGMTs' need/desire to grow through professional development and improve their classroom performance. The second integration theme centered on exercising their autonomy in their classrooms when making decisions about their practices.

In chapter 5, significant results will be considered in relation to previous research. Implications for the practice of teaching and the support of both in-service and preservice middle grades mathematics teachers will also be examined. Finally, the limitations of this present study and possible directions for future areas of research will be detailed as the discussion of the findings is drawn to a conclusion.

CHAPTER V

DISCUSSION

The purpose of this study was to explore the personal and environmental factors that influence middle grade mathematics teachers' (MGMTs) goal orientations characterized by their approaches to teaching. An explanatory sequential mixed methods design was utilized in which quantitative data from Phase 1 were collected to measure MGMTs' mathematics teaching self-efficacy (MTSE), personal goal orientations, and perceptions of school goal structures. Furthermore, this study investigated whether MTSE and perceptions of their school's goal structure predicted MGMTs' goal orientations. In the qualitative Phase 2 of this study, interviews with MGMTs were analyzed to uncover themes that illuminated the experiences of MGMTs who were mastery-oriented in their approach to teaching despite teaching in learning environments they perceived as performance-based. To address this purpose, this study proposed the following research questions:

1. What are the mathematics teaching self-efficacy, goal orientation, and perceptions of school goal structure of in-service middle grades mathematics teachers?
2. Does mathematics teaching self-efficacy and teachers' perceptions of schools' goal structure predict goal orientation?
3. How do in-service middle grades mathematics teachers maintain their mastery goal orientations while teaching in performance-oriented school environments?

chapter 5 discusses the quantitative results from Phase 1 of the mixed methods study and includes Research Question 1 and 2. In addition, the discussion of Phase 2 of the study, which was qualitative, will address Research Question 3. This chapter is structured by research question and includes a brief section discussing the integration components of this sequential explanatory mixed methods study. Implications for the practice of teaching and the support of both in-service and preservice middle grades mathematics teachers will also be examined. Finally, the limitations of this study, possible directions for future areas of research, and concluding remarks will also be detailed.

Research Question 1: What are the mathematics teaching self-efficacy, goal orientation, and perceptions of school goal structure of in-service middle grades mathematics teachers?

Quantitative analysis revealed several key findings. Despite previous research stating that middle-grade schools are more performance goal structure than elementary schools (Midgley et al., 1995; Tuominen et al., 2020; Wigfield et al., 1991), results of the current study found that participants often self-reported a mastery goal orientation for themselves and a mastery goal structure for their schools. There are a couple of reasons why these results might differ from prior research. One reason could be that teachers who participate in research surveys tend to be those who feel most strongly about mastery-oriented practices in the first place (Lohr, 2010). The second possible reason could be that there have been significant changes in middle-grade teachers' preparation to mirror the shift in professional organizations towards more pedagogical practices that encompass mastery approaches to teaching. Results showed that middle-grade math teachers had relatively high mathematics teaching self-efficacy, which is consistent with prior research indicating that teachers with increased content knowledge as well as pedagogical content knowledge have more teaching self-efficacy as reflected in the participants' mean education and years of teaching experience (Cao et al., 2018; Corkin et al., 2015; Morris et al., 2017; Zee & Koomen, 2016). All the middle-grades mathematics teachers interviewed mentioned their

education or areas of certification when discussing how they made sense of directives such as state standards.

Research Question 2: Does mathematics teaching self-efficacy and teachers' perceptions of schools' goal structure predict goal orientation?

Quantitative results revealed that the MGMTs' perceptions of mastery school goal structure had a strong positive correlation with personal mathematics teaching efficacy. This relationship was tested in the first model to see how well PMTE predicted MGMTs' mastery goal orientation. Since Bandura (1982) posited that self-efficacy was predictive of behavior and affect. The first model tested in this study showed that personal mathematics teaching efficacy was a significant predictor of a mastery goal orientation in teaching, aligning with Bandura's (1982) work. MTSE had a larger beta value than both control variables, education and teaching experience. Furthermore, findings showed mastery goal orientation positively correlated with the perceptions of mastery school goal structure (MGS), mathematics teaching self-efficacy (MTSE) and education level. This finding corroborated Deemer's (2004) findings that teachers' perceptions of their schools' mastery goal structure was positively related to their personal goal orientation and their teaching self-efficacy.

The second model tested in this study showed that perceptions of performance school goal structure (PGS) and mastery school goal structure (MGS) were significant predictors of MGMTs' goal orientations. This result supported Wolters et al. (2010) findings which indicated that PGS and MGS were separate, distinct factors. Even though teaching experience was not a significant predictor for a performance goal-oriented approach to teaching, this finding also aligned with previous research, which that found that there were no significant differences in teachers with different levels of teaching experience (Wolters et al., 2010). Interestingly, Butler (2007) stated that performance-based approach to teaching decreases as teaching experience increases, which does not translate into teachers becoming more mastery-oriented in their teaching.

Research Question 3: How do in-service middle grades mathematics teachers maintain their mastery goal orientations while teaching in performance-oriented school environments?

Qualitative results validate the significant relationship between MTSE and beliefs about mathematics (Corkin et al., 2015), as well as teachers having positive attitudes toward teaching (Kartal, 2020). Attitudes toward teaching are also positively related to teaching self-efficacy. Kartal (2020) asserted that preservice mathematics and science teachers' attitudes toward teaching positively correlate with efficacy beliefs for teaching and many specific teaching practices. This study's qualitative findings supported this assertion. MGMTs made statements that demonstrated they loved teaching and teaching mathematics. All the interview participants expressed some form of positive attitude towards teaching and/or mathematics.

Qualitative analysis of the five interviews with MGMTs who demonstrated mastery goal orientation but perceived a performance goal school structure also yielded meaningful findings. Four themes emerged from utilizing values coding to examine the interviews. They were: MGMTs valued their students' effort and hard work, their students' autonomy and personal responsibility, their relationships with their students and their communities and their students' self-confidence, and positive dispositions towards math. Structural coding uncovered meaningful insights into MGMTs' practices. Four themes typified MGMTs'classroom behaviors when related to their environment and personal factors, such as teaching self-efficacy and goal orientation. These themes were reframing mistakes as learning opportunities, pushing students to be more autonomous and self-regulated, communicating their high valuation of students' effort through their interactions with students and encouraging students to grow and value their learning. The following section is partitioned to discuss the data aligned to Research Question 3. Specifically, mathematics teaching self-efficacy, teacher-student interactions, and mastery-oriented practices are each discussed in turn. The chapter will conclude by revisiting the conceptual framework presented earlier in Chapter 2.

Mathematics Teaching Self-Efficacy. The findings in this study supported previous research such as Cao et al. (2018), who stated that student-centered teaching was a characteristic of teachers with strong mathematics teaching self-efficacy. According to previous research (Noormohammodi, 2014), teaching self-efficacy also has positive associations with feelings of autonomy and reflective practices. This study aligns with current findings that MGMTs actively use their autonomy to change their teaching practices in the face to state directives.

Teacher-Student Interactions. This study identified two of the types of teacher-student interactions (TSI) defined by previous research. Allen et al. (2013) described emotional support and instructional support as domains in TSI. Results from this study provided rich descriptions of these types of interactions. For example, *the themes from this study of offering sympathy, changing students' dispositions, autonomy for students, and building relationships with their students* are instances that characterized opportunities for teachers provide emotional support by creating connections and prioritizing students' emotional as well as social needs (Allen et al., 2013). Furthermore, the themes *use of verbal feedback* and *use of formative feedback* could be argued to demonstrate types of instructional support, which relate to keeping students engaged and analyzing their cognitive thinking (Allen et al., 2013). Three out of five MGMTs stated that they actively sought students' feedback through practices as simple as polling, active questioning as a form of review, and encouraging students to create their own math problems. These same teachers all had several years of teaching experience. These findings align with Ewing's (2016) position, which stated that differences in teachers' level of experience influenced how well teachers crafted probing questions and challenged students' shallow learning strategies.

Mastery-Oriented Practices. This study provided several illustrations of mastery-oriented practices being utilized in MGMTs' classrooms. Kaplan et al. (2002) argued that mastery goal-oriented teachers would manifest certain practices such as seeing a mistake as a learning opportunity, expecting students to be active learners, and emphasizing understanding why something is correct. Four themes related to practice were uncovered through the conversations

with MGMTs and showcased mastery-oriented practices. First, their communications with students highlighted their high valuation of students' hard work and effort (Ames & Archer, 1988). Their use of one-on-one and classroom-wide discussions as a formative assessment of student learning also provided evidence of their mastery-oriented communication style. Second, their encouragement of students to become more reflexive, autonomous, and self-regulated supported previous research, which suggested that the creation of short-term goals for their school year also showed their mastery orientation toward teaching (Ames, 1992; Filippello et al., 2018). Additionally, their emphasis on growth was reflected in the classroom goals adopted by the MGMTs (Ames, 1992; Skaalvik & Skaalvik, 2017). Third, four out of the five MGMTs expressed a similar growth mindset as Willingham (2017) found in their case study of a mastery-oriented teacher. The next section reexamines this study's conceptual framework.

