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Perceptions of Educators on Motivational Strategies Influencing Middle School Students in Mathematics Courses

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by

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ABSTRACT

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This qualitative study examined educators' perceptions of motivational strategies influencing and motivating middle school students to comprehend and perform in mathematics courses. This study used interview data from 15 participants with 2 to 30 years of teaching experience. Educators may utilize this information in multiple settings within the classroom to influence and motivate students in mathematics courses.

Data collection strategies included one-on-one semi-structured middle school educator interviews. Analysis of data occurred in three phases: (a) categorization of data under the five organizational factors, (b) building the explanation in narrative form, and (c) re-examination of the data. The analysis of the phenomenological study data was based on the theoretical framework of the achievement goal theories - the differences in how people judge their perceptions of competence (Nicholls, 1984) and TARGET structures (Task, Authority, Rewards, Grouping, Evaluation, and Time) (Epstein, 1989). The credibility of the analysis was protected by triangulation of data through multiple sources of evidence, establishment of a chain of evidence, and member checking.

The results revealed that current and innovative motivational strategies influenced students in middle school mathematics. The results revealed how educators motivate middle school students through traditional and non-traditional strategies. Five themes emerged from the interview data analysis that contribute to the motivation of middle school students: (1) internal motivation, (2) external motivation, (3) building thinking classrooms, (4) student choice, and (5) building relationships.

DEDICATION

This work is dedicated to my children, Hannah and Eric. Through this work, I hope to inspire you to set high expectations for yourself and always persevere. Life is enjoyable but requires a strong dedication to improving oneself and continually learning and working towards personal goals. Thank you so much for helping me through this journey. I could not have done it without your understanding and support. I love you both very much. This work is for you.

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TABLE OF CONTENTS

Chapter 1. Introduction

The imbalance between needs and traditional environments results in academic motivation and performance that is particularly harmful to middle school students (Eccles et al., 1993). This qualitative study will explore motivational strategies educators can incorporate in the classroom to increase academic achievement of middle school students in mathematics.

Although adolescents' developmental aspects are beyond this study's scope, it is significant to note the many critical changes that occur during this period. Educators may not be able to change a student's environment, but educators can learn new, challenging opportunities for growth in mathematics classes. School leaders must discover strategies to motivate students to learn effectively. Middle school educators encourage average to lower-performing students by incorporating motivational factors in the school and classroom. Plante and Wigfield (2013) stated, "Achievement motivation energizes and directs behavior toward achievement and therefore is an important determinant of academic success" (p. 1). Some students are challenged by motivation and engagement in the classroom.

Educators and leaders need to investigate the amount of testing required of students. Middle school students must take standardized tests often used for placement into high school mathematics courses. Middle school educators often wonder how to persuade students to do well. Educators desire to find the magic potion for their students to be motivated to succeed in the classroom. Educators must first understand the definition of motivation to persuade students of the importance of acquiring a strong education. Singh et al. (2012) defined, "Typically, motivation is the force that accounts for the arousal, selection, direction, and continuation of behavior" (p. 20). According to the Project Management Body of Knowledge (PMBOK) definition, motivation is "Powering people to achieve high levels of performance and

overcoming barriers in order to change" (Tohidi & Jabbari, p. 820). Merriam-Webster (n.d.) defined *motivation* as "the condition of being eager to act or work or be motivated" (p. 1). Stimulus, incentive, inducement, reason, inspiration, rationale, provocation, and catalyst are synonyms for motivation (Thesaurus, 2013).

Statement of Problem

This qualitative phenomenological study examined educator perceptions about motivational factors and strategies influencing middle school students' performance in mathematics classes. The problem explored in this study is the low academic achievement of middle school students in mathematics. Over the past few years, the National Assessment of Educational Progress (NAEP) results have shown a widespread decline in student achievement (Schwartz, 2023). Between 2019 and 2023, scores for 13-year-olds fell 9 points in math, and the average reading scores fell 4 points. Motivated students have better performance, higher self-esteem, and improved psychological well-being than unmotivated students (Wong & Bukalov, 2020). Keeping motivational strategies in mind, educators need to discover multiple ways to enhance confidence to do math and assist students to grow in their performance in mathematics courses, including on standardized tests. Elementary and middle school students must have a solid foundation in mathematics to perform in high school mathematics and future careers successfully.

Statement of Purpose

This phenomenological study examined educator perceptions about motivational factors influencing middle school students' motivation to progress in mathematics classes. The purpose of the study is to improve the recent trend of low academic achievement of middle school students in mathematics (Schwartz, 2023). The present motivational strategies influencing

middle school students in mathematics will be defined as the act or process of giving someone a reason for doing something or motivating someone. The study examined middle school educators' perceptions of successful, innovative motivational strategies that may inform educators leading to the improvement of math achievement.

Significance of Study

An analysis of the educators' perspective on motivational factors and strategies influencing middle school students in mathematics courses is significant for improvement in academic achievement. The information revealed from the study may be significant to the research field and practice regarding motivational strategies influencing student growth scores in Algebra 1 End of Course (EOC) and the Tennessee Comprehensive Assessment Program (TCAP). Educators acquiring knowledge, skills, and understanding could enhance the motivational factors and strategies influencing middle school students' progression in mathematics courses.

Theoretical Framework

This study suggests to educators the significance of implementing classroom strategies through the Achievement goal theories and TARGET (tasks, authority, recognition, group, evaluation, and time) as the foundation for influencing middle school students to improve academic achievement in mathematics courses. The researcher will argue the importance of utilizing the Achievement goal theories and TARGET as a roadmap to student progress in middle school mathematics. Achievement goal theories are the differences in how people judge their perceptions of competence. The achievement goal theories define significant accomplishments as a precursor to understanding students' motivational processes (Duda, 2001). Achievement Goal interventions intend to promote a mastery-oriented classroom structure

(Ames, 1992). Educators applying classroom-level interventions can do so with the principles summarized in TARGET). Ryan and Deci (2017) discovered that educators aspire to make tasks meaningful and present various degrees of challenge without disclosing differences in ability. Students and educators should share authority in deciding classroom rules and making decisions. For recognition, a teacher should privately recognize students' progress, effort, and creativity instead of publicly commenting on a student performing well. In mastery-approach structuring, teachers should group students according to interest or by students' differences that may enable learning instead of a student's ability levels. Teachers should privately evaluate a student's progress rather than class performance. Finally, providing time to complete assignments should be flexible so students can work independently. Ryan and Deci (2017) found alignment with other achievement motivation research highlighting the importance of supporting students' needs for relatedness and connection.

The refinement of the idea and application of TARGET has been argued by researchers to be significant (Epstein, 1989). The change in the acronym will include the idea of social relationships. Miller et al. (2017) stated that teachers demonstrating positive affect, fostering mutual respect, and encouraging students' growth in high mastery-focused classrooms create a positive interpersonal class environment.

Research Questions

The essential research question for this study is: What are educators' perceptions on motivational strategies influencing middle school students in mathematics courses? The following are four supporting questions:

1. What are educators' perceptions about internal motivational strategies that have contributed to middle school students' mathematical development?

2. What are educators' perceptions about external motivational strategies that have contributed to middle school students' mathematical development?

3. Do educators use different degrees of motivational strategies to influence middle school students in mathematics?

4. How does middle school students' motivation affect the learning of mathematical concepts?

Definition of Terms

- Motivation is the process that guides, initiates, and maintains goal-oriented behaviors (Cherry, 2023).
- Intrinsic motivation is actively doing is implicit satisfaction rather than for some separable consequence (Ryan & Deci, 2000).
- Extrinsic motivation is actively doing based on satisfying an external goal, garnering praise and approval, winning a competition, or receiving an award or payment (Science Digest, 2017).

Limitations and Delimitations

Limitations of this study were that the researcher was a mathematics teacher with some of the participants from Middle School 1 and Middle School 2. Additionally, the causality of unmotivated students is difficult to investigate. The participants were limited to two urban middle schools in the same district and city. The number of participants was limited to 15 educators.

The delimitation of the study included mathematics educators in grades 6-8 in urban northeast Tennessee. The duration of the study was approximately three months.

Summary

This study is organized and presented in five chapters. Chapter 1 includes an introduction to the study, educators' perceptions of motivational strategies influencing middle school students to perform in mathematics courses, along with the statement of the problem, research questions, significance of the study, the definition of the terms, delimitations and limitations, and a summary. Chapter 2 contains an overview of relevant research related to perceptions of educators on motivational strategies influencing middle school students to perform in mathematics courses. Chapter 3 describes the methodology, including the research questions and research design, site selection, population and sample, data collection strategies, data analysis strategies, and assessment of quality and rigor. Chapter 4 presents the findings of this study. Chapter 5 provides further context and implications for practice and future studies.

Chapter 2. Literature Review

Prior research discovered the importance of a more student-centered approach to motivating middle school students. According to Bransford (2005), "even though there may be individual differences in biological aptitudes for learning certain kinds of things (music and social skills), most of the functional intelligence is learnable and hence also teachable" (p. 40). In addition, Bransford (2005) found that the causation of motivation is attributed to where students come from and what they bring to the classroom: social context.

Students that normally exhibit strong academic achievement are motivated by parental influence, extracurricular activities, and athletic requirements (O'Brien & Rollefson, 1995). Students whose parents are competent in mathematics also perform better than students whose parents show a low interest in math and regard their competencies in math as low (University of Tübingen, 2017). Students who participate in extracurricular activities demonstrate higher levels of academic achievement and greater social development (Christison, 2013). Many high-performing students already have the motivational support needed to perform in mathematics courses (Christison, 2013).

Middle school students increasingly want autonomy, particularly from adults such as parents and teachers (Steinberg, 1990). Adolescents need a safe and academically challenging environment. More specifically, they need an environment that provides a zone of comfort in addition to challenging new growth opportunities (Simmons & Blyth, 1987). Darling-Hammond et al. (2020) discovered principles for practice in learning and development. First, structures should create dedicated support systems with positive and long-term relationships between adults and students and provide academic and social-emotional support for cultivating development. Additionally, schools should establish physically and psychologically safe classrooms, where

students feel they belong. Educators need to engage in practices that help them know their students well to respond to the student's specific needs. Finally, procedures should be designed to invest in trust and promote cultural awareness among educators and families – creating a greater alignment between the home and school.

In addition to a recent drop in academic achievement nationwide (Schwartz, 2023), students' social and emotional health have also suffered substantially since the COVID-19 pandemic (Dorn et al., 2021). The school community temporarily shut down, and traditional educational goals were abandoned (Spring, 2012). Cooperative learning groups in the classroom no longer existed and were replaced with individual learning in front of a computer. Social and emotional skills are learned in the classroom, at school-sponsored events, and in the halls and the lunchroom (Spring, 2021).

Schools' educational goals are to provide equal learning opportunities between social classes, leading to intense frustration in economic inequalities between school districts, demographics, and families. Summative reports revealed that online learning for low-income families was catastrophic. Two main factors contributing to this dilemma were the lack of access to home computers and strong internet connections. Students were left alone without supervision, and the technology differed for every student. Some teachers reported that fewer than half of their students participated in online instruction. Cultivating a strong student-teacher relationship is essential in today's schools. In many families, parents that were essential workers had no choice but to go to work and trust that their child would show up for virtual learning; unfortunately, many did not. Many students had no access, no proper workspace, no grade incentives to look forward to, and in some situations, students had to watch their siblings (Spring, 2021).

Today, human capital economics is the presiding educational ideology. Economic growth is human capital economics primary goal of education. Other ideologies accentuate the education of students for social justice and the hand down of culture. Human capital economics chooses to promote knowledge or curriculum to meet the needs of an economic system. They set a vision for schools to prepare future workers for business. For schools nationally, the curriculum for human capital economics ideally is understanding what is essential for future life and a means of application to encountering life (Spring, 2011).

College Foundation of North Carolina (2022) revealed that the demand for employees who work jobs such as respiratory therapists, 23 percent, electricians, plumbers, pharmacy technicians, software developers, 22 percent, and solar energy system installers, 52 percent, is increasing through 2030. CTE programs prepare students for jobs experiencing much growth, often paying higher salaries than some non-trade entry-level occupations (Spring, 2011).

There is a major issue for all schools in the United States and globally about the global migration of workers. Spring (2011) discussed this issue as centered around brain gain and brain loss for nations. There is a growing significance for American schools to circulate workers globally. American school systems must emphasize the quality of future workers to compete internationally.

At-risk, disadvantaged, urban, and culturally deprived students have been shown to have the most academic problems. Based on information from the National Center for Educational Statistics (2010), 35 percent of students with the previously named risk factors finished high school and went on to a four-year college within two years of high school graduation. Family background is related to the level of educational achievement and the prestige of those accomplishments. In many cases, the family's economic level will determine students'

educational attainment. Studies have found that students from low-income families do not achieve a higher education level than wealthy families (Spring, 2011).

Public schools will have a dilemma if they pledge equal educational opportunities for all students. The end goal of many schools is to guarantee equal opportunities. There are two major problems facing public schools today. Schools are expected to provide equal opportunities for all students, but economic circumstances could hinder schools' power in this quest. Additionally, schools attempt to reduce social differences by ability grouping, tracking, counseling, and equal distribution of school funding. Some educators argue that these measures separate more than reduce social disparities (Spring, 2016).

The pandemic destabilized the school's promise to provide all students with an equal opportunity to advance economically. Wealthy and middle-class families had a different school closure experience than low-income families. What the different social classes could provide their children for online learning was different. Limited space to do schoolwork, poor Wi-Fi connection, and no computer access hindered many low-income students. Many rural students had no internet access (Spring, 2016).

Intrinsic Motivation

Middleton and Spanias (1999) defined *motivation* as "the reasons individuals have for behaving in a given manner in a given situation" (p. 66). Motivation is part of a student's goal structure, which is important to the student and will determine if a student will or will not engage in a math task (Ames, 1992). Intrinsic and extrinsic motivational factors and strategies were examined and analyzed in the study. *Intrinsic motivation* is defined as being motivated by personal satisfaction or enjoyment. Cleary and Chen (2009) suggest that an influencing factor on performance depends on a student's motivation and feelings towards mathematics. Students that

are highly motivated seem to engage in math activities that are meaningful and beneficial to them. Students' self-regulatory strategies are significant for effective learning, mainly because motivation is influenced by interactions between student characteristics, behaviors, and learning environments (Bandura, 2006). Self-regulatory strategies allow students to monitor and control their cognition, motivation, and behaviorisms (Schunk, 2001). Reasons for researchers' attempts to understand the role of student motivation in mathematics are because self-regulatory strategies have been found to enable and increase their mathematics achievement (Schunk, 2001), especially for highly motivated students who acquire more self-regulatory behaviors. Self-regulatory behaviors of students are class participation, asking questions, and independent study habits. When a student is successful in mathematics and enjoys the task, they perceive success as a reason to engage in mathematics because they expect to do well.

A numerical grade issued by the teacher on an assignment, and the student's perception of their contribution toward the assignment will influence their attitude about the course (Atit et al., 2020). In elementary school, most students are confident in their mathematics skills, but in middle school, many perceive mathematics as only for smart kids (Atit et al., 2020). Math-struggling students in middle school perceive failure depending solely on ability and presume applying themselves will not change the outcome (Atit et al., 2020).

In mathematics, intrinsic motivation and a student's family characteristics and structure influence academic achievement. Students from two-parent families, with no or few siblings (especially fewer older siblings) and no grandparents living with them, appeared to do better academically than other students without those characteristics (Chiu & Xihua, 2008).

Eccles and Wigfield (2000) found that when students credit their successes to ability, they tend to be more successful, and when they credit their failures to a lack of ability, they tend

to fail. The expectancy-value model contends that students who expect success and visualize a math task as valuable are strong determining factors of outcomes such as effort, choice, and persistence (Eccles & Wigfield, 2000).

A student's goal orientation is linked to their intrinsic and extrinsic motivation, which may influence student behavior (Meece et al., 1988). Intrinsic motivation is the driving force of a student to learn for the sake of learning. Intrinsically motivated students are engaged in math tasks because they enjoy them and feel that the tasks are important to them personally (Middleton, 1993).

Reppy and Larwin (2019) stated:

> Encouraging students to alter their mindset on grades will provide endless intellectual growth and motivation opportunities. When students acknowledge grades are not a final stop at failure, they will be more inclined to recognize their improvements, which will engage and motivate them to succeed. (p. 51)

Alspaugh (1988) studied students transitioning from elementary to middle school and middle school to high school. The focus of the study was to determine any association between a decrease in academic achievement and a student moving to a new school environment. The research found statistically significant achievement loss associated with the transition from elementary school to a new middle school in 6th grade compared with K-8 schools that did not have a school-to-school transition in 6th grade. In comparing districts with grades 6-8 middle schools and K–8-schools, high school dropout rates were shown to be higher in school systems with grades 6-8 middle schools. School districts should consider the findings from the research before designing a school structure (Alspaugh, 1988).

Lower achievement scores of middle school students are because of more stringent grading practices compared to elementary schools (Anderman, 2002). Murdock et al. (2000) stated that even though a grade in middle school is more reflective of actual ability, it negatively affects academics, making students less optimistic about their future success. Anderman (2002) revealed that declining grades in middle school were strongly associated with student depression and increased discipline problems.

The motivational factors that influenced students years ago may not be what influences students today. Social media was not in the lives of middle school students in the 20th century as it is in the 21st century (OECD Library, 2019). The well-being of students' social and emotional health did not receive as much attention then compared to today (OECD Library, 2019). Steinmayr et al. (2019) stated that academic motivation is not a single construct but a variety of constructs, such as motivational beliefs, task values, and goals. In the expectancy-value model by Eccles et al. (1983), three task values that positively affect achievement are intrinsic value, utility value, and personal importance. Intrinsic values for mathematics are when a student enjoys doing math activities and finds mathematics interesting. Utility values are how useful the learning is to the student's future. Personal importance is when students believe they are good at a particular subject and stress that attainment is important.

Reppy and Larwin (2020) studied the association between the perception of caring and intrinsic motivation of urban middle school students. The study was to determine if there was a correlation between middle school students' perceptions of feeling "cared for" and their intrinsic motivation. Additionally, Reppy and Larwin (2020) stated the three research questions from the study:

1. How do students perceive their intelligence concerning feeling *cared for* in the

classroom?

2. How do students perceive their educational environment with their intrinsic motivation?
3. Are students' reported feelings of *care for* or intrinsic motivation moderated by their economic status? (p. 52)

The study consisted of 1,103 active student participants from an urban district in northeast Ohio. Survey items were related to the Care Theory (Noddings, 1984), Positive Behavioral Interventions and Supports (PBIS), the Academic Motivation Scale (AMS), and demographic information.

Reppy and Larwin (2020) discovered parallels to the study by Noddings (1984) who stated:

> I do not need to establish a deep, lasting, time-consuming personal relationship with every student. What I must do is to be totally and nonselectively present to the student-to each student-as he addresses me. The time interval may be brief, but the encounter is total. (p. 180)

Educators must be sincere when establishing relationships with students because students know when a teacher is not sincere. If the teacher-student relationship is based on reciprocity, improvement in student success is visible. A student's intelligence can positively correlate to the amount of care shown in the classroom (Noddings, 1984).

Current research suggests an analogous association with previous research (Davis, 2006; Oldfather & McLaughlin, 1993). Goldstein (1999) stated that teachers should not only think that they are caring for students, but students must receive the care to strengthen their relationship

with teachers. In Davis's (2006) research, the survey displayed a significant positive correlation between how students perceive their academic environment and their intrinsic motivation.

Previous research suggests that students from lower-income families are expected to be less successful in school (Carter et al., 1999). Davis (2006) found comparable results associated with social-emotional research but no trends on the socioeconomic status (SES) question.

Middle school students experience much change during their adolescent years. Many traditional middle-grade schools emphasize competition, social comparison, and ability self-assessment during heightened self-focus (Eccles et al., 1993). Middle school students become more focused on their peers and are extremely concerned about social acceptance and developing sexual relationships (Brown, 1990; Katchadourian, 1990). Some adolescents are concerned about identity issues (Erikson, 1968), which may lead to increased self-focus and self-consciousness (Simmons & Blyth, 1987). Furthermore, most traditional middle schools are larger and less personal; therefore, teachers must interact with many more students, making it more likely that emerging motivational problems will go unnoticed. If this happens, students could slide onto negative developmental trajectories (Eccles et al., 1993). Adolescents disrupt social networks and decrease the opportunity for close adult-child relationships to develop, while adolescents may be especially concerned with peer relationships, however they may be in special need of close adult relationships outside of the home (Eccles et al., 1993).

Reppy and Larwin (2020) stated the importance of focusing on the evolution of students in school settings. According to Reppy and Larwin (2020), society has changed, but students' needs have not changed. Schools must meet social-emotional needs to be successful with students academically. All school staff members must be dedicated to the nurturing of middle school students (Reppy & Larwin, 2020).

Extrinsic Motivation

Extrinsic motivation refers to behavior that is guided by external rewards. These rewards can be tangible or intangible. Examples of tangible rewards are money and grades, while intangible rewards are praise or fame. Extrinsic motivations may include prizes for completing schoolwork to earn a good grade and doing a task to receive recognition. Some other rewards for doing homework could be a special treat or a prize. Giving a student praise for excellent work is another example of extrinsic motivation (Cherry, 2022).

Extrinsically motivated students engage in academic tasks to obtain rewards such as good grades and approval (Dweck, 1986). *Extrinsic motivation* is defined as being inspired by rewards or punishments. Furthermore, extrinsic motivational strategies are participating in an activity based on meeting an external goal, receiving praise and approval, winning a competition, or receiving an award (Santos-Longhurst, 2019). According to Ames (1992), students that are extrinsically motivated engage in academic tasks to obtain rewards or avoid punishment. These students' motivations tend to center on two performance goals. First is to obtain favorable judgments of their competence from teachers, parents, and peers. Second is to avoid negative judgments of their competence (Ames, 1992). Extrinsically motivated students will continue to perform a task even though it might not be rewarding, such as doing an instructional task that they do not find enjoyable to earn a passing grade.

Herges et al. (2017) stated that since mathematics achievement among K-12 students has been lower in American schools compared to other countries, one solution may be student motivation. The No Child Left Behind (NCLB) legislation, the Common Core State Standards (CCSS) movement, and Race to the Top increased the emphasis on mathematics achievement (Herges et al., 2017). However, many schools did not meet the U.S. Department of Education's

Adequate Yearly Progress (AYP) (U.S. Department of Education, 2011), the current version of the Elementary and Secondary Education Act. AYP measures which schools, districts, and states are held accountable for student performance under Title I of the No Child Left Behind Act of 2001 (NCLB) (Education Week, 2011). Students from other countries have also scored higher on international mathematics tests such as the Trends in International Mathematics and Science Study (TIMSS) than U.S. students. In 2011, U.S. students were outperformed by eight countries, (Korea, Singapore, Chinese Taipei, Hong Kong SAR, Japan, Russian Federation, Israel, and Finland) with several countries' average scores over 100 points above the U.S. average (Mullis et al., 2012). From 2007 to 2011, the U.S. showed no growth in eighth-grade mathematics scores on the TIMSS exam. With many students entering college and careers without the required skills and knowledge, there were concerns about low participation, persistence rates, and rates of remediation needed for college-level mathematics, leading to the development of CCSS for mathematics (U.S. Department of Education, n.d.). A solution to increasing the success and competition of students' mathematical knowledge is student motivation (Herges et al., 2017).

Wilkie and Sullivan (2018) examined the possible influence of extrinsic factors that might influence student engagement, effort, and motivation. Teachers' actions and perspectives highly influence students' motivation in mathematics. Students in the lower elementary grades (1^{st} – 3^{rd} grades) are motivated to learn mathematics because they believe they are competent and do not distinguish between effort and ability as causes of success in mathematics (Kloosterman, 1993). However, some students begin to differentiate abilities for different content domains as early as kindergarten or first grade (Wigfield et al., 1992). Many middle school students begin to perceive mathematics as a subject in which smart students succeed, and others "get by" or are unsuccessful. Middle school students begin to believe that success and failure are attributable to

ability. They also believe that effort rarely results in a notable change to their success (Kloosterman, 1993).

Middleton (2013) stated that "Motivation and achievement are developmental, interdependent, and influenced by the design of educational experiences" (p.91). Grootenboer and Marshman (2016) reviewed five studies on New Zealand and Australian middle school students' affective development in mathematics. They found that a student's relationship with their teacher seems to be the extrinsic factor affecting their motivation. Environmental factors influence student motivation when promoting a particular type of competence.

Wilkie and Sullivan's (2018) study reveals students' desire to be engaged, learn, understand, and achieve in mathematics. The study's findings also supported Hannula's (2006) understanding of the motivation of needs and goals linked to direct behavior and mechanisms that control emotions. Hannula's (2006) focus on emotion linked to motivation was shown in this study by examination of students' explanations of their emotional issues. Hannula (2006) believed that the responses that focused on emotions suggested a positive desire for something to change—discovering that most students do not want to be unsuccessful or stop trying to learn mathematics.

In Wilkie and Sullivan's (2018) study, when students were asked about their wishes for learning, they described them in positive terms. Only 0.3% of students out of 3,562 expressed their desire not to be made to study mathematics. Motivational theories suggest that students' goals and emotions stimulate their focus and behavior (Skinner et al., 2009). Hannula (2006) stated that behavior is always a dependable display of motivation. In contradiction, it appears from the data collected in Hannula's (2006) study that students may not be viewed as disconnected because of a lack of positive inclination or dysfunctional goal orientation. The

aspiration for mastery, improvement, comprehension, achievement, and learning something interesting appears to be overwhelmingly present in the students' responses. Wilkie and Sullivan (2018) found evidence of facilitating self-systems, such as mastery goal orientations and aspirations for learning, while understanding and achievement seem to both exist with disaffection. The students in Wilkie and Sullivan's (2018) study described their wishes using positive language, but this appeared not to lead to engagement as predicted by the linear process model. Wilkie and Sullivan (2018) were leading other educational researchers to question the possibility that disaffection may not necessarily cause students to hinder self-systems.

