FACTORS INFLUENCING SELF-EFFICACY AND MOTIVATION IN THE MIDDLE SCHOOL MATHEMATICS CLASSROOM

by

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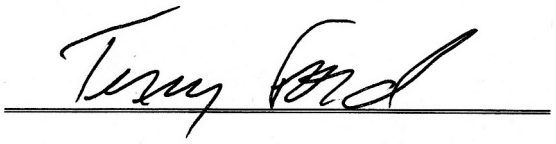

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ABSTRACT

This paper examines current research to determine factors that influence self-efficacy and motivation in the middle school mathematics classroom. The history of mathematics education is fraught with instability in curriculum due to conflicting philosophies on best practices in math. The history of motivation and self-efficacy reveals a focus on student-centered education for keeping students engaged in learning. A critical review of the literature shows the impact of social and cognitive factors on behaviors and attitudes. Teacher discourse heavily influences the classroom environment, and the relationships built between teachers and students and among students in middle school are related to student affect and performance in mathematics. Teachers should put great effort and care into the relationships built in the classroom and provide students with autonomy, challenge, and support. Future research should include more diverse populations of students and teachers across the United States.

TABLE OF CONTENTS

CHAPTER 1: INTRODUCTION

Introduction

Chapter One introduces the guiding question of the research and provides rationale that emphasizes the importance of maintaining self-efficacy in early adolescence, especially during the transition from elementary school to middle school. Different theoretical perspectives are introduced as lenses through which the research will be viewed.

Rationale

The purpose of this paper is to examine current research to determine factors that influence self-efficacy and motivation in the middle school mathematics classroom. Using a social cognitive lens, I will examine research that addresses teacher discourse, teacher-student relationships, peer relationships, implicit theories of intelligence, classroom environment, and self-regulated behavior as factors in student self-efficacy and motivation. There is naturally cross-over amongst these topics, but each lends important information for creating a classroom that is supportive, motivating, interesting, and challenging for a diverse set of students. While there are many areas of research on motivation, this paper will connect social cognitive theory, self-determination theory, flow theory, and invitational theory to motivation in middle school students.

Because adolescents in middle school experience many different kinds of physical and emotional changes, with feelings and interests in constant flux, I will be reviewing research on what teachers can do to help students develop a sense of efficacy during this important time of transition in their young lives. An effective teacher must know what to pay attention to in order to move and adapt with her changing students. In this paper, self-efficacy and motivation are somewhat intertwined. What I hope to illustrate is that there are complex social, cognitive, and

behavioral factors that influence self-efficacy and motivation in middle school and in the mathematics classroom.

I am examining self-efficacy and motivation because as a teacher of young people going through developmental struggles, I want to understand how to better identify and meet students' emotional, psychological, and academic needs. I am interested in the interpersonal relationships in the classroom and how these influence students' beliefs and behaviors.

Self-efficacy is a predictor of math performance. Mathematics is a specific domain with its own set of attitudes, behaviors, cognitive strategies, and motivational constructs. Mathematics holds a valued place in the academic curriculum; it is prominent on high-stakes measures of achievement generally used for level placement, for entrance into special programs, and for college admissions. Sells (as cited in Pajares & Graham, 1999, p. 124-125) called mathematics a "critical filter" for students pursuing science and technical careers at the college level.

Math instruction has been criticized as being boring and frustrating so that 'motivation for mathematics may suffer appreciably in all but those few students devoted to the subject' (Stanley & Benbow, 1986, p. 368) and as 'severed from the real world…consist[ing] of meaningless bits and pieces' (Davis, 1992, p. 730). Lampert (1990) contended that in school, '*doing* mathematics means following the rules laid down by the teacher, *knowing* mathematics means remembering and applying the correct rule when the teacher asks a question, and *mathematical truth is determined* when the answer is ratified by the teacher' (p. 32). How can teachers work with their students to revise these definitions so that motivation for mathematics is rescued from further deterioration?

As Bandura (1997) pointed out, "the same level of performance success may raise, leave unaffected, or lower perceived self-efficacy depending on how various personal and situational contributions are interpreted and weighted" (p. 81). A successful student who receives a B on a math test may experience lowered self-efficacy, while a struggling student who receives a B may build her mathematics self-efficacy based on a successful experience in math. Students who feel

confident in their academic abilities tend to engage in increasingly challenging activities that lead to greater competence. That confidence, however, is influenced by a variety of sources.

What makes school motivating for students? Adolescents are coming into their own physically, cognitively and socially, and the interplay of these is often tumultuous and confusing for a student who is not only transitioning into adulthood, but at the same time transitioning into a new schooling environment: moving from elementary into middle school. Students are no longer with the same teacher for most of the day. They are often shuffled from one class to the next, from one teacher to the next, from one set of classmates to another. A teacher may only be with one student for an hour each day, making it difficult to know students individually, to find out about their families and interests, and what they like about school. These are aspects of a student that a teacher must know in order to create a positive, open, accepting learning environment for her students.

There is concern in the literature about students' transition from elementary to middle school. Traditional middle grade schools are typically larger, less personal, and more formal than elementary schools. Middle grade teachers are often subject-matter specialists and typically instruct a much larger number of students than do elementary teachers in self-contained classrooms, making it less likely that they will come to know students well, believe students to be trustworthy, and grant them autonomy (Brophy & Evertson, 1978; Eccles, Feldlaufer, & Midgley, 1989). Middle grade teachers may have a hard time sustaining their own feelings of efficacy because they may not believe they will be able to truly affect the achievement of such a large number of students, especially when they see them for a such a short amount of time each day (Midgley, Feldlaufer, & Eccles, 1989).

The transition to middle school is taking place at the same time as biological changes associated with puberty, along with social and psychological developmental changes. Early adolescents have an increasing desire for autonomy, particularly autonomy from adults such as parents and teachers (Steinberg, 1990). They become increasingly focused on their peers and very

concerned about social acceptance and developing sexual relationships (Brown, 1990; Katchadourian, 1990). Many early adolescents are concerned with identity issues (Erikson, 1968), and as a result, they often show increased self-focus and self-consciousness (Simmons & Blyth, 1987). Certainty of their cognitive abilities increase as well, in particular, their capability to engage in more abstract cognitive activities (Keating, 1990).

Social cognitive theorists have acknowledged that self-efficacy acts alongside other factors that influence student outcomes, such as self-concept beliefs, anxiety, and value. It is believed that self-efficacy mediates between self-regulation and engagement. As one puts forth effort on a strategy to complete a task, they use their experiences to determine if they will persist in the task (Bandura, 1986).

Vygotsky (1978) argued that social interaction promoted cognitive development, and that students assisted by a more capable other in the *Zone of Proximal Development (ZPD)* would experience the greatest development. The ZPD is defined as the range between what a child can do with help and what the child can do on their own. In a social constructivist classroom, students are active participants in their own learning and teachers act as facilitators, designing learning activities that encourage students in co-constructing their knowledge through meaningful collaboration with their teacher and peers.

Goal orientation theory is a preeminent social-cognitive theory of motivation where motivation is embodied in a learner's reason or purpose for engaging in achievement behavior (Middleton & Midgley, 2002). Students who pursue a learning goal are more likely to experience a sense of self-efficacy for attaining it and be motivated to engage in task-appropriate activities (expending effort, persistence, using effective strategies) (Schunk, 1991). In contrast to learning goals, performance goals focus students' attention on completing a task. Performance goals may not highlight the importance of the processes and strategies utilized or raise self-efficacy for acquiring skills. Rather, an individual may be more concerned with receiving a good grade.

According to person-environment fit theorists, there are negative motivational consequences of being in an environment that doesn't match one's needs. Put into a developmental framework, Hunt (1975) argued for the importance of adopting a developmental perspective on person-environment fit in the classroom. He stressed the need for teachers to provide the optimal level of structure for students' current levels of maturity. This optimal level would pull students along a developmental path toward higher levels of cognitive maturity. He further agreed that the type of structure needed would differ for different age groups. If we accept this notion that different educational environments may be needed for different age groups in order to meet developmental needs and to foster continued developmental growth, then some changes in educational environments may be especially inappropriate at certain stages of development. For example, in the early adolescent period, "exposure to such changes could lead to a particularly poor person-environment fit, and this lack of fit could account for some of the declines in motivation at this developmental period" (p. 221). The transition from elementary to middle school may be developmentally disruptive for students, and might result in a developmental regression.

Statement of Limits

The research reviewed in this paper is concerned primarily with students in middle school or those making the transition to middle school. This is an important and often controversial area of study because students at this age are experiencing a great number of changes in their lives that could contribute to their feelings of self-efficacy and motivation. Adolescence is a critical time of development, and middle schools have been criticized for having a negative effect on self-esteem and student motivation (Eccles et al., 1993).

The research is mostly concerned with the domain of mathematics in middle school. I will also consider achievement level of students, but I will not be addressing race or socioeconomic status. Although I do not look specifically at gender, I do include research

findings that relate to important considerations for middle school teachers regarding the self-efficacy and motivation of male and female students.

Definition of Terms

Self efficacy refers to beliefs about one's capabilities to learn or perform behaviors at designated levels. Self-efficacy beliefs influence task choice, effort, persistence, resilience, and achievement (Bandura, 1986; 1997).

Goal orientation theory is a preeminent social-cognitive theory of motivation where motivation is embodied in a learner's reason or purpose for engaging in achievement behavior (Middleton & Midgley, 2002). Goal theory is a facet of motivation mainly divided into two goals: *task goals* and *performance goals* (Middleton & Midgley, 2002, p. 374). Task goals are in effect when a learner is focused on developing and improving competency, while performance goals refer to behavior that exhibits or proves competency, often in relation to other students. Performance goals can be further divided into *performance-approach* or *performance-avoid goals*, where a student avoids engaging in a task where they may appear to lack skills, especially when the task is public (Summers, 2006). Performance goals are also referred to in the literature as *ego-goals* or *ability-focused goals*.

In a *mastery goal orientation*, students seek to acquire new knowledge or master something new; they value the process of learning. With mastery goals, students' focus their attention on the task at hand. Mastery goals are comparable to both task-goals and learning-goals (Morrone, Harkness, D'Ambrosio, & Caulfield, 2004).

Self-determination theory (Deci & Ryan, 1985) posits that when individuals experience themselves as autonomous or as having choice in their actions and behaviors, as opposed to being controlled or pressured, it will naturally lead toward self-motivation, well being, and growth. Personal task value is highly related to self-determination. *Autonomy* is defined as student independence and a responsibility for oneself.

Zimmerman (2000) proposed *self-regulated learning* as three phases of self-regulation. During *forethought*, self-regulated learners plan their behaviors by analyzing tasks and setting goals. During the *performance* or *volition control phase*, they monitor and control their behaviors, cognitions, motivations, and emotions by enlisting strategies such as attentional control, encoding control, self-instruction, and attributions (Corno, 2001). While strategic behaviors are related to academic performance, knowledge of varying strategies is a stronger correlate than the mere number of strategies reported. During the final phase, *self-reflection*, learners make judgments of their progress and alter their behaviors accordingly (Pape, Bell, & Yetkin, 2003).

Social goals reflect personal social aims as well as the demands of the social context. *Intimacy goals* refer to students' need for a close, interpersonal relationship, and *social status goals* refer to students' need to belong to a well-accepted peer group and to have high social visibility (Summers, 2006).

Middle School refers to schools including sixth, seventh, and eighth grade, while *junior high* includes only seventh and eighth grades.

Summary

Chapter One introduced the guiding question of the research: what are factors that influence self-efficacy and motivation in the middle school mathematics classroom? Rationale was given that emphasized the importance of maintaining self-efficacy in early adolescence during the transition from elementary school to middle school. Different theoretical perspectives were introduced as lenses through which the research will be viewed.

Chapter Two reviews the history of motivation in education and the major advocates for student-centered learning. Also addressed are the psychology influences on motivation in education, and how the history of mathematics may have resulted in low self-efficacy for many teachers and students.

CHAPTER 2: HISTORY OF MOTIVATION IN EDUCATION

Introduction

Chapter One introduced the guiding question of this research paper: what are factors that influence self-efficacy and motivation in the middle school mathematics classroom? Rationale was provided for the importance of this question, along with a statement of research limits.

Chapter Two provides a brief history of how student motivation and self-efficacy came to be an important focus in education. In searching for a deeper understanding on this topic, I found myself looking at various learning and motivational theories, along with adolescent development in the context of middle school, and motivation in the domain of mathematics. What I have uncovered is a glimpse into the past 250 years, revealing the important work of individuals who exist on the continuum of research that has shed light on student-centered education, adolescent development, social and cognitive impacts on learning, and the role of self-efficacy and motivation in learning.

Early Schooling Influences

In 1762, philosopher Jean-Jacques Rousseau wrote *Emile*, a book that emphasized the best education for a child is one where he is allowed to learn what is important and useful through experience and discovery (Spring, 2005, p. 38). The child is kept from the outside world during this early period of life when he is most susceptible to corruption from society. Rousseau's educational vision was quite different from schooling where students were the subordinates to a teacher's wisdom and authority. He focused on a child learning out of his own curiosity and volition. Rousseau also believed that a child was born with an inherently good nature, a sharp contrast to the colonial belief of children born with original sin. His writings started educational trends that emphasized freedom of learning for children (Spring, 2005).

Johann Pestalozzi, a Swiss educator and education reformer who "popularized the first systematic method of instruction" (Spring, 2005, p. 146) was greatly influenced by the ideas presented in *Emile*. He believed in the educational power and wisdom of mothers. In 1781, he published *Leonard and Gertrude,* the story of brave and righteous Gertrude, who teaches through her maternal care in both the home and in the public sphere. A theory of education developed in the story, as Gertrude teaches her children through hands-on learning with common objects that connect to their daily activities and chores. Pestalozzi, like Rousseau, was convinced that experience was the root of real learning and would naturally lead toward an understanding of morality (Spring, 2005, p. 148). By the late nineteenth century it was apparent that Pestalozzi's teachings had influenced the way school was being taught in America. Lessons moved from individual deskwork to include a more interactive structure that used objects, models, illustrations, and real-life contexts.

German psychologist Johann Herbart, whose educational philosophy entered the U.S. in the 1880s and 1890s, built on the ideas of Pestalozzi (Spring, 2005). He agreed that learning occurred through the senses and interaction with objects, and that lessons should be planned with students' interests in mind. "Interest can arise from knowledge or from social contacts. Interests related to knowledge include speculative, empirical, and aesthetic interests; interests arising from contact with others include sympathetic, social, and religious interests" (Spring, 2005, p. 272). Applying interest toward creating educational lessons showed that student motivation was an important factor in learning.

Preparing for the Workforce

Around the same time as Herbart, adolescent development was becoming an important arena for study. Transitions to middle school affected children in different ways; their academic success depended on their ability to believe in themselves and the way they saw themselves as competent. Psychologist G. Stanley Hall was considered a pioneer in the study of adolescent

development in the 1890s (Spring, 2005, p. 249). His theories argued that adolescent energies should be focused on social objectives that would be useful to the greater society. High school curriculum was focused on experiences that would not only help students choose a career but would also build solidarity among students.

To prepare students for high school and vocational education, which was intended to develop workers to compete in an increasingly industrial and competitive economy, junior high schools were established. The goal was to differentiate the curriculum early on in order to prepare students for the workforce, along with creating the same spirit of cooperation intended for high school (Spring, 2005, p. 261-262).

John Dewey, who contributed much work toward educational psychology and theory, also believed that school should serve a social function and prepare students to address the future needs of society (Spring, 2005, p. 273). In his Laboratory School, he used methods that emphasized student interest, social interaction, and learning experiences that applied to real life contexts, much like Pestalozzi's *Gertrude*. In his 1938 book *Experience and Education*, Dewey wrote about the relationship between education and personal experience, and the importance of connectivity in learning. He stated "any experience is mis-educative that has the effect of arresting or distorting the growth of further experience" (Dewey, 1938, p. 25). Like Herbart, Dewey also believed in the influence of social factors in learning. Those who participate in a common activity construct knowledge together and share control, thus a teacher should reduce the amount of authority they exert over their students (Dewey, 1938, p. 54). Dewey believed that teachers should create activities that are socially organized, wherein each member of the group contributes to the whole. Students are motivated to participate in the learning they have control over.

Psychology Influences

In the 1950's a similar focus on experience appeared in the humanist approach to psychology, which focused on human processes, experiences, and constructs on an internal level. In 1954 Abraham Maslow's *Motivation and Personality* was published, which identified a hierarchy of human needs, beginning with the physiological and moving towards the human necessity for self-actualization: a fulfillment of one's true and unique potential. Before pursuing this ultimate goal, or even being able to recognize it, Maslow theorized that humans must have their esteem needs met, which include confidence, respect by others and for others, mastery and competence, and achievement. This approach also had an impact on educational theory, because learning must occur to support the social and cognitive development required to move through Maslow's hierarchical stages.

Parallel to Maslow's work, psychologist Erik Erikson studied human development and established the *Eight Ages of Man* theory, which illustrates eight stages that humans move through and the personality strengths developed at each stage (Mooney, 2000). The phrase *identity crisis* stems from the conflict that young people experience as they move through adolescence to adulthood. Erikson recognized that adolescence is a complex, challenging time for young people and a crucial period in their identity development. In *Childhood and Society* (1963), he wrote about the adolescent experience and identified the importance of peer interactions and independence from parents as they searched for their self-identity. In his 1968 book *Identity, Youth, and Crisis,* he claimed that there was a collective responsibility of the family and the community toward adolescent identity development (Roeser, Eccles, & Sameroff, 2000, p. 444): "in looking at youth of today, one is apt to forget that identity formation, while being 'critical' in youth, is really a *generational issue*" (Erikson, 1968, p. 29). He attributed academic, social, and emotional success of adolescents to adults meeting their developmental needs and providing them with a stimulating and encouraging environment (Roeser, Eccles, & Sameroff, 2000, p. 445).

Vygotsky was another psychologist who saw a deep connection between social experiences, learning, and development. Vygotsky believed that learning was constructed through personal experiences, and that you could not separate personal from social experience (Mooney, 2000, p. 82). In Vygotsky's *zone of proximal development*, defined as "the distance between the most difficult task a child can do alone and the most difficult task a child can do with help," a teacher acts as a more capable other, providing developmentally appropriate scaffolding to help a student achieve on the various levels presented by Erikson: academic, social, and emotional (Mooney, 2000, p. 83).

In 1977, Bandura published a self-efficacy model that explained how people coped when they were in fearful situations. This research eventually expanded to include the cognitive domain and children's beliefs about their ability in academic situations (as cited in Schunk, 1984). Bandura believed that people have control over the shape of their experiences and the direction of their lives. A sense of efficacy means that one recognizes that their beliefs can influence their surroundings. This leads to action towards setting and meeting goals and persevering through hardships. Self-efficacy has the "power to produce results" (Bandura, 1997, p. 3).

In his 1986 book, *Social Foundations of Thought and Action: A Social Cognitive Theory,* Bandura premised that efficacy involved cognitive, social, and behavioral skills that must be organized toward a goal or course of action. "Success is often attained only after generating and testing alternative forms of behavior and strategies, which requires perseverant effort" (1986, p. 391). Holding self-doubt may cause a person to give up if they experience failure. Bandura also held that efficacy can have a collective effect leading toward "group achievement and social change" (1997, p. 32).

Controversy in Mathematics Education

Mathematics instruction has been a source of controversy for the last 100 years. In the first issue of the *Mathematics Teacher* journal dating back to 1908, a teacher wrote to complain

that he held "general dissatisfaction" with the way mathematics was being taught in schools (Colvin, 1999, p. 28). Fifty years later, in the same publication, another teacher expressed, "the traditional curriculum is meaningless, and by heading for abstract mathematics, the modernists are moving further away from reality" (p. 28). Reformers seem to go back and forth between traditional methods of rote "drill and kill," and more constructivist practices that focus on mathematical problem solving, applications, and students' deeper understanding.

In 1957, mathematics education changed drastically when the Russians successfully launched Sputnik, which sparked math and science scholars to develop "new math," a modern curriculum devised to teach students mathematical theory. Teachers were trained in the new practices, but the new math was found to be difficult to apply to the real world, difficult to teach, and parents found it difficult to help their students at home (Schoenfeld, 2004). At this time, by the early 1970s, "New Math was dead" (p. 257) and curriculum returned to its previous state of learning the basics.

The 1980s also witnessed a return to basic computational skills with a minimal focus on problem solving. In 1983, the National Commission on Excellence in Education published *A Nation at Risk*, a report that essentially blamed public schools for America's inability to compete in a global economy. It called for educational reform, appealing at the states and community level to improve the quality of teachers, curriculum, and academic standards (Spring, 2005).

In the 1990s the teaching of math sparked the "math wars" (Schoenfeld, 2004). The National Council of Teachers of Mathematics published *Curriculum and Evaluation Standards for School Mathematics*, standards that focused on problem solving and students learning in cooperative peer groups, along with an emphasis on the removal of ability grouping in math classes (Colvin, 1999). Traditionalists feared that this curriculum would weaken classical mathematics foundations.

Social forces shape mathematics education. Perhaps this constant flux in decision-making throughout mathematics educational history has made mathematics education inconsistent, and

subsequently difficult to teach and to learn. Teacher self-efficacy, presented later as a predictor of student perceptions of difficulty in mathematics, is affected when curriculum changes every decade and teachers must familiarize themselves with an entirely new way of teaching, or go back to the way they were teaching years before. There are high expectations for math teachers, and also for math students, to achieve in math and put America back in the upper ranks of global economic competitors. This pressure has been felt by every generation in the last 100 years. Might this have had a cumulative effect on student self-efficacy and motivation?

What is common throughout the history presented is the relationship between social, cognitive, and behavioral factors common in both motivation and education. It is the teacher's responsibility to address each of these elements in the classroom in order to create an environment that is both interesting and motivating to each child.

Summary

Chapter One introduced the guiding question of the research and provided rationale that emphasized the importance of maintaining self-efficacy in early adolescence, especially during the transition from elementary school to middle school. Different theoretical perspectives were introduced as lenses through which the research was viewed.