Integration by Revisiting the Conceptual Framework

Several interview quotes aligned with the independent variables chosen for the regression models. Some quotes underline the orthogonal nature of goal orientation since it is possible to have both orientations simultaneously. This supports previous research, which stated that not only can a person have both orientations but also that person's environment can exhibit more than one goal structure (Ames, 1992; Kunst et al., 2018; Nasser-Abu & Amasha, 2012; Pintrich, 2000). The researcher intended to study special cases where MGMTs were resisting neoliberal policies centered around accountability measures. These MGMTs provided as Apple (2017) described "…examples of lasting interruptive strategies…" (p. 151). The interviewees were what Patton (2015) described as examples of a *positive deviance case study,* which exemplified a person that had "solved a problem where the norm in the area is for the problem to remain unsolved" (p. 279-280). This study used the intersection of social cognitive theory and achievement goal theory to define the *negative space* in positive deviant MGMTs whose mastery goal orientation didn't fit their perceptions of their school's goal structure (See Figure 1). These teachers "solved the problem" of conflict between their personal classroom goals and the goals of their state

curriculum. These special cases created their classroom goals and practices in this *negative space*. However, interestingly, the tension between the mastery-goal oriented teachers and their school goal structures was not found in the themes from the qualitative data. One reason for this may be the findings of this study suggest that agency, a person's ability to affect and to control their environment (Bandura, 2001), afforded these unique individuals the ability to navigate this negative space by depending on their strong sense of personal mathematics teaching efficacy and mastery-oriented approach to their teaching. Time and time again, the interviewees referred to their students' needs and academic success as the primary guides to their decisions. Their practices and values surrounding assessment, professional development, and classroom goals seem to stay focused on their students. Butler and Shibaz (2014) asserted that relational goals are a distinct factor of achievement goals. This study offered qualitative results which seemed to support the centering of teacher-student relationships, mastery-oriented teaching and effective teacher feedback to equip students with goal orientations that allow them to be successful. Further research is necessary to uncover more characteristics of these types of educators who according to Kunst et al., (2018) might have either a mastery or a combined approach to teaching which might have allowed these MGMTs to create learning environments that helped maintain students' interest and students' "stable mastery- or success-oriented profile" (Tuominen et al., 2020, p. 13) throughout the transitional middle grade years. Despite previous research that stated that middle grades instruction traditionally shifts to a more performance-based approach (Midgley et al., 1995; Wigfield et al., 1991), the interviewees were mastery-oriented despite perceiving their schools as performance-based. These middle-grade mathematics teachers used their autonomy to create spaces in their classrooms to value and uplift student growth while resisting neoliberal policies centered around accountability measures.

Implications

This study highlights the importance of investigating teaching self-efficacy, personal goal orientation, and educators' perceptions of their experiences as they relate to current concerns and

needs in their communities through the lens of mathematics research. Teaching self-efficacy remains a strong predictor of MGMT's teaching practices. Another implication is that teaching experience may not always predict a teacher's goal orientation. Schools must be more deliberate in the messages they send to teachers and students. Several recommendations can be offered considering these implications. Schools could implement organizational supports for in-service teachers which redefine school goals structures to support mastery-oriented teaching practices such as:

1. Longer class periods to give teachers and students time to develop closer relationships.
2. Blocks of time devoted to clubs or activities where students' and teachers' relationships are centered around common interests and not just mathematics.
3. Celebrations and recognition that are focused on growth.

Schools could also help in-service teachers (especially novice teachers) through targeted professional development to foster core values and characteristics best suited for mastery-oriented teaching, such as:

1. Teach educators to reflect on their goals for their classes and how those goals are communicated to their students.
2. Show teachers how to reflect on their perceptions of their school environment and the impact these environments have on their approach to teaching.
3. Encourage teachers to use their autonomy in their classrooms to implement best practices, especially during critical novice years.

All these supports could help middle-grade mathematics teachers maintain best practices and stay mastery-oriented over the span of their professional careers, particularly if schools try to provide this support during new teachers' critical novice years.

Limitations

Although this study provided several insights into MGMTs' personal goal orientations, their perceptions of their school goal structures and their mathematics teaching self-efficacy, this study did have limitations. First, the participants were predominantly Caucasian and female. Even though this is representative of the present teaching population, more representation from male and/or teachers of color could have depicted more "positive deviant cases" (Patton, 2015). Future studies should strive to recruit more participants from these underrepresented segments of educators. Second, interviewees were from a small, targeted sample, which was a direct result of needing to find participants whose goal orientation didn't align with their schools' goal structure. Future studies could recruit more middle-grade mathematics teachers from surrounding states to increase the pool of potential interviewees. Last, MGMTs were not explicitly probed about the tension between their orientation and their school goal structure. Future studies could pursue more qualitative data by asking these questions in more depth.

Conclusion

Middle-grade mathematics teachers today can make a choice to be mastery-oriented in their approach to their teaching. The MGMTs who discover ways to exert their *agentic power* can continue to offer effective pedagogical methods. Findings from this study indicate that personal mathematics teaching efficacy is a strong predictor of the mastery approach teaching. It is critical in today's school environments that MGMTs receive encouragement and training that improves their PMTE so these teachers will believe they can implement research-based best practices. Some mastery-oriented teachers have found ways to express their values even when these values are not supported by their schools. These teachers found ways to center their classroom goals around students' developmental and emotional needs. Some of these MGMTs have built relationships with their students despite the pull to quickly cover every topic on the state assessments and let these relationships fall by the wayside. MGMTs communicated their goals through verbal feedback and everyday interactions with their students. As a result, these

MGMTs have expressed *the acts of creative subordination* described by Barajas-Lopez and Larnell (2019). These acts show how MGMTs navigate the water of a performance-based school environment without straying from their mastery-oriented approach to teaching.

REFERENCES

Allen, J., Gregory, A., Mikami, A., Lun, J., Hamre, B., & Pianta, R. (2013). Observations of effective teacher–student interactions in secondary school classrooms: Predicting student achievement with the classroom assessment scoring system—secondary. *School Psychology Review, 42*(1), 76-98. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5602545/

Ames, C. (1992). Classrooms: Goals, structures, and student motivation. *Journal of Educational Psychology, 84*(3), 261. https://doi.org/10.1037/0022-0663.84.3.261

Ames, C., & Archer, J. (1988). Achievement goals in the classroom: Students' learning strategies and motivation processes. *Journal of Educational Psychology, 80*(3), 260. https://doi.org/10.1037//0022-0663.80.3.260

Anderman, E. M., Anderman, L. H., Yough, M. S., & Gimbert, B. G. (2010). Value-added models of assessment: Implications for motivation and accountability. *Educational Psychologist, 45*(2), 123-137. https://doi.org.10.1080/00461521003703045

Apple, M. W. (2017). What is present and absent in critical analyses of neoliberalism in education. *Peabody Journal of Education, 92*(1), 148-153. https://doi.org/10.1080/0161956X.2016.1265344

Armor, D., Conroy-Oseguera, P., Cox, M., King, N., McDonnell, L., Pascal, A., Pauly, E., & Zellman, G. (1976). *Analysis of the school preferred reading programs in selected Los Angeles minority schools, REPORT NO. R-2007- LAUSD.* Santa Monica, CA: Rand

.

Corporation (ERIC Document Reproduction Service No. 130 243) https://files.eric.ed.gov/fulltext/ED130243.pdf

Ashton, P. T. (1985). Motivation and teachers' sense of efficacy. In C. Ames & R. Ames (Eds.), *Research on motivation in education: Vol. 2. The classroom milieu* (pp. 141-174). Orlando, FL: Academic Press.

Avalos, M. A., Perez, X., & Thorrington, V. (2020). Comparing secondary English teachers' ideal and actual writing practices for diverse learners: Constrained professionalism in figured worlds of high-stakes testing. *Reading & Writing Quarterly, 36*(3), 225-242. https://doi.org/10.1080/10573569.2019.1635056

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review, 84*(2), 191. https://doi.org/10.1037/0033-295X.84.2.191

Bandura, A. (1982). Self-efficacy mechanism in human agency. *American Psychologist, 37*(2), 122 - 147. https://psycnet.apa.org/doi/10.1037/0003-066X.37.2.122

Bandura, A. (1989). Human agency in social cognitive theory. *American Psychologist, 44*(9), 1175 – 1184. https://doi.org/10.1037/0003-066X.44.9.1175

Bandura, A. (2001). Social cognitive theory: An agentive perspective. *Annual Review of Psychology, 52*, 1–26. https://doi.org/10.1146/annurev.psych.52.1.1

Bandura, A. (2012). On the functional properties of perceived self-efficacy revisited. *Journal of Management, 38*(1), 9-44. https://doi.org/10.1177/0149206311410606

Bandura, A., & Locke, E. A. (2003). Negative self-efficacy and goal effects revisited. *Journal of Applied Psychology, 88*(1), 87. https://doi.org/10.1037/0021-9010.88.1.87

Bandura, A., & Schunk, D. H. (1981). Cultivating competence, self-efficacy, and intrinsic interest through proximal self-motivation. *Journal of Personality and Social Psychology, 41*(3), 586. https://doi.org/10.1037/0022-3514.41.3.586

Barajas-López, F., & Larnell, G. V. (2019). Unpacking the links between equitable teaching practices and standards for mathematical practice: Equity for whom and under what

conditions? *Journal for Research in Mathematics Education, 50*(4), 349-361. https://doi.org/10.5951/jresematheduc.50.4.0349

Berger, R. (2015). Now I see it, now I don't: Researcher's position and reflexivity in qualitative research. *Qualitative Research, 15*(2), 219-234. https://doi.org/10.1177/1468794112468475

Berkant, G. H., Baysal, S. (2018). An analysis of the changes in pre-service teachers' perceptions towards teacher self-efficacy and academic self- efficacy and their relations with several variables. *International Online Journal of Educational Sciences, 10*(4), 164-182. https://doi.org/10.15345/iojes.2018.04.009

Betz, N. E., & Hackett, G. (1986). Applications of self-efficacy theory to understanding career choice behavior. *Journal of Social and Clinical Psychology, 4*(3), 279-289. https://doi.org/10.1521/jscp.1986.4.3.279

Björklund, C., Magnusson, M., & Palmér, H. (2018). Teachers' involvement in children's mathematizing–beyond dichotomization between play and teaching. *European Early Childhood Education Research Journal, 26*(4), 469-480. https://doi.org/10.1080/1350293X.2018.1487162

Bloomberg, L. D., & Volpe, M. (2019). *Completing your qualitative dissertation: A road map from beginning to end.* Sage Publications Inc.