Nardi and Steward (2003) found that for students in the 9th grade, negative attitudes towards mathematics in general and learning mathematics also coincide with positive images of what engagement could mimic. The researchers were unsure of using the word *wish* in their study because its intuitive meaning may convey a sense of unattainability. The word *wish* may have encouraged the students in their expressions to describe what they do not expect to have.

Negative attitudes toward learning engagement in the classroom appear to hold positive learning inclinations. The phrasing of the question using the word *wish* suggested something unattainable in middle school students' mathematics learning. In turn, it may have influenced their attention to what they long to change, such as a change in something personal instead of the characteristics of a teacher. Wilkie and Sullivan's (2018) study demonstrated that middle school students appear willing to share their learning experiences and hold strong positive aspirations for their learning. Many students responded with organized details when explaining their learning wishes:

a) Some students wanted intrinsic personal change, such as putting in more effort, confidence to be smarter, and using efficient learning skills, and

b) other students wanted extrinsic change in their learning environment, such as doing challenging or interesting tasks and working with others. (Wilkie & Sullivan, 2018, p. 250)

Wilkie and Sullivan's (2018) findings aligned with Middleton's (2013) emphasis on interest's role in motivation and student engagement. *Situational interest* is defined as including activities that are interesting to a student. In the categories of learning activity, working arrangements, and their teachers, Wilkie and Sullivan's (2018) study found that students also wanted to find mathematics learning interesting and challenging. As in Middleton (2013), Wilkie and Sullivan (2018) found that learning activities needed to be difficult enough for students not to be bored. Furthermore, it is equally significant for teachers to maintain a healthy atmosphere towards struggle and offer coping strategies for difficult tasks (Middleton & Spanias, 1999).

Herges and Duffield's (2017) study on motivation and achievement was specific to middle school mathematics students. Even though many studies have shown a direct relationship between motivation and academic achievement, there is not enough research on middle-level students. Dembo and Eaton (2000) found that mathematics learning and beliefs about students' abilities were critical in the trajectory toward mathematics at the middle school level. Middle school grades are critical focus points in mathematics achievement and motivation research. Normally once the trajectory is set, it is unlikely to change. Once a student starts having difficulty in mathematics, the trajectory is hard to alter; therefore, research on mathematics achievement and motivation for middle school students is significant.

Herges and Duffield (2017) examined 65 middle school students at a midwestern school, investigating factors relating to the motivation of middle school students and math achievement. They wanted to discover the students' beliefs and attitudes about motivation and mathematical

achievement. The results concluded that significant positive correlations were found between self-reported mathematics grades, enjoyment, confidence, parental involvement, internal motivation. Even though the data found no significant differences in achievement and attitudes towards mathematics based on gender, there were significant differences in beliefs regarding intrinsic and extrinsic motivation, mathematics value, enjoyment, confidence, parental involvement, and intrinsic parental motivation among students of all levels.

Extrinsic motivation affects middle school-age students' academic performance, even though it is sometimes viewed as less desirable than intrinsic motivation. Intrinsic factors such as ability, practice, and the instructional approach are highly reported by students as significant; students also identified extrinsic motivation as a positive influence on their math performance (Flammer & Schmid, 2003). It is important to note that middle school students are motivated differently than other age groups. Wolters et al. (2013) hypothesized that middle school students usually identified extrinsic motivation as important because students in this age group strive to please teachers and parents and are more likely to comply with school norms. For example, most seventh-grade students enjoy competitions, an extrinsic motivation. Paige (2011) stated that this group had a positive relationship with reading proficiency in other learning situations.

Plenty and Heubeck (2011) established that perceptions differed across the multiple variables associated with motivation, especially in mathematics, such as perceptions of gender, families and parenting, teacher support, and a student's ability level. Even though most studies are inconclusive or contradictory in the role of gender, several smaller studies have found that boys scored higher on mathematics tests than girls. Preckel et al. (2008) discovered that girls have the same or higher mathematics grades as boys. However, some larger national and international studies found that both male and female students had similar test scores in

mathematics. Large-scale studies, both in the U.S. (Dever & Karabenick, 2011) and Germany (Preckel et al., 2008), found that females have less interest in mathematics than boys. Additionally, boys had more confidence in solving math problems than girls, as found in a study of 158 sixth-grade students (Preckel et al., 2008).

Students whose parents have advanced levels of education are more likely to have higher achievement (Dever & Karabenick, 2011). Family structure and characteristics like parental support, participation, and encouragement are significant in students' academic achievement and motivation (Usher, 2009). Bandura and Barbaranelli's (1996) study in Rome concurred with those parental beliefs in work ethic and parental desire for their child's future positively influenced the academic achievement of middle school students. Similar reports were found in a study involving Los Angeles high school students (Fan et al., 2012). Parents may be one of the most significant motivational influences on mathematics learning because parents can encourage students to work hard, be goal-oriented, and help cultivate beliefs (Chouinard et al., 2007).

Extrinsic motivation has been found to increase academic learning in some curriculums. Although, Spring (2011) revealed that extrinsic motivation does not improve mathematics achievement. Parents, teachers, and lesson presentation also influence student motivation toward learning. Spring (2011) stated the following about parental control:

> Human capital ideology has displaced other traditional concerns of American schools, such as education for democracy, progressive education, civil rights education, environmental education, and education to maintain culture and arts. As U.S. schools become embedded in global education policies, they may become further out of the control of the majority of parents. (p. 243)

Flammer and Schmid (2003) surveyed 210 Swiss students and found that teacher-controlled factors influenced students' academic success or failure, especially for struggling students. Friedel et al. (2007) found that students' perceptions of parent and teacher learning expectations predicted their learning achievement. Student beliefs, attitudes, and social concerns can either help or hinder participation and success in the classroom (Jansen, 2006).

A school administrator's major challenge is motivating their teachers to be open to innovative ideas and approaches, be committed to students, and realize that change is to be expected. (Hoy & Miskel, 2013). "Motivation is generally defined as an internal state that stimulates, directs, and maintains behavior," (Hoy & Miskel, p. 170). The important aspects of motivation include needs, beliefs, and goals (Hoy & Miskel, 2013). Intrinsic motivation invigorates people to perform and fulfill various tasks. Extrinsic motivations are rewards and punishments that encourage a person to perform a task. A mixture of intrinsic and extrinsic motivation is when extrinsic motivational factors are the initial reasons for the start of the project, but once the project becomes interesting and curiosity develops, intrinsic motivation emerges (Hoy & Miskel, 2013).

Pinder (1984) defined *work motivation* as "a set of energetic forces that originate both with and beyond an individual's being, to initiate work-related behavior, and to determine its form, direction, intensity, and duration" (p. 8). Hoy and Miskel (2013) stated that the intrinsic and extrinsic motivation dichotomy is an individual's reason for acting. Because of interest and curiosity in a task, some people do not need to be extrinsically motivated because intrinsic motivation is internally rewarding. However, extrinsic motivation requires incentives and disincentives before being stimulated. Extrinsically motivated employees' drive toward performance is to get a good evaluation, pay increase, promotion, or perform well only to avoid a

grievance (Hoy & Miskel, 2013). Hoy and Miskel (2013) stated that "Administrators and teachers need to encourage and nurture intrinsic motivation while ensuring that extrinsic motivation supports the task at hand" (p. 172).

Extrinsically motivated students will perform and finish a task even if the task is not rewarding. For example, extrinsically motivated students will do an instructional task they do not find enjoyable to earn a passing grade. Extrinsic motivation is behavior driven by tangible or intangible external rewards. Examples of tangible rewards are money and grades, while fame or praise are intangible rewards. Some extrinsic motivations include praise, prizes, completing a homework assignment to earn a good grade or reward such as a special treat or prize, and being recognized for doing a good deed. Effective conditioning is when someone is convinced to behave in a certain way due to a reward or receiving incentives for their performance (Cherry, 2022).

Strategies of Motivation

Herges et al. (2017) stated that when middle-level students do well in mathematics, they experience higher enjoyment and more confidence. Confidence and enjoyment with mathematics will lead to students doing well in that class (Middleton & Spanias, 1999). Herges et al. (2017) revealed that students who reported earning an A or B average in a mathematics course also reported positive parent involvement and teacher support.

In a study by Herges et al. (2017), multiple implications for educators were discovered. First, communication with parents by educators can encourage both awareness and involvement since the influence and involvement of parents in the education process is significant to middle school students. The active involvement of parents in a child's education, encouraging interest in mathematics, and educators setting high expectations of students can affect mathematics

achievement (Dever & Karabenick, 2011). Second, educators should give support to students (Ahmed et al., 2010; Sakiz et al., 2012; Usher, 2009) and create a classroom environment of learning where students are provided opportunities to achieve in mathematics (Herges et al., 2017). School leaders should provide professional development for educators regarding student motivation. Professional development can inform educators about designing lessons and activities to motivate students (Turner & Warzon, 2011). Herges et al. (2017) found a strong positive correlation between intrinsic motivation and achievement. Extrinsic motivation yielded a moderate effect size, and extrinsic factors outweighed intrinsic factors in the open-ended responses from the students surveyed about what most influenced their motivation.

Anning (2015) stated that answering simple questions could help achieve goals efficiently. Additionally, Anning (2015) listed a set of ten questions suggested to increase motivation:

- What are the reasons for wanting to achieve goals?
- What steps are needed to move closer to our goals?
- What would be the consequences of not being motivated to achieve goals?
- What stops or reduces motivation?
- What obstacles or barriers sabotage motivation?
- How can someone overcome those obstacles?
- What habits can be created to increase motivation?
- What tangible reminders are needed to stay motivated?
- Who can support?
- How can a person reward themselves? (p. 1)

Students should consider what makes their goals important. They need to remind themselves periodically of what matters to them. Values are the motivating factor; therefore, students should explore their values to tap into their motivation. Instead of big goals that can be overwhelming, smaller manageable steps should be the focus. Initial pursuits of small actions toward objectives would demonstrate progression and results, boosting motivation (Anning, 2015).

Anning (2015) continued by stating that "Some people are more motivated by the consequences of not achieving something and the negative impact it may have on them, rather than the benefits of achieving it" (p. 1). Furthermore, Anning (2015) suggested the importance of being aware of what helps or hinders motivation, and the significance of action taking. Because a person knows themselves best, barriers such as thoughts they are having or imiting beliefs that may sneak up on them occasionally can sabotage a person's motivation. To stop motivational sabotage, a person should deal with those obstacles one by one. Someone can overcome barriers to motivation by being aware of what stops motivation and determining what can be done to avoid it. Breaking old negative habits and patterns is more difficult than creating new positive habits.

Visual prompts, pictures, and cues remind people of what is wanted or not wanted. Tangible reminders can assist in keeping a person on track with the desired goal and will help to interrupt the impulse to give in (Anning, 2015). Motivation can increase with a support system that holds a person accountable. Sharing successes, concerns and talking things through keeps enthusiasm up. Upon achieving a goal, rewards and treats can assist a person in staying motivated for future goals (Anning, 2015). She suggested that answering these simple questions

could help achieve goals efficiently. Consciously, a person can be ready to deal with any obstacles that come along the way (Anning, 2015).

Some middle school students emphasize lower-level cognitive strategies when the ability to use higher-level strategies increases (Eccles et al., 1993). Berger and Karabenick (2010) conducted a study to answer questions about motivation and students' use of learning strategies. The study's participants were 306 ninth-grade students enrolled in algebra classes at a Midwest urban high school (Berger & Karabenick, 2010). The research revealed that components of motivation significantly predicted students' reported use of learning strategies. Berger and Karabenick (2010) declared three types of learning strategies. Cognitive strategies are rehearsal (rehearsing a skill that has been introduced before), organizational, and elaboration. Metacognitive strategies are planning, monitoring, and regulation. Resource management strategies are help seeking and time and study environment management. Students who initially considered mathematics interesting, useful, and important, only increased their use of memorization - the controlled group used rehearsal strategies for the beginning of the term. Additionally, it is possible that value (mathematics is interesting, useful, and important) indirectly affected higher-order strategy. However, given that the value of mathematics at the beginning of the term predicted students' reported levels of self-efficacy at the end of the term, which in turn affected the use of higher-order strategies. Students were more likely to use rehearsal because it takes less time and effort than higher-order strategies.

A second hypothesis that learning strategy use predicts student motivation was not supported, contradicting the model designed by Borkowski et al. (2000) that proposed that learning strategy use would predict student motivation. Over the term, the use of three adaptive

learning strategies (metacognition, help-seeking, and time and study environment management) decreased, suggesting that students became less self-regulated learners during the term.

Berger and Karabenick (2010) stated that there were correlations between expectancy-value components and learning strategies, like the study conducted by Pintrich et al. (1993). Self-efficacy and task value (mathematics is interesting, useful, and important) are more strongly related to higher-order learning strategies than lower-order ones. The study discovered the importance of considering value, cost, and self-efficacy separately when examining the impact of motivation.

Bidirectional means that motivation affects strategy or strategy affects motivation. There was compelling evidence indicating that student motivation and the use of learning strategies are related. However, there was insufficient understanding about their reciprocal effects, meaning whether motivation affects strategy use, the converse, or whether the effects are bidirectional, and which components of motivation and strategies are involved. Berger and Karabenick (2010) discovered that students' self-efficacy in mathematics and value predicted their reported use of learning strategies. However, there was no evidence that the learning strategy used predicted motivation and strengthened support for unidirectional (moving in a single direction) effect of motivation during that time interval. Implications for models of self-regulated learning and instruction are discussed. There is less evidence on whether motivation affects strategy use or is bidirectional. Students' self-efficacy in mathematics courses and value -mathematics is interesting, useful, and important - predicted their use of learning strategies. There was no evidence that the learning strategy uses predicted motivation (Berger & Karabenick, 2010).

Suhr (2018) defined some effective strategies for increasing motivation:

> Strategies that include rewards are having a growth mindset, having students create goals for their assignments, and overall learning, as well as strategies that involve communication and providing students and parents with feedback, are just some of the strategies considered to be effective for increasing motivation amongst adolescent-aged learners. (p. 4)

Additionally, Suhr (2018) discovered the following to be significant:

> students belonging to the classroom, goal setting and self-efficacy, implementation of literacy centers as a tool for promoting self-efficacy and self-regulation, the benefits of extrinsic and intrinsic motivation in the classroom, using social and emotional learning programs, making learning meaningful and interesting for students, the impact of formative assessment, and an emphasis on progress, not perfection, in the growth mindset classroom. (pp. 6-15)

Toshalis (2012) stated that a student-centered approach would motivate individual students to achieve in a particular class. Toshalis (2012) suggested asking students to assist in identifying other factors that might elevate their motivation. The identification of other motivational factors may include changes to the context or the individual's beliefs and behaviors. Suhr (2018) declared, "By being aware of the motivational and engagement strategies, teachers can create classroom environments and lessons that foster a sense of achievement, belonging, and growth" (p. 24).

Alexander (2013) presented the idea that students should get paid for their performance in schools. Alexander (2013) wrote about a distributive policy called, "pay-for-performance" which stated that students would get paid for satisfactory performance. The mechanisms associated with distributive policies are capacity building, hortatory, and inducements. Capacity-

building policies are long-term investments, such as the long-term professional development of educators. A hortatory policy is to act on the information received. School policies are best to have a mixture of the mechanisms (Alexander, 2013).

Alexander (2013) proposed in his "pay-for-performance" idea an example of an inducement mechanism that is merely a short-term transfer of resources and is best used when diverse behavior is acceptable. A second example of inducement is The Race to the Top grant, a financial incentive rewarded to states if they pursue suggested programs and innovative ideas (Race to the Top, 2012). A third example is Quality Compensation (Q Comp), a teacher-pay incentive program that rewards achievement (Alexander, 2013). In 2005, Minnesota passed the Q Comp Law, which is a statewide program that provides additional funding to districts to support them in designing alternative teacher compensation and professional development systems (The Educators 4 Excellence-Minnesota, 2014).

Mandates are when there is vast stakeholder support for a policy that requires compliance and punishment if compliance is not met. Unfortunately, mandates do not give funds to pay for the required policies. Individuals with Disabilities Educational Act (IDEA) (1990) is an example where mandates are met with expectations that the school districts will fund the mandates.

Alexander (2013) showed the importance of providing incentives during a student's learning process instead of rewarding good test scores. Small age-appropriate incentives would give a struggling student confidence while recognizing the students who do not struggle with academics. Students earning small rewards can improve education outcomes. Alexander found and reported that monetary payment to students for better exams or test scores did not prove that the students improved. The main reason was that students often did not know how to improve, even if they desired to improve.

Franck (2017) stated that economists found that when they gave high school-aged students money as a reward for performing well on a low-stakes assignment (such as getting paid for reading books), scores improved by approximately 5 percent. Nevertheless, the studies also found that those effects do not last long-term (Alexander, 2013).

Franck (2017) stated that high school students in America score higher compared to other countries on low-stakes tests such as the Organization for Economic Co-operation and Development's (OECD) Programme for International Student Assessment (PISA). He also discovered that students are more willing to answer test questions when motivated by cash. The economics department at the University of California San Diego, and the University of Chicago found that scores improved by approximately 5 percent by giving high school-aged students money as an extrinsic incentive. Franck (2017) concluded that the educational gap between the U.S. and other international schools might have less to do with comprehension than effort. Further statistical information from 2012 discovered that the U.S. is in the bottom quartile of OECD's 65 countries, even though 70 percent of U.S. students graduate from high school and are ranked 36th for mathematics (PISA, 2012). The economics department at the University of California San Diego (UCSD), and the University of Chicago (UC) found that using money as a motivator could raise American math test scores to a 19th ranking (Franck, 2017).

Economists compared students from Shanghai and the United States using a 25-minute mathematics test consisting of 25 PISA questions. Some students in each group were given $25 (or an equivalent Chinese renminbi), then $1 was taken away for every wrong or incomplete answer. When offered money for correct answers, the students from Shanghai did not change their performance. While the American students, when offered money for correct answers, attempted more questions and were more likely to get correct answers (Franck, 2017).

Franck (2017) stated that "We estimate that increasing student effort on the test itself would improve U.S. mathematics performance by 22 to 24 points [on PISA], equivalent to moving the U.S. from 36th to 19th in the 2012 international mathematics rankings" (p. 1). In an interview with CNBC, an economist at UCSD, Sally Sadoff stated "The general insight is that maybe students aren't trying as hard as they could be trying. It takes mental effort, mental power." (Sadoff et al., 2017, as cited in Franck, 2017, p. 2). Sadoff further stated:

> American students perform better when the results of the effort are readily apparent on high-stakes S.A.T. tests or final exams, which have significant effects on college admissions or grade point averages. However, the fact that many students lose academic drive outside these select exams may betray a typical attitude toward schoolwork. (Sadoff et al., 2017, as cited in Franck, 2017, p. 2)

The data revealed that normally American students do not get as many questions correct on the latter part of an exam compared to the first half, but the students that were offered money scored better in the latter half of the test by eight percentage points. American students also scored three percentage points higher in the first half of the test, suggesting money was a motivational factor. The economists at the University of California, San Diego (UCSD), and the University of Chicago (UC) also discovered that in comparing American males and females, monetary incentives increased the male student's score twice as much as the females.

The focus was not to evaluate how incentives work, but instead to use incentives as a tool to understand the interaction of culture and motivation to perform on tests between major economic powers. Sadoff's group was not the first set of economists to offer cash to students or teachers for increased performance (Sadoff et al., 2017, as cited in Franck, 2017). Studies have shown improvements in test performance for cash payments (Franck, 2017).

Fryer (2012) found that offering students money for standardized test grades did not show any increase in the test grades. Fryer paid the students for their grades on a series of exams and paid some Chicago ninth graders every five weeks for test performance. In addition, Fryer paid Dallas 2nd-graders for every book they read and another amount to the District of Columbia students for good attendance and behavior. Ethical issues about monetary incentives have emerged, but because of growing interest in the topic, Sadoff stated:

> I think for a lot of kids, their parents are just instilling a habit (of good study practices). But for some kids, I think there is a role for us. If the return to education is so high, why aren't kids trying? (Sadoff et al., 2017, as cited in Franck, 2017, p. 3)

Fryer (2012) found that the cash payments to students were not successful, except for paying kids to read, which significantly affected comprehension, vocabulary, and language skills.

Student-Centered Approach

Many educators use Constructivism Learning Theory to help students learn by encouraging them to construct or discover their knowledge actively. Learners use prior knowledge on any subject and build on that knowledge with innovative ideas; therefore, the reality is conceived by their individual, unique experiences as a learner. Educators must completely understand the principles of constructivism because the work will influence how all students learn. A positive result of constructivist learning theory is that everyday educators can expect students to bring their unique experiences to the learning environment. New educators must acquire their credentials, but it is also important to understand how learning theories impact the teacher and the student (Western Governors University, 2020). Western Governors University (2020) outlined 8 principles of constructivism:

- Knowledge is constructed: knowledge is built upon prior knowledge
- People learn to learn as they learn: for a better understanding of the future
- Learning is an active process: learning involves sensory input to construct meaning
- Learning is a social activity: learning is associated with our connection with people
- Learning is contextual: we learn in ways connected to things we already know
- Knowledge is personal: students own prior knowledge and experiences to bring
- Learning exists in mind: engaging the mind is key to successful learning
- Motivation is key to learning: students cannot learn without being unmotivated. (p. 1)

Three types of constructivism can be used by teachers with their students, cognitive, social, and radical. Cognitive constructivism depends on the stage of the learner's cognitive development, with new learning beginning at that point (Piaget, 1970). Social constructivism is a process of learning from others that helps students to construct their own knowledge and create their building blocks. Knowledge develops from how people interact and collaborate with each other. As Vygotsky (1986) discovered, social constructivism is like cognitive constructivism with the added element of peer influence. Radical constructivism is different from the other two types. Radical constructivism is a theory of knowledge that provides a realistic approach to questions about truth and human understanding (Walshe, 2020). The theory interprets knowledge developed by Ernst von Glasersfeld in 1974 (Western Governors University, 2020). Piaget (1970) found the importance of cognitive structures and the basis for learning and knowledge construction. Piaget (1970) studied the learning technique within the context of natural sciences instead of how culture affects cognitive development. Vygotsky (1986) explained learning through dialogue and focused on categorical perception, logical memory, conceptual thinking, and self-regulated attention.

Western Governors University (2020) explains how teachers can bring constructivism to the classroom. The four key areas to implementing constructivism successfully are: a) shared knowledge between teachers and students, b) shared authority between teachers and students, c) teachers are only facilitators, and d) cooperative groups are small in numbers (Western Governors University, 2020). In addition to these four key elements of constructivism in the classroom, teachers should also focus on student questions and interests. Lessons should be built on what students already know. Classrooms should be interactive and student-centered. Finally, students' knowledge stems from negotiation and group work (Western Governors University, 2020).

Some disadvantage of constructivist learning theory is its lack of structure. Grading is often removed, and the setting is more casual to help students engage in learning. With most schools' high stakes testing requirements, this type of classroom is hard to sell to many teachers and schools (Western Governors University, 2020).

A ClassPad project in Finland investigated middle school students' experiences with learning in mathematics lessons that required self-guided use of technology, and minimal instruction. After the ClassPad project ended, the data collection from 23 students was the basis of the report's analysis. The research found that students illustrated two different process profiles; they either reported feeling satisfied or unsatisfied with their learning. The findings also discovered that student-centered learning (SCL) occurred more when the teacher's role was minimal, and the students were given time to self-guide their learning in an environment with various materials (Eronen & Kärnä, 2018).

The key elements of SCL from the student’s point of view are easy-to-use technologies, shared understanding of the work style, and diverse problems (Eronen & Kärnä, 2018). ClassPad

technology is a way to convey deep thought into the structure of complicated learning processes during student-centered learning. Also, ClassPad introduced components related to the processes from the students' point of view. The ClassPad model can be used as a tool to understand the components and feelings that relate to SCL and to develop pedagogical practices to support self-regulated learning. First, the appropriate tool speeds up the proficiency process and can make it more enjoyable for self-guided learners (Eronen & Kärnä, 2018). Second, it is important for teachers to ensure that students are aware of the focus of the SCL process, and the significance for collaboration (Speck, 2003). The teacher should encourage students to ask for help developing a plan for the tasks since the processes of SCL can be obscure to students. In SCL, it is critical that students understand that the teacher will only guide and support the student if needed (Chiu, 2004). Third, task selection for student learners is significant for SCL to become a success (Eronen & Kärnä, 2018). The problems should include a wide range of choices regarding the difficulty level. If the tasks are too easy, the students may lose interest, and if the tasks are too rigorous, they will be overly challenging (Eronen & Kärnä, 2018). In addition, the finding revealed that learning math, particularly in the SCL approach, may produce different feelings toward mathematics and impact students' views about the course of study (Eronen & Kärnä, 2018). For mathematics, more micro-analytic research on students' learning processes during math lessons is needed (Eronen & Kärnä, 2018).

Francisco's (2013) research on teaching practices in mathematics stated that one of the focuses has been on collaborative task-based methods for improving the learning process and outcomes and providing more opportunities for the student to control their learning. One example is that collaborative task-based learning increased learners' abilities to solve, administer, and memorize mathematical concepts and principles, which provided more imagination and

advanced the power of reasoning through a task (Derting & Ebert-May, 2010). However, the traditional direct-teaching approach is still a powerful method to advance student learning (World Economic Forum, 2015), especially in teaching mathematics (Haapasalo & Samuels, 2011). The widespread issue of student-centered methods is an important subject to discuss (Alliance of Excellent Education, 2012; Finnish National Board of Education, 2016).

O'Neill and McMahon (2005) stated that the interpretation of SCL varies. Cumulatively, SCL is “active learning," and highlights student’s autonomy (Zimmerman, 2002). The act of student learning, students having a choice in their learning, and the shift of power in the teacher-student relationship are other descriptions associated with SCL (O'Neill & McMahon, 2005). Lea and Stephenson (2003) stated that SCL is opposed to the teacher-centered approach. The first relationship of SCL is learning contexts centered on students, implying that learning is intrinsic and generated with little educator assistance.