This chapter reviewed the history of the visionaries of early schooling such as Rousseau, Pestalozzi, and Herbart, who believed in a nurturing education that centered on students' natural curiosities and interests. When adolescent development became a subject of interest, it was determined that student energy at this age should be focused on social objectives, such as preparing for the workforce. Dewey agreed that education should have a social objective, but also advocated for the social and cognitive development of the student. From the 1940s to the present, psychology has had a great impact on educational practices. Maslow, Erikson, Vygotsky, and Bandura all contributed to the body of research and writings on motivation, adolescent

development, socially constructed learning, and self-efficacy. Motivation in mathematics has been influenced by a history of fluctuation in mathematics education and reform.

Chapter Three examines research on self-efficacy and motivation in the middle school mathematics classroom. It is organized into six subsections: classroom environment and the transition to middle school; challenge, avoidance, affect, and self-efficacy; self-efficacy and self-regulated learning in the transition to middle school; teacher discourse as a motivating factor in the math classroom; classroom relationships, self-efficacy, and motivation; and teaching implicit theories of intelligence. Each study is reviewed and critiqued in order to examine factors that influence self-efficacy and motivation in middle school mathematics students.

CHAPTER 3: CRITICAL REVIEW OF THE LITERATURE

Introduction

Chapter One introduced the guiding question of the research and provided rationale that emphasized the importance of maintaining self-efficacy in early adolescence, especially during the transition from elementary school to middle school. Different theoretical perspectives were introduced as lenses through which the research was viewed.

Chapter Two reviewed the history of the major early schooling influences such as Rousseau, Pestalozzi, and Herbart, and Dewey, who believed in a student-centered pedagogy. Later, when adolescent development was studied for educational means, it was determined that middle school should begin preparing adolescents for the workforce. Psychology has had a great impact on educational practices. The work of Maslow, Erikson, Vygotsky, and Bandura contributed to the body of research and writings on motivation, adolescent development, socially constructed learning, and self-efficacy. In the field of mathematics, motivation has been influenced by a history of fluctuation in mathematics education and reform.

Chapter three examines research on self-efficacy and motivation in the middle school mathematics classroom. It is organized into six subsections: classroom environment and the transition to middle school; challenge, avoidance, affect, and self-efficacy; self-efficacy and self-regulated learning in the transition to middle school; teacher discourse as a motivating factor in the math classroom; classroom relationships, self-efficacy, and motivation; and teaching implicit theories of intelligence.

Classroom Environment and the Transition to Middle School

This section presents four studies that discuss the significance of the transition from elementary school to middle school and factors at the classroom and school level that influence students' self-efficacy and motivation. Goal theory will be examined to address the motivational

constructs of both school and classroom and the role that teacher efficacy plays in creating a positive learning environment.

Midgley, Anderman and Hicks (1995) conducted a correlational study to investigate the different goal orientations held by teachers and students in elementary school compared to those of teachers and students in middle school. They found that in middle school there is a greater perceived emphasis on performance over task goals than in elementary school. Teachers in elementary school were found to endorse goals and instructional practices that were task-goal oriented. The self-efficacy of both students and teachers was positively influenced by task goals in the school.

Participants in this study were teachers and students from two elementary and two middle schools in one school district near a major metropolitan area. The community was mostly blue-collar, with 25% of students qualifying for free or reduced lunch. Students in the district were mostly white, and 17% of students were African American.

Fifty elementary teachers (43 female and 7 male) and 108 middle school teachers (63 females and 45 males) participated. The student sample was 291 4^{th} and 5^{th} graders in elementary school and 678 sixth and seventh graders in middle school.

Elementary teachers completed mailed surveys in the late fall and middle school teachers completed surveys in the early winter of the 1990-1991 school year. Items assessed their achievement goals for their students, instructional practices, personal teaching efficacy, beliefs about school ability as being fixed or changeable, and perception of school culture as stressing performance or task goals. Students completed items adapted from the *Patterns of Adaptive Learning Survey* (PALS) (Midgley & Maehr, 1993 as cited in Midgley, Anderman & Hicks, 1995, p. 95). Items assessed students' perceived self-efficacy, perceptions of school culture, personal achievement goals, and beliefs about school ability.

At the middle school level, *t* tests concluded that teachers believed that their schools stressed performance goals ($t = -2.44$, $p < .05$) and elementary teachers perceived a school wide

stress on task goals ($t = 3.48$, $p = .001$). ANOVA results showed that middle school students perceived a greater school focus on performance goals compared to elementary school students ($p < .001$). Multiple regression showed that the strongest predictors of teacher efficacy were perceiving that the school stressed task goals ($\beta = .28$, $p < .01$) and believing that school ability is modifiable ($\beta = .29$, $p < .001$). Using task-focused instructional practices ($\beta = .23$, $p < .01$) was another significant predictor of teacher efficacy. These predictors accounted for thirty-three percent of total variance for teacher efficacy.

Sample items from teacher and student survey scales were provided, with alpha coefficients ranging from .55 to .92. The reliability of the items on the PALS instrument has been verified in the literature. A limitation of the research methods is that the PALS scales for middle and elementary schools did not contain identical items.

A weakness to the internal validity is the nonrandom selection of the sample and the one-shot nature of the survey. It was also not explained how the researchers selected this population. The researchers suggested that future longitudinal studies with larger sample sizes were needed: studies that follow children, their goal orientations, and learning approaches over the transition from elementary school to middle school. Further, there were no follow-up procedures to the survey to see how the results may have changed over time.

The schools in the study represent a small population of teachers and students from a mostly white and working-class community. The results can only be generalized to similar populations. Other studies that include diverse populations in rural or suburban areas should be consulted.

Midgley, Feldlaufer, and Eccles (1989) conducted a quasi-experimental time series study of students and teachers during the transition to junior high school to investigate the relationship between students' motivational beliefs in mathematics and their teachers' sense of efficacy. They found that students who moved from a high-efficacy teacher in sixth grade to a low-efficacy teacher in seventh grade had the lowest expectancies for academic achievement, the lowest

perceived performance, and the highest perception of task difficulty in mathematics. These findings imply that teacher efficacy is related to student beliefs and attitudes in the mathematics classroom.

Data was collected across two years as part of a four-wave panel study, *The Transitions at Early Adolescence Project*. Participants were a 1,329 subsample of the 2,501 students from the *Transitions Project*. Students were 96% white. Students represented 11 middle-income school districts in southeastern Michigan, near Detroit. Participating teachers were those who were teaching sixth grade mathematics during the first year of the study and were transitioning to teach in a seventh grade junior high classroom for the second year. Year one of the study included 143 math classrooms, with 171 classrooms in year two. Teachers participated for both years, but students did not have the same teacher both years.

Teacher efficacy measures were given to pretransition teachers in the fall of year one and to posttransition teachers in the fall of year two. A questionnaire assessed teacher beliefs such as teachers' trust and respect for students, beliefs about the use of control and discipline in the classroom, feelings of personal teaching efficacy, and views of ability as being fixed or malleable.

Student questionnaires were administered four times by field staff during regularly scheduled math class. Data was collected on two consecutive days in the fall and spring of sixth grade and fall and spring of seventh grade. Measures assessed students' beliefs, values, and behaviors across multiple domains, but only scales for mathematics were used. Standardized test scores measured student achievement. Based on standardized math test scores, researchers identified low-achieving students, whom they believed would be most affected by teacher efficacy.

Simple regression was used to find the relation between teacher efficacy and student self- and task-related beliefs in mathematics for spring of each year. There was a significant association between teacher efficacy and students' perceived performance and expectancies in

math in the spring of sixth grade (perceived performance $F = 5.81$, $\beta = 0.07$; expectancy $F = 5.75$, $\beta = 0.03$, $p < .02$). In spring of seventh grade, there was an even stronger relation between teacher efficacy, students' perceived performance, expectancies, and perceived task difficulty in math (perceived performance $F = 8.82$, $\beta = 0.08$, $p < .01$, expectancy $F = 11.89$, $\beta = 0.09$ and perceived task difficulty $F = 14.04$, $\beta = -0.10$, $p < .001$). Students who had a teacher with high efficacy both years felt they were doing better in math and expected to do better in the future compared to students with low-efficacy beliefs.

Multiple regression was used to determine the association between teacher efficacy and within-year changes in students. Academic expectancies and perceived performance decreased over the two school years for all students (year one academic expectancies: $t = 2.05$, $\beta = 0.04$; year one perceived performance: $t = 3.55$, $\beta = 0.08$, $p < .001$; year two expectancies: $t = 2.81$, $\beta = 0.06$, $p < .01$; year two performance: $t = 3.04$, $\beta = 0.07$, $p < .01$). However, students who moved from high-efficacy teachers to low efficacy teachers lowered their expectations (from $M = 5.58$, $SD = 1.17$ to $M = 5.12$, $SD = 1.40$) and perceptions of their math performance (from $M = 5.69$, $SD = 1.14$ to $M = 5.22$, $SD = 1.46$) and raised their perception of the difficulty of math more (from $M = 3.26$, $SD = 1.38$ to $M = 3.53$, $SD = 1.41$) when compared to students with more efficacious teachers for both years (expectations: from $M = 5.85$, $SD = 1.06$ to $M = 5.55$, $SD = 1.21$; perceived performance: from $M = 5.73$, $SD = 1.11$ to $M = 5.58$, $SD = 1.31$; perception of difficulty: from $M = 3.16$, $SD = 1.35$ to $M = 3.05$, $SD = 1.32$). For lower achieving students, the only group that had higher expectances and perceived performance in the seventh grade compared to sixth grade were those that moved from low- to high-efficacy teachers (from $M = 4.56$, $SD = 1.63$ in 6^{th} grade to $M = 5.14$, $SD = 1.16$ in 7^{th} for expectancy and from $M = 4.69$, $SD = 1.57$ in 6^{th} grade to $M = 4.87$, $SD = 1.36$ in 7^{th} for performance). Those that experienced the most negative change were low-achieving students who had low-efficacy teachers both years (from $M = 4.82$, $SD = 1.53$ in 6^{th} grade to $M = 4.36$, $SD = 1.61$ in 7^{th} for expectancy, from $M = 5.01$, $SD = 1.49$ in 6^{th} grade to $M = 4.54$, $SD = 1.55$ in 7^{th} for performance, and from $M = 3.72$, $SD = 1.38$ in

6th grade to $M = 3.94$, $SD = 1.41$ in 7th for perceived difficulty) or who moved from a high- to low-efficacy teacher in the transition to middle school (from $M = 4.98$, $SD = 1.44$ in 6th grade to $M = 4.26$, $SD = 1.50$ in 7th for expectancy, from $M = 5.06$, $SD = 1.35$ in 6th grade to $M = 4.30$, $SD = 1.60$ in 7th for performance, and from $M = 3.74$, $SD = 1.37$ in 6th grade to $M = 3.85$, $SD = 1.36$ in 7th for perceived difficulty).

Over both years, 474 students had a low-efficacy teacher, 117 moved from a low-efficacy teacher to a high-efficacy teacher in year two, 559 had a high-efficacy teacher in year one and a low-efficacy teacher in year two, and 179 had a high-efficacy teacher for both year one and two.

Sample items from the measures were provided in the study. Average alpha coefficients for the teacher personal efficacy scale was $\alpha = .65$, and $\alpha = .78$ for student measures.

The longitudinal nature of this study may pose a threat to internal validity due to effects of maturation and history of subjects. However, with four points of data collection over two years, this study adds longitudinal data to the existing research on teacher efficacy by accounting for the potential that the effect of teacher efficacy on student motivation may have a changing impact over time. Students in junior high are usually with their math teacher for one period each day; it may take time for their beliefs to become salient and have a noticeable effect on students' behaviors and attitudes in math. During this time, other issues in students' lives could affect their perceptions of their abilities in school. This study adds strength to the hypothesis that a teacher's personal sense of efficacy may cause changes in students' beliefs during the transition to junior high school, but the magnitude of the effects were small, and the sample was large.

It would be necessary to find other research that examines teacher efficacy in low- and high-income areas to fully understand how teacher efficacy may be affected by socioeconomic status of both teacher and students. Furthermore, a more diversely populated sample would strengthen generalizability of findings.

Eccles, Wigfield, Midgley, Reuman, Mac Iver, and Feldlaufer (1993) conducted a large-scale, longitudinal correlational study that examined the effects of changing from an elementary

school to middle school environment on early adolescents' achievement goals, values, behaviors, and motivation in mathematics. They also looked at how teachers' beliefs relate to student motivation during this transition. They found that overall, students and teachers perceived a decline in student control and autonomy, in teacher support and teacher efficacy, and in performance and value of mathematics during the transition to middle school. This study provides important information about the effect of teacher efficacy on student achievement and the importance of creating a classroom environment that is developmentally appropriate for students.

Participants were 3,248 teachers and students from 117 elementary school classrooms and 134 junior high school classrooms in 12 southeast Michigan school districts. Interestingly, ethnicity of participants was not given.

This study lasted for two years and consisted of four waves. Students were followed from elementary school (year one of the study) to junior high (year two). Most students (N = 2,500) made the transition from sixth grade in elementary school to seventh grade in junior high during the 2 years. The 4 waves were: (1) fall of sixth grade, (2) spring of sixth grade, (3) fall of seventh grade, and (4) spring of seventh grade.

Students completed questionnaires in math class on two consecutive days in each wave. The questionnaires measured achievement beliefs and values in math, English, social activities and sports, motivational beliefs, self-worth, and perceptions of their math class environment. Teachers completed questionnaires that measured beliefs and attitudes such as trust and respect for students, the need for control and discipline over students, theories of intelligence, and personal teaching efficacy.

To measure classroom environment characteristics, three versions of the same measure were developed. For students, it was the *Student Classroom Environment Measure*, administered with the student questionnaires at each wave. It measured students' perceptions on teacher fairness and demeanor, competition among classmates, cooperative learning opportunities, and teacher's interest in math. For teachers, it was the *Teacher Classroom Environment Measure*,

which assessed teaching and grading practices, discipline practices, use of rewards, and the provision of autonomy and cooperation opportunities. The third version was the *Observer Classroom Environment Measure*. Observers who were unaware of the study's hypothesis received extensive training before observing and rating classrooms. An interrater reliability was measured at .76 for both years. Observers measured areas such as teacher friendliness and fairness, teacher control/student input, student competition, and teacher expectations and value of math.

Analyses findings showed that the seventh grade teachers believed their students were more untrustworthy, and needed more discipline and control compared to sixth grade teachers ($F = 8.64$, $p < .003$). Students reported that their sixth grade teachers showed greater value of mathematics by making math interesting and explaining its importance ($t = 9.86$, $p < .0001$). Observers noted that sixth grade teachers were also more likely than seventh grade teachers to emphasize intrinsic reasons for doing mathematics ($F = 6.91$, $p < .03$).

Seventy-eight percent of students analyzed moved from a high-efficacy sixth grade math teacher to a low-efficacy seventh grade math teacher. These students also reported lower success expectancy in math, lower perception of their performance, and higher reports of perceiving math as difficult at the end of seventh grade (based on a scale of 1-7: success expectancy went from $M = 5.58$, $SD = 1.17$ to $M = 5.12$, $SD = 1.40$; perceived performance went from $M = 5.69$, $SD = 1.14$ $M = 5.58$, $SD = 1.17$ $M = 5.58$, $SD = 1.17$ $M = 5.58$, $SD = 1.17$). This effect was even stronger for low-achieving students.

Findings from paired *t* tests on student data and ANOVAs on teacher and observer data showed that observers and students viewed the seventh grade teachers as less friendly and fair than sixth grade teachers (sixth grade: $t = 11.42$, $p < .0009$, seventh grade: $t = -2.89$, $p < .004$). Observers reported that teachers in seventh grade were less warm and supportive, and more likely to be pessimistic about students' ability to self-regulate their own work. All three groups reported

an increase in ability grouping between classes, comparison of grades, and whole-class instruction after the transition to junior high.

Teacher support was an indicator of students' intrinsic motivation. Most students reported that their sixth and seventh grade teachers were high in support, but students who moved from high to low support showed a decline in intrinsic value and perceived usefulness and importance of math. Low-achieving students were more affected when they moved from a high to low-support classroom in seventh grade.

To measure stage-fit environment, teachers and students were also surveyed on their perception of control over decision-making in the classroom. These items asked students and teachers if students had a say over different areas in their math work, and if they *should* have a say. Findings showed that students wanted more decision-making opportunities in the classroom, but teachers and students both reported that in junior high they had fewer chances for this kind of control.

The researchers made it clear that they were looking for relationships, not cause and effect. All instrumentation was clearly described with sample items provided in the appendix. Items seemed to be appropriate for age and unbiased. In particular, the *Observer Classroom Environment Measure* was highly objective, and its presence as a source of outsider information on classroom environment was an important factor in the strength of this study. Another strength is the use of 12 different school districts in both lower- and middle-income communities. Even though it was not randomly selected, the sample size is very large, allowing for greater power in the statistical results.

However, because of the nature of a longitudinal study, it is not possible to control for history and maturation, which are bound to occur in some form or another over the course of two years. The findings are consistent with other research. The researchers suggest that future longitudinal research should be conducted in schools that have the most relatively facilitative school and classroom environments.

Middleton (1995) conducted a qualitative case study to examine intrinsic motivation and the relationship between teachers' and students' personal constructs of motivation in mathematics at the middle school level. His results shed light on the importance for teachers to understand their students' motivational constructs and to create lessons and activities that provide more student autonomy.

The participants in this study were five math teachers in one sixth grade, two seventh grade, and two eighth grade classrooms in a rural, mostly middle-class school district in Wisconsin. Six students from each classroom also participated in the study. This sample of teachers and students was predominantly white, which was representative of the school district.

Teachers in each classroom were asked to rank their students in order of their perceived degree of motivation in math. Six students were then selected from each class to participate in the study: the three highest and lowest in perceived motivation. The groups were then adjusted by substitution so that students were all closely matched in their mathematics ability, but still in close proximity in regard to degree of motivation.

Classrooms were observed and videotaped for one class period during a typical lesson. Field notes were made on classroom atmosphere, math content, overall motivation of the class, and the motivational attempts made by the teacher. Teachers were subsequently interviewed, and asked to list 10 math activities they had implemented with students that they felt were the most important. The interviews included nine more items, aimed at understanding how teachers thought about motivation as they planned lessons, how they accounted for the motivation of their highly and less motivated students, how they defined motivation, what level of knowledge they had about motivation, and if they had any formal training in motivation.

After the teacher had listed 10 math activities they considered important, students were presented with dyads randomly comparing these activities and were asked, "What makes the first activity more fun than the second?" (Middleton, 1995, p. 260). Their responses were termed students' *personal constructs* of motivation. The number of dyads was limited to 20 to account

for potential frustration or fatigue from students. Examples of personal constructs include, “It is fun,” “It is challenging,” “It helps you learn better,” and “You get to make things” (Middleton, 1995, p. 272).

Once the personal constructs were given, each construct was paired with each activity. Using a computer program, students entered a rating from 1-5 for how well a particular construct described an activity. Teachers went through the same procedure for giving and rating their own personal constructs, and then teachers predicted their students’ beliefs by repeating the procedure with their students’ constructs.

Middleton used an additive clustering technique to organize and compare student and teacher constructs to see the degree of similarity between student motivations and teacher beliefs about student motivations.

One teacher, Ms. Morris, and her six students were described in great detail to demonstrate trends seen in other classrooms. The more highly motivated students described tasks as fun (intrinsically motivating) if they were challenging, used higher thinking skills, and were hands-on. These constructs were central to Ms. Morris’s beliefs about what was motivating to her students, but her attempts to rate her students’ constructs were not successful. Correlations were .17, .02, and .01 (p-value not given). It was found that less motivated students had similar constructs to the more highly motivated students, but the number and type of constructs these students gave was smaller. The less motivated students also seemed to have an aversion for tasks that were perceived as too challenging. Ms. Morris had greater success in her attempts to rate these students’ constructs. Correlations for two students were .48 and .47 ($p < .01$). However, for her least motivated student, Ms. Morris’s rating was low, at $r = .02$. On average, the correlation between teachers and student ratings was only $r = .30$ ($p < .01$), suggesting that overall, teachers were poor at predicting their students’ motivational constructs.

When looking across the five classes observed for this study, it appeared that students’ motivation constructs were very similar to their teachers’ constructs. For example, when a teacher

put an emphasis on mathematics application, students reported that applying math to real-life problems made doing math more fun. This pattern suggests that teacher beliefs may influence their students' motivational constructs.

Middleton clearly explained his theoretical positioning on intrinsic motivation. His methods for collecting and analyzing data were explicitly described. To control for maturation (student boredom or frustration) during the rating of personal constructs, students were allowed to stop at any point and come back to finish later.

A weakness of this study was the researchers' lack of control for bias. It was not mentioned how the researcher gained entry to this population, if research assistants helped with the data collection, or if member checks were done with the teachers to verify the findings of the study based on their interview responses. It appears that the author was the only researcher collecting and interpreting the data. Furthermore, it should be noted that in the collection of personal constructs of motivation from students, asking students which math activity "is more fun," could be a leading question.

Transferability should be restricted to teachers with similar pedagogical goals as the teachers in this study. These teachers were volunteers, and teachers who volunteer to do a study on intrinsic motivation may not be the average teacher. The interviews show that the five participating teachers were already looking for ways to improve their pedagogy and student engagement in their mathematics classes. However, even these seemingly high-involved teachers' personal constructs did not match with their students. Further research is needed that includes students of various achievement levels to examine how their personal constructs of motivation compare to those of their classmates and their teacher.

Creating a task-focused classroom environment may not be so easy, especially when there are trends that middle school and junior high teachers find themselves in school environments with a perceived emphasis on performance goals. This could make it difficult for teachers and students to develop a sense of efficacy, which Midgley et al. (1995) showed to be

positively influenced by task goals in the school. Midgley et al. (1995) found that elementary school teachers and students reported greater school focus on task-goals, while middle school teachers and students reported greater school focus on performance goals. Regardless of teacher efficacy, students' academic expectancies and perceived performance appeared to decline over the transition to middle school, suggesting that at a school level, changes may need to be made (Midgley et al., 1989).