Bourgeois, S. J., & Boberg, J. E. (2016). High-achieving, cognitively disengaged middle level mathematics students: A self-determination theory perspective. *RMLE Online, 39*(9), 1-18. https://doi.org/10.1080/19404476.2016.1236230

Briley, J. S. (2012). The relationships among mathematics teaching efficacy, mathematics self-efficacy, and mathematical beliefs for elementary pre-service teachers. *Issues in the Undergraduate Mathematics Preparation of School Teachers, 5*, 1–13.

Brinkmann, J. L. (2019). Making a difference: Increasing elementary pre-service teachers' self-efficacy in mathematics. *Educational Planning, 26*(1), 7-21. https://doi.org/10.1080/10476210.2018.1466875

Buchholtz, N. (2019). Planning and Conducting Mixed Methods Studies in Mathematics Educational Research. In: Kaiser, G., Presmeg, N. (eds) *Compendium for Early Career Researchers in Mathematics Education*. ICME-13 Monographs. Springer, Cham. https://doi.org/10.1007/978-3-030-15636-7_6

Buss, R. R. (2010). Efficacy for teaching elementary science and mathematics compared to other content. *School Science and Mathematics, 110*(6), 290-297. https://doi.org/10.1111/j.1949-8594.2010.00037.x

Butler, R. (2007). Teachers' achievement goal orientations and associations with teachers' help seeking: Examination of a novel approach to teacher motivation. *Journal of Educational Psychology, 99*(2), 241. https://doi.org/10.1016/j.ijer.2013.09.006

Butler, R. & Shibaz, L. (2014). Striving to connect and striving to learn: Influences of relational and mastery goals for teaching on teacher behaviors and student interest and help seeking. International *Journal of Educational Research*, 65, 41–53. https://doi.org/10.1016/j.ijer.2013.09.006

Cao, Y., Postareff, L., Lindblom, S., & Toom, A. (2018). Teacher educators' approaches to teaching and the nexus with self-efficacy and burnout: examples from two teachers' universities in China. *Journal of Education for Teaching, 44*(4), 479-495. https://doi.org/10.1080/02607476.2018.1450954

Cetinkaya, B., & Erbas, A. K. (2011). Psychometric properties of the Turkish adaptation of the Mathematics Teacher Efficacy Belief Instrument for in-service teachers. *The Spanish Journal of Psychology*, *14*(2), 956-966. doi:10.5209/revSJOP.2011.v14.n2.41

Chang, Y. L. (2015). Examining relationships among elementary mathematics teacher efficacy and their students' mathematics self-efficacy and achievement. *Eurasia Journal of*

Mathematics, Science and Technology Education, 11(6), 1307-1320. https://doi.org/10.12973/eurasia.2015.1387a

Charalambous, C. Y., Philippou, G. N., & Kyriakides, L. (2008). Tracing the development of preservice teachers' efficacy beliefs in teaching mathematics during fieldwork. *Educational Studies in Mathematics, 67*(2), 125-142. https://doi.org/10.1007/s10649-007-9084-2

Cheema, J. R., & Kitsantas, A. (2014). Influences of disciplinary classroom climate on high school student self-efficacy and mathematics achievement: A look at gender and racial–ethnic differences. *International Journal of Science and Mathematics Education, 12*(5), 1261-1279. https://doi-org.argo.library.okstate.edu/10.1007/s10763-013-9454-4

Chesnut, S. R., & Burley, H. (2015). Self-efficacy as a predictor of commitment to the teaching profession: A meta-analysis. *Educational Research Review, 15*, 1-16. http://dx.doi.org/10.1016/j.edurev.2015.02.0011

Clark, V. L. P. (2019). Meaningful integration within mixed methods studies: Identifying why, what, when, and how. *Contemporary Educational Psychology, 57*, 106-111. https://doi.org/10.1016/j.cedpsych.2019.01.007

Clark, V. L. P., & Ivankova, N. V. (2015). *Mixed methods research: A guide to the field* (Vol. 3). Sage publications.

Cleary, T. J., & Kitsantas, A. (2017). Motivation and self-regulated learning influences on middle school mathematics achievement. *School Psychology Review, 46*(1), 88-107. https://doi.org/10.17105/SPR46-1.88-107

Corkin, D. M., Ekmekci, A., & Papakonstantinou, A. (2015). Antecedents of teachers' educational beliefs about mathematics and mathematical knowledge for teaching among in-service teachers in high poverty urban schools. *Australian Journal of Teacher Education, 40*(9), 3. https://doi.org/10.14221/ajte.2015v40n9.3

Cohen, J. (1988). Set correlation and contingency tables. *Applied Psychological Measurement*, *12*(4), 425-434. doi:10.1177/014662168801200410

Creswell, J. W., & Creswell, J. D. (2017). *Research design: Qualitative, quantitative, and mixed methods approaches.* Los Angeles: Sage Publications, Inc.

Creswell, J. W., Plano Clark, V. L., & Garrett, A. L. (2008). Methodological issues in conducting mixed methods research designs. In M. M. Bergman (Eds.), *Advances in mixed methods research* (pp. 66-83). Sage Publications, Inc.

Crotty, M. (2015). *The foundations of social research: Meaning and perspective in the research process* (2nd ed.). SAGE Publications, Inc.

Cury, F., Elliot, A. J., Da Fonseca, D., & Moller, A. C. (2006). The social-cognitive model of achievement motivation and the 2× 2 achievement goal framework. *Journal of Personality and Social Psychology, 90*(4), 666. https://doi.org/10.1037/0022-3514.90.4.666

Dellinger, A. (2002). *Where the rubber meets the road: Linking theory, measurement and methodology in research on teacher efficacy and teachers' self-efficacy beliefs*. Paper presented at the meeting of the Southwest Educational Research Association, Austin, TX.

Deemer, S. (2004). Classroom goal orientation in high school classrooms: Revealing links between teacher beliefs and classroom environment. *Educational Research, 46*(1), 73–90. https://doi.org/10.1080/0013188042000178836

Dweck, C. S., & Leggett, E. L. (1988). A social-cognitive approach to motivation and personality. *Psychological Review, 95*(2), 256–273. https://doi-org.argo.library.okstate.edu/10.1037/0033-295X.95.2.256

Elliot, A. J., & McGregor, H. A. (2001). A 2× 2 achievement goal framework. *Journal of Personality and Social Psychology, 80*(3), 501- 519. https://doi.org/10.1037//0022-3514.80.3.501

Enochs, L. G., & Riggs, I. M. (1990). Further development of an elementary science teaching efficacy belief instrument: A preservice elementary scale. *School Science and Mathematics, 90*(8), 694-706. https://doi.org/10.1111/j.1949- 8594.1990.tb12048.x

Enochs, L. G., Smith, P. L., & Huinker, D. (2000). Establishing factorial validity of the mathematics teaching efficacy beliefs instrument. *School Science and mathematics*, *100*(4), 194-202. https://doi.org/10.1111/j.1949-8594.2000.tb17256.x

Every Child Succeeds Act (ESSA) of 2015, Public Law No. 114-95, S.1177, 114th Cong. (2015).