In summary SCL, learning becomes self-generating and self-propelling, and educators must not hinder student learning. Secondly, an SCL relationship, in which teaching is like a kind of handicraft work, is assigned the preposition *on*. Once a teacher establishes a student's broad educational needs, students react to those plans (Erone & Karna, 2018). For SCL to be successful, the teacher's ability to convey necessary material and a student's responsibility to learn it is essential for learning (Erone & Karna, 2018). The third relationship, involving collaboration, is assigned the preposition *with* (Erone & Karna, 2018). Learning contexts centered on students will bring the teacher into partnership with the student, implying that learning develops as the teacher and student collaborate. Student-centered methods allow students opportunities to collaborate and cooperate. Also, SCL offers students self-guiding opportunities to make decisions about their own processes. Active participants work together at

various times during the learning process, but SCL is not meant to be the only method of student learning and instruction (Holliman & Scanlon, 2006).

According to Roschelle and Teasley (1995), cooperative work successfully divides the work among participants as an activity in which each person is responsible for a portion of the problem-solving. Collaboration is when the participants share engagement in a coordinated effort to solve the problem together. Turner (1995) defines self-guidance as when the learners guide and plan their learning, such as defining homework. As a result, the learner's intrinsic motivation towards learning has improved and can produce better learning outcomes. Self-guidance is defined similarly to self-regulated learning, supporting an opportunity to consider the process phases of preparatory, performance, and appraisal in a unique way (Puustinen & Pulkkinen, 2001). Minimal instruction is a pedagogy that differs radically from traditional direct teaching. The minimally guided approach contains two main assumptions: (1) students solve unique problems or acquire complex knowledge in informational settings, and (2) students acquire knowledge through experience (Roschelle &Teasley, 1995).

Hooper (2020) states, "Groupthink occurs when a group values cohesiveness and unanimity more than making the right decision. In situations characterized by Groupthink, individuals may self-censor criticism of the group decision, or group leaders may suppress dissenting information" (p.1). Hoy and Miskel (2013) stated that Groupthink is a problem that has existed for a long time. An example of Groupthink among educators is not speaking up because you like your colleagues and want to avoid putting them in an awkward position by challenging their ideas, but you also want the school to be successful. This can result in no one considering other plans while the dominant team leader firmly pushes their idea (Drew, 2023). Janis (1985) examines conditions that encourage Groupthink. Insulation from contact with others

in the same group who are not in the 'in-group' of policymakers, lack of impartial leadership (charismatic leaders and followers seek to please), and lack of norms requiring systematic analysis may nurture Groupthink. Hoy and Miskel (2013) further state that high stress from low self-esteem, recent failures, excessive difficulties, and moral issues fosters Groupthink.

Some characteristics of Groupthink see the group as infallible, not being open-minded, and valuing conformity over a free discussion. Janis (1985), the developer of Groupthink theory, characterized Groupthink as strong pressures toward uniformity. Members were inclined to avoid raising controversial issues and questioning weak arguments. Hooper (2002) provided three key elements of Groupthink:

> a) Groupthink occurs when the value of cohesiveness and unanimity is more important than making the right decisions, b) people may suppress undesirable information and self-censor criticism, and c) group leaders have a responsibility to avoid Groupthink and improve the decision-making process. (p. 1)

Mohammad (2019) disclosed that school administrators could encourage healthy debate and discussion to avoid Groupthink and not steer from dissent or view it as a negative part of school culture. Leaders can offer training in and engagement with ethics and other skills. The rotating of new members in and old members out of groups may weaken insulation or discourage the formation of Groupthink. Mohammad (2019) further stated that all individuals could contribute by following moral principles and critical thinking.

Hite and Taylor's (2012) case study about middle school students interested in and motivated by science, technology, engineering, and mathematics (STEM) investigated the sources behind a student's enjoyment of STEM. The purpose of this study was to advance or

bridge understanding of students' interest in and motivation for STEM activities (Hite & Taylor, 2021).

In the study, the students participated in at least 1 of 4 designed Out-of-School Time (OST) STEM activities. Hite and Taylor's (2012) research has shown that participation in OST STEM courses is key in sparking a student's interest in STEM experiences. Some of the activities included computer science and 3D printing. The hands-on learning tools used in STEM learning excited one student so much that he wanted to come before and after school, even during lunchtime. Hite and Taylor (2012) expressed the significance of understanding the reasons behind students' attitudes toward STEM.

The theme of the Hite and Taylor (2021) study was Sources of STEM Motivation and Interest. Additionally, several subthemes emerged from the data collection. The first subtheme was self-motivation and intrinsic interest. Students referenced activities such as coding, engineering, robotics, and fashion design as stimulating minds to the point of advancement and learning more. Some students worked at home on the activities because they enjoyed them so much. The next subtheme was teachers. The theme's focus was teacher-student interactions and students' opinions about their STEM teachers. The students told stories of how their teacher inspired them by driving them to the program site, inviting them to the program, and pushing them to do more than they realized they could do.

Hite and Taylor's (2021) work provides statements from students who participated in the OST STEM classes. One student said, "When I came to middle school, I was always interested in engineering and wanted to try something new. And so, I showed up for robotics club, and I just had a knack for it. And I loved it" (Hite & Taylor, 2021, p. 9). One student talked about his

connection to the activity, feeling happy, and liking creating things. Many other student accounts expressed positive experiences participating in the OST STEM experience.

Hite and Taylor (2021) had little control over the events (OST STEM activities), and their focus was on the group of students participating in and benefitting from the intervention of OST STEM experiences. The results of Hite and Taylor's (2012) study discovered that the OST activities provided middle grades students with opportunities to pursue their STEM learning interests and motivations, with encouragement from teachers, family, and friends. Students described how they engaged in collaborative hands-on activities that were goal-driven, and by making their own choices and decisions. By using strategies to effectively measure the effects of the OST STEM programs, along with purposefully implementing interesting and motivating projects, the project may retain adolescent students' interest in and motivation for STEM in high school and in the future (Hite & Taylor, 2012). The results also suggested that students' motivation and intrinsic interest in STEM were OST STEM's main sources of interest. The STEM teachers, students' enjoyment of the OST activities, parental support, friends, and supportive persons outside of school were also notable sources contributing to interest and motivation for OST STEM.

Most high schools and colleges offer STEM-type courses. Many careers are STEM-related as well. McNally's (2012) research discovered that students participating in OST STEM understood science better than before taking STEM courses. Other out-of-school organizations, such as the Boy Scouts of America and Young Engineers, are significant role model programs which align with the research conducted by Hite and Taylor (2021).

Many students have gaps in their learning, which can lead them to become unmotivated in the classroom, mainly because they are academically behind compared to other students

(Usher, 2012). Programs that can help students close these learning gaps can be significant. Kelly (2023) introduced one college's offering of additional help to students learning competency-based courses by providing peer-to-peer digital interactions through a program called *InScribe,* a digital community platform. Students can ask questions about a topic, ask to help find information, and share ideas anytime and anywhere. Not only can students ask questions, but they can see what has been posted. The peer-to-peer option would be available if a student were late, and every available resource was offline or closed. Many students are stimulated in courses, but others struggle. Learning the basic concepts of a course is essential for continuing to the next level of the course, and with the help of *InScribe*, students can get caught up (Kelly, 2023).

The college stated that *InScribe* worked with them and not against them. With the help of *InScribe*, the school can keep track of everything being posted. The college sees students wanting to help each other with thoughtful and timely responses. Students feel that they have support when the curriculum is difficult. Students using the program believed they now had a path to understanding and mastering the content (Kelly, 2023).

There is abundant research evidence suggesting that learners' cognitive and noncognitive capacities develop reciprocally and are interconnected (Chatterji & Lin, 2018). The purpose of Chatterji and Lin's (2018) study was to design self-reported measures of three noncognitive constructs for fostering student learning in mathematics: self-efficacy (M-SE), self-concept (M-SC), and anxiety (M-ANX). They used "noncognitive" to refer to dispositions, beliefs, social-emotional or affective mindsets, and attitudinal constructs. What may not involve a student's intellect, *soft skills* are related to motivation, integrity, and interpersonal interaction.

Noncognitive (*soft skills*) capacities for students are associated with their personality, temperament, and attitudes (ACT Work Keys, 2014).

Chatterji and Lin's (2018) focus was on measuring mathematics-related self-efficacy (M-SE), self-concept (M-SC), and anxiety (M-ANX) at the student level, which could then be evaluated at classroom and school levels to monitor progress over time. Chatterji and Lin (2018) administered a user-centered design and validation approach. The evidence confirmed at both student and classroom levels that replicated evidence supported validity arguments on information produced by four of five scales about M-SC, M-ANX, and M-SE. Secondly, the evidence confirmed a two-factor structure for M-SC representing positive math affect and perceived competence. A one-factor structure for M-ANX representing negative math effect. These are precursors to a perceived confidence factor of M-SE which, in turn, positively influenced mathematics achievement scores, balancing negative effects of M-ANX.

The survey scales demonstrated an analogy with current reform policies in the United States calling for schools to monitor changes in cognitive and noncognitive domains of student development. Validated scales could serve the information needs of teachers and decision-makers in similar school settings. Developing the noncognitive capacities of students is beginning to be recognized by educational researchers as important in advancing mathematical achievement levels in students. The evidence from Chatterji and Lin's (2018) study supports continued action in the noncognitive capacities of students.

Innovative Technological Strategies

Two common goals in education provide a useful lens for examining motivation: passing assessments and getting into college (Usher, 2012). Students need to acquire tools that will help

them achieve educational goals. Students showed a high degree of autonomous and competence motivation when they used gamified online learning (Bovermann et al., 2018).

One of the latest and most modern learning technologies with artificial intelligence is called Chatbox. Chatbox is designed with text messages or speeches to replicate conversation in a scripted way. Using Chatbox, students will type in questions or keywords and receive answers or explanations instantly. Key features of the innovative technology are that it will ask questions, answer questions, retrieve information, visualize the contents, provide useful information, and establish the knowledge that the student must learn, such as math skills (Yin & Goh, 2021).

Chatbox proposed viable solutions to the students individually and to explore online content. There are two types of tools, rule-based and retrieval-based digital learning tools. Also, a generative chatbot provides a suitable response from input through Natural Language Processing and deep machine learning that has preprogrammed responses to match the text messages or speech input (Vanichvasin, 2021).

Chatbox is effective to use as a student learning tool. Results from Vanichvasin's (2021) study stated that Chatbox was easy to use and understand, innovative, and fun to learn. Vanichvasin (2021) stated that students enjoy the program because it jokes to create fun learning. After using Chatbox, post-test scores on a specific skill or topic were significantly higher than the pre-test scores. The advantages of using Chatbox are that it is fun, engaging, interesting, and entertaining for learning. Additionally, it is inexpensive and frees teachers from responding to repetitive questions (Vanichvasin, 2021). The results of the study were in line with Winkler and Söllner (2018) who reported that chatbots had a positive impact on successful learning and student satisfaction when used as personalized learning support.

Personalized support can improve student learning outcomes and provide interactive e-learning environments for students with multiple benefits. According to Llic and Markovic (2016), “For Chatbox users, it will take less time to obtain answers. Also, students will have better interaction since Chatbox is safe and easy to chat online” (p. 45). Cameron et al. (2017) added, “Students will experience creative learning, have access to learning content, and will have 24/7 support service” (p. 45). Additionally, Chatbox can refresh memory for recalling, revising, and remembering information. Chatbox helped students to improve efficiency when used in instruction (Cameron et al., 2017). Furthermore, Chatbox responds to repetitive, frequently asked questions that can easily be resolved. Students view chatbots as a novel phenomenon.

Teacher benefits of Chatbox are that it is a teaching guide and assistant with a wide range of functions. Teachers can use questions asked to collect data, modify a knowledge base, and expand more knowledge. It can be used as an instant messaging platform. Students and teachers have individual accounts, where no download or programming knowledge is required (Vanichvasin, 2021).

Chatbot is used in customer service, guiding a system, acting as performer agents, and diagnosing a disease (Vanichvasin, 2021). Vanichvasin’s (2021) study used chatbot technology as a digital learning tool on Facebook's instant messaging platform to increase research knowledge. Using chatbot technology in education settings gives personalized learning support to increase student research knowledge. Some disadvantages to students using Chatbox are unmatched questions needing more links and a list of questions and keywords. Many studies (Santirattanaphakdi, 2018; Lerdsahapan, 2015; Bungodchai, 2017) have been related to the success of Chatbox outside of education. As Chatbox use increases as an educational tool in the classroom, more studies can be conducted (Vanichvasin, 2021).

Ogbuehi and Fraser (2007) focused on the effectiveness of using innovative teaching strategies for 8th-grade students. The sample used for the study was 661 middle school students from 22 classrooms. After analysis of three different surveys, the findings supported an association between perceptions of the classroom learning environment and students' attitudes to mathematics and conceptual development.

Compared to the traditional approach to teaching systems of equations, the research investigated whether using an innovative teaching method involving a numerical method (Cramer's rule) enhanced the classroom environment, students' attitudes, and conceptual development. Ogbuehi and Fraser (2007) discovered moderate positive associations between the learning environment and students' attitudes to mathematics. This study suggested that more positive student attitudes are associated with practices of constructivism.

Ogbuehi and Fraser (2007) discovered that achievement was higher for the group involved in the innovative strategy for teaching (Cramer's rule) and learning systems of linear equations. Few international learning environment studies have been conducted, specifically on mathematics courses (Aldridge et al., 2004; Mink & Fraser 2005; Spinner & Fraser, 2005). None of the previous studies focused on the teaching and learning of systems of linear equations and comparing students' attitudes. Ogbuehi and Fraser (2007) is distinct because it focuses on including students' attitudes to mathematics and the classroom environment, not solely on achievement. A quality of the research design is how the control group generated data that could be used to meaningfully compare the experimental groups learning innovative strategies for teaching and learning systems of linear equations with another teaching method. It is important to note that the experimental and control groups were given pre-tests and post-tests to measure changes in a classroom environment, students' attitudes, and conceptual development.

Ogbuehi and Fraser's (2007) research, in some measure, supported teaching challenging mathematical topics to eighth-grade students no matter their sociocultural and socio-economic status. If the students from the low socio-economic community could learn the intended, rigorous topic and their attitudes towards mathematics improved, then other students from higher socio-economic communities are likely to benefit with the same teaching approach. Additionally, the investigation of associations between students' attitudes to mathematics and dimensions of the classroom environment suggests that teachers might promote student enjoyment of mathematics by creating classroom environments that emphasize personal relevance, student control, involvement, and task orientation (Ogbuehi & Fraser, 2007). One generalization from the study was that there was significant evidence that students from lower and higher socio-economic communities could learn the posed topic (systems of linear equations involving Cramer's rule), and their attitudes towards mathematics improved. A second generalization was in investigating associations between students' attitudes to mathematics and the classroom environment. A teacher that promotes classroom environments robust in student involvement and task activities, more student control, and personal, contextual connections could help students to enjoy mathematics. One limitation of the study is the small sample size, limited to only eighth-grade students in California, which disabled the use of Analysis of Covariances (ANCOVA) and Multivariate Analysis of Covariances (MANCOVA). Another limitation was that one of the researchers was also one of the 8th-grade teachers, which could have given rise to bias, and the teacher may not have been an impartial observer (Ogbuehi & Fraser, 2007).

The Institute for Interactive Technologies at Bloomsburg University introduced the discovery of the LEGO Mindstorm's Robotic Invention System (Mauch, 2001). Mauch (2011) found that students in the study were highly engaged throughout the process because students

visualized their robot as a toy. First, the students learned how to control the robot and then commanded the robot to perform specific tasks. Students developed interpersonal, communication, and team-building skills. The robot system provided students with direct, hands-on problem-solving and written problem-solving. Tests measuring problem-solving skills require students to provide a solution and demonstrate the steps in determining the answer. The limitations in adopting the robots are the cost and classroom implementation. The teachers stated difficulties with time since their middle school was not on a block schedule (90 minutes per class). As robotics systems become more popular in homes and schools, a determination about their significance for gifted students and for students who are not mathematically inclined can be determined (Mauch, 2011).

Kwon (2017) conducted a quantitative student-centered study involving 3D printers and 3D design software at two STEM summer camps. He found that students were deeply engaged in learning through technology-integrated learning environments. The study positively affected students' motivation, interests, and mathematical and technical skills, and influenced students to be critical thinkers, problem solvers, and to use collaboration skills. Kwon (2017) noted that it is important to understand the impact of technology and the best ways to integrate it into the classroom. The results revealed significant increases in mathematical, motivational, and technical skills.

Evolving technological applications are impacting how students interact and learn. Because technology is so widespread in our society, students will be using technology in their careers, even more so than their in-school settings (Ching & Basham, 2005). With the decrease in the cost of programs such as Excel®, software programs, and innovative technologies, schools can implement and provide technology for the curriculum (Hollenbeck & Fey, 2009). By using

these sophisticated technologies in instructional pedagogy, researchers need to understand the implications of technology used to accomplish educational goals. With the increase of technology in the classroom, properly implemented technology enhances learning experiences and academic performance (Lavin et al., 2010).

Engineering, science, and mathematics require visualization and critical thinking. Because of these requirements, all information cannot be presented using paper and pencil (Kwon, 2017). Healy and Hoyles (1999) stated that technology could enhance teaching and conceptual development and strengthen visual skills if used appropriately. A way to improve student performance is to improve students' spatial visualization. 3D software design has been shown to allow students to think visually in three dimensions (Ziden et al., 2012). Introducing concepts and teaching through technology in classrooms is a fun and exciting way to engage students because they can understand the subject (Hollenbeck & Fey, 2009). In mathematics classrooms, graphing calculators, Geometer's Sketchpad, e- transformation, and Geogebra can be used as effective technological tools in learning. Ching and Basham (2005) stated that seeing real-world applications through technology motivates students to learn. The addition of technology to any subject in school can be an effective teaching strategy since experimenting with the technology will enhance the student's technical skills for application to real life (Kwon, 2017).

Some researchers are skeptical about the benefits of technology use in the classroom. Erkoç and Gecü (2013) showed that drawing by hand enhances students' mental rotation skills more than using Google SketchUp. Educators are also concerned that students are not truly learning because they rely too much on technology (Dror, 2008). Hollenbeck and Fey (2009) stated that students no longer know how to do simple multiplication or division. Further stating

that this is not always the case, a calculator can be used as an initial step in developing an approximation before solving the problem. The calculator can help reduce errors in calculation but should not be a substitute for true mathematical learning. Mathematical calculations can be very tedious and stressful for students; therefore, it is better to be more focused on the critical thinking of the task instead of the computations (Hollenbeck & Fey, 2009). Calculators are enhancing our students' knowledge, and removing these devices would hinder student advancement Kwon (2017).

In Kwon's (2017) STEM summer camp study, the researchers argued that the findings indicate how technology, especially 3D printing and 3D design software, positively affects students' overall performance. The results of the study found that a summer camp program's 3D printing and design class positively influenced students' motivation, interests, mathematic skills, and real-life skills. The results showed the practical importance of student performance. Kwon (2017) suggested that even more success would have been evaluated if the intervention had been longer to reduce the cognitive load for students. Because of the overall positive results, Kwon (2017) suggested taking 3D printing and designing a class learning environment. Moreover, by implementing 3D printing and designing in classrooms, students will have different opportunities for learning because they will be engaged in relevant, interesting, and authentic activities by incorporating advanced technology into classrooms. The importance of teacher training and clearly defined objectives of every integrated lesson is significant to show student technology proficiency and performance (Kwon, 2017).

Additionally, Kwon (2017) suggested some factors for teachers and schools to consider that could increase or decrease the effectiveness of technology are:

> the background knowledge of the students can lessen the effectiveness of technology in classrooms, the socioeconomic of the student because they would need their laptop to access the software system (Falck, Mang, & Woessmann, 2015), and some students may not be exposed to computers or SketchUp software." (p. 40)

It is important to note that in the study, every student met the learning outcome, which was to create and print a 3D object successfully.

Van (n.d.) conducted a study about internet memes having or not having a detrimental effect on students' comprehension of mathematics, which for some students, requires more motivation than other subjects in school. *Seductive details* are highly interesting but irrelevant tidbits of information that an educator may occasionally throw in to motivate students to pay attention and know the relevant information to pass an exam. Since the student may be unsure whether they will be tested on irrelevant material, it can cause their memory to overload because of extraneous information. The students make every effort to try and remember those details, alongside the main lesson takeaways (Van, n.d.).

Van's (n.d.) quantitative study hypothesized that including memes would motivate students more than the control condition stimuli, which was a mere title. Bini et al.'s (2020) ethnographic examination into math meme groups identified two main types of memes. The first is the mathematical meme condition that implicitly encodes verifiable mathematical statements. A mathematical meme is a type of meme that humorously combines a mathematical statement with a meme base. Because mathematical memes present a mathematical concept using a familiar framework, understanding the relationships between the concepts depicted in these memes becomes a puzzle - encouraging students to use critical thinking (Bini et al., 2020). The

second meme type is the emotional meme condition. Emotional memes present subjective feelings about the experience of math instead of encoding a provable mathematical concept. In analysis of the two meme conditions, one hypothesis in Van's (n.d.) study was that mathematical memes should strengthen student test performances more than the emotional meme. The hypothesis was supported since the mathematical meme was correlated with more interest than the control condition. Van's (n.d.) research found that there was no effect of the meme conditions on intrinsic, extraneous, or germane cognitive load types or on the post-test scores. As for the aggregated variable, motivation, there was no effect as well.

Van (n.d.) revealed that the mathematical meme had significantly boosted students' curiosity about the lesson content, even though the literature on the seductive details effect suggests that the irrelevant meme would negatively impact students' cognitive load and performance. The results showed that neither meme significantly affects students' cognitive load or performance. Van (n.d.) suggested that interesting stimuli like memes may not necessarily harm students' learning. Further investigation into whether the motivating potential of memes could translate into longer-term effects on math tendencies and performance is worthwhile (Van, n.d).

Sundararajan and Adesope's (2020) meta-analysis found that in two studies featuring math or statistics lessons, seductive details have been shown to enhance learning. Sundararajan and Adesope (2020) suggest that seductive details have the potential to motivate or situationally intrigue students who might be initially intimidated by the complexity of math. They further stated that seductive details could motivate students intimidated by mathematics and foster positive emotions toward the lessons. Um et al., (2012) suggested that seductive details can displace students' anxiety, which helps them to perform better on tests. However, mathematics

literature is limited in seductive details. In Reddy's et al. (2020) study, the intention was to use internet memes and interesting content that is positively regarded by many students.

Dawkins (1976) defines a meme as content that is replicated, altered, and propagated through a culture or group. Social media groups share math memes about the irony of students learning math for the sake of understanding memes instead of passing their math classes. Also, social media groups share math memes by connecting how carefully students treat calculations in their memes with how lightheartedly students answer their formal math assessments. Suggesting that cultural artifacts increase the notability of meme culture can encourage students to learn math (Bini et al., 2020).

The effect of seductive details in Van's (n.d.) study stated that interesting but irrelevant stimuli in a lesson could worsen performance by placing an unnecessary load on the learner. The emotional meme (subjective feelings about the experience of math) is chosen for being interesting but irrelevant to the lesson. Van (n.d.) expected that the emotional meme would result in the poorest performance and have the highest extraneous load, whereas the mathematical meme demonstrated the highest relevance and highest interest ratings. Neither assumption happened when analyzing the results. There were no detectable differences between the means of each stimuli group for either performance or extraneous load. The results suggested that even if a stimulus like the emotional memes that meets the criteria of a seductive detail does not necessarily hinder learning any more than an interesting stimulus such as the mathematical meme might help to learn, which brought doubts about the destructive nature of seductive details in math context (Sundararajan & Adescope, 2020).

Students are increasingly intrigued with mathematical memes with a novel math concept shown at the start of the lesson. The memes make students more curious about how to make

sense of the math in the meme instead of how to make sense of a simple math standard title (Sundararajan & Adescope, 2020). Because ethnographic research on mathematical memes has revealed that these stimuli produce more substantial discussions and questions about complicated concepts, it would suggest that mathematical memes make students more curious about the incoming lesson than emotional memes. However, the emotional meme was also significantly more intriguing than the control condition. It further suggested that including math memes, whether emotional or mathematical, can help intrigue students going into a lesson. The study's test used a mathematical meme in the riddle format, producing slightly stronger intrigue (Van, n.d.).

Factors of Academic Achievement

Sass's (2023) timeline highlighted America's educational history from 2000. Three major events are listed: a) In 2001, the controversial No Child Left Behind Act (NCLB) was approved byCongress and signed into law by President George W. Bush in 2002. The law mandates high-stakes student testing. NCLB held schools accountable for student achievement levels and provided penalties for schools that did not make adequate yearly progress (AYP) toward meeting the goals of NCLB, b) In 2009, the Common Core State Standards (CCSS) Initiative was launched. Common Core moved from theory to reality in 2015. It began to have practical impacts on how and what teachers around the country were teaching, and c) In 2015, the U.S. Senate and President Obama approved Every Student Succeeds Act (ESSA), which replaces, No Child Left Behind and allows more state control in judging school quality (Berman, 2015). Accountabilities are the first step toward America becoming a future educational leader. Educators could question if accountability measures need revision to better align with the needs of future employers (Berman, 2015).

Barnes (2020) observed that the Scholastic Aptitude Test (SAT) and American College Test (ACT) are obsolescent ways of evaluating college readiness and potential to succeed in the workforce. Barnes (2020) stated, "They are not the metric of career success in the Technology Age, of a gig economy, highly skilled, with rapid innovation driven by agile planning and upskilling" (p. 1). Educators may question whether standardized tests predict success in colleges and the job market. Furthermore, students may question the reasons for working towards successful performance on high-stakes tests.

Much research provides information on how school climate and student motivation impact students' academic achievement. However, far less research has been conducted about the mediating effects of motivation in linking student perceptions of school climate to achievement in reading and mathematics. Fan and Williams (2018) examined the role of self-efficacy and intrinsic motivation in linking student perceptions of school climate to reading and mathematics achievement.