With regard to teacher efficacy, students who move from a teacher with high-efficacy in sixth grade to a teacher with low-efficacy in seventh grade may not be prepared for the increasingly difficult mathematics they will encounter in the years to come. As Midgley et al. (1989) found, students who had high-efficacious teachers before and after the transition to middle school felt they were doing better in math and expected to continue to do well in the future. High-achieving students were not as dramatically influenced by a highly-efficacious teacher as low-achieving students appeared to be, suggesting that teachers' self-efficacy may have different effects on students with different abilities. Students who are low-achieving may be less certain of their ability and more extrinsically motivated, so their teacher's beliefs may have a greater impact on their own beliefs.

These studies show that teacher efficacy and classroom goal structure have an impact on student outcomes, including self-efficacy and motivation, especially during the transition from elementary school to middle school and junior high. "Learning environments, at both the classroom and school level, can be characterized in terms of the achievement goals that are stressed" (Midgley, Anderman, & Hicks, 1995, p. 91). By the time students finish their seventh grade year, they may have lower motivation and satisfaction with their school experience.

In the transition to middle school, Eccles et al. (1993) found that seventh grade students wanted more decision-making opportunities and found their teachers to be less friendly and fair than in sixth grade. Although adolescents are developmentally capable of greater autonomy and

require more freedom to make decisions, the seventh grade teachers in this study believed their students to be more untrustworthy and in need of greater discipline and control.

Middleton's (1995) qualitative case study found a disconnect between the motivation constructs of teachers and their seventh grade students. This implied that even a highly involved teacher is not always accurate in predicting what is motivating for her students. However, Middleton's findings suggested that a teacher's personal beliefs about what is motivating may in turn influence students' beliefs. This case study, combined with the previous studies in this section, indicate that the classroom environment and their teacher's beliefs can positively influence students' self-efficacy and motivation.

Challenge, Avoidance, Affect, and Self-Efficacy

The five studies in this section discuss the role of challenge in the classroom and how it relates to students' self-efficacy and motivational goals using goal theory, invitational theory, and flow theory. Why do some students avoid challenging learning situations and making mistakes, while others find them exciting, even if they make errors along the way? How can students maintain self-efficacy and motivation in the face of challenge? When attempting a new or challenging task one is likely to make mistakes or feel doubtful about their abilities to succeed. Yet Vygotsky (1978) believed that learning involved experiencing success and new competencies while engaging in challenging work. If his theory is correct, then the avoidance of challenge means missing out on opportunities to learn.

Self-efficacy beliefs can greatly influence students' perceived academic ability and performance. Bandura's (1997) four hypothesized sources of self-efficacy are mastery experiences, vicarious experiences or modeling, physiological and affective states, and verbal persuasions. Usher & Pajares (2006) argued that *invitations* were an additional source of efficacy in middle school students. The beliefs that people develop about themselves and about others shape their experiences, and invitational theory (Purkey, 2000) proposed that individuals can

purposefully send themselves positive messages which can thus improve their abilities and general well being.

Difficult academic tasks can cause feelings of anxiety and work to undermine students' self-efficacy (Usher & Pajares, 2006). This strong emotional reaction can have a negative effect on their expected success, and increasing support for students' physical and emotional well being and reducing negative conditions may strengthen student self-efficacy.

Perception of academic challenges greater than one's skills can also result in anxiety, while others find pleasure in challenges. Csikszentmihalyi's *flow theory* (cited in Schweinle, Meyer, & Turner, 2006) described the experience of the intrinsically motivated; individuals who engage in an activity because they enjoy it, find it interesting or challenging, and perceive they have the necessary skills to accomplish it. Flow occurs when someone perceives the challenge of an activity to be balanced with his or her skills.

Wigfield and Eccles (2001) disagreed with the premise of flow theory, arguing that students do not necessarily value optimally challenging tasks, but rather, tasks in which they believe they can succeed. Eccles and Wigfield (1995) found that task difficulty is related negatively to task value and ability perceptions, suggesting that students perceive challenge as a threat to their sense of competence.

Pajares and Graham (1999) conducted a correlational study with sixth graders during their first year of middle school in order to investigate the influence of motivational factors on students' math performance over the course of the year. Students' self-efficacy was the only predictor of performance at the start and end of the school year. By the end of the year, students reported lower effort and persistence, and valued mathematics less than at the beginning of the year.

Participants were 273 sixth grade students from a southern suburban middle school. The majority of participants were 70% White, 17% African American, 9% Asian American, and 4%

Hispanic American. Researchers did not have access to students' socioeconomic status. Based on their standardized 5th grade test scores, students were in the 69th percentile for math.

Surveys measuring student attitudes were group administered on one day in October and one day in April. Teachers were not present. On each day following the survey administration in fall and spring, math teachers administered a math performance measure, and then subsequently scored and recorded students' grades and turned them in to the researchers. The performance measure was an actual high-stakes test rather than a simulated test, and students were aware that this test was used to determine their math grade for the term.

Instruments used were the *mathematics self-efficacy* measure, which assessed students' confidence level to solve 20 math problems similar to those they would complete on a high-stakes test at the end of their math unit. Students measured their confidence of their ability on an 8-point Likert scale. Math anxiety was measured using an adapted version of Betz's *Mathematics Anxiety Scale.* Math self-concept was measured using the *Academic Self-Description Questionnaire II*, specific for beliefs of early adolescents. Students' judgments of their capability to use self-regulated learning strategies was measured by the *Self-Efficacy for Self-Regulated Learning Scale,* a subscale from *Bandura's Children's Multidimensional Self-Efficacy Scales.* Value of mathematics related to perceived importance, interest, and math enjoyment used measures adapted from Eccles' *Student Attitude Questionnaire*. Engagement was also measured using three items chosen for this study. Cronbach's alphas showed high reliability for all measures.

Previous academic achievement was assessed using two measures: (1) students' scores on the math section of the Iowa Test of Basic Skills (ITBS), which they took at the end of 5th grade; and (2) students' GPA in math for their entire fifth and sixth grade years.

Multiple regression analysis determined that self-efficacy made a significant contribution to performance when the other measured variables were controlled (fall: $r = .57$, $p < .0001$; spring: $r = .59$, $p < .0001$). Math self-efficacy and math self-concept were significantly correlated at the beginning and end of sixth grade (fall: $r = .66$, $p < .0001$; spring: $r = .70$, $p < .0001$). This

suggests that students who see themselves as mathematicians may adopt a higher self-efficacy in their math classes than students who do not see themselves as someone who has been good in math. Anxiety and self-efficacy had a strong negative correlation (fall: $r = -.68$, $p < .0001$; spring: $r = -.68$, $p < .0001$).

Results from *t* tests showed significant differences for performance and self-efficacy at the beginning and end of the school year (performance: $t = -3.3$, $p < .002$; self-efficacy: $t = -.79$, $p < .002$). Decrease in self-efficacy could have been the result of a more difficult performance measure in the spring. At the end of the school year, students reported math as less valuable ($t = -.25$, $p < .002$), and reported lower effort and persistence than at the beginning of the year ($t = -.37$, $p < .002$). By the end of the year, students were more overconfident and less accurate in their judgment of their ability in math, consistent with other research findings (Chen & Zimmerman, 2007).

Math self-efficacy was the only motivation variable to predict performance both at the beginning and end of the school year, a finding consistent with Bandura's (1986, 1997) claim that self-efficacy beliefs predict academic outcomes. The finding of students' decreased value, effort, and persistence towards math is consistent with previous studies on students' transition to middle school (Midgley, Feldlaufer, & Eccles, 1989).

Limits to internal validity for a year-long study include effects due to maturation and history, but the use of a real high-stakes test as the performance measure strengthens the accuracy of students' reported attitudes.

Chen and Zimmerman (2007) conducted a pretest/posttest comparing American and Taiwanese students to investigate if students' self-efficacy beliefs in mathematics were accurate when the level of difficulty on a math test increased. They also investigated whether students in both countries differed in their self-evaluation processes and effort judgments as difficulty increased. They found that American students had a slightly higher level of self-efficacy when the math problems were easy, but declined in self-efficacy when the math became moderately

difficult. American students put in a limited amount of effort as math difficulty increased and were generally not as accurate as Taiwanese students in reporting their self-efficacy judgments. This study provides information about how students' self-efficacy is affected by the difficulty of their schoolwork, and provides math teachers with insight about how students respond as difficulty increases in the mathematics classroom.

Participants were 188 sixth graders in Taiwan, from five classrooms in one school, who represented a wide range of academic abilities, and 107 American seventh grade students. These students were mostly Caucasian and represented four schools in one Nashville school district. All students were from middle-class areas.

Students were given a math performance pretest and posttest during two different sessions and received practice so they understood the procedures. The tests included 15 items from the *Third International Mathematics and Science Study*. The first session was used to evaluate students' accuracy and bias in assessing their self-efficacy. The second session was used to assess students' self-efficacy, post-performance evaluation, and judgment of effort.

Students were also given scales with 8-point Likert ratings assessing math self-efficacy, math effort judgment (how much effort a student put into a math problem), and self-evaluation (how confident a student was about the correctness of their answer).

The difficulty of the math items were ranked according to students' ability to answer items correctly. If at least 65% answered correctly, the item was easy. If less than 50% answered correctly, the item was considered difficult.

A general linear model with repeated measure was performed to see if there were student changes in self-efficacy as math test item difficulty increased. Results showed that as items became more difficult, students lowered their self-efficacy beliefs and post performance self-evaluations, and increased their effort judgments (American girls, efficacy beliefs, easy: M = 7.66, SD = .79; moderate: M = 5.86, SD = 1.33; difficult: M = 6.14, SD = 1.37. American girls, self-evaluation, easy: M = 7.43, SD = .96; moderate: M = 5.69, SD = 1.64; difficult: M = 5.73, SD

= 1.65. American girls, effort judgments, easy: *M* = 2.13, *SD* = 1.38; moderate: *M* = 3.33, *SD* = 1.49; difficult: *M* = 2.97, *SD* = 1.63. American boys, efficacy beliefs, easy: *M* = 7.77, *SD* = .50; moderate: *M* = 6.67, *SD* = 1.44; difficult: *M* = 6.33, *SD* = 1.7. American boys, self-evaluation, easy: *M* = 7.74, *SD* = .47; moderate: *M* = 6.51, *SD* = 1.74; difficult: *M* = 6.23, *SD* = 1.68. American boys, effort judgments, easy: *M* = 1.94, *SD* = .75; moderate: *M* = 2.69, *SD* = 1.19; difficult: *M* = 2.40, *SD* = 1.22).

This study's internal validity was generally strong, although the American students were self-selected, and their academic ability was not provided. Instrumentation went through multiple checks to ensure clarity of language and appropriateness of items. Sample items were given for all scales used. Pretests and posttests used parallel forms to account for students becoming test-wise. To avoid maturation effects, two testing sessions were held, limited to one hour each, to avoid student fatigue.

A limitation is that students may not have had enough time to complete the math tasks, which may have affected their perceived effort. Because the focus of this paper is on American students, differential selection, maturity, or history as an influence on the results for Taiwanese students will not be discussed. However, the American sample has limited generalizability because only 107 students participated, and were mostly white and middle class. To be confident of the findings, a more diverse sample of students is needed.

Using flow theory, Schweinle, Meyer, and Turner (2006) conducted a mixed methods study on the relationship between motivation and affect in upper elementary math classes and the relationship between teachers' instructional practices and students' motivation (Study 1). The researchers found that student affect is an important factor in students' perceived math skills and their experiences in math, and that challenge can pose a threat to student efficacy. Furthermore, the importance of a task is more closely related to student motivation than task challenge. The findings suggest that when teachers value mathematics, create a positive classroom environment,

find ways to balance challenge with skill, and support student efficacy, they enhance student motivation.

Participants in the study were 42 fifth and sixth grade students who received permission to participate. Students went to three elementary schools in a small, mostly White, middle-class town in rural Pennsylvania. Six students, three girls and three boys, were chosen from seven classrooms. They represented high, average, and low achievement.

Study 1 was conducted during fall and winter of the school year. Observers distributed *Experience Sampling Forms (ESF)* during the last five minutes of math class, and selected students were to respond based on their entire experience in math class. Students completed the ESF on each of four days in the fall and four days in the winter, within a two-week period for each season. ESF forms measured 12 feelings with semantic differential terms on a 9-point Likert type scale, such as: excited-bored, happy-sad, alert-sleepy, cooperative-competitive, involved-uninvolved,

To assess perception of challenge, skill, perceived importance, and perceived success, students also answered questions on a 10-point Likert scale. Examples of items for challenge and skill include: “How challenging was math class today?” and “How did you feel about your skills in math today?” (2006, p. 275). Importance items asked students about the importance of the math class to themselves and to others, and success was measured by asking students if they were successful in math that day.

Factor analysis identified four categories of children’s perceptions of motivational or affective classroom context: Social Affect (affective terms from the semantic differential items that related to involvement in a group), Personal Affect (affective terms about the individual student), Efficacy (students’ perceived ability and skills in math), and Challenge/Importance (challenge and importance to student and others). In each of the seven classrooms, challenge was negatively correlated to efficacy (r = -.38, r = -.36, $p < .05$; r = -.57, r = -.73, $p < .01$, and r = -.04, r = -.06, and r = -.23, not significant). Challenge accounted for 5.44% of the variance in

Challenge/Importance, and Importance (importance to self and importance to others) accounted for 11.41% and 80.87%, respectively. All three factors were positively correlated (challenge: r = .63; important to self: r = .95; important to others: r = .79, $p < .01$), so perceived challenge implied importance, but importance had a much heavier influence on the factor. A positive relationship was also found between challenge/importance and social and personal affect (respectively, r = .37, r = .16, $p < .01$), though the correlation was stronger for social affect (students feeling involved, cooperative, part of the group). Efficacy was positively correlated with importance (r = .15, $p < .05$) but negatively correlated with challenge (r = -.23, $p < .01$).

A weakness to the generalizability of this study was the small sample size with self-selected participants. The researchers used multiple "experiences" from each student, to provide the sample, but the findings only represent 42 students. That, combined with the context being a small, rural, mostly White town, further weakens generalizability. Research that uses a larger sample with more diverse participants, in urban and suburban settings, needs to be done. A strength is the use of the ESF instrument, which has been widely used. The authors did not provide the Cronbach's alpha for this study.

Using goal theory, Turner, Thorpe, and Meyer (1998) conducted a correlational study on the relationship between upper elementary students' goal orientation and a negative affect about making mistakes in mathematics. Students' self-reports on their beliefs and behaviors showed how they coped with challenges in the mathematics classroom.

The participants were fifth and sixth grade students in three public elementary schools in a Pennsylvania town, with a mostly white, middle-class population. Seven fifth and sixth grade teachers and their 160 mathematics students, 38 fifth graders and 122 sixth graders volunteered for the study.

Two surveys were administered in May of the 1994-1995 school year: (1) The School Failure Tolerance Scale and (2) The Patterns of Adaptive Learning Survey (PALS). The School Failure Tolerance Scale measures student affect after failure, preferred level of difficulty in math,

and strategies after failure. PALS measures students' learning goals, self-efficacy, and strategy use.

Cluster analysis was conducted to classify students based on their patterns of goals, negative affect, and self-regulatory beliefs and behaviors. Four motivational-affective clusters were found. The first two indicated approach patterns, and the second two indicated avoid patterns. In the *learning oriented* cluster, students were highly engaged and motivated. These students had the highest learning goal focus (M = .792), the lowest scores for negative affect (M = -.924) and the highest scores for strategy use (M = .899), preference for difficulty (M = .951), and self-efficacy (M = .471). In the *success oriented* cluster, students were motivated, but more influenced by performance goals. These students had the second highest score for performance goals (M = .722) though their self-efficacy scores were the highest (M = .595). The *uncommitted* cluster showed students who demonstrated low self-efficacy (M = -.464) and weak goal orientation (learning goals, M = -.391; performance goals, M = -.443) in mathematics. Their negative affect was the second highest (M = .234). The *avoidant* cluster was the least adaptive and most focused on ability goals. This group showed the lowest self-efficacy (M = -.966) and the greatest negative affect (M = .965). They reported very little use of learning strategies (M =-1.334).

Learning goals did not emerge as strong predictors of "cluster membership," but the characteristics of challenge orientation found were consistent with learning goals, and the most adaptive clusters, 1 and 2, had the highest scores for learning goals. Overall, a learning goal orientation was correlated with low negative affect (r = -.26, p < .05), higher rate of strategy use (r = .55, p < .05), preference for difficulty (r = .58, p < .05), and higher self-efficacy (r = .26, p < .05). The uncommitted and avoidant clusters showed patterns of more maladaptive responses to challenging work. This may be the result of low self-efficacy and low preference for difficulty. If students believe that they don't have the ability to be successful at a math task, especially if math

ability is very important to them, they may prefer academic work that shows off their ability relative to others, rather than enhances their learning.

The internal validity of this study had strengths and weaknesses. The surveys administered are well documented in the literature, and the sample items provided for each scale were developmentally appropriate for the age group and seemed neither leading nor biased. However, it was not thoroughly discussed how or if researchers were trained to administer surveys in an objective and uniform manner.

A limitation of this study is the relatively small sample size of 160 students who self-selected to participate. Furthermore, the students were mostly white and came from a small middle-class town, which makes it very difficult to generalize to more diverse populations or populations in urban areas. To be confident of the study's findings, a more diverse sample of students is needed. A similar study conducted with middle school students would provide comparative data on the relationship between motivation constructs, affect, and self-regulatory beliefs and behaviors.

Usher and Pajares (2006) conducted a correlational study to investigate if principles from invitational theory could be additional sources of student self-efficacy in middle school. The authors found a correlation between invitation and students' academic self-efficacy.

The researchers selected 468 sixth graders who attended two different public middle schools in the Southeastern United States (238 girls, 230 boys). The majority of the students were Caucasian and African American (56% and 35%, respectively). Of these students, 205 attended a middle school in an affluent neighborhood outside an urban area where 31% of students qualified for free or reduced-price lunch. The remaining students attended a suburban, largely middle-class middle school in which 17% of students qualified for free or reduced lunch.

The researchers administered a variety of instruments to measure student self-efficacy judgments and sources of efficacy. The instruments used were: (a) *Sources of Self-Efficacy Scale*, (b) *Inviting/Disinviting Index-Revised*, and (c) *Children's Self-Efficacy Scale*. These instruments

assessed (a) students' evaluation of Bandura's (1997) four hypothesized sources of self-efficacy (mastery experience, vicarious experience, social persuasions, and emotional and physiological measures), (b) the degree to which individuals were inviting to themselves or to others, and (c) students' judgments of their academic capabilities and ability to use self-regulated learning strategies. Researchers administered the instruments during one reading class period. Teachers were not present during administration. The time of day and time of year were not given, though the title of the study stated that participants were "entering middle school students." Students' average semester grades (0-100 scale) for language arts, reading, and mathematics were used to assess academic achievement. These grades were provided by the school's administration (p. 10).

Hierarchical regression analyses found that self-efficacy correlated with each of the four sources of self-efficacy (mastery experience: girls $r = .67$, boys $r = .60$; vicarious experience: girls $r = .36$, boys $r = .45$; social persuasions: girls $r = .62$, boys $r = .50$; emotional and physiological measures: girls $r = -.53$, boys $r = -.27$, for all r values, $p < .0001$). When invitations were added to the prediction of self-efficacy, both inviting self and inviting others made a significant contribution as predictors of self-efficacy (boys: $r = .49$ for self and $r = .46$ for others; girls: $r = .49$ for self and $r = .42$ for others, for all r values, $p < .0001$).

Due to the large sample used in urban and suburban areas, the results can be generalized somewhat broadly to populations of White and African American students, but not necessarily those living in rural areas.

Limits to internal validity include nonrandom sampling. Although referenced, authors did not give examples from the Inviting/Disinviting Index instrument administered to participants, leaving it unclear as to how invitations were measured.

From the correlations between invitational messages and self-efficacy, there appears to be a relationship between the two variables. Invitational theory and social cognitive theory seem to share common principles.

These five studies give insight into the nature of the complex interplay between self-efficacy, motivation, self-beliefs, and academic performance. Pajares and Graham (1999) found that self-efficacy was a strong predictor of performance of 6th grade math students during their first year of middle school, and that over the course of the year, students valued math less and showed decreased effort. Chen and Zimmerman (2007) discovered that self-efficacy and effort of middle school students decreased as difficulty of mathematics increased. Using goal theory, Turner, Thorpe, and Meyer (1998) found that students with a learning goal orientation were more willing to attempt difficult math problems and held higher self-efficacy. Using invitational theory, Usher and Pajares (2006) found a correlation between self-efficacy and sending inviting messages to oneself and to others. Using flow theory, Schweinle, Meyer and Turner (2006) found that teachers could enhance student motivation and support student efficacy by creating a positive learning environment and balancing challenge with skill.

The more learning is perceived as rewarding and enjoyable and the less it is seen as boring or a source of anxiety, the more students may attempt new challenges and seek learning for its own sake. Students' experiences in the classroom—motivational and emotional—are crucial to their attitudes, behaviors, and achievement.

While student affect as it relates to motivation is still somewhat unexplored, it appears that when a goal is important to a student, they develop feelings around the goal, and these feelings influence their efficacy and motivation to achieve the goal.

Chen and Zimmerman's (2007) study is unique in that it related self-efficacy to difficulty of math problems and how students see their effort and ability with different levels of difficulty in math problems. It also investigated self-efficacy across cultures, and compared the mostly individualistic American culture with a mostly collective Asian culture. Taiwanese students were generally more efficacious in mathematics. Self-efficacy beliefs may function very differently across cultures.