Ewing, B. (2016). The identification of teaching interactions used in one-to-one teaching of number in the early years of schooling. *Cogent Education, 3*(1), 1132525. https://doi.org/10.1080/2331186X.2015.1132525

Fadlelmula, F. K., Cakiroglu, E., & Sungur, S. (2015). Developing a structural model on the relationship among motivational beliefs, self-regulated learning strategies, and achievement in mathematics. *International Journal of Science and Mathematics Education, 13*(6), 1355-1375. https://doi.org/10.1007/s10763-013- 9499-4 n

Federici, R. A., Skaalvik, E. M., & Tangen, T. N. (2015). Students' perceptions of the goal structure in mathematics classrooms: relations with goal orientations, mathematics anxiety, and help-seeking behavior. *International Education Studies, 8*(3), 146-158. https://doi.org/10.5539/ies.v8n3p146

Field, A. (2018). Discovering statistics using SPSS. 5th ed. Sage

Filippello, P., Buzzai, C., Costa, S., Orecchio, S., & Sorrenti, L. (2020). Teaching style and academic achievement: the mediating role of learned helplessness and mastery orientation. *Psychology in the Schools*, 1-12. https://doi.org/1002/pits.22315

Filippello, P., Harrington, N., Costa, S., Buzzai, C., & Sorrenti, L. (2018). Perceived parental psychological control and school learned helplessness: The role of frustration intolerance

as a mediator factor. *School Psychology International, 39*(4), 360-377. https://doi.org/10.1177/0143034318775140

Gatbonton, E. (2008). Looking beyond teachers' classroom behavior: Novice and experienced ESL teachers' pedagogical knowledge. *Language Teaching Research, 12*(2), 161-182. https://doi.org/10.1177/1362168807086286

Gamlem, S. M. (2019). Mapping teaching through interactions and pupils' learning in mathematics. *SAGE Open, 9*(3). https://doi.org/10.1177/2158244019861485

Gee, J. P. (2000). Chapter 3: Identity as an analytic lens for research in education. *Review of Research in Education, 25*(1), 99-125. https://doi.org/:10.3102/0091732X025001099

Giles, R. M., Byrd, K. O., & Bendolph, A. (2016). An investigation of elementary preservice teachers' self-efficacy for teaching mathematics. *Cogent Education, 3*(1), 1-11. https://doi.org/10.1080/2331186X.2016.1160523

Gonzalez, A., Peters, M. L., Orange, A., & Grigsby, B. (2017). The influence of high-stakes testing on teacher self-efficacy and job-related stress. *Cambridge Journal of Education, 47*(4), 513-531. https://doi.org/10.1080/0305764X.2016.1214237

Gresham, G., & Burleigh, C. (2019). Exploring early childhood preservice teachers' mathematics anxiety and mathematics efficacy beliefs. *Teaching Education, 30*(2), 217-241. https://doi.org/10.1080/10476210.2018.1466875

Gutman, L. M. (2006). How student and parent goal orientations and classroom goal structures influence the math achievement of African Americans during the high school transition. *Contemporary Educational Psychology, 31*(1), 44-63. https://doi.org/10.1016/j.cedpsych.2005.01.004

Hackett, G., & Betz, N. E. (1989). An exploration of the mathematics self-efficacy/mathematics performance correspondence. *Journal for Research of Teachers of Mathematics, 20*(3), 261-273. https://www.jstor.org/stable/749515

Hair, J. F., Anderson, R. E., Tatham, R. L., & Black, W. C. (1998*). Multivariate data analysis with readings.* Prentice Hall.

Hall, J. M., & Ponton, M. K. (2005). Mathematics self-efficacy of college freshman. *Journal of Developmental Education, 28*(3), 26.

Huang, X., Liu, M., & Shiomi, K. (2007). An analysis of the relationships between teacher efficacy, teacher self-esteem and orientations to seeking help. *Social Behavior and Personality: An International Journal, 35*(5), 707-716. https://doi.org/10.2224/sbp.2007.35.5.707

Hunt-Ruiz, H., & Watson, S. B. (2015). The effect of early fieldwork on mathematics efficacy beliefs for pre-service teachers. *Southeastern Regional Association of Teacher Educators Journal, 24*(2), 59-66. https://files.eric.ed.gov/fulltext/EJ1083124.pdf

Jones, B. (2007). The Unintended Outcomes of High-Stakes Testing. *Journal of Applied School Psychology., 23*(2), 65. https://doi.org/10.1300/J370v23n02_05

Kaplan, A., Middleton, M. J., Urdan, T., & Midgley, C. (2002). Achievement goals and goal structures. In C. Midgley (Eds.), *Goals, goal structures, and patterns of adaptive learning* (pp. 21-53). Routledge.

Kartal, B. (2020). Pre-service Science and Mathematics Teachers' Teaching Efficacy Beliefs and Attitudes toward Teaching: A Partial Correlation Research. *Australian Journal of Teacher Education, 45*(9), 42-61. https://doi.org/10.14221/ajte.2020v45n9.3

Kelley, K., & Bolin, J. H. (2013). Multiple regression. In *Handbook of quantitative methods for educational research* (pp. 69-101). Brill.

Knekta, E., Runyon, C., & Eddy, S. (2019). One size doesn't fit all: Using factor analysis to gather validity evidence when using surveys in your research. *CBE—Life Sciences Education, 18*(1), rm1. https://doi.org/10.1187/cbe.18-04-0064

Kunst, E. M., van Woerkom, M., van Kollenburg, G. H., & Poell, R. F. (2018). Stability and change in teachers' goal orientation profiles over time: Managerial coaching behavior as a

predictor of profile change. *Journal of Vocational Behavior, 104*, 115-127. https://doi.org/10.1007/s12186-017-9182-y

Larsen, J. (2015). Adult Students' Experiences of a Flipped Mathematics Classroom. *Adults Learning Mathematics, 10*(1), 50-67.

Lauermann, F., & Butler, R. (2021). The elusive links between teachers' teaching-related emotions, motivations, and self-regulation and students' educational outcomes. *Educational Psychologist, 56*(4), 243–249. https://doi.org/10.1080/00461520.2021.1991800

Lee, C. S., Hayes, K. N., Seitz, J., DiStefano, R., & O'Connor, D. (2016). Understanding motivational structures that differentially predict engagement and achievement in middle school science. *International Journal of Science Education, 38*(2), 192-215. https://doi.org/10.1080/09500693.2015.1136452

Linder, S. M., Smart, J. B., & Cribbs, J. (2015). A multi-method investigation of mathematics motivation for elementary age students. *School Science and Mathematics, 115*(8), 392-403. https://doi.org/10.1111/ssm.12146

Lohr, S. L. (2010). *Sampling: design and analysis*. Brooks/Cole.

Love, A. M., Toland, M. D., Usher, E. L., Campbell, J. M., & Spriggs, A. D. (2019). Can I teach students with Autism Spectrum Disorder?: Investigating teacher self-efficacy with an emerging population of students. *Research in Developmental Disabilities, 89*, 41-50. https://doi.org/10.1016/j.ridd.2019.02.005

Maehr, M. L., & Midgley, C. (1991). Enhancing student motivation: A schoolwide approach. *Educational Psychologist, 26*(3-4), 399-427. https://doi.org/10.1080/00461520.1991.9653140

Malinen, O. P., Savolainen, H., Engelbrecht, P., Xu, J., Nel, M., Nel, N., & Tlale, D. (2013). Exploring teacher self-efficacy for inclusive practices in three diverse countries. *Teaching and Teacher Education, 33*, 34-44. https://doi.org/10.1016/j.tate.2013.02.004

Margolis, H., & McCabe, P. P. (2006). Improving self-efficacy and motivation: What to do, what to say. *Intervention in School and Clinic, 41*(4), 218-227. https://doi.org/10.1177/10534512060410040401

Martin, D. P., & Rimm-Kaufman, S. E. (2015). Do student self-efficacy and teacher-student interaction quality contribute to emotional and social engagement in fifth grade math? *Journal of School Psychology, 53*(5), 359-373. https://doi.org/10.1016/j.jsp.2015.07.001

Matteson, S. M., Swarthout, M. B., & Zientek, L. R. (2011). Student motivation: Perspectives from mathematics teachers. *Action in Teacher Education, 33*(3), 283-297. https://doi.org/10.1080/01626620.2011.592123

McCoy, D. L., Luedke, C. L., & Winkle-Wagner, R. (2017). Encouraged or weeded out: Perspectives of students of color in the STEM disciplines on faculty interactions. Journal of College Student Development, 58(5), 657-673. https://doi.org/10.1353/csd.2017.0052

McGee, J. R., & Wang, C. (2014). Validity-supporting evidence of the self-efficacy for teaching mathematics instrument. *Journal of Psychoeducational Assessment, 32*(5), 390-403. https://doi.org/10.1177/0734282913516280

Midgley, C., Anderman, E., & Hicks, L. (1995). Differences between elementary and middle school teachers and students: A goal theory approach. *Journal of Early Adolescence, 15*, 90-113. https://doi.org/10.1177/0272431695015001006

Midgley, C., Maehr, M. L., Hruda, L. Z., Anderman, E., Anderman, L., Freeman, K. E., & Urdan, T. (2000). *Manual for the patterns of adaptive learning scales*. University of Michigan.

Morris, D. B., Usher, E. L., & Chen, J. A. (2017). Reconceptualizing the sources of teaching self-efficacy: A critical review of emerging literature. *Educational Psychology Review, 29*(4), 795-833. https://doi.org/10.1007/s10648-016-9378-y

Moseley, C., & Utley, J. (2006). The effect of an integrated science and mathematics content-based course on science and mathematics teaching efficacy of preservice elementary

teachers. *Journal of Elementary Science Education, 18*(2), 1-12. https://doi.org/10.1007/BF03174684

Muenks, K., Yang, J. S., & Wigfield, A. (2018). Associations between grit, motivation, and achievement in high school students. *Motivation Science, 4*(2), 158. https://doi.org/10.1037/mot0000076

Musoleno, R.R. and White, G.P., 2010. Influences of high-stakes testing on middle school mission and practice. *RMLE Online, 34*(3), pp.1-10. https://doi.org/10.1080/19404476.2010.11462076

Musil, C. M., Warner, C. B., Yobas, P. K., & Jones, S. L. (2002). A comparison of imputation techniques for handling missing data. *Western Journal of Nursing Research, 24*(7), 815-829. https://doi.org/10.1177/019394502237390

Nasser-Abu Alhija, F., & Amasha, M. (2012). Modeling achievement in mathematics: The role of learner and learning environment characteristics. *Educational Research and Evaluation, 18*(1), 5-35. https://doi.org/10.1080/13803611.2011.640862

National Center for Education Statistics. (2022). *Characteristics of Public School Teachers. Condition of Education*. U.S. Department of Education, Institute of Education Sciences. https://nces.ed.gov/programs/coe/indicator/clr.