Fan and William's (2018) study described self-efficacy as an individual's perceptions and beliefs of their capabilities and what they expect to achieve with these capabilities. In other words, self-efficacy is a student's confidence to control their motivation, behavior, and social environment (Bandura, 1997). Intrinsic motivation is an individual's desire to engage in reading and math activities for interest and enjoyment (Schunk & Zimmerman, 2006). Bandura (2001), stated:

> Both the appraisal of relationships that occur within the social environment and appraisals of structures within the social environment which represent the broader systems that direct behavior such as rules, norms, and social practices are

> significant in the development and maintenance of personal motivational processes including both self-efficacy and intrinsic motivation. (p. 4)

Hoy and Mizkel (2013) suggested that an open climate is cooperation and respect between faculty members and between the faculty and the administration. Furthermore, students of all ages would benefit from being a part of a functional school climate. Hoy and Mizkel (2013) analyzed climate profiles of open and closed elementary schools and found that disengagement is significantly lower in a closed climate than in an open climate. Fan and Williams (2018) examined two dimensions of students' perceptions regarding school climate. The first is order, safety, and discipline; the second is fairness, clarity of school rules, and teacher/student relationships. The results favored relations between perceptions of teacher/student relationships and all four motivation constructs. Fan and Williams (2018) suggested "… that educators can influence student's perceptions of self-efficacy and intrinsic motivation at school through their thoughtful interactions with students" (p. 11).

Furthermore, the research found a negative result concerning students' perceptions of order/safety/discipline and intrinsic motivation. Students' perception of fairness/clarity of school rules and self-efficacy was also reported negatively (Fan & Williams, 2018). A previous study by McMahan et al. (2009) found that low friction predicted higher self-efficacy. Fan and Williams (2018) suggested that the results differed because the motivational measures reflect a student's view of classroom experiences versus the entire school climate.

Geary (2018) found that academic achievement improves when students are involved in extracurricular activities and describes the importance of volunteering in various activities or organizations. Geary (2018) stated:

> … it is especially important for educators to understand the developmental stages of our youth fully, get to know their students and their learning styles make modifications to meet their needs and be a good role model. Opportunities for extracurricular activities must be available to all students, whether in various sports, clubs, art, music, or journalism. (p. 43)

Geary (2018) further stated that teachers should encourage all students to get involved, set and accomplish goals, succeed, and teach them how to be good and responsible children, adolescents, teenagers, and adults.

Atit and Power (2020) examined the role of spatial skills and mathematics motivation in middle school mathematics achievement. A student's expectancy is guided by their belief in their ability and self-efficacy to succeed in mathematics. There are four components that students may value, which are intrinsic interest, attainment value, utility, and cost. A student's intrinsic interest is enjoying a math task. The importance of doing well on a math task is attainment value. Utility value is why a student may need to know math for their future.

Moreover, the cost is the effort and time needed to complete a math task (Wigfield & Eccles, 2000). Mathematics expectancy and value beliefs decline as the student enters middle school grade levels (Jacobs & Lanza, 2002). Self-regulation influences a student's learning behavior (Atit & Power, 2020).

Knowledge and ego are two types of goal orientations (Duda & Nicholls, 1992). Students with a knowledge orientation value knowledge and learning new skills by working hard, attempting problems, and working with others, extending to being more actively involved in a cognitive task. Students with an ego orientation value superior ability and believe that success comes from comparing themselves to their peers, extending to showing little to no changes in

their cognitive engagement. Some students do not value challenging work and believe that good behavior in class will lead them to success (Atit & Power, 2020).

Lee (2009) stated that mathematical anxiety slows down mathematics achievement for most people. Mathematics anxiety is "feelings of tension and anxiety that interfere with manipulating numbers and solving mathematical problems in a wide variety of ordinary life and academic situations" (Lee, 2009, p. 551). A positive predictor of mathematics achievement is self-efficacy, a student's belief in their ability to succeed in mathematics. With difficult math tasks, high self-efficacy students show greater persistence in all skill levels than low self-efficacy students. Furthermore, Lee (2009) noted that a student's mathematics motivation is influenced by many factors, such as goal orientations, beliefs about what is important, and perceptions about their contributions.

Atit and Power (2020) examined students' motivation for learning mathematics. The measures used in the study consisted of two questionnaires, Glynn and Taasoobshirazi's (2007) Science Motivation Questionnaire (SMQ), and the Mathematics Motivation Questionnaire (MMQ). The MMQ measured the following six motivational constructs: intrinsically motivated math learning, extrinsically motivated math learning, the relevance of math learning to personal goals, self-determination, self-efficacy, and low math anxiety.

In combination, spatial skills and motivation may predict mathematical performance. Spatial sense is an understanding of shape, size, position, direction, and movement, which can mean being able to describe and classify the physical world we live in. In high school, this course of study is called Geometry (Australian Government, 2020). A major part of spatial reasoning is imagining, where students use their imagination to help them see and move objects; for example, demonstrating to students the number line with the help of blocks, then asking

students to visualize different numbers in their heads with these blocks (Using Spatial Reasoning in Math, 2017). When confidence and math anxiety were included in the design, spatial skills predicted mathematics performance in boys, but there was no difference in girls (Atit & Power, 2020).

Ferguson and Maloney (2015) concluded that spatial skills and math anxiety might be linked because students with high math anxiety performed worse on spatial skills tests than students with low mathematics anxiety. From Maloney (2011), understanding to what extent motivational factors combined with spatial skills predict mathematics achievement at the middle school level could explain how to increase mathematics outcomes and improve students' interest in STEM occupations. Ferguson and Maloney (2015) examined whether spatial skills and mathematics motivation individually predicted middle school students' mathematical achievement and whether these relations were moderated by gender. Secondly, they investigated how students' spatial skills and motivation predicted middle school students' mathematics achievement, and lastly, if student mathematics performance differed between students with low compared to prominent levels of spatial skills.

Atit and Power (2020) highlighted the need to simulate cognitive and motivational factors in teaching mathematics performance. The findings provided the importance of how spatial skills and motivation for learning mathematics are the main factors of middle school students' mathematics achievement. Students' ability to mentally visualize and manipulate images is a cognitive skill intertwined with positive student motivation and is crucial for mathematical success and outcomes (Atit & Power, 2020). Also, the findings demonstrated that various levels students have with spatial skills are not factors in the motivation of students' mathematics achievement.

Longoria (2021) stated that transitioning to middle school can be one the most challenging times for student's developmentally and academically. The support they receive, and their comprehension of the new learning environment are essential. Longoria's (2021) quantitative research study explored a range of factors that contribute to motivation and student achievement, including reading and math as students transition from elementary to middle school. Middle school students from two Rio Grande Valley urban middle schools with a sample of 100 students participated in the study. Math and reading STAAR scores for 5th -grade and 6th -grade were evaluated to determine if students' academic performance on the tests had improved, stayed the same, or decreased. The students also completed a survey to determine additional variables that contributed to the student's performance on the test. A multiple linear regression analysis was used to determine the variables that contributed to motivation and the level of performance on reading and math STAAR tests when students transition from elementary to middle school. The study found that motivation had a significant correlation to student achievement when merged with students having the support of a mentor, math and reading perceptions, students' transition experience, and parental involvement. The regression evaluation results indicated that there were five significant independent factors contributing to academic success. At 37.5% of the total variance, motivation was the most significant of the five independent factors. The other variables included mentorship, math perception, reading perception, transition experience, and parental involvement. In combination, the five independent factors contributed to 66% of the study experience (Longoria, 2021).

Transition students need individuals that are already established in the new setting to acknowledge their needs. Also, students have someone within to help customize this new experience, by providing support for them to acclimate to their surroundings (L'Esperance et al.,

2013). Developing good, positive relationships with individuals is important for the well-being of the student. It is also imperative for adolescents to have a safe and positively influential learning environment (Bandura, 2000).

Longoria (2021) conducted a study about the academic effects on students when transitioning to a new learning environment. The social cognitive theory shows similarity with the results from the study, indicating the significance of motivation and the development of constructive behaviors (Longoria, 2021). The experience students gain by observing and interacting with others is the evidence that supports motivation and the social cognitive theory. Motivation and its influence on academic success proved to be connected to numerous factors. It is significant to develop relationships and have positive associations with individuals in a safe and positively influential learning environment (Bandura, 1996; Bandura, 2000). Adolescents need to conform to the environment that allows them independence and a chance to find the reasons for and importance in what they are learning (Bandura, 1996; Bandura, 2000). The environment-fit theory is defined as having the connections and real-life applications that will ensure the learning is perceived as beneficial, of interest, and exciting (Eccles et al., 1993).

From the perspective of the students, Longoria (2021) was able to obtain valuable information about the transition from elementary school to middle school and gain more specific knowledge of variables that may be contributing to the academic decrease in reading and math scores in their first year.

Longoria (2021) found six significant areas contributing to the academic and developmental decrease in the students' reading and math achievement levels:

- teachers having the support of their leaders with the develop of relevant and real-life lessons to make connections to the learning – strengthen students' positive perceptions about reading and mathematics,
- embedding a transition plan for each student to ensure that they have a positive experience as they move from elementary school to middle school. The students will need assistance in adjusting to and a new social realm and learning environment,
- teachers discovering innovative ways to challenge and motivate all students. For academic success, assist and support teachers in making learning fun and interesting,
- school's focus on creating positive climates is crucial. The school culture should demonstrate trusting, be supportive, and develop caring relationships between staff and students,
- schools finding a way to connect every student with a mentor that supports their social, emotional, and academic needs - students should attend an advisory class that will assist in these needs, and students should get involved in an area of interest at school, and
- schools inviting parents to stay connected to the school. (Longoria, 2021, p. 71)

Erentaite et al. (2022) explored the diverseness of motivation, comparing performance connections by applying a student-oriented approach. The study found an association with student background and perceived classroom climate to achievement motivation and performance in middle school students. The researchers identified student subgroups with different patterns of motivation and performance without assuming a consistent coalition between these constructs across the entire sample. In addition, the study considered the reciprocity between distinct types of motivation, which most often is overlooked in variable-oriented studies. Erentaite et al. (2022) examined three key aspects of achievement motivation:

academic self-concept, academic task value, and positive school-related affect. The two aspects of school performance were standardized test scores in reading and math. Achievement, motivation, and performance at school are reciprocally related. Empirical studies have reported a significant difference in the findings, with some of the studies revealing the associations between the constructs to be weaker than expected (for meta-analyses and reviews, see Hansford & Hattie, 1982; Valentine et al., 2004).

In Huang's (2011) meta-analysis studies, the researchers discovered varying sizes of the links between motivational constructs and performance. The long-term connections with academic performance were distinguished as medium to large in the aspect of achievement motivation and academic self-concept (Huang, 2011). In comparison, the cross-sectional correlations between self-concept and performance reported in Erentaite et al.'s (2022) meta-analysis differed between 0.17 and 0.3, indicating a weak to moderate cross-sectional association. Valentine et al. (2004) reported in an earlier study that a small mean regression coefficient of 0.08 between self-related characteristics of motivation and subsequent academic performance. Subsequently, the effect varied across the studies included in this meta-analysis, which is in line with an earlier meta-analysis about the same issue (Hansford & Hattie, 1982). Korpershoek et al. (2019), found a weak characterization in the correlation between school-related affect and achievement. Erentaite et al. (2022) did not find any connection between academic task value and school performance among secondary school students, but a null to weak correlation of task value with knowledge and skills was reported in a meta-analysis with adult learners.

Erentaite et al. (2022) proceeded to understand the link between motivation and performance. They viewed the perspectives of two cohorts, which consisted of 998 students for

one sample group and 441 students in a second. The researchers examined typical patterns of motivation and performance and their correlates. The researchers identified both concordant and discordant patterns of achievement motivation and performance. Low motivation and low performance students (34%) and high motivation and high-performance students (18%) were compared in Erentaite et al.'s (2022) study. The levels of motivation were highly consistent with scores on math and reading assessments. Other subgroups that differed were student socio-economic background, special educational needs, gender, and perceptions of classroom climate. The research revealed context-dependent patterns of the correlation between characteristics of achievement motivation and performance. Meaning, educators should understand that the relation between achievement motivation and performance at school may play out differently for different students.

Some students' motivation to learn may be mostly connected to their learning results, while other students' performance may differ from their achievement motivation. The differences between individual students may become extremely important in middle school, especially among low-performing students. Some students' motivation to learn and school performance declined in middle school. The type of middle school students who drop in school performance and motivation is not only low-performance but anxious and socio-economically vulnerable (Eccles & Roeser, 2009). To address the learning needs of all students, schools should improve their understanding of the diverseness in their achievement motivation and performance (Eccles & Roeser, 2009). Erentaite et al. (2022) relied primarily on a person-oriented approach and focused on identifying patterns of achievement, motivation, and performance in two cohorts of 8th-grade students. Erentaite et al. (2022) discovered a comprehensive understanding of all

types of student learners and classroom characteristics related to several types of motivation and performance in middle school.

Korpershoek et al. (2019) did not find any substantial association between the previously mentioned characteristics of achievement, motivation, and academic performance. Because of differing findings, Erentaite et al. (2022) stated that researchers are encouraged to discover explanations for the variations across different studies and samples. Many interested in the link between motivation and performance, should seek the operationalization and measurement of motivation and performance aspects and socio-economic status, grade, and ability, to explain the reasons for the differing results in linking motivation and performance (Hansford & Hattie, 1982; Korpershoek et al., 2019). Some or all external influences, such as, deadlines or exams, the quality of teaching and study materials, distorted perceptions of student's performance, may explain why the role of internal motivational processes are weaker than expected for academic performance (Vu et al., 2021). Influenced by external factors, strong academic performance may not necessarily lead to a higher motivation. Moreover, poor actual performance may not always be disastrous for a student willing to learn (Vu et al., 2021).

Shields (2021) discovered the most recent motivational factors that promote academic motivation among high-performing, economically disadvantaged middle school students. Two additional factors, not listed below, are for students to find a way out of poverty and aspire to attend college.

Shield (2021) highlighted the most recent motivational factors are:

> variety of learning models (ex., technology, group collaboration, and experimental/project-based learning), teachers challenging students, encouragement from teachers, parental involvement, and parent-teacher

relationship, value of education, community partners, and organizations, school activities, recreational/tutoring programs, faith-based organizations, and school connectedness, being accepted by others, support from school staff, student goals, and determination. (pp. 85-96)

Tools for Change

Yilmaz (2011) stated, "Learning theories are essential for effective teaching in that they shed light on different aspects of the learning process" (p. 204). Learning theories are separated into three main types: *behaviorism, cognitivism, and constructivism*. Yilmaz (2011) conducted a study that focused on the primary characteristics of cognitivism, its philosophical and theoretical basis, its implications for classroom practices, and its illustrative teaching methods. Yilmaz (2011) revealed the importance of teachers acquiring subject matter and pedagogical content knowledge and skills to be able to accomplish their goals effectively. Fosnot (1996) stated, "We again run the risk of short-lived reform unless educators understand the theory behind the practice" (p. 204). Behaviorism is named the dominant learning theory among teachers (Fosnot, 1996).

In contrast with cognitivism, behaviorism does not explore what is going on in students' minds. Yilmaz (2011) revealed that teachers must be more educated in applying the cognitivism perspective on learning. Yilmaz (2008b) reviewed works on educational psychology or teaching methods that indicated teachers do not recognize how learning is viewed or defined from a cognitive perspective.

Three of the eleven implications of cognitivism for classroom practices are to link new material with what is currently known, provide organized instruction, and recognize the limits of attention. Yilmaz (2011) suggested that the next steps for teachers would be utilizing the

following teaching methods based on some principles of cognitive learning theory: cognitive apprenticeship, reciprocal teaching, anchored instruction, inquiry learning, discovery learning, and problem-based learning.

Sherier (2015), a middle school student, suggests alternatives to testing, such as memory cards, board games, flashcards, and games to test knowledge of a certain subject instead of a test each week per course. She also proposed student choice in assessing skills like multiple choice, projects, or essay writing. Universities can create a more equal and empathetic college admission process by seeking alternatives to evaluate student performance. Colleges must consider the efficiency and effectiveness of the admissions evaluation, such as for standardized tests and performance assessments. Standardized tests are an analytical way to assess one candidate relative to another quickly, while performance assessments are not as efficient and require more effort to evaluate capstone and portfolio materials (Barnes, 2020). In the United States, for schools to be reformed to the theories presented in the article written by Senge (1990) as cited in Hoy and Miskel (2012), most changes will have to come from how we determine college acceptance (ACT Scores) and teacher evaluations (based on level of effectiveness).

The first step, a deep understanding of 'systems thinking', is critical. Senge (1990) stated that systems thinking is "the discipline that integrates the others, fusing them into a coherent body of theory and practice" (p. 12). Systems thinking theory comprehends and addresses the whole and examines the interrelations between the parts. Systems thinking is the cornerstone to personal knowledge, mental models, building shared vision, and team learning. Hence, learning organizations see people as active participants, reacting to the present and creating the future (Senge, 1990).

Rewards

Schools can adopt a program to reward students for mastering skills rather than reaching a particular performance level and target behaviors or tasks that students feel are achievable. Usher (2012) recommends for schools to give reward tasks that are challenging enough to maintain students' interests but not so challenging that the student gets frustrated and gives up. Additionally, schools are charged to consider academic rewards, such as books, rather than non-academic rewards, and allow students to decide if they want to work towards a reward. Schools need to have the rewards quickly given so that students see a link between their actions and the reward and have teachers or other individuals give out the rewards; importantly, students should not depend on a reward (Usher, 2012).

Assessments

Usher (2012) recommended for schools to recognize that the most motivating assessments are those with competence and interest or value dimensions. Also, Usher (2012) suggested schools make students aware of what they need to learn to do well on the assessment and remember that assessments reward skills other than performance levels, such as creativity, effort, and growth. Furthermore, schools may consider administering more frequent assessments that start with easier goals and gradually increase in difficulty or providing students with opportunities to demonstrate their knowledge with performance tasks or low-stakes tests before taking an assessment that counts (Usher, 2012).

For students in the American education system, there has been an undeniable shift in the amount of anxiety they feel when it comes to their performance in school (Neighmond, 2013). In 2013, 45 percent of students reported feeling stressed by school pressures. By 2019, 61 percent of teens said the same thing (Neighmond, 2013). Some professionals associate this with the

increasing pressure students face to attend college or university after graduation. Alternatives to testing for college acceptance are to focus on elements of their application, work portfolios, and one-on-one interviews (Neighmond, 2013).

Postsecondary Education

Postsecondary education needs to provide academic and social support, not only scholarships, to ensure students who aspire to postsecondary education are prepared. In addition, it provides access and encouragement for students to enroll early in the courses they will need to be ready for college (Usher, 2012). Usher (2012) suggested actions and policies schools can implement that may help improve student motivation.

It is important to study research on high school students' perspectives since eighth-grade students will be transitioning to high school. Two reasons for changing how high schoolers think about their education are student loan debt and the job market (Council on Foreign Relations, 2022). Over the last decade, student debt has increased at an astonishing rate. Troyer (2019) stated that the overwhelming debt has impacted how high schoolers think about their futures. Although there has been a decline in recent years, college prep has been a huge part of the high school experience for students (Troyer, 2019).

School Programs

Usher (2012) stated that schools should adopt programs to identify and address potential dropouts and students who show low motivation. Furthermore, Usher (2012) suggested that schools should provide professional development to educators to encourage student motivation by helping teachers identify students at risk of low motivation or who have social, emotional, or developmental challenges that could affect motivation. Additionally, school districts should share ways that educators can demonstrate motivation in their teaching by promoting high

expectations for all students, increasing students' autonomy, emphasizing knowledge instead of performance, or producing an environment without fear of failing by taking risks (Usher, 2012).

The Open-Systems Perspective, an integrated system model with rational and natural elements, emerged "as a set of interacting elements that acquires *inputs* from the outside, transforms them, and produces outputs for the environment" (Hoy & Miskel, 2013, p.21). Input in organizations ranges from people and raw materials to information and money. Hoy and Miskel (2013) suggested, "In the transformational process, inputs are changed into something of value, called outputs, which are then exported back into the environment" (p. 21). Schools and school systems can adapt to rapid change if given the autonomy to produce different outputs from the current ones. For example, school leaders should influence state leaders to decrease teachers' pressures regarding the teacher-effectiveness requirement for tenure and position security by using fewer behavioral perspectives and more constructivism and cognitive perspectives on learning. This change in the transformation process would change the environment and its output products (Hoy & Miskel, 2013).

As designers, stewards, and teachers, leaders can expand capabilities to understand complexity, clarify vision, and improve shared mental models (Senge, 1990). Systems thinking for learning organizations can decentralize the role of leadership in organizations, while still incorporating policies, strategies, and structure, but more importantly, developing a common vision, core values, and mental models. It is imperative to design the learning process to deal productively with leaders' critical issues. People tend to focus on the parts rather than seeing the whole, and they fail to see an organization as a powerful process. Senge (1990) stated, “We learn best from our experience, but we never directly experience the consequences of many of our most important decisions” (p. 6). Typically, people look to actions that produce improvements in

a brief amount of time, instead of viewing actions in systems terms which involve significant long-term results.

The power of influence is a way school reconstruction can begin. For 'true' school reform, political leaders (federal, state, and local), universities (new inspiring leaders and teachers), and current school leaders and teachers will need to be educated and committed to the theories of systems thinking, open-systems perspective, and the approaches and applications of the technical core (Senge, 1990).

A major issue for students is academic underachievement. When unmotivated students begin to sense that it is unlikely that they will meet grade level expectations, graduate, attend college, or obtain a well-paying job, they have reasons to not meet school expectations, take school seriously, master the classroom material, and they will eventually drop out of school (Nance, 2016).

Sacks (2016) suggested for the nation to move more families out of poverty, but there are many obstacles to lower-income children's academic achievement. Sacks (2016) stated that one solution would be to include more parents, caregivers, and communities in the educational system. There are only a few promising solutions that may help the country to efficiently narrow the achievement gap for children who presently live in poverty, such as providing families with support and education, home visits programs, and improving families' access to Head Start programs. Nance (2016) stated:

> Too often educators teach students with acute needs, but current federal and state education funding laws do not provide adequate school resources to address those needs. The result is that many of those students fall behind their peers, become disengaged and disillusioned with the educational process, misbehave, and drop

> out or are pushed out of school, which, again, significantly increases the probability of becoming involved in the juvenile justice system. (p. 317)

Jacobs and Ryan (2018) stated that early childhood maltreatment is associated with significantly lower academic outcomes. Jacobs and Ryan's (2018) Michigan study of third graders concluded that approximately 18 percent had been formally investigated by Child Protective Services (CPS) for maltreatment. Children with an experience of early childhood maltreatment typically come from disadvantaged families (Jacobs & Ryan, 2018) - leading to a probable academic performance decline. After reviewing the estimates of maltreatment, Jacobs and Ryan (2018) indicated that child abuse and neglect could not be treated as a secondary issue.

Motivational factors that influenced students years ago may not be what influences students today. Mental health challenges that impact a student's full access to and participation in learning are a struggle for many middle school students. These challenges are often misconceived and can lead to behaviors that are inconsistent with school expectations (Cardona, 2021). The COVID-19 pandemic intensified social and emotional health and personal importance for students. Prior to COVID-19, social and emotional health and personal importance were not given the same amount of attention to student's well-being (Cardona, 2021).

National Research Center on the Gifted and Talented (NRCGT) (2013) stated that utility values are how useful learning is to a student's future. Instructional activities must be important to the student's future vision or significant to their pursuit of other goals. NRCGT (2013) further stated that educators and parents should help students see beyond the current activity to its long-term benefits. Additionally, research on gifted underachievers has demonstrated the significance

of gifted students acquiring academic and career goals. Personal importance is when students believe they are good at a particular subject and stress that attainment is important.

Evaluation of Instructional Programs (2021) in a particular school district stated the following:

> Various assessment resources, including state-mandated comprehensive test results, should be utilized to evaluate the curriculum. The Superintendent of Schools shall report annually to the Board of Education on the progress the schools are making toward attaining their educational goals. To facilitate instructional improvement, all major programs and curriculum changes will be evaluated. The evaluation timelines will be established when the Board approves the major programs and curriculum changes (Policy 4.702).

In addition, a particular school district stated the following in 2022:

> A system-wide curriculum council shall be established and maintained under the direction of the Superintendent of Schools. The system wide curriculum council will be a vehicle to provide the support and resources required for the system wide improvement of curricula and instruction (Policy 4.200).

Campbell's Law (Campbell, 1976) found that the more any quantitative indicator is used, the more it will distort and corrupt the process it is wanted to monitor (Goldstein, 2011). Benchmark testing is a good indicator of acquired knowledge but is only useful if the teacher analyzes the results for modifications/reteaching and discusses the results with the students for future improvements. Additionally, benchmark testing should be limited to one per nine-week period. Lezotte (1991) stated that if students spend ample amounts of time learning certain skills, they will more than likely comprehend those skills. Benchmark testing can take away two days

of instruction; one day for students to take the benchmark and another day to do error analysis of frequently missed problems from the group. Hoy and Miskel (2013) stated that standardized tests have difficulty capturing real-life problems.

Berliner (2011) suggests that the higher the stakes are in testing, the less likely to get an accurate measure of the curriculum you want to evaluate. An example, the New York Police Department wanted to increase the number of cleared cases. To meet the high stakes demands, officers convinced criminals to confess to non-related charges. In return for their confessions, criminals received a lesser charge, and officers could now report a clear case. When stakes go up, validity goes down (Berliner, 2011).

Fairbanks (2021) stated that many educators know that when middle school students do well in mathematics, they experience higher enjoyment. In addition, when students do well, they have more confidence. Confidence and enjoyment with mathematics will make students successful in that class (Middleton & Spanias, 1999). Finally, students who reported earning good grades, an A or B, also reported positive parent involvement and teacher support. Teachers can support students and create a classroom atmosphere that is valuable to learning while providing students a chance to learn and be successful.