Self-Efficacy and Self-Regulated Learning in the Transition to Middle School

The five studies in this section will examine how goal theory, self-efficacy, and self-regulated learning influence student behavior and motivation during the transition to middle school. Hopefully this will shed light on research that suggests the value of mastery experiences, self-regulation strategies such as evaluation and help-seeking, and the appropriate use of goals and rewards in middle school. Also addressed is how teaching students strategies to regulate individual learning may support their need for autonomy and have a positive impact on self-efficacy.

Self-determination theory (Deci & Ryan, 1985) posits that when individuals experience themselves as autonomous or as having choice in their actions and behaviors, as opposed to being controlled or pressured, it will naturally lead toward self-motivation, well being, and growth. Self-determination is similar to the value component of Pintrich and DeGroot's theory of self-regulated learning (as cited in Grolnick, Gurland, Jacob, & Decourcey, 2002) because both refer to students' beliefs about the value and interest of a task. Personal task value is highly related to self-determination.

Self-determination is particularly important during times of transition, such as the transition from elementary to middle school, because it promotes problem solving and flexible strategy use in new situations. Individuals who are self-determined are more likely to solve problems autonomously and adapt more easily during times of change.

The transition to junior high is often described as a point of vulnerability for early adolescents (Midgley, Feldlaufer, & Eccles, 1988). Students moving from elementary school leave a small, intimate setting in which they are close to their teachers to a larger institution where they have multiple teachers (Grolnick et al., 2002). At this point in their lives, young people are also experiencing biological and psychological changes (Erickson, 1968) that may result in uncertainty about one's self-concept and academic self-efficacy. Providing autonomy

opportunities for students may help them gain confidence. However, students may require explicit direction and support to help encourage them in their independence.

Using rewards in school is a common practice, and Schunk (as cited in Schunk, 1984) found that rewards could enhance self-efficacy because they symbolize a student's success and progress. Schunk found that telling children they will get a reward if they perform well on a task motivated the children to perform well. When students worked at the task and observed their progress, their sense of efficacy was strengthened.

Setting goals is another common school practice. *Proximal goals* are those that can be achieved quickly, and espousing proximal goals is thought to result in greater motivation than having no goals or goals that take time to meet, especially in younger children who are more focused on the present (Schunk, 1984). Bandura (1986) believed that goals provided standards against which people compare their present performances. When students take on a new goal, they feel a sense of efficacy for achieving it, motivating them to try new things, listen to advice from others, and persist even when challenged. As they experience progress, they continue feeling efficacious because they are building new skills as they work toward their goal. Self-efficacy may help strengthen motivation and lead learners to establish new goals when they master their present ones.

Usher and Pajares (2006) conducted a one-shot correlational study to examine the relationship between Bandura's theorized sources of self-efficacy and the academic and self-regulatory efficacy beliefs of students entering middle school. They investigated how sources informing self-efficacy (mastery experiences, vicarious experience, social persuasions and physiological state) differed as a function of gender, academic ability level, and race/ethnicity. For the purposes of this paper, the focus will be on academic ability. Usher & Pajares found that all four sources independently predicted academic and self-regulatory self-efficacy. Mastery experience was the main influence for all participants, however it did not predict self-efficacy beliefs for low-achieving students.

The participants in this study were 263 sixth grade students, ranging from 10-13 years old. They were entering a public middle school in a suburban area of the southeastern United States. Of the total group, 140 were girls, 123 were boys, 180 were Caucasian, 52 were African American, 17 were Hispanic, six were Asian, and eight were of other ethnicity. The school was mostly middle-class, with 17% of students receiving free or reduced lunch.

Survey instruments were administered during one reading class period in the second semester of the sixth grade academic year. Reading classes were above-level, on-level, or below-level. Teachers were not present during survey administration. The instructions were explained verbally, and students were encouraged to ask questions on any portion they did not understand.

The scales used on the survey were adapted from *Sources of Self-Efficacy* scale, using 24 items to evaluate students' assessment of the four self-efficacy sources, six items for each source. The authors conducted exploratory factor analysis to find the constructs underlying the source items. Scales for academic self-efficacy and self-regulated learning efficacy were subscales taken from *Bandura's Children's Multidimensional Self-Efficacy Scale.* Separate ANOVA tests were conducted to determine the gender, race/ethnicity, and reading ability differences in reading grade, the four efficacy sources, academic efficacy, and self-regulation efficacy. Only Caucasian and African American students' results were used for analyses.

Results showed that for students reading above level mastery experience was more of a predictor for academic self-efficacy ($\beta = .260$, $p < .05$) and self-efficacy for self-regulation ($\beta = .217$, $p < .05$) than below-level students (*ns)*. Mastery experience was a strong predictor of both factors for on-level students ($\beta = .356$, $p < .001$ for academic self-efficacy, $\beta = .522$, $p < .0001$ for self-regulation). Academic self-efficacy in general was not predicted by the sources. Only physiological state negatively predicted self-efficacy for self-regulation in below-level students ($\beta = -.350$, $p < .05$), accounting for 22% of the variance (Usher & Pajares, 2006, p. 135).

Findings from this study showed that girls' academic self-efficacy was strongly influenced by social persuasions ($\beta = .376$, $p < .0001$) and boys' self-efficacy for self-regulation was influenced more by mastery experience ($\beta = .341$, $p < .001$). Although gender is not specifically addressed in the question, it is still important to note this difference because it demonstrates the need to view each individual student to address his or her needs in the classroom.

It was not mentioned if the students in this study were randomly chosen to participate, a natural weakness of internal validity. For this type of study, a larger sample size would have been beneficial. However, the population under study was described in detail and the authors do not generalize beyond this population. The items used in the survey were adapted from other scales, but reported acceptable estimates of reliability ($\alpha = .80$ to .86 for mastery experience, $\alpha = .56$ to .87 for vicarious learning, $\alpha = .72$ to .91 for social persuasion, and $\alpha = .76$ to .91 for physiological state).

The authors used information about academic ability based on reading ability because of a tendency for students who are weak in reading to also be weak in most academic subjects (Alvermann & Phelps, 2002, as cited in Usher & Pajares, 2006, p. 130). It would be necessary to research similar methods used with middle school math students to verify findings in the mathematics domain.

Schunk (1996) conducted two different research studies, but only Study 1 will be described here. It was a pretest/posttest research design using two interventions (learning and performance goals with self evaluation, and learning and performance goals without self-evaluation) to investigate the effects of goals and self-evaluation practices on student achievement and motivation. He found that learning goals led to higher self-efficacy, skill, motivation, and task-orientation with or without self-evaluation. A performance goal with self-evaluation also had a positive impact on self-efficacy. This research helps show the complex

interplay between students' goal orientations, self-regulation, and their motivation and achievement outlook.

Participants were 44 fourth grade students from two classes in one elementary school in North Carolina. Students were mostly middle-class; 24 were White and 20 were African American.

A pretest was given that measured goal orientation, self-efficacy, skill, and persistence, and was administered by an outside tester. The goal portion surveyed four different orientations: task, ego, affiliative, and work avoidant orientations. The self-efficacy test included a practice session for students, which like in the real test students assessed math problem difficulty and their judgment of their ability to solve it. The skill and persistence test measured students' skills in adding and subtracting fractions.

For the intervention, students were randomly assigned to one of four experimental conditions: (1) learning goal with self-evaluation (LG-SE), (2) learning goal without self-evaluation (LG-NoSE), (3) performance goal with self-evaluation (PG-SE), and (4) performance goal without self-evaluation (PG-NoSE). Over the course of seven days, students received 45 minutes of instruction and practice in their condition groups with teachers from outside their school. The same teacher was there for all seven sessions. The sessions were highly structured. In the first 10 minutes teachers gave the goal orientation and modeled a demonstration on fraction operations. In the next 10 minutes students practiced in a hands-on activity. For the remaining 25 minutes, children worked on solving problems alone, a time frame considered "sufficient to allow for demonstration of differences in self-regulatory processes brought about by the goal and self-evaluation treatments" (Schunk, 1996, p. 366). Over the course of the seven daily sessions, teachers repeated the goal orientation to students to ensure its effects. For the self-evaluation portion, students in the self-evaluation conditions judged their capabilities at the end of each session. Students without the self-evaluation condition answered a different question asking how they enjoyed the work.

The posttest was given on the day after the last session. Its measures were the same as the pretest, except for the skills test, which used similar but not identical questions. The tester did not know anything of the children's condition or performance during the intervention.

Study 1 tested the hypothesis that learning goals would lead to higher achievement outcomes compared to performance goals. Findings showed that learning goals led to higher self-efficacy with or without self-evaluation. On a scale of 10-100, with self-evaluation, scores jumped from $M = 44.8$, $SD = 8.4$ on the pretest to $M = 85.3$, $SD = 9.9$ on the posttest. Without self-evaluation, scores still rose from $M = 39.3$, $SD = 17.4$ on the pretest to $M = 81.0$, $SD = 16.3$ on the posttest. A performance goal with self-evaluation also had a positive impact on self-efficacy (pretest: $M = 40.8$, $SD = 15.2$; posttest: $M = 87.9$, $SD = 9.1$), which was much greater than performance goal alone (pretest: $M = 43.1$, $SD = 14.8$; posttest: $M = 64.6$, $SD = 11.8$).

Students in both learning goal conditions and performance goal with self-evaluation solved significantly more problems (LG-SE: $M = 39.1$; LG-NoSE: $M = 36.6$; PG-SE: $M = 34.6$) than the performance goal/no self-evaluation condition (PG-NoSE: $M = 27.0$). Students not only solved more problems, but maintained accuracy. The number of problems children completed related positively to self-efficacy ($r = .53$, $p < .01$), skill ($r = .51$, $p < .01$), and persistence ($r = .42$, $p < .01$). Among the LG-SE students, there was a positive correlation between self-evaluation scores and posttest self-efficacy ($r = .74$, $p < .01$) and persistence ($r = .77$, $p < .01$). Students in the learning goal condition with self-evaluation persisted the longest. Both conditions with self-evaluation had a significant effect on skill, which was measured by number of correct solutions on 31 problems (LG-SE pretest: $M = 2.8$, $SD = 3.6$; posttest: $M = 14.1$, $SD = 3.8$; PG-SE pretest: $M = 3.0$, $SD = 3.3$; posttest: $M = 13.8$, $SD = 3.8$).

Strengths included controlling for tester/teacher bias in various places by having individuals from outside of the school participate in the administration of the tests and instructional sessions. Pretest and posttest variation was used for the skills test to account for students becoming test-wise. Students were randomly assigned to the experimental conditions.

The pretest items for goal orientation were somewhat confusing, and even the researcher cautioned the reader in interpreting the results, suggesting that students may have had "difficulty comprehending the instrument" (p. 365). It was also not explained how much time students took to complete the pretest and posttest items. Although previous research found similar results, for this study a control group could have been used that had no goal intervention, using students' general goals, to see how this affected student self-efficacy, skill, and persistence.

The difference in instructions that explained learning or performance goal orientation at the beginning of the lessons was extremely subtle, and it is difficult to discern a distinguishable difference. They were repeated at the beginning of each session, and then "the teacher asked if that sounded reasonable" (p. 367), to which no student disagreed. Fourth grade students are not likely to disagree to such a leading question in this type of situation.

Because the research of this paper is about middle school students, this findings on this sample of 4th graders cannot be generalized to middle school. However, this study's findings are consistent with other research on the positive effects of learning goals on student motivation (Schunk 1989, 1991), adding strength to its generalizability.

Ryan and Pintrich (1997) conducted a one-shot correlation study to investigate how adolescents' perceptions of their cognitive competence, social competence and achievement goals were related to their help-seeking behavior in math class. They also investigated how these relationships were mediated by student attitudes toward help seeking. Help seeking was seen as a characteristic of self-regulated learners (Newman, 1994). The researchers surveyed the responses of 203 seventh and eighth graders and found that adolescents' motivational, social, and cognitive characteristics were all related to their help seeking in math.

Using a questionnaire that focused on experiences in their math class, researchers sampled 201 seventh graders (mean age = 12.8 years) and 101 eighth grade students (mean age = 13.7 years) attending junior high school in a city in southeast Michigan. Students were mostly white and from middle-class backgrounds.

The questionnaire used a Likert-type scale for all items that ranged from 1 (strongly disagree) to 7 (strongly agree). It included two subscales adapted from the *Perceived Competence Scale for Children* (Harter, 1979, cited by Ryan & Pintrich, 1997, p. 333) that were specific to the mathematics domain and measured cognitive and social competence. To measure personal achievement goals (task goals, extrinsic goals, relative ability goals), scales were adapted from the *Patterns of Adaptive Learning Survey* (Midgley, Maehr, & Urdan, 1993, cited in Ryan & Pintrich, 1997, p. 333). To measure attitudes toward help seeking, items were developed that asked students about their perceptions of benefits and threats associated with asking for help. There was a distinction between the perceived threat of asking a peer for help and asking their teacher. Questionnaire items were adapted from previous research to assess avoidance of help seeking and adaptive help seeking by students when they needed help in math class.

Analyses examined the relations among motivational constructs, help-seeking attitudes and behaviors, gender, grade level, math achievement, and the mediation effects of attitude on motivation toward help seeking in math. The results showed that task-focused goals, cognitive competence, and benefits all had significant negative correlations with avoidance of help seeking (respectively, $R^2 = -.47$, $R^2 = -.45$, $R^2 = -.50$, $p < .01$). Extrinsic and relative ability goals ($R^2 = .47$, $R^2 = -.22$) and threat from peers and teachers ($R^2 = .36$, $R^2 = .45$) had significant positive correlations with avoidance of help seeking ($p < .01$). Extrinsic goals and threat from teachers had significant negative correlations with adaptive help seeking ($R^2 = -.32$, $R^2 = -.21$, $p < .01$). Math achievement was positively correlated to students' perceptions of cognitive competence in math ($R^2 = .35$, $p < .01$) and negatively correlated to avoidance of help seeking ($R^2 = -.13$, *ns*).

Attitudes were shown to have an influence on help seeking. Adolescents with high perceptions of social and cognitive competence were less likely to feel threatened by their peers in asking for help. Students with task-focused goals who cared about understanding and learning the material were more likely to see help seeking as a useful strategy. When students perceived

that help seeking was beneficial, they were more likely to ask for help when they needed it. They were less likely to ask when there was a perceived threat from peers or their teacher.

This study extended research on help seeking by simultaneously looking at achievement goals and attitudes in the math classroom. The findings indicate that students' attitudes toward help seeking, both positive and negative, are an important factor in their achievement goals. Students with a lower perceived cognitive competence felt threatened to ask their teachers for help, and students with a lower perceived social competence felt threatened to ask their peers for help. Students who held a mastery orientation were more likely to see the benefits of help seeking strategies and use them in their learning. Students with a strong orientation toward extrinsic goals did not see the benefits of help seeking, and felt threatened by asking for help from their peers and their teacher.

It was not explained how the participants were chosen for this study. A random sampling of students would have strengthened the internal validity of the research.

Researchers provided all scales with sample items used in the questionnaires administered to students. The reliability of the items was strong (range of Cronbach's α was .73-.91), and all items were written in appropriate language for junior high students.
Research using similar scales, conducted over a longer time period, could further provide insight into the relationship between motivational variables, attitudes, and student help seeking and avoidance behavior. To strengthen generalizability, similar research could also be conducted with more diverse populations of students in different contexts such as rural and suburban areas in other parts of the U.S.

This study examined the role of students' perceptions of their cognitive competence (belief in their ability to understand and complete their schoolwork) in their attitudes toward help seeking. Pintrich & De Groot (1990) found that students with high perceptions of their ability were more likely to self regulate their learning through use of cognitive strategies. Also examined in this study were students' perceptions of their social competence (how easily one forms

friendships, their likability, and their importance as a member of their class). Though help seeking is a learning strategy, it depends greatly on social factors. The authors hypothesized that adolescents' perceptions of social competence would influence their use of help seeking in math. Students comfortable with themselves and with their peers were more likely to ask for help and less likely to avoid help when they needed it.

Pape, Bell, & Yetkin (2003) conducted a qualitative teaching experiment using a sociocultural theoretical perspective that "designed learning experiences focused on strategies middle school children use in academic settings to support students' developing sense of agency and skill in controlling their learning" (Pape et al., 2003, p. 180). Using analyses from multiple sources, they concluded that after the experiment many students were better able to communicate their mathematical understanding and justify their reasoning, and were better able to articulate their self-regulation strategies. However, not all students showed growth, and many chose not to use the strategies. Nonetheless, findings suggested that self-regulation was a critical goal for mathematics education.

Participants were seventh grade students from two mathematics classrooms in an alternative arts school located in a downtown city in the Midwestern United States. Participants were chosen by a lottery. One classroom consisted of 29 above-grade-level pre-algebra students and the other classroom was made up of below-average math students learning the regular seventh grade math curriculum.

The researchers used a teaching experiment model where researchers collaborated with a practicing teacher to implement theoretical perspectives into classroom practice. Together, two researchers and one teacher acted as participant observers as they planned instruction, co-taught lessons, and collected and analyzed data. Five data sources were used: (1) information from teacher planning sessions, (2) field notes supported by videotapes of lessons, (3) teachers' written reflections, (4) student responses from the *Strategy Observation Tool*, and (5) classroom

discussions of strategy use and students' written reflections on using the *Strategy Observation Tool.*

Students were asked to make daily observations and record the strategies they used to learn math on the *Strategy Observation Tool*. The tool was aligned with Zimmerman's (2000) three phases of self-regulated learning: forethought, performance, and self-reflection (see Introduction) and was implemented to support students in their "growing awareness of themselves as agents in the learning process by supporting their efforts to observe their strategic behaviors and to attribute outcomes to these behaviors" (Pape et al., 2003, p. 196). Students' responses were examined after each nine-week quarter of the school year. After researchers recognized that students weren't using the tool as it was intended, it went through several modifications to focus more on helping students notice the relationship between their behaviors and learning outcomes.

Students showed varying levels of growth over the school year. A small proportion recognized the relationship, both positive and negative, between their strategies and their grades. The *Strategy Observation Tool* did not prove to be effective for some students who were especially struggling with math or who were already proficient in math. And even though there was constant discussion of strategy use, some students either didn't make the connection or chose not to implement the strategies in their own learning.

The researchers concluded several factors that were crucial to student learning from a sociocultural perspective. Using multiple representations and rich mathematical tasks gave students opportunities to use concrete materials, pictures, words, and math symbols to help them manipulate and visualize math problems. Through collaborative classroom discourse using scaffolding and press for understanding, the teacher led students through increasingly difficult and complex math tasks focused on thinking mathematically. During classroom discussions, the teacher encouraged students to name and describe the strategies that helped them accomplish their math tasks, making their strategies public and showing students multiple ways to solve a

problem. Researchers also identified that students had varying needs for explicitness and support for using self-regulation strategies.

A strength to the credibility of the qualitative methods was the use of prolonged and substantial engagement, as the study lasted for the entire school year. Triangulation of multiple data sources also strengthened results, although peer debriefing and member checks could have helped the authors identify any potential bias and progressive subjectivity. The methods of analyses were not clear, other than reviewing and discussing the data, and following student progress in using the *Strategy Observation Tool*.

Limits of findings included transferability. This study took place in a small, alternative arts school, and it may be problematic to transfer these results to a public schooling context.

Finally, Schunk (1984) conducted a pretest/posttest study with three treatments to compare the effects of performance-contingent rewards to those of proximal goals on task motivation and self-efficacy in students, and to find the effects of combining rewards with goals. During division skill instruction, children were offered different combinations of rewards and goals. Findings showed that combining rewards with goals resulted in the highest self-efficacy. This suggests the use of rewards and goals in the classroom to motivate students' achievement.

Participants were 33 students from two middle class elementary schools, ages 9-11, chosen for their initial lack of division skills.

Students were administered a pretest by one of four female adult testers. Before taking the self-efficacy measure on division problem difficulty, children practiced by judging their ability to jump distances that grew progressively longer. On the self-efficacy measurement, students assessed 14 division problems for difficulty without finding the solution. They privately judged their certainty of being able to solve the problems correctly on an efficacy scale of 10-100. Self-efficacy scores were summed and averaged across the 14 judgments.

The division skills pretest was administered right after efficacy assessment. Skill was based on the number they solved correctly, and minor errors were not penalized.

Students were randomly assigned randomly to one of three treatment groups (N=11): rewards only, goals only, and rewards with goals. All students received two 45-minute training sessions over two consecutive school days, during which they worked on two training packets. Children solved the problems on their own and received no feedback on their solutions.

For the rewards treatment, students were told at beginning of the training session that they would earn five points for each problem they completed and could exchange their points for prizes at the end. They were shown the prizes (markers, pens, stickers, notebooks).

In the goals treatment, the proctor suggested at the start of first session that children should work on at least 20 problems during the session, and asked students if that seemed reasonable. During the second session, testers suggested a goal of 10 problems.

In the rewards with goals treatment, the students received both treatment instructions before their training. Half of the students received rewards instructions first, and half were given goal instructions first. Before working on their problems, they judged their expectancy for attaining the goal suggested to them using the previous self-efficacy scale.

The posttest was administered the day after the second training session, and children were told they would not be receiving rewards. An individual unaware of the treatment assignments was responsible for scoring tests and training materials.

Findings showed no significant differences between experimental conditions on any pretest measure. On the posttest self-efficacy measure, on a scale of 10 (low) to 100 (high), students in the rewards with goals treatment judged their self-efficacy significantly higher (M = 80.6, SD = 17.8) than students in the goals-only (M = 62.0, SD = 20.4) or rewards-only treatments (M = 60.8, SD =20.7). These students also exhibited significantly higher division skill (based on the number of correct solutions to 14 problems: M = 9.2, SD = 2.7) than children in the rewards-only (M = 6.2, SD = 2.9) and goals-only treatments (M = 5.9, SD = 2.7).

The instrumentation and treatment procedures were clearly explained and followed by all proctors of student training sessions. Because the treatment lasted two days, it is possible that

students could have spoken to one another and found out other students received rewards. This may have discouraged students not receiving rewards. However, at the end of their second session, the goals-only students were unexpectedly allowed to choose prizes. This was intended to "disentangle" the effects of the rewards-only treatment, which experienced reward anticipation and reward receipt.