National Council of Teachers of Mathematics. (2000). *Principles and standards for school mathematics*. Reston, VA: National Council of Teachers of Mathematics.

Nkwake, A. M. (2020). Why Are Assumptions Important?. In *Working with assumptions in international development program evaluation* (pp. 97-114). Springer, Cham.

Ngo, T. H. D., & La Puente, C. A. (2012, April). The steps to follow in a multiple regression analysis. In *SAS Global forum* (Vol. 2012, pp. 1-12).

No Child Left Behind (NCLB) Act of 2001, Pub. L. No. 107-110, § 101, Stat. 1425 (2002).

Noormohammadi, S. (2014). Teacher reflection and its relation to teacher efficacy and autonomy. *Procedia-Social and Behavioral Sciences, 98*, 1380-1389. https://doi.org/10.1016/j.sbspro.2014.03.556

Ocak, G., & Yamac, A. (2013). Examination of the relationships between fifth graders' self-regulated learning strategies, motivational beliefs, attitudes, and achievement. *Educational Sciences: Theory and Practice, 13*(1), 380-387. https://files.eric.ed.gov/fulltext/EJ1016657.pdf

Oliver, D. G., Serovich, J. M., & Mason, T. L. (2005). Constraints and opportunities with interview transcription: Towards reflection in qualitative research. *Social Forces, 84*(2), 1273-1289. https://doi.org/10.1353/sof.2006.0023

Parker, P. D., Marsh, H. W., Ciarrochi, J., Marshall, S., & Abduljabbar, A. S. (2014). Juxtaposing math self-efficacy and self-concept as predictors of long-term achievement outcomes. *Educational Psychology, 34*(1), 29-48. https://doi.org/10.1080/01443410.2013.797339

Patrick, H., Anderman, L. H., Ryan, A. M., Edelin, K. C., & Midgley, C. (2001). Teachers' communication of goal orientations in four fifth-grade classrooms. *Elementary School Journal, 102*, 35-58. https://www.jstor.org/stable/1002168

Patton, M. Q. (2015). *Qualitative evaluation and research methods* (4th ed.). SAGE Publications, Inc.

Perera, H. N., & John, J. E. (2020). Teachers' self-efficacy beliefs for teaching math: Relations with teacher and student outcomes. *Contemporary Educational Psychology, 61*, 101842. https://doi.org/10.1016/j.cedpsych.2020.101842

Pianta, R. C., Hamre, B. K., & Allen, J. P. (2012). Teacher-student relationships and engagement: Conceptualizing, measuring, and improving the capacity of classroom interactions. In *Handbook of Research on Student Engagement* (pp. 365-386). Springer, https://doi.org/10.1007/978-1-4614-2018-7_17

Pintrich, P. R. (2000). An achievement goal theory perspective on issues in motivation terminology, theory, and research. *Contemporary Educational Psychology, 25*(1), 92-104. https://doi.org/10.1006/ceps.1999.1017

Plass, J. L., O'Keefe, P. A., Homer, B. D., Case, J., Hayward, E. O., Stein, M., & Perlin, K. (2013). The impact of individual, competitive, and collaborative mathematics game play on learning, performance, and motivation. *Journal of Educational Psychology, 105*(4), 1050. https://doi.org/10.1037/a0032688

Putwain, D. W., & Symes, W. (2011). Teachers' use of fear appeals in the mathematics classroom: Worrying or motivating students? *British Journal of Educational Psychology, 81*(3), 456-474. http://dx.doi.org.argo.library.okstate.edu/10.1348/2044-8279.002005

Raymond, M. R., & Roberts, D. M. (1987). A comparison of methods for treating incomplete data in selection research. *Educational and Psychological Measurement, 47*(1), 13-26. https://doi.org/10.1177/0013164487471002

Reeve, J. (2009). Why teachers adopt a controlling motivating style toward students and how they can become more autonomy supportive. *Educational Psychologist*, *44*(3), 159-175. https://doi.org/10.1080/00461520903028990

Retelsdorf, J., Butler, R., Streblow, L., & Schiefele, U. (2010). Teachers' goal orientations for teaching: Associations with instructional practices, interest in teaching, and burnout. Learning and instruction, 20(1), 30-46. https://doi.org/10.1016/j.learninstruc.2009.01.001

Rice, L., Barth, J. M., Guadagno, R. E., Smith, G. P., & McCallum, D. M. (2013). The role of social support in students' perceived abilities and attitudes toward math and science. *Journal of Youth and Adolescence, 42*(7), 1028-1040. https://doi.org/10.1007/s10964-012-9801-8

Riggs, I. M. (1988). *The development of an elementary teachers' science teaching efficacy belief instrument.* Unpublished doctoral dissertation. Kansas State University, Manhattan, KS.

Riggs, I. M., & Enochs, L. G. (1990). Toward the development of an elementary teachers' science teaching efficacy belief instrument. *Science Education, 74*, 625 -637. https://files.eric.ed.gov/fulltext/ED319601.pdf

Ryan, S. V., Nathaniel, P., Pendergast, L. L., Saeki, E., Segool, N., & Schwing, S. (2017). Leaving the teaching profession: The role of teacher stress and educational accountability policies on turnover intent. *Teaching and Teacher Education, 66*, 1-11. https://doi.org/10.1016/j.tate.2017.03.016

Saldaña, J. (2016). *The coding manual for qualitative researchers*. Sage.

Schafer. J. L. & Graham, J.W. (2002). Missing Data: Our View of the State of the Art. *Psychological Methods,7* (2), 147-177. https://doi.org/10.1037//1082-989X.7.2.147

Schunk, D. H., Meece, J. L., & Pintrich, P. R. (2014). *Motivation in education: Theory, research, and applications* (4th ed.). Pearson Education, Inc.

Schwandt, T., Lincoln, Y., Guba, E., & Mathison, S. (2007). Judging interpretations: But is it rigorous? Trustworthiness and authenticity in naturalistic evaluation. *New Directions for Evaluation, 2007*(114), 11-25. https://doi.org/10.1002/ev.223

Segarra, J., & Julià, C. (2022). Mathematics Teaching Efficacy Belief and Attitude of Pre-Service Teachers and Academic Achievement. *European Journal of Science and Mathematics Education, 10*(1), 1-14. https://doi.org/10.30935/scimath/11381

Sekreter, G., & Doghonadze, N. (2015). Applications of goal theory to teaching mathematics. *Journal of Education in Black Sea Region, 1*(1), 65-73. https://doi.org/10.31578/jebs.v1i1.11

Simon, M. (2011). *Assumptions, limitations and delimitations. Recipes for success (2011 Ed)* (Doctoral dissertation, Dissertation and scholarly research. Seattle, WA, Dissertation Success).

Skaalvik, E. M. (1997). Self-enhancing and self-defeating ego orientation: Relations with task and avoidance orientation, achievement, self-perceptions, and anxiety. *Journal of Educational Psychology, 89*(1), 71. https://doi.org/10.1037/0022-0663.89.1.71

Skaalvik, E. M., Federici, R. A., & Klassen, R. M. (2015). Mathematics achievement and self-efficacy: Relations with motivation for mathematics. *International Journal of Educational Research, 72*, 129-136. https://doi.org/10.1016/j.ijer.2015.06.008

Skaalvik, E. M., & Skaalvik, S. (2017). Still motivated to teach? A study of school context variables, stress and job satisfaction among teachers in senior high school. Social *Psychology of Education, 20*(1), 15-37. https://doi.org/10.1007/s11218-016-9363-9

Smart, J. B. (2014). A mixed methods study of the relationship between student perceptions of teacher-student interactions and motivation in middle level science. *RMLE Online, 38*(4), 1-19. https://doi.org/10.1080/19404476.2014.11462117

Sommet, N., & Elliot, A. J. (2017). Achievement goals, reasons for goal pursuit, and achievement goal complexes as predictors of beneficial outcomes: Is the influence of goals reducible to reasons? *Journal of Educational Psychology, 109*(8), 1141. https://doi.org/ff10.1037/edu0000199f

Sterner, W.R. (2011), What is missing in counseling research? Reporting missing data. *Journal of Counseling & Development, 89*, 56-62. https://doi-org.argo.library.okstate.edu/10.1002/j.1556-6678.2011.tb00060.x

Stevens, T., Aguirre-Munoz, Z., Harris, G., Higgins, R., & Liu, X. (2013). Middle level mathematics teachers' self-efficacy growth through professional development: Differences based on mathematical background. *Australian Journal of Teacher Education, 38*(4), 9. http://dx.doi.org/10.14221/ajte.2013v38n4.3

Strayhorn, T. L. (2015). Factors influencing black males' preparation for college and success in STEM majors: A mixed methods study. *Western Journal of Black Studies, 39*(1), 45.

https://www.questia.com/library/journal/1G1-419267248/factors-influencing-black-males-preparation-for-college

Tabachnick, B. G. & Fidell (2018). *Using multivariate statistics* (6th Ed.), MA: Pearson.