Professional development can equip educators to plan lessons and activities designed to motivate students, even viewed as having long-term effects on instructional practices (Turner & Warzon, 2011). Roggeman (2021) commented about her role in training new teachers:

> Just as no two people are the same, no two students learn at the same rate. Effective educators need to be able to pivot and craft instruction that meets the needs of the individual student to address the needs of the 'whole child.' Sound knowledge in multiple learning theories is a first step to this and another reason

> great teachers work their entire careers to master both the *art and the science* of teaching. (p. 2)

Summary

Chapter 2 contains an overview of relevant research related to perceptions of educators on motivational factors and strategies influencing middle school students in mathematics courses, specifically, the achievement goal theories, and intrinsic motivation, extrinsic motivation, methods of motivation, student-centered approach, innovative technological strategies, factors of academic achievement, and tools for change. Chapter 3 describes the methodology. Chapter 4 presents this study's findings about the research questions and emergent themes. Chapter 5 presents the interpretation and discussion of data related to the essential research question, educators' perceptions on motivational strategies influencing middle school students in mathematics courses.

Chapter 3. Methodology

This phenomenological study examined educator perceptions about motivational factors influencing middle school students' motivation to progress in mathematics classes. The purpose of the study is to improve the recent trend of low academic achievement of middle school students in mathematics. The examination of motivational strategies may inform educators, leading to the improvement of math achievement.

Even though there are other means to measure student knowledge and understanding, cumulative exams are quantitative reports about what students have learned or have not learned in a particular course of study. The researcher wants to discover what educators perceive as successful motivators demonstrating growth in student understanding and comprehension of educational skills. The research involved an in-depth study of groups of individuals to discover information or to achieve a new understanding of the groups (Neubauer, 2019). Studies often require the knowledge of the experiences of others so that they can influence new insights about a certain phenomenon. Neubauer stated, "Human beings, who are almost unique in having the ability to learn from the experience of others, are also remarkable for their apparent disinclination to do so" (p. 90). Phenomenology describes the meaning of an experience in terms of what was experienced and how it was experienced (Neubauer, 2019). Qualitative phenomenology is essential for scholars to learn from the experiences of others (Neubauer et al., 2019).

Research Questions

The essential research question for this study is: What are educators' perceptions about motivational factors influencing middle school students in mathematics classes? Four supporting questions of this study are:

1. What are educators' perceptions about internal motivational strategies that have contributed to middle school students' mathematical development?

2. What are educators' perceptions about external motivational strategies that have contributed to middle school students' mathematical development?

3. Do educators use different degrees of motivational strategies to influence middle school students in mathematics?

4. How does middle school students' motivation affect the learning of mathematical concepts?

Research Design

Phenomenology is the type of qualitative study used in this study. Phenomenological research is significant to the study because it seeks to explain the nature of things through how educators experience them. Harappa (2021) described a phenomenological research design as appropriate for studying phenomena. Discovering lived experiences that impact an individual will assist in determining the level of motivational strategies a teacher or school needs to implement. Perceptions of middle school educators and studying their commonalities are highlighted in phenomenological research. In alignment with the achievement goal theories, the study's goal was for the researcher to discover things that might help educators with current strategies to motivate and engage students in mathematics courses.

The phenomenological study is the tradition most suited to successfully address motivational factors influencing middle school students to perform in mathematics courses. Phenomenology investigates the everyday experiences of human beings while discarding the researchers' prior assumptions about the phenomenon. What educators believe motivated students in the past may not be what motivates them today.

Site Selection

Two urban middle schools, Middle School 1 and Middle School 2, in northeast Tennessee, were the sites represented in the study. Educators from both schools instruct students in 6th - 8th grades. Both schools are ranked in the top 20% of Tennessee public schools. Middle School 1 and Middle School 2 are two of Tennessee's top-ranked public schools. Middle School 1 and Middle School 2 have an average math proficiency score of 41% (versus the state's public-school average of 27%) (Public School Review, 2023). Middle School 1 and Middle School 2 were selected to improve their average math proficiency scores, even though their scores averaged higher than the state. The findings in this study may assist other school districts, outside of Middle School 1 and Middle School 2's school district, in improving student progress toward learning attitudes and proficiency score averages in mathematics.

Sample

For qualitative research, the objective is not statistical significance but data saturation, requiring a purposeful sample. Fusch and Ness (2015) stated the following about data saturation, "when there is enough information to replicate the study when the ability to obtain additional new information has been attained, and when further coding is no longer feasible" (p. 1).

The sample for this study was chosen because Middle School 1 and Middle School 2 were selected by their school district to improve their average math proficiency scores. The researcher used snowball and convenience sampling to gather and analyze educator perceptions about student motivation for the study. Snowball sampling is a recruitment technique in which participants are asked to assist researchers in identifying other potential participants (Oregon State University, 2011). The researcher will use convenience sampling by asking educators who previously worked with the researcher to participate in the study.

Participants

The sample for the current study will include 15 middle school mathematics educators in grades 6th – 8th grade from Middle School 1 and Middle School 2. The study will involve voluntary participants. The participants will not have their names used in the study data collection or reports. The researcher will use pseudonyms and broad descriptors instead of names. The pseudonyms for the fifteen participants will be Teacher 1, Teacher 2, and Teacher 3, continuing chronologically.

Data Collection

The American Education Research Association (AERA) (2006) stated, "Two overarching principles underlie the development of these reporting standards: the sufficiency of the warrants and the transparency of the report." (p. 33). Warranted is when sufficient evidence must be collected to justify the research results.

The researcher will use qualitative methodologies and data collection strategies to calibrate prejudice and extrapolate the thought process of the participants, analyzing and estimating the issues from an in-depth perspective (Jamshed, 2014). The study will include semi-structured, one-to-one interviews with fifteen individual educators currently teaching 6^{th}-8^{th} grade mathematics. Each participant will be contacted by email or cellphone requesting participation. Once the participant confirms commitment, the individual interview information will be emailed. Participants will participate in audio-recorded interviews with potential follow-up interviews. The participants will answer the semi-structured interview questions in person or via Zoom. All interviews will be audio-recorded, transcribed, coded, and analyzed.

The duration of the audio interviews is forty-five minutes to one hour. In the consent letter, participants will be asked to give the researcher permission to use any quotations provided

by the participants that may be used in the researcher's presentation. All information that can identify the participant will be removed from the data.

Following the individual teacher interviews, the researcher will transcribe the audio recording to collect data for the research inquiry. The researcher will use textual memoing to write additional thoughts and new directions in the findings. The next step is to use the initial open coding with a line-by-line approach to reveal any themes from the data. Textual memoing may lead to considering additional sub-themes developing innovative ideas about the objectives if the researcher decides to continue the research topic by including student perspectives.

Individual interview responses are necessary for the triangulation of data and in-depth discussions into different perceptions about the questions posed. The data will be kept in a locked filing cabinet, and information stored on a Personal Computer (PC) will be password protected.

Data Analysis

There were three phases of data analysis. The first began with a review of all the transcribed individual teacher interviews to categorize data under the themes that emerged. In the second stage, the basic research questions were examined to begin building the explanation in narrative form. Information was outlined chronologically, and quotes were chosen to add to the explanation. Data were triangulated through multiple sources of evidence. The third stage was coding and re-coding the interviews to maintain consistency. Member checking, and their feedback was used to clarify portions of the study. Information under each factor was further categorized according to frequency. The data were compared to the achievement goal theory (Nicholls (1984) and TARGET structures (Epstein, 1989).

The coding method will be line-by-line, with a color legend for developing themes and categories. Also, the researcher may find code mapping interesting, using three iterations: the initial coding, looking for patterns in the initial coding, and the application to the data set (Anfara, 2002).

The researcher will triangulate the data in this research by implementing line-by-coding and a second numerical line-by-line coding system. The credibility of the data collected is important. The researcher must have confidence in the accuracy of the findings. The data will be transferable and dependable. The researcher must be able to provide a chain of evidence between data and conclusions. Finally, data triangulation can give a balanced and fair view of many perspectives.

Analysis and interpretation of the collected data is an important standard for qualitative research. The reporting may require clear statements of the outcomes with rigorous evidence acquired by the standards for reporting provided by AERA (2006). Methodological rigor attempts to present the data, giving explanations that are refutable, replicable, and public (Denzin, 1978). Thick description interpretations of the individual interviews will consider the directly unobservable contextual understanding of the results. This detailed level will inform educators to incorporate motivational strategies in the classroom.

Theoretical Framework

Nicholls (1984) stated, "The achievement goal theory is based on developmental ideas regarding how young people move through a temporal process whereby the concept of ability is gradually differentiated from effort, task difficulty, and luck" (p. 1). Task and ego involvement are two states of the achievement goal theory. The two contrasting states are conceptions of ability determining how students define success in learning settings (Harwood et al., 2008). A

student's internal sense of ability is viewed as high or low in their previous academic performance (Nicholls, 1984). The theoretical framework for this study will be aligned with achievement goal theory.

This study suggests to educators the significance of implementing classroom strategies through the Achievement goal theories and TARGET as the foundation for influencing middle school students to improve academic achievement in mathematics courses. The researcher will argue the importance of utilizing the Achievement goal theories and TARGET as a roadmap to student progress in middle school mathematics.

Assessment of Quality and Rigor

Credibility

The researcher's bias can influence the study, especially in phenomenological research. Bias is a disadvantage but is admitted and mitigated rather than ignored (Regoli, 2017). A qualitative study requires that it must be credible and trustworthy. With individual interview responses, triangulation of the data would strengthen the credibility of the findings. Member checks will be conducted for respondent validation. The individual interview results may be returned to participants to check for accuracy and should resonate with their experiences. The researcher can establish credibility by following the Institutional Review Board (IRB) 's statements and the participant content form.

Transferability

In qualitative research, transferability is interchangeable with generalizability. The current research study is transferable since the evidence findings can be utilized within other contexts, situations, times, and populations (Sutton & Austin, 2015). Teachers need the most innovative tools and strategies to help their students to progress in the classroom and with

comprehensive exams. Educators interviewed in the study could expand to a much larger sample of teacher interviews across the state. The study's continuation would deliver perspectives from many cultures and demographic areas. Students included in individual interviews would also provide rich data about what factors motivate them.

Dependability

The coding and re-coding methods will be line-by-line, with a color legend for developing themes and categories. Peer examination of the study will allow qualified, impartial colleagues to review and assess the transcripts, methodology, and findings. The researcher will use peer examination techniques to inquire about the process in an independent, unbiased way to establish credibility. One of the four criteria of trustworthiness is dependability. The current study demonstrates dependability since the results will show that they are consistent and can be repeated (Sutton & Austin, 2015).

Confirmability

Creswell (1998) suggested that at least two verification procedures be administered. There are eight verification procedures: prolonged engagement and persistent observation, thick description, clarifying researcher bias, triangulation, peer review, external audits, negative case analysis, and member checks.

The researcher will use triangulation matrices to study what motivates middle school students in mathematics courses. Internal validity is a common criticism of qualitative research (LeCompte & Goetz, 1982). Triangulation between the individual interviews will strengthen the validity and reliability of the research (Anfara, 2002). A second verification procedure the researcher will utilize is member checks.

Ethical Considerations

The researcher's role is to communicate their research, to collaborate with others where appropriate, and to transfer and exploit knowledge to middle schools and school districts (Sutton & Austin, 2015). The researcher in this study has been a mathematics educator for the last 28 years. The researcher strived to be unbiased in their approach and writing to this topic. The researcher will be honest and ethical throughout the research process. For the duration of the research project, the researcher will follow the code of ethics for East Tennessee State University's Educational Leadership and Policy Analysis Program. The researcher gained prior approval from the dissertation committee in the Educational Leadership and Policy Analysis department of East Tennessee State University before any participants were recruited for this study. After the research study was approved by the dissertation committee, the researcher requested and received approval from the East Tennessee State University Institutional Review Board (IRB).

The researcher has disclosed the purpose of the study and respects the norms and characteristics of all cultures. All participation in this study was voluntary and the participants were given the option to stop at any time. Each participant signed an informed consent, and IRB requirements were explained to each participant. Under IRB regulations, the researcher will protect the identity of all participants by keeping their identity anonymous by coding their responses and using numbers and letters to identify the interviewees instead of using their names. The employment and location of the participants will also be anonymous to protect their identity. As required by the IRB, the transcripts of the interviews and the digital recordings will be housed in a secure password protected file for 6 years.

Summary

Chapter 3 contains the methodology related to the essential research question, educators' perceptions on motivational strategies influencing middle school students in mathematics courses. The research questions and research design, site selection, population and sample, participant information, data collection strategies, data analysis strategies, and assessment of quality and rigor are included. Chapter 4 presents this study's findings about the research questions and emergent themes. Chapter 5 presents the interpretation and discussion of data related to the essential research question, educators' perceptions on motivational strategies influencing middle school students in mathematics courses. The framework of the achievement goal theory was used to guide the process.

Chapter 4. Findings

The purpose of this study was to examine educators' perceptions about motivational strategies influencing middle school students in mathematics classes. The researcher used the achievement goal theories and TARGET (tasks, authority, recognition, group, evaluation, and time) framework to the motivational strategies significant in 6th – 8th grade mathematics comprehension. The achievement goal theories define substantial accomplishments as a precursor to understanding students' motivational processes (Duda, 2001). Achievement Goal interventions intend to promote a mastery-oriented classroom structure (Ames, 1992). Educators applying classroom-level interventions can do so with the principles summarized in TARGET. Ryan and Deci (2017) discovered that educators aspire to make tasks meaningful and present various degrees of challenge without disclosing differences in ability. This framework helped the researcher argue the importance of utilizing the achievement goal theories and TARGET (Task, Authority, Rewards, Grouping, Evaluation, and Time) as a roadmap to student progress in middle school mathematics.

In mastery-approach structuring, teachers should group students according to interest or by students' differences that may enable learning instead of a student's ability levels. Teachers should privately evaluate a student's progress rather than class performance. Finally, providing time to complete assignments should be flexible so students can work independently. Ryan and Deci (2017) found alignment with other achievement motivation research highlighting the importance of supporting students' needs for relatedness and connection.

Chapter 4 presents the participants' perceptions of what strategies influenced student progress in mathematics as found in their recorded responses to the interview questions. In conclusion of the 15 educator interviews, five emergent themes were revealed. The five

emergent themes are educator perceptions about middle school students' internal (intrinsic) motivation, external (extrinsic) motivation, building thinking classrooms, student choice in the classroom, and building relationships with students. Information was gathered from 15 participants, both male and female, ranging from 2-30 years of teaching experience. These participants are all licensed teachers from two middles schools in northeast Tennessee.

Description of Participants

The sample for the current study included 15 middle school mathematics educators in 6th – 8th grade from Middle School 1 and Middle School 2. Emails were sent to twenty-five 6^{th} – 8^{th} middle school math teachers, special education teachers, and one math coach. Thirteen middle school math teachers, one special education teacher, and one math coach agreed to participate in the study. Six participants currently teach 8th-grade mathematics, 4 teach 7^{th} grade, and 3 teach 6^{th} grade. Two of the six 8^{th} grade math teachers also teach Algebra 1 to the highest-level math students from both middle schools. Out of the 15 participants, 12 were female and 3 were male. The study involved voluntary participants, who were at least 18 years old. To keep confidentiality, each participant was assigned a pseudonym. The researcher assigned each participant a pseudonym instead of names and broad descriptors. The pseudonyms for the fifteen participants will be Educator One, Educator Two, and Educator Three, continuing chronologically. Table 1 is a summary of participant information.

Table 1

Participant Information

Participants	Male (M) or Female (F)	Current Teaching Assignment	Years of Teaching Experience
Educator One	F	8^{th}- Grade Algebra 1/Math 8	18

Educator Two	F	8th- Grade Algebra 1/Math 8	19
Educator Three	F	Pre-Algebra/Math 7	29
Educator Four	F	Pre-Algebra/Math 7	12
Educator Five	F	8th- Grade Math	19
Educator Six	F	Pre-Algebra/Math 7	30
Educator Seven	F	6th-8th- Grade Special Education	3
Educator Eight	F	6th-8th – Grade Math Coach / Math Teacher	2 / 21
Educator Nine	F	8th- Grade Math	26
Educator Ten	M	Pre-Algebra/ Math 7	21
Educator Eleven	M	6th- Grade Mathematics	20
Educator Twelve	F	8th- Grade Algebra 1/Math 8	13
Educator Thirteen	F	8th- Grade Algebra 1/Math 8	2
Educator Fourteen	F	6th- Grade Mathematics	15
Educator Fifteen	M	7th- Grade Mathematics	27

Semi-Structured Interview Questions

In the semi-structured interviews, the participants were asked a series of questions. (Appendix A). The following sections will discuss those questions' outcomes and the themes that emerged. The 15 interview questions were intended to discover educator perceptions about motivational strategies that influence middle school students to perform in mathematics classes. Questions 1 through 5, 9, and 15 addressed internal (intrinsic) motivational strategies, question 7 external (extrinsic) motivational strategies, questions 10 and 12 pertained to building thinking

classrooms and communication with students. Question 8 addressed student choice as a motivator, and questions 6, 11, and 14 discussed how building relationships motivates students in 6^{th} - 8^{th} grades. One additional question was asked of the participants.

Analysis of Data

Data collection strategies included one-on-one semi-structured middle school educator interviews. Analysis of data occurred in three phases: (a) categorization of data under the five organizational factors, (b) building the explanation in narrative form, and (c) re-examination of the data. The analysis of the phenomenological study data was based on the theoretical framework of the achievement goal theories - the differences in how people judge their perceptions of competence (Nicholls, 1984) and TARGET structures (Epstein, 1989). The credibility of the analysis was protected by triangulation of data through multiple sources of evidence, establishment of a chain of evidence, and member checking. The results revealed that current and innovative motivational strategies influenced students in middle school mathematics. The results also revealed how educators motivate middle school students through traditional and non-traditional strategies. Five themes emerged from the interview data analysis that contribute to the motivation of middle school students: (1) internal motivation, (2) external motivation, (3) building thinking classrooms, (4) student choice, and (5) building relationships.

The main question of this study was: What are educators' perceptions about motivational strategies influencing middle school students in mathematics classes? To gather data to address this question, 15 participants were interviewed using semi-structured questions and an interview guide to ensure consistency. The interview guide used was based around these four questions:

1. What are educators' perceptions about internal motivational strategies that have contributed to middle school student's mathematical development?

2. What are educators' perceptions about external motivational strategies that have contributed to middle school students' mathematical development?

3. Do educators use different degrees of motivational strategies to influence middle school students in mathematics?

4. How does middle school students' motivation affect the learning of mathematical concepts?

Chapter 4 presents the participants' perceptions as to what factors contributed to their success as found in their recorded responses to the interview questions.

Internal Motivation

One emergent theme revealed educator perceptions about internal (intrinsic) motivational strategies found to influence middle school students in mathematics classes. Intrinsic motivation refers to motivation within an individual driven by personal interest, enjoyment, or a sense of accomplishment. When students are intrinsically motivated, they engage in an activity because they find it inherently satisfying or meaningful, without relying on external factors like rewards or support. Addison (2016) acknowledged Winston Churchill's famous quote, "Attitude is a little thing that makes a big difference" (p. 1), is instilled in students by educators, parents, coaches, and student's internal motivation.

The researcher asked the participants if students come to them with built-in internal motivational skill sets, and the educators said that some students do, but mostly, teachers must teach them intrinsic skill types such as autonomy, purpose, and mastery. Educator Two described that when grading math papers, she marks the points that students get correct instead of the ones they miss - focusing on the positive and not the negative. Educator Eleven remembered that he would show his students videos of motivational speakers, clips, videos, and life-skill-based

thinking. He further stated that it was important to him that since these students would be in my class for only a year, he would like to teach them more about life than just math. Educator Eleven expressed that his motivational techniques may not be meaningful or useful to a student within the current year, the next year, in high school, or possibly until later in life. Then the student may say, "Oh, yeah, I remember when my 6th-grade math teacher showed me that video on this, and that kind of got me thinking about stuff".

Educator Twelve stated that students must understand that mathematics is not a 'wall' in front of them. Further stating:

> When students are struggling, it is one of the biggest hurdles we must overcome. Students sometimes have the idea that they cannot improve. As teachers, we must break down these barriers and let students know that this is not the end.

Educator Twelve wants to get students to believe they can improve, but this is one of her biggest battles. She believes that students can improve with each day.

While parental support is typically considered extrinsic, it can also play a role in fostering and reinforcing intrinsic motivation. For example, a supportive and encouraging family environment can help students develop a love for learning or a strong work ethic, which can lead to intrinsic motivation to succeed in their academic pursuits. All 15 participants agreed that parental support motivates students in math courses. Three participants who teach Algebra 1 and Math 8 identified that they see more motivation from parental support in their higher-level students. All participants stated that lower-level students need parental support but have not witnessed enough support from parents. Educator Thirteen stated that talking with parents about

their student's progress was a great motivator in influencing students to perform in her math class.

Educator Two expressed the following about encouraging students to put forth effort in math classes:

> Parent involvement is good support, but sometimes that's hard to overcome because peer influences at this age are sometimes overriding, you know, even more so than parental involvement. If I communicate with the parents and they are engaged, often that is a positive support for your classroom – especially for students completing work. For many years, I'll email (a parent), and they say, 'Yes, I'm going to get them (their student) to do it (the work), and then they (the parents) don't follow through. You (teacher) know that the kid is just struggling internally, and you know parents say, "I don't know. I can't do anything with them either."

Educator Eleven posited:

> Parental guidance and influence are still there, but it is tied to those students who are intrinsically motivated to be competitive with their grades. Those parents tend also to be the parents most concerned about grades. I do find that there is a disconnect between parent and student occasionally, as parents have high expectations, and students do not have any internal motivation to do any better. They (the students) know an expectation, and some students will rise to that expectation, but as far as self-motivation to do well, it's not there for some students – so the parents are hit and miss.

Confidence in mathematics is an area that many students are lacking. Seven participants revealed that they attempt to meet students where they are with their math skills and build additional math skills from that point. The researcher read the following statement and asked the participants their thoughts and opinions: "Students must believe they can improve, or they will stop trying." All 15 participants agreed with the statement. Three of the 15 educators emphasized that students must have a growth mindset.

Educator Twelve highlighted:

> I have a student right now who is exceptionally low, and he doesn't know the prerequisites for the multi-step equation problems. So, it has been something that I've struggled with him, but yesterday we did a fun Halloween (activity), just plotting coordinate planes and making a picture, and he experienced success. I think it was the first time he's experienced success this year. He created this picture. Armstrong (another teacher) came and talked to me and said, "Tristan was so excited that he did this activity yesterday. What was it?" I was like, of course, that skill is below grade level, but by him doing that, he came in today willing to tackle what we were doing in class, which was more on grade level. So, I do things like that, and this is the kind of thing I incorporate into the spiral review time. Sometimes, it's a prerequisite skill, and with that group of students, that's where I try to hook them before I move to the new stuff. You know, the fact that he graphed a picture is an improvement, and now he believes that there's something he can do in math and build on. I've just proven that you can improve and get better, and they must believe it. Otherwise, they won't even pick up the pencil and try.

Educator Twelve said the following about intrinsically motivated students:

> I think they (the students) like the feeling of being successful. They like that feeling, and I feel like sometimes I must start with that feeling of being successful before I can tackle challenging material and teach them the endurance and the grit to persevere through more challenging things, but they all (students) want to feel successful.

Educator Eight stated, "You've got to expose the students to all levels of mathematics. You've got to allow the kids to see the math, even if you're telling me, you can't do it." Educator 11 remembered that he was one of those students who wanted to win everything. That was just his mentality, his personality. He said that he still has those individuals in his classroom. Some kids want to do the best they can do. They want to know if they did better than everyone else in the classroom all the time, but that is a small number of students. Educator Eleven emphasized that his students love any challenge. When talking to his students about their TCAP scores, he had some kids in the highest range (exceeded expectations), and when he said to them, individually,

> How about you set your goal to miss four fewer questions on the next benchmark test?" The student replied, "I was going to say to set my goal at missing two or less because I don't think I'll miss any.

Educator Eleven said, "Well, that's great. Let's give you some wiggle room because you don't have to be perfect all the time." Educator 11 revealed that he believes in teaching students to have a growth mindset because, throughout life, it may not always come easy.

Standardized tests are a state requirement for the two middle schools in the study. The researcher asked educators if they believed standardized tests, such as TCAP, motivated their students. Fourteen educators said that standardized tests did not motivate students. Four participants explained that many students are stressed and have anxiety about taking high-stakes tests. However, 5 participants noted that many high-achieving students see standardized tests as motivating because of internal motivation and placement into future courses.

Educator Twelve posited the following about standardized tests as a motivator for students:

> I don't think it's (standardized tests) a motivator for students. I think it's information for us as teachers and information for parents. I think, you know, it should be information for students, but I don't think it's a motivator, especially when we don't retain (students). At my previous school, standardized testing could (retain students). You (a student) would be retained if you did not pass classes. One of our motivators was that if the students could prove on the standardized tests that they knew enough material to succeed in the next tier or grade level, they could take the F's and go on to the next grade level. The educators felt that when they retained students who had deficits in knowledge but were willing to work, they could continue to progress at the next grade level. You could have students who lack a work ethic but somehow learn enough knowledge to have the foundation they need for the next grade level. We would let them go on. If this happened here, the TCAP would then be a motivator for them because they're (the students) trying to prove to us that they know what they're doing.

Educator Eleven said that during a meeting with a non-performing student and the school principal, he asked the student, "What can we do to help, or what can we change for you so that you want to do more in the classroom?" The student did not have an answer for himself. Educator 11 also expressed that this was one major reason he changed from teaching 8th to teaching 6th grade. He explained that in the 6th grade, you might have a few students like this, but in 8th grade he felt like many more students had reached the point in math where they just felt defeated and unsuccessful for so many years in a row that they did not see the point of even trying anymore. They knew they were behind - so the students shut down.

External Motivation

The second theme discovered educator perceptions about external (extrinsic) motivational strategies that influence 6 – 8th grade students in mathematics courses. Parental support is typically considered an extrinsic motivation for students. Extrinsic motivation refers to external factors or rewards that influence a person's behavior, such as praise, grades, money, or, in this case, support from parents. When students receive support from their parents, it can be a form of external motivation to encourage them to succeed academically or in other areas of their life. For example, parents may offer rewards or assistance with homework, which can motivate students to study or perform well in school.