Students' practice on the self-efficacy scale was jumping, rather than using it for academic purposes. Later research has shown that self-efficacy is contextual, thus students may have experienced disconnect between the practice and the real testing.

Due to the small sample size, and the lack of random sampling, the results cannot be greatly generalized. Selection was based on teacher identification of students who were considered to lack division skills, so the results can only be applied to students low in division skills. Information about students' overall academic achievement is not given.

The five studies in this section discussed how goal theory, self-efficacy, and self-regulated learning influenced student behavior and motivation during the transition to middle school. Usher and Pajares (2006) found that mastery experiences were the main influence for predicting academic and self-regulatory efficacy beliefs in entering middle school students. Schunk (1996) found that with or without self-evaluation, learning goals led to greater self-efficacy, skill, and motivation. With self-evaluation, performance goals also had a positive effect on student self-efficacy in mathematics. Ryan and Pintrich (1997) found that adolescents' motivational, social, and cognitive characteristics were all related to their use or avoidance of help seeking, a characteristic of self-regulated learning. Pape, Bell, and Yetkin (2003) concluded that through mathematical learning experiences focusing on strategy use, many students were better able to communicate their self-regulation strategies and recognized a connection between their use of strategies and their grades, though some chose not to utilize them. Finally, Schunk (1984) found that combining rewards with proximal goals in mathematics increased student self-efficacy, task motivation, and achievement.

The degree to which children are self-determined and able to self-regulate their learning has important consequences for their achievement, coping, preference for challenge, and moral reasoning. Greater self-determination is associated with more positive behavior- and adjustment-related outcomes, including at difficult times of transition in children's lives, such as entry to junior high school. The facilitation of children's self-determination is considered an important goal of educators.

Helping students set goals is a self-regulation strategy appropriate for many middle school students. As discussed in Pape et al. (2003), students showed varying levels of growth over one school year. Even after a year of implementing mastery-focused instruction and self-regulated learning strategies, there were some students who still did not choose to apply the strategies. For students who were struggling in math, and for those who were proficient, the self-regulation tool used by students didn't prove useful.

Schunk (1996) found that either an orientation toward learning goals or performance goals, along with self-evaluation, had a significant effect on student self-efficacy and persistence. Students who demonstrate a performance goal orientation may benefit from adding self-evaluation processes to their work, an effective strategy for helping students who are low ability but have high performance goals. If students have opportunities to evaluate their progress against their previous work, they may maintain a higher sense of self-efficacy instead of comparing their work to that of their classmates to determine ability.

Teacher Discourse as a Motivating Factor in the Mathematics Classroom

Nicholls (as cited in Turner et al., 2002) found that the nature of the learning context impacts how students' perceive their ability. As discussed in the previous section, students who lack successful experiences in mathematics may feel anxious about their ability and use avoidance strategies such as help seeking from their teacher or peers. Asking for help, and thus admitting an area of struggle, can put adolescents in a vulnerable position at an already difficult

time in their lives. However, it is believed that students' self-efficacy can be fostered through encouragement and support from others (Bandura, 1997).

The seven studies in this section discuss how mathematics teachers create the classroom context through their discourse as early as the first days of school. The research clearly indicates that teacher discourse is a powerful influence on the learning experiences of students. The following studies describe how teacher discourse in the mathematics classroom has far-reaching effects on student motivation, self-efficacy, goal orientation, self-regulation, student autonomy, and affect. A high level of support in teacher discourse appears to have great benefits for students with either performance or task-goal orientation. On the other hand, nonsupportive language can have damaging effects on student motivation, self-efficacy, and achievement in middle school mathematics.

The impact of teacher practice on student motivation may begin as early as the first days of school, as the teacher establishes the classroom environment. As part of a larger study that examined avoidance in mathematics in students transitioning from elementary to middle school, Patrick, Turner, Meyer, and Midgley (2003) examined how the practices of eight sixth grade teachers in the first two days of school influenced classroom environment, student perception of teacher support, student motivation, and use of avoidance strategies (e.g. self-handicapping, avoiding help-seeking, disruptive behavior, cheating) during the school year.

Using a mixed-methods research design, the researchers employed a "bottom up, inductive method appropriate for theory building" (p. 1522). The researchers were interested in expanding their understanding of goal theory to how it might explain relationships between teacher practices and classroom motivational atmosphere in ways previously unseen, such as the relationship between teacher discourse and student goal orientations.

This study took place in eight sixth grade classrooms in seven K-6 elementary schools in an ethnically diverse school district in the Midwest. Eight math teachers and their 176 sixth grade students participated in the study. Of 20 teachers who agreed to participate, eight were randomly

chosen for the study sample. For the qualitative research, classroom discourse was recorded and analyzed at different times during the school year. On the first and second days of the school year, researchers attended classrooms for three to four hours, tape-recorded classroom discourse and took additional notes to supplement the recordings. At the end of both fall and spring semesters of the school year, researchers tape-recorded and observed five math lessons in each classroom. These lessons were from the same *Connected Mathematics* curriculum unit being taught in all classrooms in the district. Discourse from spring semester was used in triangulation with discourse from the beginning of the school year.

From the discourse data taken during the first two days of school, charts were created for each classroom that identified four different teacher discourse practices: what teachers said about 1) school and the upcoming year, 2) him/herself, professionally/personally and anticipated relationships with students, 3) students and their relationships, and 4) anticipated classroom procedures. From these charts, researchers identified three different classroom environments. Three teachers were described as supportive, three were ambiguous, and two were nonsupportive.

Supportive environments were those where teachers supported students intellectually and emotionally, were respectful, enthusiastic, and used humor in their classrooms. There were high expectations that all students would learn. Supportive teachers expressed positive expectations about the upcoming year: "A lot of what we're going to be doing will be figuring out how to do things…and once you figure it out, you'll know how to do it. Someone can't take that away from you…it becomes yours" (p. 1537). Teachers also spoke with optimism about their expected relationships with students: "I personally feel that if there's some way that I can help you, if there's something that you need, if I can help you,…my former students will tell you—(forcefully) I will be there for you!" (p. 1539).

Ambiguous classrooms were not consistently learning-oriented or academically supportive. Teachers were not consistent in their classroom management practices. After telling students, "Every person has something important to say. And we should always allow someone

else to speak," the teacher did not intervene when students later bickered and told one another to "shut up." Ambiguous teachers did not demonstrate a strong relationship with students. For example, after noting confusion and providing explanations to help struggling students, one teacher said, "We've been at this for 10, 15 minutes and all you have is a triangle sketched." Furthermore, ambiguous teachers did not appear to understand students' developmental level.

Nonsupportive environments included a strong sense of teacher control and power, and intellectual and emotional support was not apparent. Low expectations were reflected in nonsupportive teachers' authoritarian classroom management practices: "Here are your consequences—I decide what happens" (p. 1541). There were also low expectations of student behavior, such as implying that students would do poorly or cheat. During the first days of school, in an activity where students were introducing themselves, one teacher explained, "Some people I remember, some people I don't. I'll try to remember who you are" (p. 1541).

Researchers analyzed consistency of teacher discourse by comparing observations conducted in the spring semester to initial classroom environments. They also compared the different kinds of initial classroom environments with the students' quantitative reports on perceived teacher support and student goal orientation.

The quantitative methods were surveys administered to students at the end of the fall and spring semester. Surveys followed a 5-point scale format and all items on surveys were specific to math. Students were asked to report on how supportive they perceived their teacher to be, how their teacher promoted mutual respect among students, and what kinds of goals (mastery or performance) were promoted in math class (p. 1530). Students also completed survey questions with regard to their use of avoidance strategies in math. Survey scales were taken from the *Classroom Life Measure and the Patterns of Adaptive Learning Survey*.

Results of discourse analysis in the spring showed that teachers who created initially supportive environments maintained these environments during the school year. Students in supportive classrooms at the beginning of the year reported their teachers to promote more mutual

respect (on a scale of 1-5: *M* = 4.67, *SD* = .51) than students in nonsupportive classrooms (*M* = 4.14, *SD* = .81), but not more than in ambiguous classrooms (*M* = 4.37, *SD* = .72). In the fall and spring, these students also perceived greater teacher support (fall: *M* = 4.32, *SD* = .72; spring: *M* = 4.24, *SD* = .81) than students in nonsupportive (fall: *M* = 3.51, *SD* = .99; spring: *M* = 3.27, *SD* = 1.09) or ambiguous classrooms (fall: *M* = 3.22, *SD* = .87; spring: *M* = 2.90, *SD* = 1.05). There was also a greater focus on mastery goals (fall: *M* = 4.43, *SD* = .48; spring: *M* = 4.35, *SD* = .66) than students in nonsupportive (fall: *M* = 3.93, *SD* = .78; spring: *M* = 3.51, *SD* = .96) or ambiguous classrooms (fall: *M* = 3.97, *SD* = .54; spring: *M* = 3.46, *SD* = .89). Students in nonsupportive classroom environments reported a greater focus on performance goals (fall: *M* = 3.74, *SD* = .81, compared to *M* = 2.98, *SD* = 1.04 for ambiguous and *M* = 2.80, *SD* = .96 for supportive classrooms).

There were significant differences in use of avoidance behaviors by students in supportive classrooms compared to ambiguous or nonsupportive classroom environments. Students in supportive classrooms reported significantly less engagement in handicapping and disruptive behavior (spring: self-handicapping *M* = 1.61, *SD* = .71; disruptive behavior: *M* = 1.87, *SD* = .92) than ambiguous (spring: self-handicapping *M* = 2.11, *SD* = .98; disruptive behavior: *M* = 2.73, *SD* = 1.36) and nonsupportive environments (spring: self-handicapping *M* = 2.39, *SD* = .85; disruptive behavior: *M* = 2.54, *SD* = 1.16), and less avoidance of help-seeking behavior (spring: *M* = 2.01, *SD* = .98) than nonsupportive environments (spring: *M* = 2.53, *SD* = .99).

From the findings of this study, an effective strategy for fostering student motivation is to establish a positive classroom environment in the first days of the school year. Creating a supportive space is important to building a classroom community and to the development of positive learning goals. A strength of this study was the in-depth discourse analysis of multiple teachers from different classrooms across multiple schools. Triangulation of student surveys, audio-recordings and researcher observation ensured internal validity. Further, researchers underwent training in writing field notes and analyzing discourse to confirm consistency. It would

have been helpful to know the specific diversity of the "ethnically diverse" student sample to have a better understanding as to what extent these results are generalizable to other populations. Because this study was conducted in an elementary school, there is a need to compare students' perceptions of teacher supportiveness in middle school, when students are not with the same teacher all day. Finally, it would be beneficial to find research that investigates not only student motivation, but also how motivation in turn affects student achievement.

Walker (2008) conducted another study on teacher practice and discourse. She looked at authoritative, permissive, and authoritarian teachers who employed both mastery and performance-based goals in order to see their effects on student engagement, self-efficacy, and learning. Walker hypothesized that authoritative teaching would provide an optimal environment for students.

This study was conducted in two phases in one of three public schools of a rural U.S. mid-South community. The subjects were three 5th grade math teachers and 45 of their students across their three classrooms. The 20 boys and 20 girls who participated were all Caucasian.

The methods of this study were similar to those in the previous study by Patrick et al. (2003). A mixed method approach used classroom observations and teacher discourse analysis, teacher interviews, and student interviews. In phase one, using purposive sampling (student surveys and information from the school principal) at the end of the prior academic school year, Walker identified two teachers who were similar in their use of mastery and performance goals but who differed in their demandingness and responsiveness: one teacher was authoritative, the other authoritarian in teaching style. The school principal nominated a third teacher who also used mastery and performance goals, but was considered to have a permissive style.

In phase two, which began at the start of the following school year, 5th grade students were surveyed four times, once every four weeks, over the course of an entire semester. Surveys were a 4-point scale format and measured student perceptions of teacher mastery and performance-focused practices, teaching style, student engagement, and self-efficacy beliefs.

Survey measures were adapted from previous research studies. Also in phase two, researchers observed the three teachers for approximately 11 hours each over seven to eight observation visits during the semester. A written record was kept of classroom dialogue, teacher discourse, and classroom activity. In the first weeks of the school year, teachers were interviewed about their goals and values, and analyses of interviews focused on determining teachers' relative attention to management, autonomy support, and responsiveness (p. 230). Teacher discourse was categorized by demandingness (comments about classroom management, student autonomy, and tasks) and responsiveness (feedback toward students, setting standards), and further divided into supportive and nonsupportive statements (p. 226). Results from the opening days of school were compared to those at the end of the semester.

All teachers addressed the same goals for their students in their interviews: development of personal responsibility and proficiency in mathematics. The authoritative teacher's discourse was highly demanding (77% demanding, 23% responsive) and all statements were supportive. The authoritarian teacher was similar to the authoritative teacher in demandingness (78%), but her responsiveness was mixed (13% supportive, 9% non supportive). The authoritative teacher had a greater focus on autonomy support than the authoritarian teacher (13% compared to 4%). An example of support for student autonomy: "If you are the checker of this problem, you need to explain to the other person what he or she did wrong" (p. 226). The authoritarian teacher, on the other hand, made statements that discouraged student autonomy: "You know you aren't supposed to be up without permission." The permissive teacher made more demand statements than the other teachers (92%), but her responsiveness, though supportive, was rare (7% supportive, 1% nonsupportive). Only 2% of her statements were about student autonomy.

The survey data showed that all students perceived more use of mastery goals by their teachers, although students in the authoritarian classroom perceived less support of student autonomy and less responsiveness from their teacher than in the other two classrooms. Their reports of self-handicapping were also higher than the authoritative classroom, and they reported

lower academic self-efficacy than their authoritative peers, although self-efficacy results were not significant.

It is interesting to note that while all teachers wanted their students to develop mastery, personal responsibility and recognized the importance of modeling, the authoritative teacher provided students with the most demandingness *and* responsiveness in their discourse, and provided the greatest support for autonomy, in which students were entrusted with responsibility to complete a task. An example of a supportive classroom management demand is "When you're done, sit down. We're going to look at these problems and then move on to the next thing" (Walker, 2008, p. 226). The statement is clear and firm and ensures a smooth transition in classroom activities.

Students in the authoritarian classroom reported lower self-efficacy, suggesting that perhaps they did not receive support for their ability to do good work on their own. A teacher who is both demanding and responsive in their dialogue with students may positively influence student motivation.

While the results of this study seem to indicate that teacher discourse can influence self-efficacy, student engagement, and achievement, it would have been helpful to have student survey data from spring semester to compare to the beginning of the year. This would show any changes that occurred over the entire school year. Also, the data was based on only three teachers and their students in a rural school, all of whom were Caucasian, which limits generalizability to other populations in more diverse parts of the nation.

Turner, Meyer, Anderman, Midgley, Gheen, Kang, and Patrick (2002) conducted a mixed method study to investigate the relationship between classroom learning environment and students' reported use of avoidance strategies such as self-handicapping and avoidance of help-seeking. This study was part of a larger longitudinal study that focused on the relationship between learning environment in mathematics and student beliefs and behaviors during their transition from elementary school to middle school.

Researchers used surveys measuring students' perceptions of the classroom goal structure, along with characteristics of teachers' instructional discourse, to determine the classroom learning environment. Teacher discourse was examined for its relation to instruction, motivation, and organizing classroom activities and class time. Quantitative results showed that an emphasis on mastery goals in the classroom was positively related to low reports of avoidance behaviors. Qualitative analyses focused on teacher discourse revealed that motivational support was much more common with teachers in high-mastery/low avoidance classrooms than in low-mastery/high-avoidance classrooms.

Participants in this study included 1,092 sixth grade students in 65 classrooms across four ethnically and economically diverse school districts in three Midwestern states. Students were required to gain parental permission to participate in the study. The students, who were 52% female, 70% Euro-American and 30% African American, participated by completing surveys. For the qualitative portion of the study, researchers asked permission from 20 classrooms in one school district to observe their classrooms in addition to participating in the survey. The final nine classrooms were randomly chosen from those who agreed, resulting in nine sixth grade classrooms from nine schools. Of the nine teachers, two were male and three were African American.

Trained research assistants administered the surveys to students in their classrooms in late winter and spring of 1998-1999, assuring students it was not a test and that their answers would not be shared. If students were absent, they completed the survey another time. Five scales were used. One assessed the avoidance of help seeking (Ryan et al., 1998, cited in Turner et al., 2002), and the others were taken from the *Patterns of Adaptive Learning Survey* (Midgley et al., 2000, cited in Turner et al., 2002). All scales were proven to be reliable from their use in previous research with young adolescents. The five scales in the survey assessed: (1) self-handicapping avoidance strategy; (2) avoidance of help-seeking; (3) students' preference to avoid novel approaches to doing academic work; (4) perception of classroom mastery goals; and (5)

perception of classroom performance goals. Information about student gender, ethnicity, standardized achievement scores, and final grade in math were collected from school records, and math grades were coded on a scale of 1 to 13 (13 = A+, 12 = A, 11 = A-, etc.)

For discourse collection, math instruction was observed and audio recorded during the same two math units (on factoring and geometry) in each classroom. Transcriptions were then taken. Observation visits occurred for five days in the fall of 1998 and five days in the spring of 1999. All classrooms were using the same *Connected Mathematics* curriculum, and by the end of the observation period all classrooms had at least seven transcripts. Only whole-class discourse was used for analysis because it included messages about learning, performance, and expectations, elements most akin to students' reports of goal structures and avoidance strategies.

To supplement the audiotapes, observation field notes were taken by observers who received nine hours of training to ensure they maintained a similar focus during observation sessions. The notes served to provide a context for the recordings. Observers sat in the back of the classroom, with only one observer in a classroom at a time. However, at least two observers were assigned to each classroom to avoid bias.

Discourse transcripts were coded into three categories: instructional, organizational, and motivational discourse. Two subcategories were developed for each category: supportive and nonsupportive discourse. Transcript coding was conducted by two coders in three parts to establish validity of codes and reliability between coders. The first part refined coding categories and the second part established interrater reliability. Once these had been verified, the transcripts were reread and coded for motivational support and nonsupport. Discourse analyses were conducted before the survey analyses to avoid researcher bias.

From the large sample of 1,092 sixth grade students, hierarchical linear modeling (HLM) was used to determine if students in some classrooms reported using avoidance strategies more than students in other classrooms. Variance in avoidance strategies differed significantly between classrooms: self-handicapping, $\chi^2(64, N = 65) = 155.13$, $p < .001$; avoiding help seeking, $\chi^2(64, N$

= 65) = 101.03, $p < .01$; avoiding novelty, $\chi^2(64, N = 65) = 112.91$, $p < .001$. Separate analyses using one-way ANOVA were conducted to find the generalizability of these HLM results to the nine classrooms observed for discourse, and revealed significant differences among the nine observed teachers. Four classrooms were chosen for further analyses, two high-avoidance/low-mastery classrooms and two low-avoidance/high-mastery classrooms.

In the two low-avoidance/high-mastery classrooms, teacher discourse consisted of a large amount of motivational support (23% and 20%). The motivational messages from teachers told students they were learning, encouraged students to keep trying ("Don't say 'I don't know what to do.'…if I can do it, you can do it."), and emphasized that all students could learn and achieve. These classrooms also showed patterns of holding students accountable and providing cognitive support, along with words of humor, caring and understanding from the teacher. The two high-avoidance/low-mastery classrooms were low in their use of motivational support (8% and 6%). These classrooms showed patterns of either high cognitive support with low motivational support or high demand for correctness and low cognitive and motivational support. One teacher, Ms. Anderson, used transfer of responsibility more than any other observed teacher (24.26%, $z = 1.98$), but her students reported high-avoidance strategies and low-mastery goals. It seemed that she transferred responsibility too soon, before students were confident that they understood. After asking a question, she often did not give "wait time" before asking, "Do you agree?" Or, she asked one student a question and then called on two other students, without waiting for the first student to attempt an answer.

Strengths of this study included triangulation of student surveys, recorded transcripts, and observation field notes as sources of information. Researcher bias was attended to in both the transcript coding process and in having multiple observers in each classroom. All scales, items, and alpha coefficients were provided, and appeared to be non-leading and unbiased. Coding categories and methods were clearly described. Due to the large sample size and diversity of the participants, the results can be generalized to other populations of Euro-American and African

American mathematics students in sixth grade, although a random sampling of students is preferred.

A limitation of the qualitative measures mentioned by the researchers is the possibility that teachers and students presented their "best face" (Turner et al., 2002, p. 103) when being observed and recorded. This may have been the reason for the low frequency of nonsupportive motivational discourse in the observed classrooms. Researchers did not mention conducting member checks with participants to verify their findings. The findings are consistent with other studies, and the strengths of this study make its findings convincing. The sixth grade students in this study were still in elementary school. Similar research conducted after the transition to junior high would generalize these findings to older adolescents.

Morrone et al. (2004) conducted a mixed-methods study to investigate the ways that instructional discourse influenced the perception of mastery goals in a social constructivist college mathematics course. They found that instructional discourse patterns of scaffolding, pressing for understanding, and higher-order thinking promoted mastery goals among students. The findings suggest that teachers should consider the power of their words for promoting motivation in the mathematics classroom.

Participants were 28 elementary education students enrolled in an experimental mathematics course for teachers at a large urban university in the Midwestern United States.

The design of the math course was to improve students' mathematics problem solving ability and deepen their understanding of math. The class followed social constructivist methods, where students worked in groups to solve complex math problems and then shared their methods and solutions with the entire class. Each class during the semester was videotaped and researchers transcribed the whole group discussion with an emphasis on teacher statements. Transcripts were analyzed using the *Observing Patterns of Adaptive Learning (OPAL)* instrument, using coding protocol established in the OPAL manual. Teacher discourse was coded into the OPAL categories

of task-structure, task-messages, scaffolding, press for understanding, higher-order thinking, authority, recognition, grouping, evaluation, and time.