Tabachnick, B. G., Fidell, L. S., & Ullman, J. B. (2007). *Using multivariate statistics* (Vol. 5, pp. 481-498). Boston, MA: Pearson.

Tassell, J. L., Maxwell, M., Stobaugh, R., & Mittelberg, J. (2019). Math and technology leadership academy: Impact on mathematics teacher sense of efficacy. *International Journal of Innovation in Science and Mathematics Education (formerly CAL-laborate International), 27*(3). https://search.proquest.com/docview/2245633130?accountid=3320

Taylor, S. J., Bogdan, R., & DeVault, M. (2015). *Introduction to qualitative research methods: A guidebook and resource*. John Wiley & Sons.

Thomson, M. M., Di Francesca, D., Carrier, S., & Lee, C. (2017). Teaching efficacy: Exploring relationships between mathematics and science self-efficacy beliefs, PCK and domain knowledge among preservice teachers from the United States. *Teacher Development, 21*(1), 1-20. https://doi.org/10.1080/13664530.2016.1204355

Thornberg, R., Forsberg, C., Chiriac, E. H., & Bjereld, Y. (2020). Teacher–student relationship quality and student engagement: A sequential explanatory mixed-methods study. *Research Papers in Education*, 1-20. https://doi.org/10.1080/02671522.2020.1864772

Tschannen-Moran, M., & Hoy, A. W. (2001). Teacher efficacy: Capturing an elusive construct. *Teaching and Teacher Education, 17*(7), 783-805. https://doi.org/10.1016/ S0742-051X(01)00036-1

Tuominen, H., Niemivirta, M., Lonka, K., & Salmela-Aro, K. (2020). Motivation across a transition: Changes in achievement goal orientations and academic well-being from elementary to secondary school. *Learning and Individual Differences, 79*, 101854. https://doi.org/10.1016/j.lindif.2020.101854

Unlu, M., Ertekin, E., & Dilmac, B. (2017). Predicting relationships between mathematics anxiety, mathematics teaching anxiety, self-efficacy beliefs towards mathematics and mathematics teaching. *International Journal of Research in Education and Science, 3*(2), 636-645. https://doi.org/10.21890/ijres.328096

Urdan, T. (2004). Using multiple methods to assess students' perceptions of classroom goal structures. *European Psychologist, 9*(4), 222-231. https://doi.org/10.1027/1016-9040.9.4.222

Urdan, T., & Kaplan, A. (2020). The origins, evolution, and future directions of achievement goal theory. *Contemporary Educational Psychology*, *61*, 101862. doi:10.1016/j.cedpsych.2020.101862

Usher, E. L., Ford, C. J., Li, C. R., & Weidner, B. L. (2019). Sources of math and science self-efficacy in rural Appalachia: A convergent mixed methods study. *Contemporary Educational Psychology, 57*, 32-53. https://doi.org/10.1016/j.cedpsych.2018.10.003

Usher, E. L., & Pajares, F. (2009). Sources of self-efficacy in mathematics: A validation study. *Contemporary Educational Psychology, 34*(1), 89-101. https://doi.org/10.1016/j.cedpsych.2008.09.002

Utley, J., Moseley, C., & Bryant, R. (2005). Relationship between science and mathematics teaching efficacy of preservice elementary teachers. *School Science and Mathematics, 105*(2), 82-87. https://doi.org/10.1111/j.1949-8594.2005.tb18040.x

VanVoorhis, C. W., & Morgan, B. L. (2007). Understanding power and rules of thumb for determining sample sizes. *Tutorials in Quantitative Methods for Psychology, 3*(2), 43-50.

Vedder-Weiss, D., & Fortus, D. (2018). Teachers' mastery goals: Using a self-report survey to study the relations between teaching practices and students' motivation for science learning. *Research in Science Education, 48*(1), 181-206. https://doi.org/10.1007/s11165-016-9565-3

Walshaw, M. (2008). The concept of identity positioning the self within research. *ICME 11 Proceedings*. https://www.mathunion.org/fileadmin/ICMI/files/About_ICMI/Publications_about_ICMI/% 20ICME_11/Walshaw.pdf

Wigfield, A., Eccles, J. S., Mac Iver, D., Reuman, D. A., & Midgley, C. (1991). Transitions during early adolescence: Changes in children's domain-specific self-perceptions and general self-esteem across the transition to junior high school. *Developmental Psychology, 27*(4), 552. https://doi.org/10.1037/0012-1649.27.4.552

Willingham, J. C. (2017). Revealing layered mathematical learning goals through an examination of mindset. *North American Chapter of the International Group for the Psychology of Mathematics Education*. https://files.eric.ed.gov/fulltext/ED581373.pdf

Wills, J. S., & Sandholtz, J. H. (2009). Constrained professionalism: Dilemmas of teaching in the face of test-based accountability. *Teachers College Record, 111*(4), 1065-1114. https://doi.org/10.1177/016146810911100401

Wilson, S. (2014). 'Fail at maths and you fail at life': Learned barriers to equal opportunities-Mathematics anxiety and quality of life. *International Public Health Journal, 6*(2), 147-160. https://search.proquest.com/docview/1625960586?accountid=3320

Wolters, C. A., & Daugherty, S. G. (2007). Goal structures and teachers' sense of efficacy: Their relation and association to teaching experience and academic level. *Journal of Educational Psychology, 99*(1), 181–193. https://doi.org/10.1037/0022-0663.99.1.181

Wolters, C. A., Fan, W., & Daugherty, S. (2010). Teacher-reported goal structures: Assessing factor structure and invariance. *Journal of Experimental Education, 79*(1), 1–29. https://doi.org/10.1080/0022097090329234

Wong, T. K., Tao, X., & Konishi, C. (2018). Teacher support in learning: Instrumental and appraisal support in relation to math achievement. *Issues in Educational Research, 28*(1), 202-219. http://www.iier.org.au/iier28/wong.pdf

Wood, J. L., Newman, C. B., & Harris III, F. (2015). Self-Efficacy as a determinant of academic integration: an examination of first-year black males in the community college. *Western Journal of Black Studies, 39*(1). 3-17. https://search.proquest.com/docview/1688657642?accountid=3320

Wu, P. F. (2011). A mixed methods approach to technology acceptance research. *Journal of the Association for Information Systems, 13*(3). https://doi.org/10.17705/1jais.00287

Yeh, C. (2018). Democratic accountability in the neoliberal era: The politics of teaching and teacher education in mathematics classrooms. *Policy Futures in Education, 16*(6), 764–780. https://doi.org/10.1177/1478210318776470

Yong, A. G., & Pearce, S. (2013). A beginner's guide to factor analysis: Focusing on exploratory factor analysis. *Tutorials in Quantitative Methods for Psychology, 9*(2), 79-94.

Zee, M., & Koomen, H. M. (2016). Teacher self-efficacy and its effects on classroom processes, student academic adjustment, and teacher well-being: A synthesis of 40 years of research. *Review of Educational Research, 86*(4), 981-1015. https://doi.org/10.3102/0034654315626801

APPENDIX A

EXEMPT APPROVAL LETTER

Oklahoma State University Institutional Review Board

Date:	05/25/2021
Application Number:	IRB-21-235
Proposal Title:	Understanding Mastery-Oriented Middle Grades Mathematics Teachers' Resilience in Performance-Oriented School Environments.
Principal Investigator:	Tonya Rhodes
Co-Investigator(s):	
Faculty Adviser:	Jennifer Cribbs
Project Coordinator:	
Research Assistant(s):	
Processed as:	Exempt
Exempt Category:	

Status Recommended by Reviewer(s): Approved

The IRB application referenced above has been approved. It is the judgment of the reviewers that the rights and welfare of individuals who may be asked to participate in this study will be respected, and that the research will be conducted in a manner consistent with the IRB requirements as outlined in 45CFR46.

This study meets criteria in the Revised Common Rule, as well as, one or more of the circumstances for which continuing review is not required. As Principal Investigator of this research, you will be required to submit a status report to the IRB triennially.

The final versions of any recruitment, consent and assent documents bearing the IRB approval stamp are available for download from IRBManager. These are the versions that must be used during the study.

As Principal Investigator, it is your responsibility to do the following:

1. Conduct this study exactly as it has been approved. Any modifications to the research protocol must be approved by the IRB. Protocol modifications requiring approval may include changes to the title, PI, adviser, other research personnel, funding status or sponsor, subject population composition or size, recruitment, inclusion/exclusion criteria, research site, research procedures and consent/assent process or forms.
2. Submit a request for continuation if the study extends beyond the approval period. This continuation must receive IRB review and approval before the research can continue.
3. Report any unanticipated and/or adverse events to the IRB Office promptly.
4. Notify the IRB office when your research project is complete or when you are no longer affiliated with Oklahoma State University.

Please note that approved protocols are subject to monitoring by the IRB and that the IRB office has the authority to inspect research records associated with this protocol at any time. If you have questions about the IRB procedures or need any assistance from the Board, please contact the IRB Office at 405-744-3377 or irb@okstate.edu.