Educator Eight stated:

> You must have that relationship with the parents. You must allow them to be part of your classroom- whether that is (through) Newsletters, Blooms, or email. When I taught, calculators would always go on sale, and I typically had Honors Algebra, so that I would send an (email) a week before school even started (about the calculator sale). I would introduce myself and say, "Tax-free weekend is coming

> up" or "Tomorrow, students will be going to homeroom." So, I believe in opening the door to parents; if it's open, they are more apt to come. Give them that open door.

When describing internally motivated students, Educator Two stated:

> At the eighth-grade level, they (students) are more internally motivated. Their motivation comes more intrinsically because they already desire to do well and are asking questions. They're the ones that always have their homework. They're the ones that always give you (the teacher) that parental support. Often, those are the ones that have the sports and that are involved, so you know they do have parental support. When I have those conversations with the parents of a student who is not doing homework, often there is no parental support.

Educator Twelve stated the following about parental influence in recent years:

> Students are different because parents are different. So, I think the way they view teachers and education plays in the changes. Kids are kids, and I don't feel like kids, in general, are different. They're the same kids. However, the way the parents support teachers is vastly different. Therefore, the way students act is different.

Educator Thirteen stated that making parent phone calls home was a great motivator in influencing students to perform in her math class. Coaches, sponsors, and mentors support are also motivators for middle school students. Educator Two highlighted that sports and students in the arts are more disciplined in math coursework. Educator Eleven said he regularly fills out

progress reports from most coaches for middle school sports teams, such as soccer, basketball, and cheer.

The researcher asked participants if they believed students receiving extrinsic rewards such as small prizes, tokens, extra credit, stickers, and food motivated students in the classroom. Three of the 15 participants used little extrinsic motivators, and rather, they preferred only to provide intrinsic skill sets to their students. Thirteen of the participants exercised external motivational strategies with their students.

Educator Six stated:

> I give out tickets, and we will have a ticket sale at the end of the 9- weeks. They (the students) would earn tickets for different things. My team partners didn't want to do that this year, but I felt like it was something that I needed to reach out on my own. So, what I am doing now is if they answer a question great in class, go beyond with their homework, or even if they're being kind to each other, (I am) looking outside the classroom as well, I'm giving them a ticket. And then, at the end of the nine weeks, I am drawing for 4 $5 gift cards to win. The students know that the more tickets they have, the better chance they have. The ones (students) that are going to do are going to do, unfortunately, there are ones that aren't. I think sometimes they want us to think they don't care about getting tickets, but I do sometimes see that it goes a long way if students do earn tickets because they do have a chance, and I think that helps them buy in. (The student) says, "Oh, well, you know, maybe if I do something else, then I'll get another ticket." I'm trying to think, if this is something I want to continue? I mean because it can get costly. We don't get help, but you know it is something that I'm trying to see. It

> does make some difference for most of my students. I know I won't reach all, but if I can reach most, I'm doing better than I was.

Educator Six also noted that not everybody can do enough to earn the tickets, but she also has other opportunities for students, such as having lunch with the teacher or lunch with a friend. Also, the students who got all their homework turned in get to go outside for an extra recess.

Educator Six offered incentives at the end of the 9 weeks. One incentive was for eligible students to rotate between their team classrooms. Each classroom teacher provides something fun for them to do together. One teacher will stay with the students who must stay and do their makeup work. Another teacher took the students for extra team time outside. Teacher groups would play cornhole, have relay races, and have a nacho bar. Each rotation was 15 to 20 minutes. Students who had to stay in to make up work could join the incentive activities once they finished – even if it were for one rotation, the student still had a chance to participate.

Another incentive Educator Six incorporates in her classroom was an ice cream incentive at the end of the quarter where the students must earn each part needed to make an ice cream sundae – starting with earning a bowl, then a spoon, napkin, ice cream, and up to three toppings. Each week, the team teachers orchestrated opportunities for students to earn something towards the ice cream sundae, so by the end of the 9-weeks, they earned each part. She mentioned that some students only earned a bowl, but it was a learning experience for them to work harder next time. She explained to the students that they had to have all their homework turned in and no more than one behavior alert. The students learned that they did not get the benefit if they did not complete the assignments. Educator 6 emphasized that the students must turn in good quality work, keep track of their grades, and have good overall behavior to attend the ice cream party.

Educator Fifteen stated, "Middle schoolers are motivated by candy, and I have a big bag beside me." He commented that “if they can come back and give me a great answer on something, that is wonderful." Educator Fifteen gives rewards for doing well on the quarterly checkpoints by getting them donuts or something of the sort. He said that even though it is money out of his pocket, it is well worth it if you can get those results.

Educator Thirteen revealed, "So it's amazing what they'll do for a scratch and sniff sticker. They'll attempt extra credit for those - no extra points, just that.” She added that she would offer the students a tootsie pop question towards the end of the semester, and if they answered a higher-order thinking question, she would give them a tootsie. Educator 13 also mentioned that her team, Team Bobcat, discussed having Popsicle Fridays for the students who had all their assignments turned in for the week. She believes that offering students with positive reinforcement would be good.

Educator Fourteen was asked if any team (consisting of 3 or 4 core subject teachers) incentives were provided for students. She said that they did. Students could participate in the incentive activities mostly for effort during the nine weeks. Students had to get everything completed and turned in on time. She and other participants stated that students who try with good effort also get to attend the celebration. Some team celebrations include movie day, extra team time, or beach days. Some students did not get to celebrate because they were missing many assignments or did not get the work in on time. Two participants said they let the students go to the team activities after finishing their missing work.

Building Thinking Classrooms

The third theme revealed educator perceptions about building thinking classrooms through innovative strategies and communication through consistency and data-conferencing

with middle school students. Liljedahl (2021) stated that educators often struggle to implement lessons that help students beyond rote memorization and repetitive calculations. Institutional norms and habits that infiltrate all classrooms can enable “non-thinking” student behavior. Liljedahl (2021) observed that teachers have difficulty implementing rich mathematics tasks to engage students in deep thinking. Participants in this study shared accounts of traditional and non-traditional motivational strategies that promote building thinking classrooms.

Educator Four explained that she will display a lesson slide, and the students will be asked to do much questioning and thinking about why they are to follow certain procedures in math. She mentioned that she likes to teach math in an inquiry-type way and incorporate partner work in her lesson design. Through the years, she has found that many middle school teachers do not like to do group work, but she still likes to do group work in addition to some independent practice. She utilizes exit tickets to give students an opportunity for a formative assessment.

Educator Four posited:

> We have a math warm-up that we do every day. I do it differently than some other teachers. Even though I use the same materials as the other teachers, I prefer to make Monday through Wednesday (the first three days of the week) for practice. You (the student) try to do it and get it done, and if you ask for help, I'll help you. When we go over it (the warm-ups), we all go over it together, make corrections, and try to learn from our mistakes. Middle schoolers sometimes have difficulty being confident enough to give something a shot. Last year, I had kids who would sit there and not write anything down, so that's why I started doing this type of warm-up. It's all being built by Thursday, so you should know what to do because we've had many examples. At the end of the week, I collect it for a grade. (Some

students said), "Well, I don't have to work that hard at this on Monday through Wednesday because she's going to go over it in a little bit, and I can just write it down." (If I) start to see kids doing that, I will say, "I'm not going over it today. It'll be homework, and I'll go over those answers tomorrow".

Educator Four stated that she loves to do Gimkit with her students in the classroom. Gimkit is a new, innovative way for students to use gaming to learn mathematics. Gimkit is a game teachers use with their students in the classroom that requires knowledge, collaboration, and strategy to win. She also uses Reflex Math, another program designed to introduce math skills through games. Educator Four uses non-computer-based games in her classroom as a motivator too.

Educator Four revealed an innovative game she plays with her students in 7th grade called A Glow Party. The students are all to wear white clothing in the Glow classroom so they will also glow. Then, she reviews their math skills before the checkpoint by blacking out the windows and turning on four big black lights. She then will put up white paper and give the students highlighters for writing. Educator 4 said the students love reviewing math skills with a Glow Party.

The Unfair Game is another interactive game used in Educator Four's classroom. This game starts with every student getting a number, and if the students got their math question right, they would get to put their number on the board next to a prize. Educator 4 would have many different prizes. The game would continue with math questions and more options for students to put their number beside a prize. It worked similarly to an auction, so the prize was won by the student who had their number posted the most beside the prize.

Educator 8 also mentioned some exciting motivational strategies that may influence and attempt to get middle school students interested in mathematics. If it is being silly, if it is reading a book such as *The Very Hungry Caterpillar* to explain exponential growth, singing a song such as the tune of *Pop Goes the Weasel* to introduce the quadratic formula, doing a cheer to introduce a new math skill, or anything that you can do to get the students to be involved and enjoy learning.

Educator 9 highlighted a typical day in her classroom:

> I do a specific warm-up targeted toward a certain skill or standard, and it should be a review and problems that are spiraled in intentionally. The warm-up might be an individual whiteboard review where I'm just putting things under the document camera, and they (the students) are responding to me on the individual whiteboards as a class because it's such valuable feedback. I will see them as a group and know if I get the students' answer B (the correct answer), then I decide, "Okay, they've got that, or they didn't get that, and I'll show them why, and the reason." There are other days where I might have a piece of paper that's just maybe 4 or 5 questions for warm-up. It might be that we use that time to go over an assessment from the day before. If it's a quiz or something that doesn't take up much time, we might use that. And then, after the warm-up, there are times when we turn in homework. There are times when we grade homework. If we grade it, sometimes they keep their own to get that feedback. However, I don't want to give them any practice or activity that they don't get feedback from because I feel like it is a wasted effort on their part, and I am not doing them any services by saying, "Okay, well, that's just not going to count." They (the students) need to know

> what they're doing wrong. I always want to see what the product is, you know. Are they understanding? And then I'll go on to the new lesson. I do like to give them lots of examples. (Then the teacher said) "I've taught this skill, provided examples, given you notes, and you have all the tools you need. Are you ready?" I use a color-coded card system for them to give me feedback - red, yellow, and green. So, if they show red, they're lost, yellow (means) they need more time and more help, and then green (means), "I've got it, I'm good, I'm independent, I can go on." So, if they (the students) give me lots of yellow or red, I'll know it's not time yet. I need to keep on with this, and I need to give them more. I work with small groups in the back of the room, and when the majority is ready, we go on.

Educator 9 shared that she uses IXL's Group Jam and Leaderboard with her students because IXL practices the standards, and the students love competition. Group Jam is when the teacher can work on a problem with them. The Leaderboard is when the teacher sets a start and finish time, with parameters about what allows the students to be on the Leaderboard. A teacher can set the IXL session to have students get points by correct answers to questions or the number of questions answered. The teacher can also set the grade level that you want students to be practicing on to earn points. Students can work on it outside of school hours.

Another game that Educator 9 uses in the classroom is called Blooket. Blooket is a computer gaming program that practices one-level math skills. The teacher picks good math practice. In one of the games in Blooket, the students can steal cryptocurrency. They get so excited about that, and they love it. The students are extremely motivated to be winners. The part that she loves about it is that so many changes can go on during the game. Someone could be in one of the top three spots, but in 60 seconds, someone else has passed them up – such as

swapping gold. Kahoot is another game like Blooket, but with Blooket, more students can make a comeback and be a winner.

Educator 1 explained that she lets the students use her Microsoft Surface Personal Computer (PC) to let them write out their work and share it with the class. She would ask her students to try a problem, and then she would go and help the students with the problem. If she finds someone who has the correct work on their paper, she will let them show the class on the Surface display screen.

Student Choice

The third theme revealed educator perceptions about student choice in middle school mathematics classrooms. Student choice in mathematics courses is a recent motivational strategy to encourage students to perform. Two 6th-grade participants in the study said they let students choose between levels A, B, or C for classwork or homework. Educator 14 calls the different levels mild, medium, or spicy (the most challenging). The other 6th grade and 7th grade participants said providing student choice in the classroom changes yearly depending on the students' maturity and behavior. Thirteen participants stated that they use the strategy of student choice when deciding about a class reward or Blooket game. Student choice in this situation would be a group vote – not necessarily an individual choice.

Educator Twelve explained:

> I have done student choice in the past. I've done things like choose your adventures and choose which assignment they will complete to demonstrate their understanding. They (the students) must move through a series of tasks or activities. Students have had much fun with those. The problem with those is that they're very time-consuming to create and grade. So, in a time when time is

> lacking, unfortunately, since I am on a 4-person team (3-person teams have 90 minutes of instruction and 4-person teams have only 60 minutes), I default to assignments designed for most students. Still, I see benefits in it (having assignment options).

Educator Twelve further commented:

> I have student choices with extra credit. I have a bin that has a series of 10 to 20 extra credit assignments. They're all standards based. (In the bin could be activities), we didn't have time to do it in class together. They (students) can choose which one they want to do for extra credit. I typically will have a hodgepodge of different standards, and they can go through and see what they feel most confident with and get more practice with that skill. I don't do this in my Algebra classes because of time, but I do it for Math 8 because those are the ones (students) who could pick something that they feel most comfortable completing.

Educator Thirteen had a unique classroom management system where students had to fill a jar of beans for good behavior. The student's behavior was based on a list of expectations that she put on board. If her students met the expectations, they would get to put more beans in the jar, but she would take 5 or 10 beans away if there were violation. When the students filled the jar, they could earn prizes they voted on.

Educator Three summarized the following strategy of student choice:

> When it comes to the time for the independent practice piece, my students can analyze their understanding level and choose activities based on those levels. So, everybody has various levels of understanding and different entry levels, and so

> they get to choose their practice on those certain levels, and within levels A, B, and C. They will have different choices that would involve things like computer work, Quizzes (gamification), paper puzzles, and workbook pages. Everybody has an entry-level that is on their level of understanding and their choice of learning style for producing a product. Students are required to finish the activity they chose.

Educator Three highlighted a special day for the students outside the normal setting. She said that the students did not realize it was the same process they normally do, but the way she presented it made it seem more exciting. She gets all kinds of resources out with many different paper and computer options, such as IXL. Once the students complete one of the tasks, they will come to the teacher, and she will give them feedback. They will receive a point if she agrees that the student is on track. Whoever has the most points at the end of the block gets a treat. Educator 3 said that this special day has been successful.

Building Relationships

The last emergent theme established was the significance of building relationships with middle school-age students in mathematics classrooms. All 15 participants said building relationships with their students was the most important motivational strategy influencing middle school students to perform. The researcher asked the participants to explain their strategies in building relationships with students.

Educator One revealed:

> This will be a theme through all my answers. Building relationships with the kids is extremely important. I can build a relationship with them and feel like it's a safe place to say, "Hey, do you want better for yourself? Someday, this is the way

> you're going to do it. You know your education is free. No one can ever take it from you. We've got to build on this. I can't work harder than you're working for yourself." All those things work if I have built a relationship with them. I can start changing how they view math class - how they view the work they're willing to put into it each day. In some of the classes, depending on the teacher, the kids are going in and laying their heads down, and that's, you know, not okay in my classroom. You must keep up. You must work. I will help you, but you need to be here, paying attention and working, and I can meet you halfway from there. So, I guess I'm trying to build that relationship. I would say, “My expectations in the classroom are that everyone can be successful. So, I was hoping you could work through these problems as a team. You're the team leader.” Students love being the team leader, which has helped them build their confidence in math. Another thing that I do is I try to stop by once or twice a week and talk to our eighth-grade assistant principal and say, "Hey, I'd like you to call out this kid and just tell them that you've heard how great they're doing in math, that they're working hard." Anything to get them excited about math.

Educator Ten captured a setting in his classroom where he plays math videos of songs with motions to help students understand a particular skill, such as order of operations and slope-intercept form. He will also act the videos out with his students to show his humor to the class. He said that some of his students love music and enjoyed recording themselves acting and dancing to certain math topics. Because of that, the 7th graders made some great videos on what we were doing with songs. During team time one day, he saw a girl doing a little math dance. He walked over beside her and started dancing with her, and ever since then, she has done math for

him. He explained that she was not the best student, but she never said a word if he told her to be quiet and pay attention, noting that before their connection, she probably would have talked back or refused to work.

Educator Eight shared that one of her 7th grade math teachers has her students wait before entering the classroom so she can personally greet each of them. The students wait for her before they come into the classroom, and this is her way to build those relationships with her students.

Educator One shared a story about a girl in her class. She explained that the girl had the police at her house all night. The girl worked for about 10 minutes during math class and then laid her head down. Educator 1 knew she would not get through to her that day, but she asked the girl if she was hungry and offered her a breakfast bar. This teacher helped the girl with her basic needs for that day.

Educator One also mentioned that she always keeps her expectations high for her students. If she has an underperforming student in her class, she will say to them, "Hey, I'm not going to leave you alone when I call on you. I want you to try to do this." She encourages her students to use their voices and develop their confidence. The teacher needs to get those kids who do not believe in themselves and show them they can do more than they think. Educator One believes it is a big battle with many of these kids as they have been beaten down because math has not come easy. She stresses that she tries to find success wherever she can find it with her students.

Educator Ten said:

> The biggest thing for me with kids is just trying to learn something about them. For example, recently, I have a little girl who does barrel racing. She's not the best

> student academically or behaviorally, but for whatever reason, because I knew that about her, I could talk to her about it. She does well for me. The other teachers found that out, so now she's conversing with them. So, for me, getting the kids motivated is just finding something about them that I can talk to them about and then turning it around where I could say, "You need to be doing this and need to be studying more. You know, I need this from you". They can really then do it, but until then, they don't. I try to build a relationship with them and go a long way, so then do the next thing, which is math for me. That's been the biggest thing, I would say.

Educator Ten emphasized that he has conversations with some kids who he feels could be doing better – students that may be making some bad choices. He will tell them they need to "pick it up", or they will not have a choice. He told them that when they go to high school, they will be grouped in classes with kids they do not want to be with, and we tell their parents that, too. Some students are influenced by this conversation, but other students are not influenced. Educator Ten noted that he started seeing a substantial change in some students by the end of the school year.

Educator Eight posited:

I am the math coach for 6th - 8th grade, and I have a seventh-grade teacher whom I have never seen anybody differentiate from, like she does. The teacher used student choice strategies on her back table. She has A - D levels for homework choices; some are an IXL activity. That's a choice. If you have a game that night, you can pick the easier worksheet, or if you want a challenge, she has a challenge, or she has a puzzle worksheet. She gives students choices every day. The amount of work that she does, and she has it down to an art, and if a student comes

back in and says, "Well, I didn't get this finished," she can say, "Well, you had a choice, that was your choice." So, it almost puts accountability back on the student. I remember my children in elementary school. They had the tick-tac-toe board for spelling word lists, and we could pick tick, tac, or toe. We didn't have to do all 9. We got to pick the ones we wanted to do. So, being a former secondary teacher, I have been amazed at the middle school teachers and their ability to differentiate between every level of student.

Summary

In Chapter 4 the researcher examined perceptions about motivational strategies influencing middle school students in mathematics classes through interviews with 15 mathematics educators from two middle schools in East Tennessee. Each responded to 15 semi-structured questions based on an essential question with four sub-questions. The interview data were transcribed and analyzed to find emergent themes that captured traditional and non-traditional motivational strategies influencing the performance of middle school students in mathematics courses. The data was also analyzed to identify significant and implementable motivational strategies for educators to motivate middle school students.

Chapter 4 presents the data analysis related to the essential research question, perceptions of educators on motivational strategies influencing middle school students in mathematics courses. The supporting sub-questions address educators' perceptions about internal and external motivational strategies that have contributed to middle school students' mathematical development. Additionally, the sub-questions explore how educators use different degrees of motivational strategies to influence middle school students in mathematics and how students' motivation affects the learning of mathematical concepts. Building relationships between

students and teachers will be identified as the most important motivational strategy to influence students to perform in mathematics courses.

The framework of the achievement goal theories - the differences in how people judge their perceptions of competence (Nicholls, 1984), and TARGET structures (Task, Authority, Rewards, Grouping, Evaluation, and Time) (Epstein, 1989) were used to examine and categorize data. The results revealed four key themes that were consistent during the interviews: (a) internal motivation, (b) external motivation, (c) building thinking classrooms, (d) student choice, and (e) building relationships. Chapter 5 will discuss the findings, discussion, conclusions, and recommendations from this study.

Chapter 5. Discussion, Conclusions, and Recommendations

Introduction

Chapter 5 contains the findings, discussion, conclusions, and recommendations from this study. Middle school educators often wonder how to persuade students to do well. Educators seek to engage students and increase student motivation to succeed in the classroom. Educators must first understand the definition of motivation to persuade students of the importance of acquiring a strong education.

The study's purpose was to investigate teacher perceptions about influential motivational strategies implemented in middle school mathematics courses. The present motivational strategies influencing middle school students in mathematics will be defined as the act or process of giving someone a reason for doing something or motivating someone. The study examined middle school educators' perceptions of successful, innovative motivational strategies that may lead to the improvement of math achievement. This study aligned evidence-based strategies to motivate students in math settings to achievement goal theories and TARGET (tasks, authority, recognition, group, evaluation, and time) as the foundation for influencing middle school students to improve academic achievement in mathematics courses. In this study, educator experiences were analyzed by the individual educators' ability to implement motivational strategies to their students in 6th - 8th grade mathematics classes. Both internal and external motivational strategies, along with building thinking classrooms, student choice, and building relationships were explored to identify common themes among the interviewees who have been successful.

Data was collected using snowball sampling and convenience sampling through interviews of 15 individuals ranging from 2 to 30 years of teaching experience. These individuals

self-identify as licensed 6th – 8th grade mathematics teachers over the age of 18. Transcriptions of the interviews were coded to identify common themes among the participants. The themes that appeared in the data became the findings of this qualitative study and linked to the strategies that educators in two Northeast Tennessee middle schools have implemented in their classrooms.

Statement of Problem

This qualitative phenomenological study examined educator perceptions about motivational factors and strategies influencing middle school students' performance in mathematics classes. The problem explored in this study is the low academic achievement of middle school students in mathematics. Over the past few years, the National Assessment of Educational Progress (NAEP) results have shown a widespread decline in student achievement (Schwartz, 2023). Between 2019 and 2023, scores for 13-year-olds fell 9 points in math, and the average reading scores fell 4 points. Motivated students have better performance, higher self-esteem, and improved psychological well-being than unmotivated students (Wong & Bukalov, 2020). Keeping motivational strategies in mind, educators need to discover multiple ways to enhance confidence to do math and assist students to grow in their performance in mathematics courses, including on standardized tests. Elementary and middle school students must have a solid foundation in mathematics to perform in high school mathematics and future careers successfully.

Summary of Findings

The perceptions on motivational strategies influencing middle school students in mathematics courses were recorded after an interview was conducted using semi-structured questions. Fourteen of the 15 participants described standardized tests were not a strategy that motivates student when asked “Do you believe standardized tests motivate students to reach their

mathematical goals?" The researcher used semi-structured questions to allow the participants to give a detailed account of their experience without any bias from the researcher. After analyzing the data, common themes emerged from each research question. A common theme of the significance in building relationships between students and teachers emerged from the data. All 15 participants believed that building relationships was the most influencing factor in motivating students to perform in mathematics. Building relationships between teachers and students is a significant motivational strategy used in classrooms for those participants. More discussion on this can be found under Research Question 4.

Research Question 1 Discussion

Research question 1 focused on internal motivational strategies that have contributed to middle school student's mathematical development. Five themes emerged from the research data. The first emergent theme was educator perceptions about middle school students' internal (intrinsic) motivation. Two sub-themes emerged from the data collected. First, teachers must care, encourage, and develop internal motivational skill sets with middle school students. Second, many students have a desire to perform, but for some, their confidence level in mathematics is lacking. The data revealed that many parents instill intrinsic motivation in students through their environments, and teachers continually encourage students by teaching internal skill sets in the classroom, whereas some students naturally acquire internal motivation.

Standardized testing is a tool for teachers and parents to understand students' knowledge of a skill. Educator's perceptions about standardized tests as a motivating factor which influences student performance is that high stakes testing only is considered a positive strategy with high-level students. The educator's perception is that many students, both high and low performing, are stressed about their performance when they are required to take high-stakes tests. For

students in the American education system, there has been an undeniable shift in the amount of anxiety they feel when it comes to their performance in school (Neighmond, 2013). Educator Six revealed, “I think sometimes it puts a lot of undue stress on students, especially my higher achieving students like my pre-algebra class.” She also said:

> My pre-algebra students asked if the test was going to count toward whether they got into algebra next year or not, so it was a motivator. But I don't know if it's the right motivator because sometimes they fall short, and then it's like, what am I gonna do if I didn’t do well?

Reppy and Larwin (2020) studied the association between the perception of caring and intrinsic motivation of urban middle school students. The study was to determine if there was a correlation between middle school students' perceptions of feeling "cared for" and their intrinsic motivation. Educator 1 expressed:

> I really think if you have formed a true, believable bond with your kids, and they think you care about them. They think that you care about them, you want what's best for them, and that you're going to help them achieve - they'll do anything for you. I believe having that positive relationship is honest to goodness, the most important thing.

Educator One also expressed:

> I don't really want to know what a student’s previous teachers have to say about them. Don’t tell me. I don't want to have a preformed idea of what those kids are going to be like. You know, let me form my own opinion and let me build on that relationship.

In Davis' (2006) research, the survey displayed a significant positive correlation between how students perceive their academic environment and their intrinsic motivation. Intrinsic factors such as ability, practice, and the instructional approach are highly reported by students as significant; students also identified extrinsic motivation as a positive influence on their math performance (Flammer & Schmid, 2003). Extrinsic motivations are rewards and punishments that encourage a person to perform a task. A mixture of intrinsic and extrinsic motivation is when extrinsic motivational factors are the initial reasons for the start of the project, but once the project becomes interesting and curiosity develops, intrinsic motivation emerges (Hoy & Miskel, 2013). Hoy and Miskel (2013) found that the intrinsic and extrinsic motivation dichotomy is an individual's reason for acting. Because of interest and curiosity in a task, some people do not need to be extrinsically motivated because intrinsic motivation is internally rewarding. Hoy and Miskel (2013) stated that "Administrators and teachers need to encourage and nurture intrinsic motivation while ensuring that extrinsic motivation supports the task at hand" (p. 172).