To find out how students perceived the goal orientation of their classroom, researchers analyzed students' end-of-semester reflections and identified the following themes: construction of mathematical meaning, groupwork, struggle, change in self-efficacy and math self-concept, and teacher's role. Researchers attempted to match student responses with items on the *Patterns of Adaptive Learning Scales (PALS)*. For example, the PALS item "My teacher wants us to understand our work, not just memorize it" was matched with the student comment "She asked students questions to get them to think about the problem instead of just giving an answer" (Morrone et al., 2004, p. 27).

The highest percent of codes (69%) for teacher discourse were in the task category, followed by authority (16%) and recognition (11%). Task statements included scaffolding: "Okay, so you kept thinking of what happens to the population to keep that ratio"; pressing for understanding: "That is an important insight to notice that. What does it mean?"; and higher-order thinking: "What does that mean? When can you do that? When does it make sense to add that way?" (p. 32-33). Recognition statements acknowledge students' contributions without praise or evaluation, and were framed as part of the teacher's questioning about the math: "Can you explain how your solution is different from John's solution?" (p. 31). Authority related to the release of teacher responsibility by encouraging students to take an active role: "Let's have some conversation. Who would like to share what they did and how they…went about thinking?" (p. 32).

The methodology produced believable, convincing findings consistent with other studies. Researchers performed prolonged and substantial observation over the course of the entire semester. Excerpts from transcripts were provided to demonstrate coding methods. Researchers established interrater reliability by coding the first third of the transcripts as a team, the second third by two researchers, and the last third by one member of the team, producing a reliability rate

of .87. Triangulation of data from transcripts and student reflections strengthened the credibility of the qualitative research. Member checks were not mentioned, but based on corroborating research with the following study using middle school students as participants, there is transferability of these findings.

Middleton and Midgley (2002) conducted a correlational study to investigate the relationship between students' educational beliefs and behaviors in math and teachers' use of press for understanding in math class. Press for understanding is a teaching strategy that attempts to focus student attention, check for understanding, draw out reasoning, and help students make connections between concepts. The authors hoped to find out if students' perceived press for understanding added to the influence of their goal orientation in predicting student outcomes. They found the strongest correlation was between a task goal orientation and students' perception of press. This study indicated that pressing students for their understanding in mathematics may help them develop a task goal orientation, which is seen as a more adaptive goal than performance orientation.

Participants were 512 eighth grade students from nine Michigan middle schools in four ethnically and economically diverse school districts described as working- and middle-class. Students were 59% African American and 41% European-American. Participating students were involved in a longitudinal study that began in fifth grade.

Data was collected in the spring of eighth grade. Surveys used measures from the *Patterns of Adaptive Learning Survey (PALS)* and asked students about their goal orientations, academic beliefs, and academic behaviors (self-regulation, self-efficacy, help-seeking and avoidance behaviors). All measures were specific to the math domain.

Hierarchical regression was used to find the relation of press for understanding to students' academic beliefs and behaviors controlling for their personal goal orientations. Confirmatory factor analysis showed that press for understanding was separate from the three personal achievement goal orientation constructs (task, performance-avoid, performance-

approach). Academic press for understanding was most strongly related to a task goal orientation ($r = .42$, $p < .001$) and was also positively related to adaptive behaviors such as self-regulation ($r = .42$, $p < .001$) and self-efficacy ($r = .28$, $p < .001$) and negatively to less adaptive behaviors such as avoiding help-seeking ($r = -.21$, $p < .001$) and avoiding academic risk ($r = -.11$, $p < .05$).

Findings confirmed previous research that an orientation toward task goals positively predicted self-regulation. Instrumentation measures were included in the study, and appeared nonleading and written in appropriate language for eighth grade. Cronbach's alpha was .76 to .86 for all scales. PALS measures were taken from previous research, which allows for comparison to other studies using the same measure.

The sample population for this study was not randomly chosen, a weakness to internal validity. Participation was voluntary, and students had to obtain parental permission, which only 83% received. Participating students could have self-selected for a variety of reasons that could weaken the generalizability of the sample.

No significant differences were found between African American and European American students, or between males and females on perceptions of press. This finding adds to the generalizability of the results.

This study suggests that pressing students for their understanding plays a positive role in student learning and provides them with an advantage beyond just holding task goals because it offers a higher level of cognitive demand, a level that students may both need and want. In *Listening to Urban Kids*, students "wanted a teacher who nudged them along and made sure they worked. Students felt that few of them had the confidence, drive, perseverance, or determination to do it on their own…that unwavering push usually had to come from their teachers" (Wilson & Corbett, 2001, p. 70).

Like the Turner et al. (2002) study that investigated teacher discourse and students' avoidance strategies in mathematics, the following research was also part of a longitudinal study that focused on students' beliefs towards mathematics as they transitioned to middle school.

Turner, Meyer, Midgley, and Patrick (2003) conducted a mixed methods pretest/posttest study to investigate the relationship between teacher discourse and students' affect and behaviors in two sixth grade math classrooms holding both high-mastery and high-performance goals.

Participants were two mathematics teachers and their students in two sixth grade classrooms from two urban elementary schools in the same school district in the Midwestern U.S. Out of 24 students in "Mrs. Robinson's" class, 18 completed surveys, and 16 out of 27 students in "Mrs. Clark's" class participated. Both classes represented a diverse make-up of students. Participation was voluntary and students had to obtain parental permission. Both classes were equivalent in their achievement levels.

On the first two days of the school year, the classes were observed and teacher discourse was audio recorded and transcribed in order to document "how the teachers set priorities, established procedures, created community, set the affective tone, and sent messages about the nature and importance of school work" (Turner et al., 2003, p. 364).

In the fall and spring semesters, students completed surveys administered by trained research assistants. They included six subscales, using a 5-point Likert scale specific to the mathematics domain. The six subscales assessed: (1,2) students' perceptions of the goal orientations in the classroom (mastery and performance goals); (3) students' use of self-handicapping ("Some students put off doing their math work until the last minute. Then if they don't do well, they can say that is the reason. How true is this of you?"); (4,5) academic self-regulation and positive coping ("If something bad happened to me during math, I would tell myself that I'll do better next time"); and (6) students' negative affect for failure in math ("If I gave a wrong answer to my teacher's math question, I would feel terrible").

During fall and spring of the school year, each classroom was observed for five days and teacher discourse was recorded. Each classroom followed the same new math curriculum, so the observations were on the same mathematics content. Trained observers took field notes on

nonverbal information to add context to the audio recordings. Field notes were integrated into the transcripts when they were typed.

Discourse was classified using a priori categories: (1) instructional discourse that focused on student autonomy and student understanding; (2) motivational discourse that focused on student effort, affect, and collaboration; and (3) organizational discourse that focused on management and procedures. Two subcategories were developed within each type of discourse: supportive discourse (guiding students, holding students accountable, focus on errors as learning opportunities, focus on peer support and positive affect, encouragement to stay on task) and nonsupportive discourse (teacher focused on correct answers, teaching by telling, use of sarcasm or humiliation, emphasis on individual success, going off topic, disrupting student learning).

Both classrooms were perceived by students to emphasize high-mastery and high-performance goals. Classrooms did not differ in students' reports of self-regulation or positive coping, but students' reports of negative affect and self-handicapping were significantly different. Mrs. Clark's students reported significantly greater negative affect after failure ($t(32) = -2.97$, $p < .01$) and more self-handicapping ($t(32) = -3.43$, $p < .01$) than Mrs. Robinson's students. Discourse analysis showed that both teachers used high frequencies of supportive discourse rather than unsupportive. However, in her instructional discourse, Mrs. Robinson supported student autonomy more than twice as often as Mrs. Clark. Mrs. Robinson's motivational discourse was 21% supportive and 1% nonsupportive, compared with 11% supportive and 5% nonsupportive for Mrs. Clark.

Observation data on the first two days of school showed that the teachers provided students with two different expectations. Mrs. Robinson told her students that the new math curriculum would be fun, and they would all improve in their math, reading, writing, and organization skills, and expressed feelings about her confidence in her ability as their teacher. Mrs. Clark told students that not all students were good at math but that it was important to master the facts.

The authors provided a clear coding method with examples of teacher discourse. However, in their reporting, the language sometimes felt biased against Mrs. Clark, even though her discourse did appear to be less supportive and encouraging than Mrs. Robinson's. The authors did not say if member checks were employed at any point in order to make sure researchers were accurately representing the teachers. Samples of all instrumentation were provided, all were adapted from measures used in previous studies and had strong internal reliabilities of Cronbach's alphas between .73 and .82.

While both teachers may have had similar classroom goal constructs, it is difficult to compare two different teachers when only looking at student surveys and when they are observed only 12 days out of the school year. Both larger samples and longer studies could be conducted, along with more qualitative data that can address finer details of student motivation. Maturation and history could have affected teachers as well as students. Also, both teachers were using a new math curriculum that could have affected their outlook and behavior during the school year. The discourse observation data provided strongly suggests that Mrs. Robinson was more supportive than Mrs. Clark and had a higher emphasis on mastery goals.

This study showed that two teachers, who both held high expectations and worked hard to help their students learn, could still have different influences on student affect based on their discourse in the classroom. The use of nonsupportive language in Mrs. Clark's classroom may have resulted in her students' adopting self-handicapping strategies and a negative affect in math class because they were afraid of making mistakes.

Turner, Cox, DiCintio, Meyer, Logan, and Thomas (1998) conducted a multi-method study of upper-elementary (fifth and sixth grade) students' reports of involvement in their mathematics instruction to investigate the quality of their experience in their math classrooms. They examined the instructional practices in high- and low-involvement classrooms for insight on the relationship between teacher-discourse patterns and students' quality of experience. The researchers intended to study actual classroom activities and their relation to student motivation

in order to extend previous traditional research, which had been limited to surveys and laboratory settings, and assimilate motivational theory into mathematics instruction. Their results showed that involvement in mathematics could be socially constructed through whole-class instruction.

The participants in this study were 42 fifth and sixth grade students and their teachers. Seven classrooms in three middle schools were chosen in a small town in rural Pennsylvania. The town was a mostly middle-class, white population. According to CAT (California Achievement Test) test scores, by national standards four of the classes were above average and two were average ability.

Six student "informants" from each class were randomly selected by gender from students who returned permission slips, totaling 21 girls and 21 boys. Classroom discourse was audio taped during mathematics instruction for four-five days during spring semester, and tapes were then transcribed. Researchers also developed an observational instrument to supplement the audio recordings for each math class. Observers sat at the back of the room to take field notes describing instructional activities, work written on the board, teacher and student attitudes, group work, and movement in the classroom. Observations were recorded for 34 math classes.

During the last five minutes of class on observation days, an "experience sampling form" (ESF) was distributed to the informants. There were 13 semantic differential scales for students to choose how they were feeling, such as "cheerful-crabby," "involved-uninvolved," "lonely-part of group," and "bored-excited" (Turner et al., 1998, p. 734). These were measured on a 9-point Likert scale. An additional item, "Do you wish you had been doing something else?" measured intrinsic motivation, and two questions were asked to measure challenge-skill match: "How challenging was math class today?" and "How were your skills in math today?" (Turner et al., 1995, p. 734).

Classroom discourse was coded using six a priori categories, three representing scaffolding and three representing nonscaffolding instructional discourse. From previous research, the authors gleaned three important ways that teachers involve students in learning

during scaffolding: (a) negotiating meaningful learning; (b) promoting student control of thought and actions through transfer of responsibility; and (c) providing intrinsic supports for learning. In scaffolded instructional discourse, students are active participants in the teaching and learning process. During negotiation of meaningful learning, teachers met students where they were and helped them build meaning while pressing them for understanding. During transfer of responsibility, teachers moved from sharing responsibility toward higher expectations for students to guide their own learning. When providing intrinsic supports, teachers "balance challenge and support, evoke students' interest and curiosity, mediate frustration, provide encouragement, advocate risk taking, respond to errors, and comment on progress" (Turner et al., 1998, p. 733). Students were active participants in each of these processes.

Nonscaffolding instructional discourse was categorized into (a) Initiation-Response-Evaluation (I-R-E), (b) procedures, and (c) extrinsic support. In contrast to scaffolded discourse, nonscaffolding forms of teacher discourse are teacher-focused and characteristic of low-involvement in the classroom. Teachers often "tell" students the answer or ask funneling questions that focus on getting the right answer. Motivation is typically extrinsic and is not supportive of student autonomy.

Teacher discourse transcripts were coded by category. Only teacher responses were coded, and could be coded in multiple categories. Researchers first practiced coding on transcripts recorded earlier in the year. *Gamma* was used to calculate interrater agreement, and a gamma of at least .83 was achieved for each teacher, 1 being perfect agreement.

To determine level of involvement, classrooms were compared based on mean student ratings of the items, "How challenging was math class today?" and "How were your skills in math class today?" Results showed that for three of the seven teachers, the means for challenge (Adams: $M = 5.8$, $SD = 0.9$; Benjamin: $M = 7.4$, $SD = 0.9$; Carey: $M = 6.5$, $SD = 1.1$) and skill (Adams: $M = 5.1$, $SD = 1.5$; Benjamin: $M = 7.6$, $SD = 0.6$; Carey: $M = 6.0$, $SD = 2.1$) were both high and closely related. For the other four teachers, their challenge means were lower (Duncan:

M = 2.8, *SD* = 1.6; English: *M* = 4.5, *SD* = 1.2; Ford: *M* = 4.1, *SD* = 0.7; Grant: *M* = 3.6, *SD* = 2.7) and their means for skills exceeded those for challenge (Duncan: *M* = 4.9, *SD* = 2.4; English: *M* = 6.3, *SD* = 1.6; Ford: *M* = 6.4, *SD* = 1.6; Grant: *M* = 7.9, *SD* = 1.0). The three high challenge/high skill ratings indicated teachers in high-involvement classrooms, while the four low challenge/high skill ratings indicated low-involvement classrooms.

To find the relation between quality of experience and involvement, and if students in high-involvement classrooms were more likely to experience flow, researchers classified students into four groups based on Csikszentmihalyi's (as cited in Turner et al., 1998, p. 736) criteria for quality of experience: flow, boredom, apathy, and anxiety. A nonflow category was comprised of boredom, apathy, and anxiety, and a *Flow category x Teacher* interaction was tested, revealing a significant Teacher x Flow interaction, χ^2 (1, *N* = 182) = 10.97, *p* < .001. Results showed that students in two of the three high-involvement classrooms reported significantly more flow experiences than students in other classrooms. Students experienced anxiety when the challenge was too high, and apathy or boredom when the challenge was too low.

Qualitative analysis of classroom discourse revealed that when teachers scaffolded classroom instruction using whole-class discussions on the math concepts and tasks, it created a supportive environment conducive to student involvement. Teaching strategies in high-involvement classrooms included pressing for understanding, modeling different learning strategies, providing opportunities for autonomy, and accurately assessing students' needs. They also viewed errors constructively and assured students that it was okay if they didn't understand. Teachers in high-involvement classrooms were respectful toward mathematics and presented the subject as interesting and valuable.

A strength of this study was the use of triangulation, with researchers collecting data through audio recordings and transcripts of classroom discourse, student response logs, and observational field notes. The transcripts provided in the qualitative analysis demonstrated the findings from students' responses. Although the duration of the study was only five days, it was

conducted in spring semester after students had been with their teacher for nearly the entire school year.

A weakness of the study was the small sample size. Only six student informants were selected from each class to complete the experience sampling form and provide their perceptions of their class experience. The qualitative component of the study may have disallowed a larger sample. The ESF instrument seemed appropriate for fifth and sixth grade, without leading or biased questions. However, it was adapted from another version used for adolescents and adults, and students may have interpreted the items differently, affecting the results. The teachers in this study were volunteers, and the results from this study cannot necessarily be transferred to other populations of teachers. High-involvement classrooms may not be as common as every three out of seven teachers, as in this study. A final critique of this study is the inclusion of member checks. It was not mentioned if researchers checked with the participants to verify the accuracy of their findings.

While the students in this study were still in elementary school, research is needed on involvement in junior high and middle school contexts to find out if similar trends occur after the transition to junior high. The findings can be generalized to other populations of white fifth and sixth graders who have average to high ability in mathematics. Similar research that includes students representing a greater diversity in urban and suburban settings is also needed.

Student involvement is not quite the same as engagement or interest. Involvement is a complex interaction of cognition, motivation, interest, and affect, where attention is concentrated, focused and comprehension is deep (Reed & Schallert, 1993, as cited in Turner et al., 1998). Involvement implies an emotional investment and a motivational drive. This study focused on student involvement in learning mathematics. Involvement is related to flow theory (Csikszentmihalyi, 1988, cited by Turner et al., 1998, p. 731), which posits that being involved in activity chosen for its own sake and which challenges one's existing abilities promotes personal growth. It is this balance between challenge and skill that is of particular importance. Finding a

balance between challenge and skill puts students in their zone of proximal development. Of course, students' perceived self-efficacy in math influences their perception of their skill. Nonetheless, if the challenge is greater than one's perceived skill, she may feel anxious, and if skill exceeds challenge, the student may feel bored. Finding that space where one experiences flow, and knowing how to find that space, can be a meaningful and empowering experience for the learner. Teachers in this study demonstrated the benefits of scaffolded instruction, providing support for students' needs and gradually releasing responsibility so the student is in control of their own learning. This occurs on a cognitive level, but also on a social, motivational, and affective level.

These seven studies describe how the context created by teacher discourse in the mathematics classroom has far-reaching effects on student motivation, self-efficacy, goal orientation, self-regulation, student autonomy, and affect. The messages teachers communicate to students let them know if the class is focused on student learning and participation, or if there is greater concern with student performance. A focus on mastery goals, along with a high level of support in teacher discourse, appears to be a key influence on student self-efficacy and motivational behavior.

Teacher discourse appeared to be a powerful source of motivation and positive student behavior as early as the first days of school (Patrick et al., 2003). Supportive teacher discourse included emphasis on mastery goals, consistent intellectual and emotional support, respect, enthusiasm, and humor, along with high expectations for the learning of all students (Patrick et al., 2003; Turner et al., 2002). Students in motivationally supportive environments showed more autonomy, less avoidance behaviors, and less negative affect about making mistakes than students in less supportive environments (Morrone et al., 2004; Turner et al., 2002; Turner et al., 2003). Motivationally supportive teachers held students accountable and provided cognitive support along with words of caring and understanding (Turner et al., 1998; Walker, 2008).

Instructional discourse patterns of scaffolding, pressing for understanding, and higher-order thinking promoted mastery goals among students (Middleton & Midgley, 2002; Morrone et al., 2004). Motivation was promoted in the mathematics classroom through teachers' acknowledgement of student contributions without evaluation, and appropriate release of responsibility to students. Turner et al. (1998) found that teachers in high-involvement classrooms were respectful toward mathematics in their discourse and presented the subject as interesting and valuable. Research findings suggested that teacher discourse can influence self-efficacy, student engagement, and achievement, and that students need teachers who are demanding yet highly responsive. Teachers who are supportive with their students from the very first day of school and remain consistent throughout the school year may be more likely to have a positive affect on student motivation and self-efficacy.

Classroom Relationships, Self-Efficacy, and Motivation

The seven studies in this section discuss the importance of relationships in the classroom as influences on student motivation and self-efficacy. Both teacher-student relationships and peer relationships create the social framework in which students engage in the learning process. Interactions, both positive and negative, can impact students' attitudes and behaviors toward learning and academic achievement.

Bandura's (1997) third source of self-efficacy information consists of the *social persuasions* that people receive from significant others. Students, especially adolescents and those still developing skills in making accurate self-assessments, may be dependant on others to provide them with feedback and judgments on how they are doing in social and academic domains. Of course, social persuasions are limited in their ability to create enduring increases in self-efficacy. Bandura (1986) cautioned that it might be easier to weaken an individual's self-efficacy through social persuasions than to enhance it, hence the importance of supportive teacher discourse as illustrated in the previous section. Nonetheless, supportive messages and

encouragement from parents, teachers, and peers whom they trust can bolster students' effort and self-confidence, particularly when accompanied by conditions and instruction that help bring about success.

Students also build their self-efficacy beliefs through the *vicarious experience* of observing others, and models can play a powerful role in the development of self-efficacy. Students are most likely to change their beliefs if the model they are observing is similar to them. Therefore, it may be more likely for a peer to influence an adolescent's self-efficacy over their teacher, who is significantly older (Bandura, 1986). Watching a classmate perceived to be similar succeed at a challenging academic task may convince uncertain students that they also can succeed. Vicarious experience is most influential when students are uncertain about their own abilities or are limited in experience with the task (Bandura, 1986, p. 403).

Peer relationships are a source of controversy in adolescent motivation to achieve in school. Some have argued that peer influence discourages effort and interest in schoolwork, though in a study by Brown et al. (as cited in Berndt, Laychak, & Park 1990), adolescents said that more often than not, their peers challenged them to work hard and succeed in school. As the following research suggests, peer influence and relationships can either be positive or negative, depending on the attitudes and behaviors of the students involved.

Noddings (as cited in Wentzel, 1997) explained that unless teachers are able to provide a safe and supportive classroom environment, the academic objectives of schools cannot be met. In this section, research presents the role of positive teacher/student relationships and pedagogical caring in middle school environments and the impact on student motivation and social and academic outcomes.

In a socioconstructivist classroom, cognition is perceived as a socially shared construct (Sivan, 1986, as cited in Summers, 2006), which allows for the conceptualization that the participants of the classroom also socially mediate motivation. Therefore, motivation cannot be separated from the instructional process and the classroom environment.

In a socially mediated academic space, students' academic and social goals, which are defined quite differently, are likely to interact with one another. Whereas achievement goals reflect one's need to be successful academically, social goals involve personal objectives related to the social context one is in. Social intimacy goals reflect a person's need for a close relationship with a friend, while social status goals show a need for popularity and to be a member of a well-accepted peer group.

Collaborative and peer-learning literature argues that if students are motivated by the group they are in and care about the success and learning of their group, they will be more likely to motivate and encourage one another to succeed.