Sincerely,
Oklahoma State University IRB

APPENDIX B

INITIAL RECRUITMENT EMAIL

Dear fellow teachers,

I am a doctoral student and I need your help! During this time of reflection, I am conducting a study on how mathematics teachers stay mastery-oriented despite being in performance-oriented learning environments. I selected you to ask because you are potentially a part of my targeted sample population. Could you spare about 10 minutes to complete an online survey? You will also be asked to participate a 45- 60 minutes follow-up interview if your responses match those of the targeted sample population's.

You are under no obligation to participate in this research, it is your choice whether to be a part of the study or not. You may decide not to be a part of the study, even after you have started the survey. You may stop and leave the study.

There is a benefit to you if you participate. If you complete the study, you will be entered for a raffle drawing for one of three $50 Amazon Prime gift cards. This research may help lift the voices of fellow mathematics teachers and help point the way to important research to be done for mathematics teachers in the future. There are no foreseeable risks or discomforts associated with this study. Follow this link to the survey: (link would be inserted here) If you have problems, you can also copy and paste the following URL into your browser: (complete link would be inserted here)

Feel free to share this email with your fellow middle-grades math teachers! If you have any questions about this research or your participation in the study, you are welcome to contact me at:

Tonya Rhodes

tonya.rhodes@okstate.edu

Doctoral Candidate

Graduate Teaching Assistant

School of Teaching, Learning, and Educational Sciences

245 Willard Hall

918-951-6597 (cell)

405-744-8022 (work)

I will make every effort to answer your questions. Thank you for your time!

Approved: 05/25/2021
Protocol #: IRB-21-235

APPENDIX C

INFORMED CONSENT FORM

University Research Compliance

PARTICIPANT INFORMATION FORM

Understanding Mastery-Oriented Middle Grades Mathematics Teachers' Resilience in Performance-Oriented School Environments

You are invited to be in a research study about the mathematics teaching efficacy, perceived school goal structures and goal orientations of middle grades mathematics teachers conducted by Tonya Rhodes, Doctoral candidate in the School of Teaching, Learning, and Educational Sciences, Oklahoma State University, under the direction of Dr. Jennifer Cribbs, College of Education and Human Sciences, Oklahoma State University. Your participation in this research is voluntary. Your decision whether to participate in this study will not affect your employment or status in your school. There is no penalty for refusal to participate, and you are free to withdraw your consent and participation in this project at any time.

If you agree to be in this study, we would ask you to do the following things: Complete an online survey that will take about 10 minutes. Based on your responses, you may be selected to participate in a 45–60-minute video and/or audio-taped follow-up interview.

Compensation: If you complete the study, your name will be entered in a raffle drawing for one of three $50 Amazon Prime gift cards which will be rewarded once the surveys and interviews have been collected.

Confidentiality: The information you give in the study will be anonymous. This means that your name will not be collected or linked to the data in any way. Your information will be assigned a code number/pseudonym. The interview will have all identifiers to your identity removed. Video/audio interview recordings will be transcribed and destroyed within one year of study's completion.

The researchers will not be able to remove your data from the online dataset once your participation is complete. This data will be stored in a password protected computer indefinitely. The research team will ensure anonymity to the degree permitted by technology. Your participation in this online survey involves risks similar to a person's everyday use of the internet. Additionally, if you are selected for an interview through Zoom your privacy will be safeguarded as well see:https://zoom.us/en-us/trust/privacy.html If you have concerns, you should also consult the survey provider privacy policy at https://www.qualtrics.com/privacy-statement/ .

Contacts and Questions: If you have questions about the research study itself, please contact the Principal Investigator at 918-951-6597 or 405-744-8022, tonya.rhodes@okstate.edu If you have questions about your rights as a research volunteer or would simply like to speak with someone other than the researcher about concerns regarding this study, please contact the Dr. Jennifer Cribbs, the advisor, jennifer.cribbs@okstate.edu. All reports or correspondence will be kept confidential.

If you agree to participate in this research, please click "I Agree" to continue.

Approved: 05/25/2021
Protocol #: IRB-21-235

APPENDIX D

FOLLOW-UP INTERVIEW RECRUITMENT EMAIL

Dear survey participant,

I am following up with you based off your responses to the online survey you completed as a part of my study. I would like to ask you to provide a 45-60 minutes of your time for a video and/or audiotaped interview. I would like to schedule a time that is most convenient for you. We can use Zoom to meet online and to record. Please contact me as soon as you are able. I hope you are doing well. I look forward to hearing from you.

Sincerely

Tonya Rhodes

tonya.rhodes@okstate.edu

Doctoral Candidate

Graduate Teaching Assistant

School of Teaching, Learning, and Educational Sciences

245 Willard Hall

918-951-6597 (cell)

405-744-8022 (work)

Thank you for your time!

Approved: 05/25/2021
Protocol #: IRB-21-235

APPENDIX E

STUDY SURVEY

Date: _____ Survey ID#:_____

Part 1:

1. Do you currently teach mathematics? (select your response)

   a. Yes b. No

2. Do you currently teach middle grades (6th , 7th , 8th)? (select your response)

   c. Yes d. No

Please refer to when you are teaching mathematics in your classroom and indicate the degree to which you agree or disagree with each statement below by circling the appropriate number to the right of the statement.

	1	**2**	**3**	**4**	**5**
	Strongly Disagree	Disagree	Uncertain	Agree	Strongly Agree
3. I give special privileges to students who do the best work.	1	2	3	4	5
4. In this school: The importance of trying hard is really stressed to students.	1	2	3	4	5
5. I make a special effort to recognize students' individual progress, even if they are below grade level.	1	2	3	4	5
6. In this school: Students are told that making mistakes is OK as long as they are learning and improving.	1	2	3	4	5
7. In this school: It's easy to tell which students get the highest grades and which students get the lowest grades.	1	2	3	4	5
8. I display the work of the highest achieving students as an example.	1	2	3	4	5

9. In this school: Students who get good grades are pointed out as an example to others.	1	2	3	4	5
10. During class, I often provide several different activities so that students can choose among them.	1	2	3	4	5
11. In this school: Students hear a lot about the importance of getting high test scores.	1	2	3	4	5
12. I consider how much students have improved when I give them report card grades.	1	2	3	4	5
13. In this school: A lot of the work students do is boring and repetitious.	1	2	3	4	5
14. In this school: Grades and test scores are not talked about a lot.	1	2	3	4	5
15. In this school: Students are frequently told that learning should be fun.	1	2	3	4	5
16. I help students understand how their performance compares to others.	1	2	3	4	5
17. I encourage students to compete with each other.	1	2	3	4	5
18. In this school: The emphasis is on really understanding schoolwork, not just memorizing it.	1	2	3	4	5
19. I point out those students who do well as a model for the other students.	1	2	3	4	5
20. In this school: A real effort is made to recognize students for effort and improvement.	1	2	3	4	5
21. In this school: Students hear a lot about the importance of making the honor roll or being recognized at honor assemblies.	1	2	3	4	5

22. I give a wide range of assignments, matched to students' needs and skill level.	1	2	3	4	5
23. In this school: A real effort is made to show students how the work they do in school is related to their lives outside of school.	1	2	3	4	5
24. In this school: Students are to compete with each other academically.	1	2	3	4	5

PART 2:

Please indicate the degree to which you agree or disagree with each statement below by circling the appropriate number to the right of the statement.

1	**2**	**3**	**4**	**5**
Strongly Disagree	Disagree	Uncertain	Agree	Strongly Agree

25.	I can continually find better ways to teach mathematics.	1	2	3	4	5
26.	Even if I try very hard, I cannot teach mathematics as well as I will most subjects.	1	2	3	4	5
27.	I teach mathematics concepts effectively.	1	2	3	4	5
28.	I cannot be very effective in monitoring mathematics activities.	1	2	3	4	5
29.	I generally teach mathematics ineffectively.	1	2	3	4	5
30.	I understand mathematics concepts well enough to be effective in teaching middle grades mathematics.	1	2	3	4	5
31.	I find it difficult to use manipulatives to explain to students why mathematics works.	1	2	3	4	5
32.	I am typically able to answer students' questions.	1	2	3	4	5
33.	I wonder if I have the necessary skills to teach mathematics.	1	2	3	4	5
34.	Given a choice, I do not invite the principal to evaluate my mathematics teaching.	1	2	3	4	5

35.	When a student has difficulty understanding a mathematics concept, I am usually at a loss as to how to help the student understand it better.	1	2	3	4	5
36.	When teaching mathematics, I usually welcome student questions.	1	2	3	4	5
37.	I do not know what to do to turn students on to mathematics	1	2	3	4	5

PART 3:

Directions: Please circle the number that matches your response.