Herges et al. (2017) highlighted that when middle school students do well in mathematics, they experience higher enjoyment and more confidence. Confidence and enjoyment with mathematics will lead to students doing well in that class (Middleton & Spanias, 1999). Herges et al. (2017) revealed that students who reported earning an A or B average in a mathematics course also reported positive parent involvement and teacher support. Educator Thirteen explained:

> Motivation strategy is easier said than done. In a way, most people are all wired to want to learn and understand math because it’s like understanding the world around us and how it works. I think (that) the kids who say, "I don't like math" or "I don't wanna do it," just haven't had the chance to feel successful in it.

Herges et al. (2017) discovered multiple implications for educators. First, communication with parents by educators can encourage both awareness and involvement since the influence and involvement of parents in the education process is significant to middle school students. The active involvement of parents in a child's education, encouraging interest in mathematics, and educators setting high expectations of students can affect mathematics achievement (Dever & Karabenick, 2011). Students who participate in extracurricular activities demonstrate higher levels of academic achievement and greater social development (Christison, 2013). High-performing students already acquire motivation support to demonstrate success in mathematics courses (Christison, 2013).

Educator Two highlighted that internal motivation is helping students find something they can succeed in. She had a student last year whose father passed away the week before (TCAP testing), and when she returned, it was time to take the test. Educator Two said, “I know the student did not do her best; therefore, the standardized test has labeled her unjustly.”

Research Question 2 Discussion

The participant’s comments about external motivational strategies that have contributed to middle school students’ mathematical development suggested the use of rewards, gamification, individual or group competitions, and incentives. The inspirations provided by educators, teachers, coaches, and extracurricular sponsors are extrinsic motivational strategies that can influence students’ performance in math classes.

Extrinsically motivated students engage in academic tasks to obtain rewards such as good grades and approval (Dweck, 1986). According to Ames (1992), students that are extrinsically motivated engage in academic tasks to obtain rewards or avoid punishment. These students' motivations tend to center on two performance goals. First is to obtain favorable judgments of

their competence from teachers, parents, and peers. Second is to avoid negative judgments of their competence (Ames, 1992). Extrinsically motivated students will continue to perform a task even though it might not be rewarding, such as doing an instructional task that they do not find enjoyable to earn a passing grade. Extrinsic motivation refers to behavior that is guided by external rewards. These rewards can be tangible or intangible. Examples of tangible rewards are money and grades, while intangible rewards are praise or fame. Extrinsic motivations may include prizes for completing schoolwork to earn a good grade and doing a task to receive recognition. Some other rewards for doing homework could be a special treat or a prize. Giving a student praise for excellent work is another example of extrinsic motivation (Cherry, 2022).

Educator Fourteen described:

> Something I've done extrinsically is motivating them (students) with candy, chips, or food; it is a good motivator. A close second behind building relationships, food is the best motivator. Also, I celebrated at the end of the nine weeks for (students) knowing their multiplication facts. For example, we still struggle with that, and so if they make a one-hundred three different times on a 0 through 12 for a basic multiplication fax test, then we have a celebration at the end of 9 weeks, and they can choose their reward as a group, whether that's like hot chocolate and popcorn, or (it) might be a candy bar or chips, something along that nature. They (the school leaders) also have suggested some different things that are not food, for example, extra team time or getting to play games such as a group game, Kahoot, or Quizzes instead of doing a normal assignment, or even, you know, doing one that's just for fun - not necessarily content related.

Extrinsic motivation affects middle school-age students' academic performance, even though it is sometimes viewed as less desirable than intrinsic motivation. Wolters et al. (2013) hypothesized that middle school students usually identified extrinsic motivation as important because students in this age group strive to please teachers and parents and are more likely to comply with school norms. For example, most seventh-grade students enjoy competitions, an extrinsic motivation. Educator Two emphasized the significance of extracurricular involvement:

> I do think that it is a positive thing because students who are involved outside of school, not even just in sports, keep the students here, and some students need that motivation to be able to be involved, and it will help them try a little more in the subjects that they seem to struggle with. I'm a big fan of related arts such as art, chorus, and band. I think students who do activities have that tendency to be more disciplined.

Extrinsic motivation has been found to increase academic learning in some curriculums. Extrinsically motivated students will perform and finish a task even if the task is not rewarding. For example, extrinsically motivated students will do an instructional task they do not find enjoyable to earn a passing grade. Extrinsic motivation is behavior driven by tangible or intangible external rewards. Examples of tangible rewards are money and grades, while fame or praise are intangible rewards. Some extrinsic motivations include praise, prizes, completing a homework assignment to earn a good grade or reward such as a special treat or prize, and being recognized for doing a good deed. Effective conditioning is when someone is convinced to behave in a certain way due to a reward or receiving incentives for their performance (Cherry, 2022).

Research Question 3 Discussion

The third research question examined educators' use of different degrees of motivational strategies to influence middle school students in mathematics. Consistency, data-conferencing, traditional and non-traditional learning strategies by building thinking classrooms is beneficial to middle school students. One strategy of a building thinking classroom involved a series of vertical learning strategies. Students stand in groups at vertical surfaces displayed around the classroom. One person of a group of three writing on the surface, but they are only allowed to write what the other two students tell them to write. After the first problem of the task is complete, the marker is handed to a different student in the group, and the process continues until all parts of the task are answered. The groups can share their work with other groups in the classroom. Innovative activities and the use of technology in the classroom are also important motivational strategies educators use to motivate students in math.

The study examined middle school educators' perceptions of successful, innovative motivational strategies and factors that may inform teachers. Educators need to discover multiple motivational strategies to assist middle school students to grow in their performance in mathematics courses, including standardized tests.

Educator Five explained that consistency is a huge part of student success. She stated that students need that consistent environment to know what is coming up next and what to prepare for in math class. Students need to know what is expected of them without chaos and not knowing what is next or what is expected of them. Having conversations with the students about what is expected of them develops consistency. Educator Five established her expectations with the students through conversation so they knew what to do. She also believes that students have drastically changed in their learning since around 2015, but she still thinks some pieces, such as

structure, consistency, and communication, are still extremely important and should never change.

Educator Nine identified that she also believes that consistency, communication, and laying out your expectations are extremely important. She and her students discuss the TCAP color schemes and their meaning. Students seeing the orange, yellow, green, and blue levels to make sense to them. Educator Nine typically does not talk to them about scale scores. That information is usually sent home to the parents. Instead, she talks to the students about their achievement scores or percentile because these scores are out of 100, which makes much more sense to the student.

Discovering lived experiences that impact an individual will assist in determining the level of motivational strategies a teacher or school needs to implement. Educators applying classroom-level interventions can do so with the principles summarized in TARGET (tasks, authority, recognition, group, evaluation, and time). Teachers aim to make tasks meaningful and present various degrees of challenge without disclosing differences in ability.

Mathematical calculations can be very tedious and stressful for students; therefore, it is better to be more focused on the critical thinking of the task instead of the computations (Hollenbeck & Fey, 2009). Calculators are enhancing our students' knowledge, and removing these devices would hinder student advancement Kwon (2017). A mathematical meme is a type of meme that humorously combines a mathematical statement with a meme base. Because mathematical memes present a mathematical concept using a familiar framework, understanding the relationships between the concepts depicted in these memes becomes a puzzle - encouraging students to use critical thinking (Bini et al., 2020). The first step, a deep understanding of 'systems thinking', is critical. Senge (1990) stated that systems thinking is "the discipline that

integrates the others, fusing them into a coherent body of theory and practice" (p. 12). Systems thinking theory comprehends and addresses the whole and examines the interrelations between the parts. Systems thinking is the cornerstone to personal knowledge, mental models, building shared vision, and team learning. Hence, learning organizations see people as active participants, reacting to the present and creating the future (Senge, 1990).

When unmotivated students begin to sense that it is unlikely that they will meet grade level expectations, graduate, attend college, or obtain a well-paying job, they have fewer reasons to behave at school expectations, take school seriously, master the classroom material, and are more likely to drop out of school (Nance, 2016).

Kelly (2023) introduced one college's offering of additional help to students learning competency-based courses by providing peer-to-peer digital interactions through a program called *InScribe,* a digital community platform. Students can ask questions about a topic, ask to help find information and share ideas at anytime and anywhere. Not only can students ask questions, but they can see what has been posted. The peer-to-peer option would be available if a student were late, and every available resource was offline or closed. Many students are stimulated in courses, but others struggle. Learning the basic concepts of a course is essential for continuing to the next level of the course, and with the help of *InScribe*, students can get caught up.

Introducing concepts and teaching through technology in classrooms is a fun and exciting way to engage students because they can understand the subject (Hollenbeck & Fey, 2009). In mathematics classrooms, graphing calculators, Geometer's Sketchpad, e- transformation, and Geogebra can be used as effective technological tools in learning. Ching and Basham (2005) stated that seeing real-world applications through technology motivates students to learn. The

addition of technology to any subject in school can be an effective teaching strategy since experimenting with the technology will enhance the student's technical skills for application to real life (Kwon (2017).

Educator Five stated:

> I like to do a data check sheets for certain students. They do their data check and then turn it into me. I write a note to each student every other week. So, they must write their current grade, thoughts about it, and missing work. For example, one girl read her current grade and ended up with a B. She said, "I wish it were a higher grade, but I'm okay with it." I said, "Well, look how much you've improved these 9 weeks". So, it's just a way for them (the students) to track their grades and see how they've moved through the 9-weeks. Many of them (students) are like, "I don't have any missing work". I'll make them go through Power School and look, then they're, "Oh, I have four missing assignments. I've never turned this in, or I didn't do this". I respond to what they have written with things like, "We Rock." (The student's response was), "Oh, my gosh! She's proud of me for working towards a goal. Maybe I haven't met my goal, but I'm working towards it, you know." I really feel like students need to see that you're happy with baby steps for them. So, it's just verbal communication, but they (the students) can see it. Sometimes, I'll put a sticker, smiley face, or something like that on there. Next, I took the form and stapled it to their math checkpoint.

Educator 9 revealed:

> Yes, they love competition. One way I've tried is we have started doing IXL Leaderboards and Group Jams - which is just a competition between all of them

on the whole team. They get a certificate and a turn at the prize bucket, which is usually something like bath and Body Works hand sanitizer, or things like that. This has been a game-changer.

Research Question 4 Discussion

The fourth and final research question in this study was how does middle school Students' motivation affect the learning of mathematical concepts. One of the major themes that emerged from this study was the importance of building relationships and offering opportunities for student choice in mathematics classrooms. The building of strong relationships between teachers and students affects the learning of middle school students in mathematics. Educators provided strategies for performing and non-performing students through relationships and student choice as motivational strategies.

Darling-Hammond et al. (2020) discovered principles for practice in learning and development. Structures should create dedicated support systems with positive and long-term relationships between adults and students and provide academic and social-emotional support for cultivating development. Teachers must be sincere when establishing relationships with students because students know when a teacher is not sincere. If the teacher-student relationship is based on reciprocity, improvement in student success is visible. A student's intelligence can positively correlate to the amount of care shown in the classroom (Noddings, 1984).

Educator Ten made connections with his students through the years. He knows this because one of his former female students still brings him cookies even though she is in high school now. Another former student, who was not necessarily good in math but tried hard, came to tell him that he had a plan for his life and told him what he was getting ready to do. Educator

Ten was so proud to hear everything this young man was doing. He said that they had a great relationship.

Educator Seven is a Special Education teacher for 6th – 8th grade students. She highlighted the importance of having one-to-one conversations with her students as the strongest motivator. Talking and sharing with her students about their progress builds that relationship with her students. She stated that the data conferences help the students see where they are and where they want to be, even if it is only a small amount of growth. She tells her students, "We are getting there, even if it is baby steps, right, even if it's baby steps." Her students want to do well, and they listen to what she explains during the data conferences. If a student is not working how she feels that they should be, she will talk with them privately, explaining that “this is what I expect from you, and if not, there will be consequences.” Educator Seven uses small assessments, EASY CBM, to evaluate her students' growth.

Francisco's (2013) research on teaching practices in mathematics stated that one of the focuses has been on collaborative task-based methods for improving the learning process and outcomes and providing more opportunities for the student to control their learning. One example is that collaborative task-based learning increased learners' abilities to solve, administer, and memorize mathematical concepts and principles, which provided more imagination and advanced the power of reasoning through a task (Derting & Ebert-May, 2010). However, the traditional direct-teaching approach is still a powerful method to advance student learning (World Economic Forum, 2015), especially in teaching mathematics (Haapasalo & Samuels, 2011). The widespread issue of student-centered methods is an important subject to discuss (Alliance of Excellent Education, 2012; Finnish National Board of Education, 2016).

A homework and note-taking method involving student choice was also designed by Educator Three. For homework, the student will choose whatever level they want to work on Level A, B, or C. If a student feels they are struggling with the math skill that day, that student may choose Level A, but if a student is choosing a level that does not fit their ability, she has a very brief conversation with that student and will suggest that they should be choosing Level C activities.

Educator Three mentioned that she has had students with math learning disabilities choose a level they were not ready for, but in her experience, very few students chose a lower level than their ability until this year. This year, more students chose Level A instead of the more challenging levels. Because of the change this year, she has altered her student choices by having a bunch of different options and a separate set of activities called Challenge options. She said the students would choose differently if she named the levels something different than ABC. There's no qualifier for the choice the students pick. It is based on their feelings and understanding of that lesson, and it could change daily. With her Pre-Algebra class, Educator Three gives the students a choice of using graphic organizers to take notes or take their notes when she is giving the direct instruction piece. Students have expressed that they prefer to take their notes, and she has given them the option to do that, so they can choose to do that because they are responsible enough to write coherent notes. Her Math 7 students have not proved that yet; they are still filling out the graphic organizer.

In her last math review, Educator Two shared an activity where students have a choice. She had 28 questions and told her students that they had to get 20 correct, but the students got to choose 20 of the 28 to answer. Her students are making a choice.

Implications for Practice

The review of the literature, paired with the experience of teachers in this study, helped the researcher make the following recommendations:

- Building relationships between teachers and students is a significant motivational strategy in motivating middle school students to perform in mathematics
- Implementing gamification and group competitions engages students in learning mathematics
- Create staff development opportunities for teachers to learn and implement creative, innovative motivational strategies
- Provide opportunities for teachers to participate in book studies and to incorporate building thinking classrooms with vertical learning in middle schools
- Teach and assist students in instilling internal motivational techniques and methods
- Use external (extrinsic) motivational strategies to encourage students to perform in middle school mathematics classrooms
- Increase the dialogue between educators and students about real-life situations where building confidence levels in mathematics would benefit students in their future
- Encourage other school leaders and counselors to assist teachers in motivating middle school students
- Organize parental involvement events that educate parents on the importance of setting high standards and expectations by utilizing motivational strategies with students
- Develop collaborative platforms to implement ideas of motivational strategies between school districts, states in the U.S. and internationally

- Continuously strive to discover innovative strategies used in the classroom to motivate students
- Develop cross-curriculum collaborative platforms on motivational strategies to influence middle school students

Implications for Future Research

The following recommendations for future research are indicated based on the findings of this study:

- Qualitative and quantitative studies could investigate teacher perceptions pre- and post-professional development to evaluate implementation of building thinking classrooms
- Qualitative studies could investigate student perceptions in grade 6-8 and motivational factors for mathematic engagement
- Future qualitative research could investigate math educator perceptions in elementary grades
- Expand research studies by recruiting participants from multiple grade levels and other school districts in Tennessee, states in the U.S., and internationally to participate in future studies about motivational strategies to influence middle school students to perform in mathematics

Summary

Chapter 5 presents the interpretation and discussion of data related to educators' perceptions of motivational strategies influencing middle school students to perform in mathematics courses. The framework of the achievement goal theories (Nicholls, 1984) and TARGET structures (Task, Authority, Rewards, Grouping, Evaluation, and Time) (Epstein, 1989) were used to guide the process. Addison (2016) stated a famous quote by Winston

Churchill, "Success is not final, failure is not fatal: it is the courage to continue that counts." The quote was from a speech Churchill gave in 1945 to his supporters after he had already led the Allies to victory in World War II but was defeated for Prime Minister re-election. Educators must influence middle school students through motivational tactics and the importance of mathematical skill development and conceptual understanding. Educators can build confidence levels for middle school students by meeting them where they are and building relationships.

This chapter contains the findings, conclusions, and recommendations for readers who may use the results as a resource when reviewing and revising mathematical motivational strategies that can influence middle school students in the classroom. This study investigated 6th-8th-grade educator perceptions on the effectiveness of implemented internal, external, traditional, and non-traditional motivational techniques that contribute to the development and conceptual understanding of mathematics for middle school students. The study was conducted using data collected through 15 semi-structured interviews of math educators from two middle schools in northeast Tennessee. This phenomenological study used a review of literature and interview data from participants to gather common themes from their experiences. The data collected from the interviews were coded, and five common themes emerged. These findings align with the achievement goal theories (Nicholls, 1984) and TARGET structures (Epstein, 1989), which state that there are differences in how people judge their perceptions of competence, and TARGET structures defined by the implementation of task, authority, rewards, grouping, evaluation, and time, which allow educators to use as a roadmap for student motivation. The findings of this research study were used to make recommendations for practice and recommendations for future research. The findings of this research will help direct educators to emphasize the areas identified to be most effective in helping middle school students'

performance in middle school mathematics. Through the participants' experiences, one can see the need for using multiple motivational strategies and techniques in classrooms to influence middle school students' performance in mathematics courses.

References

About ALEC. American Legislative Exchange Council [ALEC]. (n.d.). https://alec.org/about/.

ACT Work Keys. (2014). *ACT Incorporated*. https://www.act.org/content/dam/act/unsecured/documents/WK-Brief-KeyFacts-CognitiveandNoncognitiveSkills.pdf.

Addison, J. (2016). Five powerful historical quotes that inspire me. https://johnaddisonleadership.com/churchill-quotes/

Aldridge, J. M., Fraser, B. J., & Sebela, M. P. (2004). Using teacher action research to promote constructivist learning environments in South Africa. *South African Journal of Education, 24*, 245–253.

Alexander, N. (2013). *Policy Analysis for Educational Leaders.* Pearson Education, Inc.

Alliance for Excellent Education. (2012). Culture shift: Teaching in a learner-centered environment powered by digital learning. http://www.all4ed.org/files/CultureSift.pdf.

Alspaugh, J. W. (1998) Achievement loss associated with the transition to middle school and high school. *The Journal of Educational Research*, *92*(1), 20-25. DOI: 10.1080/00220679809597572.

Ames, C. (1992). Classrooms: goals, structures, and student motivation. *Journal of Educational Psychology*, *84*, 261–271.

Anderman, E. M. (2002). School effects on psychological outcomes during adolescence. *Journal of Educational Psychology*, *94*(4), 795-809. doi:10.1037/0022-0663.94.4.795.

Anfara, V. A., Brown, K. M., & Mangione, T. L. (2002). Qualitative analysis on stage: Making the research process more public. *Educational Researcher*, *31*(7), 28–38. https://doi.org/10.3102/0013189X031007028.

Anning, R. (2015). Ten questions to ask yourself to increase motivation. *Life Coach Directory*. https://www.lifecoach-directory.org.uk/memberarticles/10-questions-to-ask-yourself-to-increase-motivation.

Atit, K., Power, J.R., Veurink, N. *et al.* (2020). Examining the role of spatial skills and mathematics motivation on middle school mathematics achievement. *IJ STEM Ed 7*, 38. https://doi.org/10.1186/s40594-020-00234-3.

Australian Government. (2020). Early maths skills 2: spatial sense. *Learning Potential*. https://www.learningpotential.gov.au/articles/early-maths-skills-2-spatial-sense.

Bandura, A. (2000). Exercise of human agency through collective efficacy. *Current Directions in Psychological Science*, *9*(3), 75-78. http://www.jstor.org.ezhost.utrgv.edu:2048/stable/20182630.

Bandura, A., & Barbaranelli, C. (1996). Multifaceted impact of self-efficacy beliefs on academic functioning. *Child Development*, *67*(3), 1206–1222. doi:10.1111/1467-8624. ep9704150192.

Barnes, C. (2020). Forget the SAT: Universities should try this instead. *Forbes*. https://www.forbes.com/sites/avivalegatt/2020/05/28/forget-the-sat-universities-should-try-this-instead/?sh=6520374a666c.

Berger, L. & Karabenick, S. A. (2011). Motivation and students' use of learning strategies: Evidence of unidirectional effects in mathematics classrooms. *Learning and Instruction*, *21*, 416-428.

Berman, R. (2015). 'No child left behind' is no more. *The Atlantic.* https://www.theatlantic.com/politics/archive/2015/12/no-child-left-behind-is-no-more/419475/.

Bini, G., Robutti, O., & Bikner-Ahsbahs, A. (2020). Maths in the time of social media: conceptualizing the Internet phenomenon of mathematical memes. *International Journal of Mathematical Education in Science and Technology*, 1-40.

Borkowski, J. G. (2000). A process-oriented model of metacognition: Links between motivation and executive functioning. *Issues in the Measurement of Metacognition,*1-41.

Bransford, J., Derry, S., Berliner, D.C., Hammerness, K., & Beckett, K. L. (2005). *Theories of Learning and their Roles in Teaching*. In L. Darling-Hammond & J. Bransford, eds. *Preparing Teachers for a Changing World*.

Brown, T. (2001). Mathematics education and language: Interpreting hermeneutics and post-structuralism. *Dordrecht: Kluwer*.

Campbell, D. (1976). Campbell's law. https://en.wikipedia.org/wiki/Campbell%27s_law.

Cardona, M. (2021). Supporting child and student social, emotional, behavioral, and mental health needs. U.S. Department of Education. https://www2.ed.gov/documents/students/supporting-child-student-social-emotional-behavioral-mental-health.pdf

Carter S. C. (1999). *No excuses*. The Heritage Foundation.

Chatterji, M. & Lin, M. (2018). Designing non-cognitive construct measures that improve mathematics achievement in grade 5-6 learners: A user-centered approach. *Quality Assurance in Education: An International Perspective*, *26*(1), 70-100.

Cherry, K. (2022). What is extrinsic motivation? https://www.verywellmind.com/what-is-extrinsic-motivation-2795164.

Cherry, K. (2023). Motivation: The driving force behind our actions. https://www.verywellmind.com/what-is-motivation-2795378#:~:text=The%20term%20motivation%20describes%20why,get%20that%20promotion%20at%20work.

Ching, C. C., Basham, J. D., & Planfetti, E. S. (2005). Technology in education, technology in life. In C. Vrasidas & G. V. Glass (Eds.), Current perspectives on applied information technologies: Preparing teachers to teach with technology, 225-240.

Chiu, M. M. (2004). Adapting teacher interventions to student needs during cooperative learning: How to improve student problem solving and time on-task. *American Educational Research Journal*, *41*, 365–399.

Chouinard, R., Karsenti, T., & Roy, N. (2007). Relations among competence beliefs, utility value, achievement goals, and effort in mathematics. *British Journal of Educational Psychology*, *77*(3), 501–517. doi:10.1348/000709906X133589.

Christison, C. (2013). The benefits of participating in extracurricular activities. ERIC. https://files.eric.ed.gov.

ClassPad.net. (2020). https://www.classpad.us/.

Cleary, T. & Chen, P. (2009). Self-regulation, motivation, and math achievement in middle school: Variations across grade level and math context. *Journal of School Psychology*, *47*(5), 291-314.

Council on Foreign Relations [CFR]. (2022). Is Rising Student Debt Harming the U.S. Economy? https://www.cfr.org/backgrounder/us-student-loan-debt-trends-economic-impact.

Cromley, J. G., Perez, T., & Kaplan, A. (2016). Undergraduate STEM achievement and retention: Cognitive, motivation, and institutional factors and solutions. *Policy Insights From the Behavioral and Brain Sciences, 3*(1), 411 https://doi.org/10.1177/2372732215622648.

Darling-Hammond, L., Flook, L., Cook-Harvey, C., Barron, B. & Osher, D. (2020) Implications for educational practice of the science of learning and development. *Applied Developmental Science*, *24*(2), 97-140, DOI: 10.1080/10888691.2018.1537791.

Davis H. A. (2006). Exploring the contexts of relationship quality between middle school students and teachers. *The Elementary School Journal*, *106*, 193-223. http://www.jstor.org/stable/10.1086/501483.

Dawkins, R. (1976). The selfish gene. *Oxford University Press 40th Anniversary Edition*.

Derting, T. L., & Ebert-May, D. (2010). Learner-centered inquiry in undergraduate biology: Positive relationships with long-term student achievement. *Cell Biology Education*, *9*(4), 462–472.

Dever, B. V., & Karabenick, S. A. (2011). Is authoritative teaching beneficial for all students? A multi-level model of the effects of teaching style on motivation and achievement of

mathematics students 102 interest and achievement. *School Psychology Quarterly*, *26*(2), 131–144. doi:10.1037/a0022985.

Dror, I. E. (2008). Technology enhanced learning: The good, the bad, and the ugly. *Pragmatics & Cognition*, *16*, 215-223.

Dweck, C. S. (1986). Motivational processes affecting learning. American Psychologist, *41*, 1040-1048.

Eccles J. S., Adler, T. F., Futterman, R., Goff, S. B., and Kaczala, C. M., Meece, J. L. (1983). Expectancies, values, and academic behaviors. *Achievement and Achievement Motivation*. ed J. T. Spence. 75–146.

Eccles, J. S. & Roeser, R. W. (2011). Schools as developmental contexts during adolescence. J*ournal of Research on Adolescence*, *21*(1), 225-241.

Eccles, J. S., Wigfield, A., Midgley, C., Reuman, D., Iver, D. M., & Feldlaufer, H. (1993). Negative Effects of Traditional Middle Schools on Students' Motivation. *The Elementary School Journal*, *93*(5), 553–574. http://www.jstor.org/stable/1001828

Epstein, J. L. (1989). Family structures and student motivation: A developmental perspective. In C. Ames & R. Ames (Eds.), Research on motivation in education*, 3*, 259–295. *Academic Press.*

Eronen, L., & Kärnä, E. (2018). Students acquiring expertise through student-centered learning in mathematics lessons. *Scandinavian Journal of Educational Research, 62*(5), 682–700. https://erepo.uef.fi/handle/123456789/7855.