Berndt, Laychak, and Park (1990) conducted a static group comparison to examine firsthand the influence of friends on adolescents' motivation to achieve in school. They found that discussions between friends about how to act when faced with academic dilemmas led to a similarity in friends' decisions.

The participants were 118 eighth grade students from two junior high schools in a rural Midwest school district, consisting of mostly working- and middle-class families. Over 90% of participants were white. There were 74 girls compared to only 44 boys because the girls returned their consent forms quicker than the boys.

Students were given questionnaires about their friendships, and were asked to list their closest same-sex friends who were in the same grade, in order of closeness. They also rated students in their class on how much they liked them. Students were paired based on mutual placement of names in their top five list of closest friends and an additional rating of how much they liked the other.

Previous to the treatments, students were given individual pretests that gave six different motivation-related dilemmas and asked them to make decisions about what they would do. For each scenario, there were two actions to choose from; one reflected a high-level of achievement motivation (demonstrating valuing of education), and the alternative was a low-level of

achievement motivation. On an 11-point scale, where 0 represented one option, 5 represented 'not sure,' and 10 represented the other option, students indicated how they would act. Examples of dilemmas were choosing to see a live concert of your favorite band or staying home to study for a big test you're not prepared for, choosing between doing required work and extra credit, or choosing between sports and schoolwork.

Following the pretest, pairs of friends were randomly assigned to either treatment. In the experimental treatment, pairs discussed their personal responses to the dilemmas and tried to reach a joint decision. In the control condition, students talked about issues unrelated to school. Discussions were videotaped, and after each treatment, students were again asked in a posttest to independently respond to the dilemmas.

The students' English and math teachers rated the students on six items to assess students' involvement and disruptive behavior in their classrooms ("How often does this student take part in classroom discussions?" and "How often does this student disrupt the class by talking out when he or she shouldn't be talking?") (Berndt et al., 1990, p. 666). The internal reliability for involvement and disruptive behavior were α = .86 and .94.

Finally, students assessed their friendship with their partner by rating the frequency of: (1) their time spent together, (2) occurrence of conflict, and (3) their level of intimacy based on discussion of confidential issues. Internal reliabilities for each were α = .79, .74, and .84.

Discussions were coded using methods published in previous studies (Berndt et al., 1983-1984; Kruger & Tomasello, 1986, as cited in Berndt et al., 1990). Coders used five categories: (1) statements of opinion; (2) agreements with partner; (3) disagreements; (4) commands given to the other; and (5) reasons for opinions. Coders were research assistants who real a coding manual and practiced coding videotapes prior to the study. Coding reliability was between .70 and .88 for the five items.

Different research assistants further coded the discussions using a 7-point scale assessing liveliness, cooperation, and aggression. The reliability of these codes was .91, .72, and .84, respectively.

Results showed that the discrepancies between friends in the experimental and control group were smaller on the posttest than the pretest (experimental pretest: $M = 3.57$, $SD = 1.47$; experimental posttest: $M = 2.20$, $SD = 1.12$; control pretest: $M = 3.37$, $SD = 1.47$; control posttest: $M = 3.62$, $SD = 1.66$). Pairs of girls in the experimental condition made fewer discrepant decisions ($M = 2.65$) than pairs of boys ($M = 3.74$). Boys who showed initial pretest decisions that were extreme toward either low- or high-motivation shifted toward a more neutral 'not sure' answer on their posttest. Despite their pretest decisions, girls did not shift significantly in their decisions.

Internal validity was strengthened by the random assignment of students to a control and experimental condition. History was controlled for, but maturation may have had an effect, because the duration of the study was not given and it was not clear if the treatments occurred at the same time. Furthermore, the reader is not provided with any information about the participants such as ethnicity, socioeconomic status, or achievement level in school. This type of study might best be conducted in a qualitative manner, where students talk with their close friend(s) about their decisions on real achievement motivation issues in their lives, rather than a predetermined scenario. For more realistic findings, future studies could pair students with opposite-sex friends. Many eighth grade students maintain friendships with members of the opposite sex. Overall, the discussions between friends didn't show a negative influence on students' achievement motivation.

Wentzel (1997) conducted a longitudinal study at the middle school level to investigate the relationship between adolescents' motivation for positive social and academic outcomes and their perception of pedagogical caring. To find out if motivation is stable by the time students finish middle school, or if it can change in response to feelings of support from their teachers,

Wentzel examined eighth graders while controlling for previous levels of motivation and student performance in sixth grade. She also addressed students' psychological distress and control beliefs. She found that caring from teachers was a significant predictor of students' motivational outcomes.

Participants were 375 eighth grade students from a suburban middle school in the northeastern United States. A subset of 248 students was followed from sixth through eighth grade. Of these students, there were equal numbers of boys and girls, 92% were White, 3% were Asian American, 2% were African American, 2% were Latino, and 1% other ethnicities.

Data collection occurred twice. Time 1 was the end of students' sixth grade year. Time 2 was at the end of eighth grade. The author administered all measures during normal class meetings. Students were assured their answers would be confidential and that all questions were optional.

Measures included items in six categories: perceived caring from teachers, psychological distress, control beliefs (perceived internal control, control by a powerful other, unknown source), pursuit of social responsibility goals, academic effort, and irresponsible and prosocial behavior. Irresponsible and prosocial behavior were measured by a peer nomination procedure where students were given lists of their classmates and asked who "breaks the rules, does things you're not supposed to" (irresponsible) and who "cooperates and shares, helps other kids when they have a problem" (prosocial). Student achievement data was taken at the end of sixth grade and was based on end-of-year grade point average from English, science, social studies, and math grades. To determine students' perceptions of characteristics of caring teachers, students took a "*Who Cares"* questionnaire and were asked "How do you know when a teacher cares about you? List three things that teachers do to show that they care about you," along with "How do you know when a teacher does not care about you? List three things that teachers do to show that they don't care about you" (Wentzel, 1997, p. 414).

Correlation results showed a highly significant and positive relation between perceived caring from teachers and students' academic effort ($r = .36$, $p < .001$) and to students' pursuit of prosocial ($r = .39$, $p < .001$), and social responsibility goals ($r = .45$, $p < .001$) in eighth grade. Teacher caring was related significantly and positively to internal control beliefs ($r = .27$, $p < .001$) and negatively to powerful and unknown control beliefs ($r = -.25$, $-.22$, respectively, $p < .001$), and students' reports of distress ($r = -.23$, $p < .001$). A prosocial goal in sixth grade was positively correlated with a prosocial goal in eighth grade, although the correlation was not strong ($r = .18$, $p < .001$).

Hierarchical regression analyses showed that after controlling for past behavior, students' gender, psychological distress, and control beliefs, perceived teacher caring in eighth grade was significant in explaining (in part) a change in students' motivation from sixth to eighth grade (perceived caring accounted for $\Delta R^2 = .07$, $F(1, 166) = 8.82$, $p < .001$ for prosocial goal pursuit; $\Delta R^2 = .09$, $F(1, 166) = 15.19$, $p < .001$ for responsibility goal pursuit; and $\Delta R^2 = .07$, $F(1, 166) = 14.79$, $p < .01$ for academic effort).

The whole group of 375 students gave insight into characteristics of teacher caring on the *Who Cares* questionnaire. Responses fit into six categories: modeling, democratic interactions, expectations for student behavior, nurturance, rule setting, and other. For teachers who care, 20% of responses were about democratic interactions. Examples of responses: focus is on communication; communication is open and reciprocal; treatment is fair and honest; promises are kept; trusts me; tells you the truth. Of the responses, 23% were about positive modeling: teacher cares about teaching; makes a special effort; teaches in a special way; makes class interesting. Forty-three percent of responses were about individual expectations for students: focus is on student as a person; concern with student's nonacademic functioning; asks what's wrong; talks to me about my problems; recognizes student's unique academic skills, problems, and contributions to class; asks if I need help; takes time to make sure I understand; calls on me.

The longitudinal nature of this study gives it strength, though measures could have been conducted with students during their seventh grade year as well. All measures used in this study were adapted from previously used subscales and all items showed to hold high internal consistency and reliability (Cronbach's alphas ranged from .75 to .91). The language of the items was appropriate for middle school, and items seemed to be neither biased nor leading. Interrater agreement was an average of 96% for the *Who Cares* questionnaire.

Because of the correlational nature of this study, the reader should be cautious about the findings. Perceived teacher caring is related positively to academic effort, prosocial behavior, and social responsibility goals. It could be that students who try hard in school, cooperate with classmates, and help their peers receive more positive attention from their teachers. However, based on the responses students provided on the *Who Cares* questionnaire about what makes a caring teacher, one can infer that perceived teacher support is related to increased student motivation. While this study was not specific to the mathematics classroom, it shows trends in middle school, which can be generalized to any subject.

It would be interesting to see how a more diverse group of students would respond to teacher caring, based on the various cultural backgrounds that students bring with them to school. Having both quantitative and qualitative data that examines this subject would help to better understand how students from minority populations and other cultures perceive teacher caring.

The research results reveal the importance of a relationship between student and teacher, but do not imply that teachers and students need to form close friendships. Teachers have a responsibility to help students develop cognitively and socially, and teacher support is especially important during the tumultuous years of middle school. However, the teacher-student relationship is different from friendships with peers, kinship ties, or bonds with other adult figures, and appropriate boundaries should be considered.

Using a socioconstructivist perspective, Summers (2006) conducted a pretest/posttest research design to investigate the effects of peer learning groups on students' goal orientation in

sixth grade mathematics. Both individual and shared achievement and social goals were measured to determine if shared goals influence individual student goals. It was hypothesized that after participating in collaborative groups, students would develop shared academic and social goals that along with their individual social goals and values of friendship, would impact their individual achievement goals. Findings suggested that students working in groups that collectively value academics were more likely to adopt motivational strategies connected to performance-avoidance goals over time. This provides information for teachers adopting socioconstructivist pedagogical strategies such as collaborative work groups and the implications for student motivation in the middle school mathematics classroom.

Participants were two math teachers and their 200 sixth grade students. Students attended a middle school in a mid-sized southwestern U.S. city. Teacher A and Teacher B each taught nine classes and were chosen for their consistent use of collaborative learning activities in their math classes.

The regular use of collaborative methods by both math teachers was confirmed through their responses to the *Constructivist Teaching Methods Scale (CTMS)*. Teacher A measured 4.17 and Teacher B measured 4.37. Classroom observations conducted by the researcher confirmed collaborative learning methods.

The pretest and posttest given at Times 1 and 2 were administered in math class twice during the school year: two months after school started, and two months before the end of the school year. The tests were questionnaire packets using Likert-type scales to assess various achievement and social goals: (1) social goals ("It is important to me to form one or two really close friendships in school"); (2) academic achievement motivation (using a modified version of the *Patterns of Adaptive Learning Survey (PALS)*); (3) friendship quality (students identified their best friend and indicated qualities about their friendship); and (4) shared social and academic goals ("I think it's important to make friends in math class" and "It's important to me that everyone in my math group ask each other questions"). Shared goals were measured collectively

by taking the average of students' feelings about working on tasks in peer learning groups. Two additional surveys were administered at Time 2: modifications of the shared academic goals survey and the shared social goals survey.

To assess the peer learning groups, the teacher was asked if collaborative groups were teacher or student chosen and how often the membership of the groups changed. Teachers were responsible for placing students in their groups and changed students' groups every six weeks.

At the time of analysis, only peer learning groups with two or more students with complete data were kept: 21 students for Teacher A and 32 for Teacher B. Hierarchical linear modeling was used to represent one level as group effects and one level as individual effects.

Analysis of task orientation at Time 2 revealed that shared achievement goals were a significant predictor of task orientation for students under both Teachers A ($\beta = .40$, $p < .01$) and Teacher B ($\beta = .23$, $p < .05$). This finding suggests that students who reported high shared achievement goals also tended to report high task goals for both teachers.

Analysis of performance-approach orientation at Time 2 showed that social intimacy was a significant negative predictor of change in performance-approach goals for students of Teacher B ($\beta = -2.15$, $p < .05$) suggesting that students with low social intimacy reported high performance-approach goals in this class, goals focused on success.

Analysis of performance-avoid orientation at Time 2 showed that validation and caring for a best friend was negatively correlated with change in performance-avoid goals for students of Teacher B ($\beta = -2.09$, $p < .05$), suggesting that students without a friendship that meets their needs for validation showed a tendency to report higher performance-avoid goals, where they try to avoid embarrassment and failure. Shared achievement goals also appeared to be a significant predictor of change in motivation for students in Teacher B's class ($\beta = 3.13$, $p < .001$), suggesting that there existed group effects on an individual's performance goals over time.

The measures used in this study were all previously used scales with Cronbach's alphas of .75 to .84 representing internal reliability. A potential limit of this study was that students did

not complete their questionnaire packets at school. If they had, researchers could have controlled for any confusion or misinterpretation of the measures. They could also control for students receiving outside help on the survey, which could influence the results. There is too much variation to control for among students' homes. Because this was the first year these students were in middle school, there may be many effects due to maturation and history, as students transitioned to middle school and experienced various psychological, emotional, and biological changes. Controlling for these factors is difficult, but should be noted as a limit. Students who experienced an increase in performance-avoid goals could have been impacted by other factors.

In light of the weaknesses presented, the findings in this study show that students who belong to groups with high levels of shared achievement goals in math are more likely to adopt motivational strategies where they are concerned with avoiding embarrassment and failure. It may be the intention of the teacher to build collaborative relationships among students, but it may be possible that students who working together are more conscious of their own work, and may want to avoid looking incompetent in front of their peers. From the literature on the transition from elementary to middle school, students may be feeling the effects of transitioning to a school that feels more performance-oriented and less supportive, even in a classroom that has adopted socioconstructivist goals. It would be interesting to see similar studies conducted with seventh and eighth grade participants, to find out how social and academic goals change over the course of middle school and junior high.

Dowson and McInerney (2001) took a phenomenological approach to investigate possible goal orientations other than performance or mastery goals, which are the main goal orientations addressed in motivation literature. They studied the experiences of 86 middle school students in Australia through interviews, observations, and field notes, and identified a range of social and work avoidance orientations adopted by students that affected their motivation and academic achievement. The authors also determined four social goals that were the most important to students in a schooling situation.

The participants were 86 middle school students (Grade 6, n = 27, Grade 7, n = 36, and Grade 8, n = 49, average age of students was 13) who attended six schools in the Sydney, Australia metropolitan area. Of the participants, 48 were females and 38 were males. The majority of students were Anglo-Australian, with Northeast and Southeast Asian students representing the largest minority group. An approximately equal number of students from each school participated in the study. Student achievement level and socioeconomic status were not given.

The researchers conducted three types of interviews: conversational, semi-structured, and structured. Conversational interviews were held with 64 students to find the range of achievement goals they held, with open-ended questions such as "What reasons do you have for wanting to do well in school?" (p. 37) and "Why do (or don't) you try hard at school?" (p. 37). Semi-structured interviews were held with 32 students to explore their social and work avoidance goals and to look at the behavioral, affective, and cognitive components of these goals. The structured interviews were held with 18 students, 12 of who were chosen based on their particularly intuitive or detailed responses in previous interviews. The structured interviews asked questions based on aspects of the conversational and semi-structured interviews, and posed more specific questions such as "Some students say that they have to want to beat other students before they can do good work at school. Do you need to be motivated in this way, or can you still do good schoolwork even if you don't want to beat other students? Why?" (p. 37). Out of the 86 participants, eight students took part in all three kinds of interviews.

Structured classroom observations and the recording of field notes were performed concurrently with the interviews. Students' interview responses were used to determine key points of focus for the classroom observations. The observations were mainly concerned with students' actual social and work avoidance behavior and focused on student conversations (both with classmates and with themselves) as they worked, students' interactions with their teacher, and how engaged students were as they worked on different tasks. Thirty-seven unstructured field note entries were taken that recorded students' social and work avoidance behaviors and how they

reacted to different learning contexts. Notes were also taken on observations of students' comfort level with and their perceived reactions to the research methods that were used.

This study provided new information concerning the goal orientations of middle school students. Four orientations were identified; work avoidance, social affiliation, social responsibility, and social concern. The researchers looked at behavioral, affective, and cognitive components for each. Descriptions of these goal orientations are described below.

Work avoidance goals are defined as students "wanting to achieve academically with as little effort as possible" or conversely, "avoiding demanding achievement situations to minimize expended effort" (Dowson & McInerney, 2001, p. 42). Students in the study were observed copying the work of others, asking the teacher for assistance on relatively easy problems, and were involved in a variety of off-task behaviors. This orientation was associated with feelings of "laziness, boredom, inertia, and even anger" (p. 38). One student explained, "If I'm tired or something, then I don't want to do it [schoolwork], even if I can. But if it's [the work] really hard, then I definitely don't feel like doing it" (p. 38). Depending on the learning situation, this goal orientation could manifest itself in a multitude of ways, but generally appears to be maladaptive for students in most circumstances.

Social affiliation goals are defined as "wanting to achieve academically to enhance a sense of belonging to a group or groups and/or to build or maintain interpersonal relationships" or conversely, "wanting to achieve to avoid feelings of separateness or isolation" (p. 42). Students in the study were motivated in their academic work when they were given the opportunity to work with other students in cooperative ways. Students said they looked for ways to help one another in order to convince their teacher to continue letting them work in groups, and that they tried harder to keep up in study groups to feel good in the group. Even if they disliked an academic activity, students would work at it if they felt it would keep them in a certain group. A student said, "I want to do well in history, even though I don't like it much, because if I don't, then I might have to move to a lower class and then I wouldn't be with my friends" (Dowson &

McInerney, 2001, p. 38). Social affiliation was associated with adaptive learning strategies such as planning ahead, thinking ideas through in conversations with others, testing their understanding and the understanding of others, and collaborating to ask clarifying questions to the teacher. These strategies were more easily accomplished when working in class groups over working individually.

Social responsibility goals are defined as "wanting to achieve academically out of sense of responsibility to others to meet social role obligations, or to follow social and moral 'rules'" or conversely, "wanting to achieve to avoid social transgressions and/or unethical conduct" (Dowson & McInerney, 2001, p. 39). Researchers found that some students were motivated to work harder when they were in a role that had a high level of responsibility and/or academic expectations, such as peer tutor or member of the debate team. Students reported feelings of pride, satisfaction and excitement in their academic work when they felt they had made a difference by contributing to their class or school, or by helping a classmate. Students with social responsibility goals used effective learning strategies such as self-monitoring, planning and organizing schoolwork to meet due dates, and putting forth more effort because of the roles they held. One student shared, "I want to understand my work because it's what my teachers expect of me now that I'm a tutor" (2001, p. 39).

Social concern was the final goal orientation identified by researchers. This orientation is defined as "wanting to achieve academically to be able to assist others in their academic or personal development" or conversely, "avoiding academic achievement situations where the concern of other students is at risk" (Dowson & McInerney, 2001, p. 39). Students were motivated when they had opportunities to help others: "If I know my work well, then I can help my friends if they need it. I like to help when I can" (2001, p. 39).

The authors did not provide a thick description of the time, place, context, or culture of the participants in their study. It also would have been helpful to know more about the students

who were interviewed, especially information about their socioeconomic status and level of academic achievement, to better determine the transferability of the findings.

It was not mentioned how the researchers gained entry into this populations of students, nor did they indicate the duration of their study and how they controlled for their own biases. No member checks were reported with their participants. The lack of these elements in this study necessitates further research to verify if the types of behavior seen are common to other similar contexts. Research that examines the role of work avoidance and social goals in the middle school mathematics classroom is needed.

The four social and work avoidance goals were inductively generated from the student interviews and observed classroom behavior, rather than a priori reasoning. This deepens the literature on goal theory, showing that there are a great many factors that interact to determine student motivation.

Goodenow (1993) conducted a correlational study to investigate the relationship between classroom belonging and students' expectancies for academic success, their value of academics, motivation and effort, and achievement. Goodenow defines belonging as students' "sense of being accepted, valued, included, and encouraged by others (teachers and peers) in the academic classroom setting and of feeling oneself to be an important part of the life and activity of the class" (Goodenow, 1993, p. 25). Results indicated that social relationships in the classroom were an important factor in student motivation.

Participants were 353 sixth, seventh, and eighth grade students in a middle school in a suburban area of New England. Students were mostly European-American (93%), and minority students were mostly Asian-American (Korean, East Indian, and Chinese).

Students' teachers in their English classes administered surveys once during spring semester. Whoever was in attendance at school on that day participated in the survey. Participants completed one of four versions of *The School Opinion Questionnaire*, which focused on student motivation, attitudes and experiences in math, social studies, science, and English classes. These

four versions of the survey were mixed together and randomly distributed to students. Teachers provided students' term grades and effort ratings for English class only.

The School Opinion Questionnaire included the *Class Belonging and Support Scale* (CBSS), used in this study for the first time, which measured students' perception of being liked, included, and respected in their class using 28 5-point Likert-type items such as "I often feel out of place in this class," "Other students in my social studies class like to work with me," and "My science teacher is interested in what I have to say" (Goodenow, 1993, p. 29). For this sample, the reliability of the scale was a Cronbach's alpha of .93.

Correlations showed a decline in association between belonging and expectancy of academic success and value of academics from sixth grade to eighth grade (sixth grade expectancy: $R^2 = .667$, $p < .001$; eighth grade expectancy: $R^2 = .439$, $p < .001$; sixth grade value: $R^2 = .645$, $p < .001$; eighth grade value: $R^2 = .424$, $p < .001$). The correlation between expectancy for academic success and peer support peaked in seventh grade ($R^2 = .455$, $p < .001$) and dropped significantly in eighth ($R^2 = .232$, $p < .05$). Teacher support was a predictor of value in sixth grade through eighth grade (sixth: $R^2 = .630$; seventh: $R^2 = .615$; eighth: $R^2 = .597$, $p < .001$). Value and Expectancy were related in sixth through eighth grade, with a significant increase from sixth to seventh grade (from .536 to .729, $p < .001$). There was a greater significance of teacher support impacting academic expectancies for girls than for boys.