None at All	Very Little	Strong Degree	Quite a Bit	A Great Deal
1	2	3	4	5

38.	To what extent can you motivate students who show low interest in mathematics?	1	2	3	4	5
39.	To what extent can you help your students' value learning mathematics?	1	2	3	4	5
40.	To what extent can you craft relevant questions for your students related to mathematics?	1	2	3	4	5
41.	To what extent can you get your students to believe they can do well in mathematics?	1	2	3	4	5
42.	To what extent can you use a variety of assessment strategies in mathematics?	1	2	3	4	5
43.	To what extent can you provide an alternative explanation or example in mathematics when students are confused?	1	2	3	4	5
44.	How well can you implement alternative teaching strategies for mathematics in your classroom?	1	2	3	4	5

Part 4: Demographic information

45. What gender do you identify with? (select all that apply)

a. Male b. Female c. Nonbinary

d. Transgender e. Other

46. Are you of Hispanic origin? (select your response)

a. Yes b. No

47. What is your race? (select all that apply)

a. White b. Black/African American c. Asian d. Pacific Islander

e. American Indian/Native American f. Other

48. Please provide the name of the school at which you currently teach.
_____

49. Indicate your current age. _____

50. What is your highest level of education? (select your response)

a. Bachelors b. Bachelors plus 15 c. Masters d. Masters plus 15

e. Doctorate

51. What is the total number of years you have been teaching mathematics (including this year)? _____

52. What grade levels do you teach? (select ALL that apply)

a. 1st b. 2nd c. 3rd

d. 4th e. 5th f. 6th

g. 7th h. 8th

53. Areas of Certification listed on your teaching certificate (list all that apply)_____

54. What classes are you teaching currently? (List all please)

_____

55. Current delivery method of teaching for the current school year (select all that apply)

a. Face to Face
b. Distance Learning/Online
c. Blended (Face to Face and distance learning/ online

56. Would you be willing to participate in a follow-up interview if selected? (Select one)

a. Yes b. No

Please provide your most current contact information.

Name:

Preferred Pronoun(s):

Best contact email (one that you check often):

Best contact phone number:

Alternative contact phone number:

You have now completed the survey. Thank you for your time and participation!

APPENDIX F

TENTATIVE SEMI-STRUCTURED INTERVIEW PROTOCOL

Research Question 3:

How do in-service middle school mathematics teachers maintain their mastery goal orientations while teaching in performance-oriented school environments?

1. How did you start in the teaching profession?

2. Describe what you think a teacher's goal in the mathematics classroom.

3. Tell me about your personal goals for your math classroom.

4. Share with me some of the reasons, you chose those goals.

5. Are you deliberate in communicating those goals to your learners?

   If yes, how do you communicate those goals to your learners?

   If no, what do you believe hinders you from communicating?

6. Describe how do you know if your learners are receiving these goals?

7. Describe how do you make sense of the directives concerning mathematics, passed down either by the state or your school concerning your teaching?

8. Describe how you think those directives impact you as a teacher in the mathematics classroom?

9. How do you think these directives impact your learners in the mathematics classroom?

10. Have you ever experienced times of conflict between your personal teaching goals and these directives? Could you describe some of these conflicts for me?

11. Have you experienced challenges in teaching mathematics to your learners?

If yes, then, could you share some of those challenges with me?

If no, then, how would you address mathematics teaching challenges if they arose?

12. Have there been any conversations or interactions with your learners concerning your personal mathematics teaching goals that stand out in your memory?

If yes, then, could you share these memories with me?

If no, then, why do you suppose that is so?

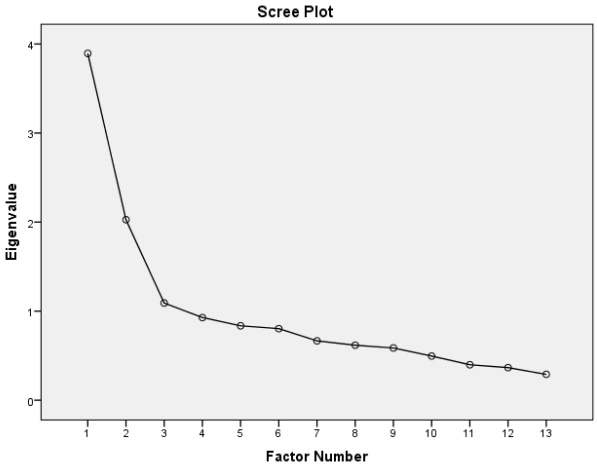
13. Is there anything you would advocate to change to make it easier for you to accomplish your personal mathematics teaching goals?

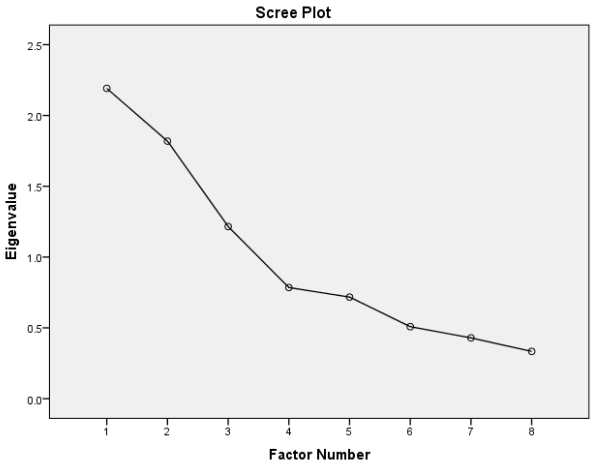
APPENDIX G

EXPLORATORY FACTOR ANALYSIS RESULTS

Figure G.1

Scree Plots for MGS/PGS and MAGO/PAGO





Note: MGS = perception of mastery school goal structure; PGS = perception of performance school structure; MAGO = mastery goal orientation; PAGO = performance goal orientation

Figure G.2

EFA Output MGS/PGS with All Items Included

KMO and Bartlett's Test

KMO		.77
Bartlett's Test	Approx. Chi-Square	266.29
	df	78
	Sig.	.00

Rotated Factor Matrix[a]

	Factor	
	1	2
Q3_7	.64	
Q3_5	.61	
Q3_9	.61	
Q3_19	.61	
Q3_22	.50	
Q3_12R	.49	
Q3_11R	-.46	.41
Q3_4		.73
Q3_18		.73
Q3_16		.64
Q3_2		.47
Q3_13		.44
Q3_21		.43

Figure G.3

EFA Output MAGO/PAGO with All Items included

KMO and Bartlett's Test

KMO		.59
Bartlett's Test	Approx. Chi-Square	133.81
	df	36
	Sig.	.00

Rotated Factor Matrix[a]

	Factor	
	1	2
Q3_8	.87	.00
Q3_20	.67	.19
Q3_3	.47	-.05
Q3_17	.05	.70
Q3_6	-.02	.60
Q3_1	-.15	.46
Q3_14	.16	.38
Q3_15	.19	.35
Q3_10	.00	.26

Figure G.4

EFA Output MAGO/PAGO With Item 10 Removed

KMO and Bartlett's Test

KMO		.59
Bartlett's Test	Approx. Chi-Square	121.92
	df	28
	Sig.	.00

Rotated Factor Matrix[a]

	Factor	
	1	2
Q3_8	.87	.04
Q3_20	.66	.20
Q3_3	.48	-.07
Q3_17	.04	.64
Q3_6	-.04	.63
Q3_15	.17	.42
Q3_1	-.16	.42
Q3_14	.14	.41

Figure G.5

EFA Output PMTE with All Items Included

Factor Matrix[a]

	Factor 1
PMTE_11R	.84
PMTE_5R	.83
PMTE_13R	.66
PMTE_2R	.63
PMTE_12	.63
PMTE_6	.61
PMTE_3	.60
PMTE_4	.51
PMTE_9R	.50
PMTE_8	.48
PMTE_1	.46
PMTE_10R	.45
PMTE_7R	.32

Figure G6

EFA Output PMTE without Item 7

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.83
Bartlett's Test of Sphericity	Approx. Chi-Square	354.90
	Df	66
	Sig.	.00

Factor Matrix[a]

	Factor 1
PMTE_11R	.84
PMTE_5R	.84
PMTE_13R	.65
PMTE_2R	.64
PMTE_6	.63
PMTE_12	.62
PMTE_3	.60
PMTE_9R	.50
PMTE_4	.50
PMTE_8	.49
PMTE_1	.46
PMTE_10R	.44

APPENDIX H

PERMISSION LETTER FOR SELF-EFFICACY FOR TEACHING MATHMATICS INSTRUMENT (SETMI)

College of Education
Department of Curriculum and Instruction
828-262-2270
FAX 828-262-2686

You have my permission to use the Self Efficacy for Teaching Mathematics Instrument in your research. Please reference the validity information and scoring guide when publishing your findings.

Sincerely,

Jennifer R. McGee, Ed.D.
College of Education
Appalachian State University
151 College St.
Boone, NC 28608
Phone: (828) 262-2270
Fax: (828) 262-2686

VITA

Tonya M. Rhodes

Candidate for the Degree of

Doctor of Philosophy

Dissertation: UNDERSTANDING MASTERY-ORIENTED MIDDLE GRADES TEACHERS IN PERFORMANCE-ORIENTED SCHOOL

Major Field: Math Education

Biographical:

Education:

Completed the requirements for the Doctor of Philosophy in Education at Oklahoma State University, Stillwater, Oklahoma in December, 2022.

Completed the requirements for the Master of Science in Teaching, Learning, and Leadership at Oklahoma State University, Stillwater, Oklahoma in 2006.

Completed the requirements for the Bachelor of Arts in Film Studies at Columbia University, New York, New York in 1994.

Experience:

Taught 7 years in public school as an educator, with involvement in general education, math enrichment and special education.

Taught remedial and college credit mathematics courses at the university level for over 10 years. Taught and mentored over 70 preservice elementary education majors at the college level.

Professional Memberships:

Research Council on Mathematics Learning

National Council of Teachers of Mathematics