Fairbanks, B. (2021). Five educational learning theories and how to apply them. University of Phoenix. https://www.phoenix.edu/blog/educational-learning-theories.html.

Falck, O., Mang, C., & Woessmann, L. (2015). Virtually no effect? Different uses of classroom computers and their effect on student achievement.

Fan W., & Williams C. (2018). The mediating role of student motivation in the linking of perceived school climate and achievement in reading and mathematics. *Frontiers in Education, 3*, 50. doi: 10.3389/feduc.2018.00050.

Fosnot, C. T. (1996). In constructivism: Theory, perspectives and practice. *Teachers College* Press.

Franck, T. (2017). American students try harder if you pay them, economists found. *CNBC: Economy.* https://www.cnbc.com/2017/11/20/money-gets-american-students-to-try-harder.html.

Friedel, J. M., Cortina, K. S., Turner, J. C., Midgley, C. (2007). Achievement goals, efficacy beliefs and coping strategies in mathematics: The roles of perceived parent and teacher goal emphases. *Contemporary Educational Psychology*, *32*, 434–458.

Fusch, P. I., & Ness, L. R. (2015). Are we there yet? Data saturation in qualitative research. *The Qualitative Report*, *20*(9), 1408-1416. https://doi.org/10.46743/2160-3715/2015.2281.

Geary, D. (2018). Factors of Academic Achievement for Middle School Students.

Goldstein, D. (2011). The test generation. *The American Prospect.* https://prospect.org/features/test-generation/.

Goldstein, L. S. (1999). The relational zone: The role of caring relationships in the construction of mind. American Educational Research Journal, *36*, 647–673.

Haapasalo, L., & Samuels, P. (2011). Responding to the challenges of instrumental orchestration through physical and virtual robotics. *Computers & Education*, *57*(2), 1484–1492.

Hackman, J. R., & Oldham, G. R. (1976). Motivation through the design of work: A test of theory. *Organization Behavior and Human Performance*, *16*, 250–279. doi:10.1016/0030-5073(76)90016-7.

Hannula, M. (2006). Motivation in mathematics: goals reflected in emotions. *Educational Studies in Mathematics*, *63*(2), 165–178.

Harappa Education. (2021). Website: diaries/phenomenological-research#heading_1

Harden, R. M., & Crosby, J. (2000). AMEE guide No 20: The good teacher is more than a lecturer-the twelve roles of the teacher. *Medical Teacher*, *22*(4), 334–347.

Harwood, C.G. & Thrower, S.N. (2020). The power of groups in youth sport. *ScienceDirect.* https://www.sciencedirect.com/topics/psychology/achievement-goal-theory#:~:text=Achievement%20goal%20theory%20holds%20that,any%20point%20during%20task%20engagement.

Herges, R., Duffield, S., Martin, W., & Wageman, J. (2017). Motivation and achievement of middle school mathematics students. *The Mathematics Educator, 26* (1), 83–106.

Hollenbeck, R., & Fey, J. (2009). Technology and mathematics in the middle grades, Mathematics Teaching in the Middle School, *14*, 430-435.

Holliman, R., & Scanlon, E. (2006). Investigating cooperation and collaboration in near synchronous computer mediated conferences. *Computers & Education*, *46*(3), 322–335.

Hooper, E. (2020). What is groupthink? Definition and examples. Retrieved from https://www.thoughtco.com/groupthink-definition-3026343.

Hoy, W. K. & Miskel, C. G. (2013). *Educational Administration: Theory, research, and practice (9th ed.). McGraw Hill.*

Isen, A. M., & Reeve, J. (2006). The influence of positive affect on intrinsic and extrinsic motivation: Facilitating enjoyment of play, responsible work behavior, and self-control. Motivation and Emotion, *29*, 297–325. doi:10.1007/s11031-006-9019-8.

Jacob, B. & Ryan, J. (2018). How life outside of school affects student performance in school. Economic Studies at Brookings. https://www.brookings.edu/wp content/uploads/2018/03/jacobs-and-ryan-report.pdf.

Jamshed, S. (2014). Qualitative research method-interviewing and observation. *Journal of basic and clinical pharmacy*, *5*(4), 87–88. https://doi.org/10.4103/0976-0105.141942.

Kamenetz, A. (2016, April 12). *Pearson's quest to cover the planet in company-run schools*. Wired. https://alec.org/about/.

Katz, J. (2014, May 2). *Toxic culture of education*. YouTube. https://www.youtube.com/watch?v=BnC6IABJXOI.

Kelly, R. (2023). Western governors university adds peer-to-peer support to competency-based courses. *Campus Technology: Learning Tools.* https://campustechnology.com/articles/2023/01/25/western-governors-university- adds-peer-to-peer-support-to-competency-based-courses.aspx?admgarea=News.

Kloosterman, P. (1993). Students' views of knowing and learning mathematics: Implications for motivation. Paper presented at the annual meeting of the American Educational Research Association.

Kuhlmann, J., & Blum, S. (2021). Narrative plots for regulatory, distributive, and redistributive policies. *European Policy Analysis*, *7*, 276-302.

Kwon, H. (2017). Effects of 3d printing and design software on students' overall performance. *Journal of STEM Education: Innovations and Research, 18*(4), 37 -42. https://www.proquest.com/scholarly-journals/effects-3d-printing-design-software -on-students/docview/1991087183/se-2.

Lavin, A., Korte, L., & Davis, T. (2010). The impact of technology on student behavior. *The Journal of Technology Research*, *2*, 1-13.

Lea, S. J., Stephenson, D., & Troy, J. (2003). Higher education students' attitudes to student-centered learning: Beyond "educational bulimia"? *Studies in Higher Education*, *28*(3), 321–334.

Lerman, S. (2001). Cultural, discursive psychology: A sociocultural approach to studying the teaching and learning of mathematics. *Educational Studies in Mathematics*, *46*, 87–113.

L'Esperance, M. E., Lenker, E., Bullock, A., Lockamy, B., & Mason, C. (2013). Creating middle grades environment that significantly improves student achievement. *Middle School Journal 44*(5), 32-39.

Liljedahl, P. (2021). *Building thinking classrooms in mathematics*. Corwin: A SAGE Company, 316

Longoria, L. V. (2021). Factors that contribute to motivation and student achievement as adolescents transition from elementary to middle school or junior high in one urban district in the rio grande valley. *ProQuest One Academic; Social Science Premium Collection*. https://www.proquest.com/dissertations-theses/factors-that-contribute-motivation-student/docview/2640409213/se-2.

Mauch, E. (2001). Using technological innovation to improve the problem-solving skills of middle school students: Educators' experiences with the LEGO mindstorms robotic invention system. *A Journal of Educational Strategies, Issues and Ideas*, *74*(4), 211-213. DOI: 10.1080/00098650109599193.

McMahon, S. D., Wernsman, J., and Rose, D. S. (2009). The relation of classroom environment and school belonging to academic self-efficacy among urban fourth- and fifth-grade students. *Elementary School Journal*, *109*, 267–281.

Merriam-Webster. (n.d.). Motivation. In *Merriam-Webster.com dictionary*. Retrieved November 28, 2021, from https://www.merriam-webster.com/dictionary/motivation.

Middleton, J. A., & Spanias, P. A. (1999). Motivation for achievement in mathematics: Findings, generalizations, and criticisms of the research. *Journal for Research in Mathematics Education, 30*(1), 65–88.

Miller A. D., Ramirez E. M., Murdock T. B. (2017). The influence of teachers' self-efficacy on perceptions: Perceived teacher competence and respect and student effort and achievement. *Teaching and Teacher Education*, *64*, 260–269.

Mink, D. V., & Fraser, B. J. (2005). Evaluation of a K–5 mathematics program which integrates children's literature: Classroom environment and attitudes. *International Journal of Science and Mathematics Education, 3*, 59–85.

Mullis, I. V. S., Martin, M. O., Foy, P., & Arora, A. (2012). Trends in International Mathematics and Science Study [TIMSS] 2011 international results in mathematics. https://timssandpirls.bc.edu/timss2011/international-results-mathematics.html.

Murdock, T. B., Anderman, L. H., & Hodge, S. A. (2000). Middle-grade predictors of students' motivation and behavior in high school. Journal of Adolescent Research, *15*(3), 327-351.

Nance, J. (2016). Dismantling the school-to-prison pipeline: tools for change. https://scholarship.law.ufl.edu/cgi/viewcontent.cgi?article=1783&context=facultypub.

National Center for Education Statistics (2010). U.S. participation in international assessments. Retrieved from http://nces.ed.gov/surveys/international.

Neighmond, P. (2013). School stress takes a toll on health, teens and parents say. *NPR.* https://www.npr.org/sections/health-shots/2013/12/02/246599742/school-stress-takes-a-toll-on-health-teens-and-parents-say.

Neubauer, B. E. (2019). How phenomenology can help us learn from the experiences of others. *Perspect Med Education*. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6468135/.

Neumann, J. (2013). Developing a new framework for conceptualizing "student-centered learning". *The Educational Forum*, *77*(2), 161–175.

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

Noddings, N. (1984). Caring, a feminine approach to ethics & moral education. *Berkeley: University of California Press.*

OECDiLibrary. (2019). Educating 21st century children: Emotional well-being in the digital age. https://www.oecd.org/education/educating-21st-century-children-b7f33425-en.htm

Ogbuehi, P.I. & Fraser, B.J. (2007). Learning environment, attitudes and conceptual development associated with innovative strategies in middle-school mathematics. *Learning Environments Research, 10*, 101–114. https://doi.org/10.1007/s10984-007-9026-z.

O'Brien, E. & Rollefson, M. (1995). Extracurricular participation and student engagement. *National Center for Educational Statistics*. https://nces.ed.gov/pubs95/web/95741.asp

O'Neill, G., & McMahon, T. (2005). Student-centered learning: What does it mean for students and lecturers? In G. O'Neill, S. Moore, & B. McMullin (Eds.), *Emerging Issues in the Practice of University Learning and Teaching*, 27–36.

Oldfather P. & McLaughlin H. J. (1993). Gaining and losing voice: A longitudinal study of students' continuing impulse to learn across elementary and middle level contexts. *Research in Middle Level Education*, *17*, 1-25.

Piaget, J. (1970). Genetic epistemology. *Columbia University Press.*

Pintrich, P. R. (1993). Reliability and predictive validity of the motivated strategies for learning questionnaire (MSLQ). *Educational and Psychological Measurement*, *53*, 801-813.

Plante, I., O'Keefe, P. A., & Théorêt, M. (2013). The relation between achievement goal and expectancy-value theories in predicting achievement-related outcomes: a test of four theoretical conceptions. *Motivation and Emotion, 37*, 65–78. doi: 10.1007/s11031-012-9282-9.

Public School Review. (2023). Top ten best Johnson City, TN public schools. https://www.publicschoolreview.com/tennessee/johnson-city.

Puustinen, M., & Pulkkinen, L. (2001). Models of self-regulated learning: A review. Scandinavian Journal of Educational Research, *45*(3), 269–286.

Race to the Top [RTTT], 2012.

Ravitz, J., Becker, H. J., & Wong, Y.T. (2000). Constructivist-compatible beliefs and practices among U.S. teachers. *Teaching, Learning and Computing – 1998 National Survey*, 4 http://www.crito.uci.edu/TLC/FINDINGS/REPORT4/REPORT4.PDF.

Reddy, R., Singh, R., Kapoor,V., Churi, P. (2020). The joy of learning through internet memes. International Journal of Engineering Pedagogy, *10*(5).

Regoli, N. (2017). 8 Advantages and disadvantages of phenomenological research. https://connectusfund.org/8-advantages-and-disadvantages-of-phenomenological- research.

Reppy, D. & Larwin, K.H. (2019). The association between perception of caring and intrinsic motivation: A study of urban middle school students, *200*(1), 48-61.

Reppy, D., & Larwin, K. H. (2020). The association between perception of caring and intrinsic motivation: A study of urban middle school students. *Journal of Education*, *200*(1), 48–61. https://doi.org/10.1177/0022057419875123.

Roschelle, J., & Teasley, S. (1995). The construction of shared knowledge in collaborative problem solving. In C. O. Malley (Eds.), *Computer-Supported Collaborative Learning*, 69–197.

Ryan R. M., Deci E. L. (2000). Intrinsic and extrinsic motivations: Classic definitions and new directions. *Contemp. Educational Psychology, 25*, 54–67.

Sacks, V. (2016). The other achievement gap: poverty and academic success. https://www.childtrends.org/blog/the-other-achievement-gap-poverty-and-academic-success.

Santos-Longhurst, A. (2019). Intrinsic motivation: How to pick up healthy motivation techniques. https://www.healthline.com/health/intrinsic-motivation.

Sass, E. (2023). American educational history: A hypertext timeline https://www.eds-resources.com/educationhistorytimeline.html.

Science Digest. (2017). https://www.sciencedirect.com/topics/psychology/extrinsic-motivation#:~:text=Extrinsic%20motivation%20is%20defined%20as,receiving%20an%20award%20or%20payment.

Senge, Peter. (1990). Peter senge and the learning organization. https://infed.org/peter-senge-and-the-learning-organization/.

Sherier, A. (2015). Educational motivation for students. https://youtu.be/exvu_imfSRw.

Shields, Jr., G.M. (2021). *A Collective Case Study of Factors that Promote Academic Motivation Among High-Performing Economically Disadvantaged Middle School.* https://digitalcommons.liberty.edu/cgi/viewcontent.cgi?article=3867&context=doctoral.

Singh, S., Singh, A., & Singh, K. (2012). Motivation levels among traditional and open learning undergraduate students in India. *The International Review of Research in Open and Distributed Learning*, *13*(3), 19-40. https://doi.org/10.19173/irrodl.v13i3.1050.

Smith, Z. R., Langberg, J. M., Cusick, C. N., Green, C. D., & Becker, S. P. (2020). Academic motivation deficits in adolescents with ADHD and associations with academic functioning. *Journal of Abnormal Child Psychology*, *48*, 237-249.

Speck, B. W. (2003). Fostering collaboration among students in problem-based learning. *New Directions for Teaching and Learning*, *1*, 59–65.

Spinner, H., & Fraser, B. J. (2005). Evaluation of an innovative mathematics program in terms of classroom environment, student attitudes, and conceptual development. International Journal of Science and Mathematics Education, *3*, 267–293.

Spring, J. (2011). *The politics of American education.* Routledge.

Spring, J. (2016). *American education (17th ed.).* Routledge.

Spring, J. (2021). *Today's guide to educational policy: Pandemics, disasters, nationalism,* religion, and global politics. Routledge.

Standards for Reporting on Empirical Social Science Research in AERA Publications: American Educational Research Association. (2006). *Educational Researcher*, *35*(6), 33–40. https://doi.org/10.3102/0013189X035006033.

Steinmayr, R., Weidinger, A. F., Schwinger, M. & Spinath, B. (2019). The importance of students' motivation for their academic achievement – replicating and extending previous findings. *Frontiers in Psychology*, *10*(1730). doi: 10.3389/fpsyg.2019.01730.

Suhr, K. (2018). *Strategies for Motivating Middle School Students*.

Sundararajan, N., & Adesope, O. (2020). Keep it coherent: a meta-analysis of the seductive details effect. *Educational Psychology Review*, 1-28.

Sutton, J., & Austin, Z. (2015). Qualitative Research: Data Collection, Analysis, and Management. *The Canadian journal of hospital pharmacy*, *68*(3), 226–231. https://doi.org/10.4212/cjhp.v68i3.1456.

Tennessee Department of Education (2023). [TDOE]. https://www.tn.gov/education.html.

Tennessee Department of Human Resources (2021). [TDHS]. https://www.tn.gov/content/dam/tn/hr/documents/LLD_LearningPortfolio2021.pdf.

The National Research Center on the Gifted and Talented (2013). Strategies to increase the utility value of your class. https://nrcgt.uconn.edu/underachievement_study/goal-valuation/gv_goalva04/#.

Thesaurus.com (2013). https://www.thesaurus.com/browse/motivation.

Tohidi, H. & Jabbari, M. (2012). The effects of motivation in education. https://www.sciencedirect.com/science/article/pii/S1877042811030771.

Toshalis, E. & Michael J. Nakkula (2012). Motivation, engagement, and student voice. https://paperzz.com/doc/8289458/motivation--engagement--and-student-voice.

Troyer, M. (2019) Twenty-five ways American education has changed in the last decade. Stacker. https://stacker.com/education/25-ways-american-education-has-changed-last-decade.

Turner, A. (2017). How does intrinsic and extrinsic motivation drive performance culture in organizations? *Cogent Education, 4* (1337543).

Turner, A. (n.d.). Sixteen proven strategies to improve manager and employee engagement https://www.insperity.com/blog/employee-engagement/.

Turner, J. C. (1995). The influence of classroom contexts on young children motivation for literacy. *Reading Research Quarterly*, *30*(3), 410–441.

Um, E., Plass, J. L., Hayward, E. O., & Homer, B. D. (2012). Emotional design in multimedia learning. *Journal of Educational Psychology*, *104*, 485-498. http://dx.doi.org/10.1037/a0026609.

U.S. Department of Education. (n. d.). College- and career-ready standards. Retrieved from https://www.air.org/our-work/education/college-and-career-readiness

U.S. Department of Education. (2011). Duncan says 82 percent of America's schools could "Fail" under NCLB this year [Press release]. Retrieved from https://www. ed. gov/news/press-releases/duncan-says-82-percentamericas-schools-could-fail-under-nclb-year.

United States National Commission on Excellence in Education. (1983). A nation at risk: the imperative for educational reform: a report to the Nation and the Secretary of Education, United States Department of Education. *Commission on Excellence in Education.* University of Tübingen. (2017). *Parents' motivation influences students' academic outcomes. ScienceDaily.* Retrieved June 3, 2022, from www.sciencedaily.com/releases/2017/05/170508083417.htm.

Usher, A. (2012). Student motivation—an overlooked piece of school reform. *Center on Education Policy Graduate School of Education and Human Development.*

Using Spatial Reasoning in Math. (2017). https://study.com/academy/lesson/using-spatial-reasoning-in-math.html.

Valentine, J. C., DuBois, D. L., and Cooper, H. (2004). The relation between self-beliefs and academic achievement: a systematic review. *Educational Psychology, 39*, 111–133. doi: 10.1207/s15326985ep3902_3.

Van, M. (n.d.). Memes and math instruction. *Department of Cognitive Science University of California, San Diego.* https://cogsci.ucsd.edu/undergraduates/honors-program/Monica-Van_HonorsThesis_-Memes-and-Math-Instruction.pdf.

Vygotsky, L. (1986). Thought and language. *MIT Press*.

Western Governors University. (2020). What is constructivism? *Teaching and Education* https://www.wgu.edu/blog/what-constructivism2005.html#close.

Wigfield, A., Harold, R., Eccles, J., Blumenfeld, P., Aberbach, A., Freedman-Doan, C., & Yoon, K. S. (1992). The structure of children's ability perceptions and achievement values: Age, gender, and domain differences. Paper presented at the annual meeting of the American Educational Research Association.

Wigfield, A., Tonks, S., and Klauda, S. L. (2016). *Expectancy-value theory: Handbook of Motivation in School*, *2nd Ed*. eds K. R. Wentzel and D. B. Mielecpesnm, 55–74.

Wilkie, K. J., & Sullivan, P. (2018). Exploring intrinsic and extrinsic motivational aspects of middle school students' aspirations for their mathematics learning. Educational Studies in Mathematics, *97*(3), 235–254.

World Economic Forum. (2015). *The Global Information Technology Report.* https://www3.weforum.org/docs/WEF_GITR2015.pdf.

Yilmaz, K. (2011). The cognitive perspective on learning: Its theoretical underpinnings and implications for classroom practices, the clearing house: *A Journal of Educational Strategies, Issues and Ideas, 84*(5), 204-212. DOI: 10.1080/00098655.2011.568989.

Yin, J., Goh, T.-T., Yang, B., & Xiaobin, Y. (2021). Conversation technology with micro-learning: The impact of chatbot-based learning on students' learning motivation and performance. *Journal of Educational Computing Research*, *59*(1), 154–177. https://doi.org/10.1177/0735633120952067.

Ziden, A. A., Zakaria, F., & Othman, A. N. (2012). Effectiveness of AutoCAD 3D software as a learning support tool. *International Journal of Emerging Technologies in Learning*, *7*(2), 57-60.

Zimmerman, B. J. (2002). Becoming a self-regulated learner: An overview. *Theory Into Practice*, *41*(2), 64–70.

APPENDICES

Appendix A: Interview Protocol

Questionnaire for Interviews

Interview Questions

Audio Interview Protocol and Questions

- *Research Purpose Statement:*

The researcher will conduct a phenomenological study aimed to discover educators' perceptions from local middle schools about motivational factors and strategies influencing middle school students in mathematics courses. At this stage in the research, the educator's perceptions of motivational factors and strategies influencing middle school students in mathematics courses will be defined as the act or process of giving someone a reason for doing something or motivating someone (Cherry, 2023). In the study, protocols will be set, and selected persons will be interviewed.

- *Qualitative Research Questions*:

What are educators' perceptions on motivational strategies influencing middle school students in mathematics courses? Four supporting questions of this study:

1. What are educators' perceptions about internal motivational strategies that have contributed to middle school students' mathematical development?
2. What are educators' perceptions about external motivational strategies that have contributed to middle school students' mathematical development?
3. Do educators use different degrees of motivational strategies to influence middle school students in mathematics?
4. How does middle school students' motivation affect the learning of mathematical concepts?

- *Audio Interview Protocol*

Hello, my name is Amy Rigsby. Thank you for taking the time out of your busy day to let me interview you. I am in the process of researching educators' perceptions about motivational strategies influencing middle school students in mathematics courses. I will be asking you a series of questions, and feel free to answer openly and honestly. This interview is an open-ended question format. Do you have any questions for me?

Audio Interview Questions: *Answer the following questions about a middle student*.

1. What internal motivational strategies have contributed to your students' mathematical development?

2. Can you provide strategies that you have used to encourage students to be internally motivated?

3. What motivates your students to perform in mathematics classes?

4. Do you find that internally motivated students perform in mathematics courses?

5. What are students' reasons for wanting to achieve a mathematical goal?

6. Do you feel students are more motivated academically when they have a positive relationship with their teacher?

7. Do you believe students receiving extrinsic rewards such as small prizes, tokens, extra credit, stickers, food, etc., help to motivate students?

8. Is *student choice* a powerful motivator in your mathematics courses?

9. What are your opinions on the following statement: Students must believe they can improve to stay motivated to perform any math task.

10. Do you use different degrees of motivational strategies to influence students in mathematics class?

11. Can you give some examples of how you motivate students who do not perform as well as other students in your mathematics classes?

12. How does a student's motivation affect the learning of mathematical concepts?

13. Do you believe the factors that motivate students have changed in the last five years? Ten years?

14. How do you encourage students to move closer to their mathematical goals?

15. Do you believe standardized tests motivate students to reach their mathematical goals?

Concluding Remarks:
Thank you, we have finished with all the questions. If I need to clarify anything regarding the interview, would you be willing to meet for a brief follow-up interview within the next two weeks? Perfect! Thank you again for participating in the interview, and I appreciate your time.

Appendix B: Recruitment Email

Recruitment Email

Hello,

I am an Educational Leadership Doctoral student at East Tennessee State University (ETSU), and I am conducting a research study that involves educators and school administrators' perceptions about current motivational factors influencing middle school students to perform successfully in core academic classes. At this stage in the research, the present motivational factors influencing middle school students to perform successfully in core educational classes will be defined as the act or process of giving someone a reason for doing something or motivating someone.

The research study will include participants over the age of 18 who must be physically present in the United States. The researcher will conduct individual interviews with sixth through eighth-grade teachers and school administrators. Minors under the age of 18 are excluded from this study.

I am looking for people who are teachers and school administrators in Tennessee. This study involves an interview which should take about 45 to 60 minutes. The interview will take place online via Zoom. Please think about participating. Participation is voluntary. If you have any questions please contact me at my email ZASR4@etsu.edu, cellphone number 423-416-4050, or address 245 Hales Road Jonesborough, TN 37659.

Sincerely,

Amy S. Rigsby
Educational Leadership Doctoral Student
East Tennessee State University

The research study will include participants over the age of 18 who must be physically present in the United States. The researcher will conduct individual interviews with sixth through eighth-grade teachers, middle school assistant principals and principals, middle school parents, and stakeholders who have an interest in students in grades sixth through eighth grade across Tennessee. Minors under the age of 18 are excluded from this study.

VITA

AMY S. RIGSBY

Education: Ed.D. Educational Leadership, 2023 East Tennessee State University Johnson City, Tennessee

Ed.S. Educational Specialist, 2015 Union College Barbourville, Kentucky

M.A. Educational Leadership and Policy Analysis, 1999 East Tennessee State University Johnson City, Tennessee

B.S. Mathematics and Secondary Education, 1993 East Tennessee State University Johnson City, Tennessee

Professional Experience: Algebra 1A/Honors Algebra 1Teacher (2023 - Present), Science Hill High School, Johnson City, TN

Algebra 1/Math 8 Teacher (2022 – 2023),
Indian Trail Middle School, Johnson City, TN;
Level 5 Effectiveness of Algebra 1 EOC/Math 8 TCAP (TVAAS Data)

Summer School Assistant Principal (2021 and 2022), South Side Elementary, Johnson City, TN

Algebra 1/Math 8 Teacher (2018 – 2022),
Liberty Bell Middle School, Johnson City, TN;
Level 5 Effectiveness of Algebra 1 EOC/Math 8 TCAP (TVAAS Data)

Principal Assistant and School Administrative Substitute (2016 – 2020), Liberty Bell Middle School, Johnson City, TN and Daniel Boone High School, Gray, TN.

Mathematics Department Head (2018 – 2011), Daniel Boone High School, Gray, TN

High School Algebra 1 Math Instructional Coach/Algebra 1 Teacher (2017 - 2018), Daniel Boone High School, Gray, TN

Advanced Algebra 2, Advanced Algebra and Trigonometry, Advanced Algebra 1 Teacher (1997- 2018), Daniel Boone High School, Gray, TN; Level 5 Effectiveness of Algebra 2 EOC (TVAAS Data)