Multiple regression analyses for the total sample showed that belonging and support contributed significantly to expectancy of academic success ($R^2 = .40$), but the variance dropped from sixth grade to eighth grade ($R^2 = .45$ in sixth, .52 in seventh, and .27 in eighth grade). This may suggest that students in earlier grades are more susceptible to feelings of belonging in their school.

A strength of the study was the provision of sample questionnaire items, which is especially important for a survey being implemented for the first time. The sample items given

did not appear biased or leading. Teachers administered the surveys, so students were not impacted by the presence of a researcher.

Due to the correlational nature of the study, it cannot be concluded that belonging and support lead to motivation. It may be that motivation, high expectations of success, and a value of academics are related to a perceived sense of support. Future longitudinal studies could be conducted to look at interpersonal relationships among students and patterns of motivation over time. Triangulation of the data using qualitative measures such as classroom observation or student and teacher interviews are other suggestions to provide a more complete understanding of these findings.

Generalizability is limited due to the low diversity of the population sampled. Students of color and those from diverse cultural backgrounds may experience classroom belonging and teacher support much differently than their Euro-American peers. A similar critique applies for including students from low-income and urban backgrounds in order to provide a more complete representation of the larger population. Students with at-risk histories, for example, may respond very differently about feelings of classroom belonging.

As part of the two-year *Transitions at Early Adolescent Project,* Midgley, Feldlaufer and Eccles (1989) conducted a quasi-experimental time series study to investigate the transition from elementary to junior high school and how changes in students' perceptions of the teacher/student relationship influenced their valuing of mathematics. They found that the intrinsic value of math was strengthened when students moved from low-support teachers in elementary school to teachers perceived as being highly supportive. This research showed the connection between teacher support and students' beliefs about mathematics.

Participants were 1,301 students who were transitioning to junior high during the duration of the study and volunteered to take part in the study. Students were predominantly white, and represented 12 school districts in middle-level income communities in southeastern Michigan.

Students were given questionnaires in the fall and spring of both their sixth and seventh grade years. Measures assessed students' beliefs about the intrinsic value of mathematics and the importance and usefulness of mathematics using a 7-point Likert-type scale. Items asked students about their interest in math, their enjoyment of math, their reasons for putting effort into their math work, their perceived importance of being good at math, and their perceived usefulness of math after high-school.

Teacher support was measured using a 4-point Likert-type scale. Items asked students to rate the frequency of the following statements: "The teacher cares how we feel," "The teacher is friendly to me/us," "The teacher treats boys and girls differently," "The teacher grades our math work fairly," "The teacher criticizes us when we do poor work." The Cronbach's alpha for this measure was .73.

Results confirmed that changes in students' valuing of mathematics are related to differences in perceived teacher support during the transition to junior high school. Interactions between change in perceived teacher support and year changes were highly significant (intrinsic value: F (3,1300) = 21.80, $p < .0001$; importance/usefulness: F (3,1300) = 16.41, $p < .0001$). Students with high perceived support during both years showed little change, but students who moved from a low-support teacher in sixth grade to a teacher perceived as high-support in seventh grade experienced an increased intrinsic value of mathematics and increased perception of the importance and usefulness of mathematics. Low-achieving students who had low-support teachers for both years experienced the greatest drop in their valuing of math across the two years (from $M = 3.40$ to $M = 2.97$).

A strength of this study was the large sample size. Sample items from all instrumentation measures were provided, and Cronbach's alphas were .73 to .80. The validity of the measures was also supported by past research analyses. A weak measure for students' perceived usefulness of math only asked students about the importance of math after they graduate from high school, not how useful it is in students' current experience.

With a longitudinal study such as this, effects from maturation and history may influence students' positive or negative attitudes towards mathematics besides teacher/student relationship. Because of the correlational nature of this study, it cannot be certain that teacher support was the cause of students' positive beliefs. Students who value math may influence the teacher/student relationship, and students who are becoming more negative toward school may perceive their teacher as uncaring and unsupportive. Future research could clarify this question. Because the sample population in this study was mostly white, research that includes diverse students is needed.

Ross (1995) conducted a multi-method study on the effects of giving students feedback on their work in cooperative group learning situations in mathematics. Ross investigated student-student interactions, student attitudes toward giving and seeking help, and teacher-student interactions during cooperative group work (p. 128). He found that the feedback strengthened students' helpfulness toward one another and increased students' skills in asking for and giving help. Help-seeking behavior has been linked to increased student self-efficacy.

Eighteen students (one of which was considered gifted) in one Grade 7 math classroom participated in the 16-week study. Ms. Bennett, the teacher, was participating in a year-long in-service program on cooperative learning at the time the study was conducted. Her personal teaching efficacy scores were consistently high, and she was an advocate for cooperative learning, each day including at least 15 minutes of group work in her math classes. The school was located in a small Canadian city with a mixture of "blue- and white-collar jobs" (Ross, 1995, p. 128). Of the participating students, 5% were bused in from the countryside.

The study began after Ms. Bennett had implemented cooperative learning in her classroom for four months. Her approach was STAD –Student Teams-Achievement Divisions, where students worked in mixed-ability and mixed-gender groups of three to five students, which changed each month. For this study, students stayed in their same groups over the course of the research.

Initially, participants completed a survey administered by their teacher that assessed their attitudes toward giving and seeking help, including perceived cost of giving and seeking help. For example, students were asked to respond to statements like "I feel shy about asking questions of other students" using a 5-point scale. Because standardized test scores were not available at the time, Ms. Bennett measured students' math ability by putting them in order from most able to least able.

Student interactions were audio-recorded for 25-30 minutes as they worked on math tasks in their cooperative groups. Four recording sessions were conducted, and the tapes were transcribed verbatim and coded to show three levels of requests: (a) asking for explanations, (b) procedures/facts, or (c) evaluations. Five types of responses were coded: (a) giving procedures/facts; (b) explanations (consisting of rationales, demonstrations, and/or references to previous examples); (c) acknowledgments (nonevaluative and content-free recognition of comments from a peer) and evaluations (of self, other students, or the task), which could be (d) positive or (e) negative (Ross, 1995, p. 128).

Two recording sessions were conducted in weeks one and four. In week six, Ms. Bennett held a class discussion on the characteristics of good group work, and students performed a skit that demonstrated the difference between high-level and low-level help. Students were given the *Self-Assessment Target* (Ross, 1995, p. 130) and were shown how they were to use it. In their work groups, students received an excerpt from the verbatim transcript of their conversation, and were asked to use the *Self-Assessment Target* to score their group-work performance and come up with a plan of improvement. The *Self-Assessment Target* continued to be implemented each week throughout the study. In week 10, the third recording session took place. In week 12, students had another round of feedback where they compared transcripts from sessions two and three to assess changes in their help seeking and help giving behavior. The last recording session occurred in week 16, along with the re-administration of student attitude surveys.

Results showed that students responded positively to the *Self-Assessment Target,* which gave students the opportunity to provide examples of questions asked in their groups, rate the questions and suggest improvements, and give examples of good answers.

The feedback produced some positive changes in student frequency of help giving, especially in positive evaluations (t = -4.50, < .001, p < .001) and explanations (t = -3.88, < .002, p < .01). Help seeking requests for facts and procedures increased (t = -2.38, < .032, p < .05), and off task behavior declined (t = 3.87, < .002, p < .01). It appeared that students were more willing to ask for help after the treatment.

The qualitative analysis of the study suggested that after the feedback sessions, "students of every ability level came to realize that those who needed help should ask for it" (Ross, 1995, p. 134). Low-ability students seeking help were more willing to ask questions, more persistent, more precise in their inquiries, and they recognized the value of high-level help. A few students changed from asking Ms. Bennett for help to asking their peers instead.

High-level students were more willing to give help after the feedback sessions. Before the feedback, Ron, who ranked one in ability, showed indifference toward his group mates unless he was asked by the teacher to explain a solution. After feedback, Ron was eager to help and offered assistance whenever he could. Ron was conscious of his change in behavior, even telling his group, "Do you notice I'm being a lot nicer?" (p. 135). Students showed more sensitivity to those who needed help. Even when they were frustrated with a slow-moving group member, the group acknowledged an obligation to help, and not just by giving answers, but through explaining. Ms. Bennett's interactions with students consistently reinforced the feedback, and she encouraged students to use their combined resources to solve problems.

The internal validity of this research could have been strengthened by a larger sample and the addition of a control group for the quantitative portion of the study. A control group would have been useful to gauge the effectiveness of the feedback treatment. Because the treatment was

implemented over a 4-month period, after four months of initial cooperative group work, history and maturation could have influenced students' reactions to the feedback.

To feel confident about generalizing the findings of this research, other studies with similar methods and instrumentation conducted in U.S. middle schools are needed. The sample population in this study was not described in any real detail, which limits the ability of the reader to determine to which populations the findings may be transferred. Student achievement was given only relative to others in the sample (and was the interpretation of the teacher), and ethnicity of students was not provided. Ross did not account for how he gained entry to the sample population, or his presence in the classroom. This would have been helpful to determine his influence on the students during the course of the study. It is not clear how he attended to his own researcher bias, or if he conducted member checks with the participants, including Ms. Bennett.

That said, this pilot study was intriguing because it provided a means to help students increase their ability to both ask for help and give help. Help-seeking behavior has been linked to increased student self-efficacy, which in turn may help motivate students to achieve in school. If students feel comfortable asking questions and gain practice working in cooperative learning situations where they ask for and receive help, it may give them a feeling of control over their own learning, which supports self-determination theory that autonomy can result in intrinsic motivation.

These studies showed that in middle school, there appears to be a relationship between classroom relationships and students' attitudes, motivation and value of academics. Students' perceptions of teacher caring were a predictor of students' motivational outcomes such as academic effort and social responsibility goals (Wentzel, 1997). Students reported that a caring teacher treats students fairly, trusts students, recognizes students as unique individuals, and takes time to make sure everyone understands. Eccles, Feldlaufer, and Midgley (1989) found that the intrinsic value of math and perceived usefulness and importance of mathematics were

strengthened when students moved from low-support teachers in elementary school to highly-supportive teachers in middle school, suggesting a connection between teacher support and students' beliefs about mathematics. Goodenow (1993) found a correlation between teacher support and student value of academics in 6th through 8th grade. She also found that belonging and support contributed more significantly to expectancy of success in 6th and 7th grade compared to 8th grade. Combined with Eccles et al. (1989), this research suggested that there could be a decline in student academic beliefs over the course of middle school in the absence of highly supportive teachers.

Summers (2006) investigated the effects of peer learning groups on 6th grade students' goal orientations and found that students working in groups that collectively value mathematics were more likely to adopt motivational strategies connected to performance-avoid goals over time, suggesting that students working in groups may feel embarrassed to make mistakes in front of a group. Ross (1995) found that when students were given feedback on their work in cooperative work groups in mathematics, their helpfulness and patience toward one another increased, along with their skills in asking for and giving help, suggesting that metacognitive opportunities during groupwork could have great benefits on social relationships in class.

Berndt et al. (1990) found that when friends, especially girls, shared and discussed what to do in different academic dilemmas, they influenced one another's decisions. This suggested that social interactions between friends can influence students' academic decisions. Through student interviews, Dowson & McInerney (2001) identified four social goals that affected student motivation and academic achievement: work avoidance, social affiliation, social responsibility, and social concern, suggesting that there are complex reasons as to why students are motivated at school, and more goal orientations than simply performance or mastery goals.

Teaching Implicit Theories of Intelligence

The final section discusses the impact of teaching implicit theories of intelligence to students. Research (Blackwell, Trzesniewski, and Dweck, 2007; Burns & Isbell, 1997; Dweck, 1986) has shown that students' theories of intelligence shape their responses to academic challenge. Students endorsing an entity theory believe intelligence is fixed and uncontrollable; intelligence is something you either have a lot or a little of, and you can't change it. In contrast, students with an incremental theory of intelligence believe that ability can be developed through effort, even in the face of challenging tasks. This orientation promotes using effort to overcome difficulty in order to increase knowledge and skill (Blackwell, Trzesniewski, and Dweck, 2007).

Blackwell, Trzesniewski, and Dweck (2007) conducted a quasi-experimental intervention study on 99 seventh-grade students at a junior high school in New York City to investigate the effects of teaching students an incremental theory of intelligence on mathematics achievement. They found that teaching an incremental theory increased student beliefs that intelligence is not fixed and can be improved through effort. Students in the experimental group experienced a reversal in their downward grade trajectory over students in the control group, and participants experienced a visible increase in academic motivation, according to their math teacher's reports on classroom attitudes and behaviors.

Participants in the study were 99 seventh graders (49 females and 50 males) at a New York City public secondary school. They were 52% African American, 45% Latino, and 3% White and Asian. The students were considered low achieving, holding sixth-grade math test scores at the 35th percentile nationally, and 79% of students were eligible for free lunch. Participation in the study was completely voluntary and student and parental consent was gained before the study began.

Students' sixth grade mathematics grades were used to measure their prior achievement and determine eligibility for the intervention. At the beginning of the fall term of seventh grade,

99 seventh grade students took part in a *Theory of Intelligence* questionnaire that assessed their initial motivation profile, surveying their learning and performance goals, beliefs about effort, and attributions in response to failure. Of these 99, 95 volunteered to participate in the study. These students were already enrolled in advisory classes, which the school randomly assigned in groups of 12-14 students, to provide extra help with their studies. Each advisory class was randomly assigned to either the experimental condition (incremental theory training) or the control condition. All students were told that they would be participating in an 8-week workshop where they would learn about how the brain learns, effective study skills, and anti-stereotypic thinking. Sixteen undergraduate assistants were trained as mentors for the students and teams of two assistants implemented the workshops.

Out of the eight total sessions, sessions 1 and 2 and sessions 5 and 6 were the same for both control and experimental groups. The experimental group received an intervention reading called "You Can Grow Your Intelligence" while the control group learned about memory. The experimental group also held discussions about how learning makes you smarter, while the control group discussed academic difficulties and successes. At the end of the intervention both groups were given the same multiple-choice quiz on the workshop content and ensured that they were not graded on the quiz. Three weeks after the last workshop session, students retook the *Theory of Intelligence* questionnaire to assess how their self-theories changed over the course of the intervention. After the workshop, students' teachers were asked to make note of individual students who showed a change in their motivational behavior. Teachers were under the impression that all students received the same intervention. Finally, students' math grades from three time points (Time 1: spring of sixth grade, Time 2: fall of seventh grade, Time 3: spring of seventh grade) were used to compare the differences between the achievement trajectories of both the experimental and control groups.

Results from the multiple-choice quiz showed the experimental group effectively understood the theory of intelligence and that both groups were equivalent in their learning from

the workshops. A paired sample *t*-test showed that after the intervention, the experimental group participants' theory of intelligence changed to endorse an incremental theory (4.36 pre-intervention vs. 4.95 post-intervention, Cohen's $d = .66$, $t = 3.57$, $p < .05$), but the control group did not experience change in theory (4.62 pre-intervention vs. 4.68 post-intervention, Cohen's $d = .07$, $t = .32$, *ns*). Teacher reports on change in student motivation showed that 27% of the students in the experimental group were cited by their teacher as demonstrating a positive change in their math class, compared with only 9% of the control group, which was a significant difference ($\chi^2 = 4.72$, odds ratio = 3.26, $p < .05$).

Researchers found a significant effect of the experimental condition on the change in students' grades from fall to spring of seventh grade (Time 2 to Time 3; $b = .53$, $t = 2.93$, $p < .05$). Within only a few months of the intervention, the experimental group's downward grade trajectory stopped, while the students in the control group who held an entity theory continued to experience a decline in grades, common for students transitioning to junior high school.

The internal validity of the research methods seems to be quite sound, especially because of the existence of a control group. Although students were selected based on their achievement level and participated voluntarily, their advisory classes were randomly assigned to be experimental or control.

One must consider history and maturation of the students as factors, but the findings are strong enough to believe these factors were not too influential on the results. The effects of experimental treatment diffusion on the control group, and compensatory equalization of treatments are worth questioning: students were not told they were in different workshops, but did they talk to one another about what they were learning and notice differences? If so, did the students in the control group take issue with it? The experimental treatment seemed to be administered in an understated manner. Again, if there were effects, they were not significant enough to affect the outcomes. There also could have been variance in the experimental and control groups due to the influence of the mentors that conducted the workshops. The quality of

relationships built over the 8-week course may have impacted students' academic performance and motivation.

The generalizability of this study is limited, in part because the sample was somewhat small (n=99), a limitation noted by the authors in their discussion. The results of this study can only be generalized to the population studied: adolescents who are low achieving and from relatively low socioeconomic backgrounds. More research is needed to determine if average or high-achieving students would be impacted in a similar way, and further research that includes Caucasian and Asian students in the sample. These results are strictly for an urban population. Research conducted with larger samples and more diverse populations is needed, but these results are telling in that teaching low-achieving students an incremental theory of intelligence may have a positive effect on their motivation and achievement in school.

Based on this research, one can infer that a student's theory of intelligence can have an impact on their achievement motivation, and that teaching students an incremental theory of intelligence at the middle school level can help to increase student motivation and attitude toward academic achievement. Students in the experimental group who held an entity theory of intelligence reversed their declining grade trajectory, while entity theorist students in the control group continued to decline. This change occurred over just one semester. It seems highly likely that teaching students that their academic ability can be strengthened through effort can affect their motivation enough to improve their effort and in turn, their grades.

Burns and Isbell (2007) conducted two one-shot case studies (Experiments 1 and 2) investigating the interactions between individuals' self-theories of intelligence and experimentally primed theories in the mathematics domain. The first experiment investigated the effects of receiving information that matched one's own theory versus mismatching information on math achievement on a difficult math test. A second experiment studied how people of varying ability levels responded to these kinds of treatments. They found that the effects of priming individuals with an entity or incremental theory of intelligence depended on the person's existing

self-theory of intelligence and their mathematics skill level. Priming with an incremental theory did not necessarily result in higher performance, as intelligence theory research previously showed. Entity theorists with a high level of math skill actually performed better when primed with a fixed theory of intelligence relative to incremental theorists.

In Experiment 1, 84 female undergraduates were solicited through phone and email based on information collected in an earlier screening which included a measure of participants' implicit theories about math intelligence. The eligible participants were considered to be skilled in math (SAT math scores were between 550 and 730, M = 629.3), and highly identified with the math domain. No information was given regarding the ethnicity or age of the participants, nor in what geographical area the study was conducted. In Experiment 2, the participants were 69 female undergraduates (mean age was 19.88 years) from a variety of majors who represented a broad range of skills in mathematics (SAT math scores between 300 and 750, M = 531.4). Of the participants, 75.3% were Caucasian, 11.6% were Asian, and 11.6% were African American. The authors did not explain how these participants were selected.

For Experiment 1, participants were randomly assigned to either the fixed or malleable theories manipulation condition. Participants were instructed to read a passage from a “new” educational psychology textbook and were asked to provide feedback on the textbook. The passage either focused on how math ability can be changed by different environments or how math ability is fixed and is just one form of intelligence that one can possess. The participants then were asked to take part in another unrelated study that surveyed regional differences in performance on standardized math tests. The participants would be representing their region and receive feedback that compared their scores to those of others schools. Math anxiety of participants was also measured before taking the math test. They were given a sample question to show the level of difficulty of the test they were about to take, and asked how worried they were that their test performance would give a negative reflection of themselves or their gender. The actual math test was comprised of 15 difficult questions taken from the math GRE. Participants

had 15 minutes to work on the test. To check that the initial implicit theory manipulation was effective, after the test researchers asked participants how much they would prefer to answer challenging questions if they were to take another math test. Those in the malleable condition were shown to be more likely to prefer difficult problems than those in the fixed condition, thus the manipulation was believed to have its intended effect.

Findings showed that when exposed to a malleable intelligence view, entity theorists felt significantly less pre-test anxiety (M = 3.02, SD = 1.73) than when exposed to a fixed view (M = 3.64, SD = 1.75). Incremental theorists' anxiety did not differ as a function of the theory priming. For math performance, entity theorists in the fixed condition performed better (see next paragraph).

Their findings for their first experiment showed that for highly skilled individuals, those with an entity, or "fixed" (Burns & Isbell, 2007, p. 52) theory of intelligence experienced less math anxiety when primed with an incremental or "malleable" (2007, p. 52) theory (M = 2.68, SD = 1.79) compared to the incremental theorists (M = 4.00, SD = 1.59; $t(42) = 2.60$, $p < .02$). However, entity theorists performed better on a math test with the fixed intelligence prime (M = 4.33, SD = 2.12) over the incremental theorists (M = 2.83, SD = 1.86), $t(40) = 2.39$, $p < .03$. In contrast, both entity and incremental participants in the malleable condition did not differ in their test performances.

In Experiment 2, the researchers selected 69 female participants with a broad range of math abilities in order to determine the generalizability of their findings from Experiment 1. The treatment was similar, with participants randomly assigned to either the malleable or fixed condition. However, there were some big differences from Experiment 1. To avoid any competition effects that may have been at work in Experiment 1 when researchers said they were comparing regional test scores, participants in Experiment 2 were told they were pilot testing problems for the math GRE. Their pre-test math anxiety was not measured to avoid "activating stereotype threat concerns in the participants" (Burns & Isbell, 2007, p. 60), and the participants

were asked to measure how much their math performance was due to their effort in order to test the effectiveness of the theory manipulation.

Findings for the second experiment showed that for participants in the malleable condition, math performance was more likely to be attributed to effort ($M = 4.76$, $SD = 1.30$) compared to those in the fixed condition ($M = 3.57$, $SD = 1.34$), $F(1, 65) = 13.56$, $p < .001$. This demonstrated that the intended effect of theory manipulation occurred. Incremental theorists who were exposed to the malleable condition, their own theory, attempted more math problems ($M = 14.35$, $SD = 1.60$) compared to those exposed to the fixed condition, a contradictory theory ($M = 12.17$, $SD = 3.38$), $t(30) = 2.48$, $p < .02$). There was no effect on math performance for either prime. Researchers concluded that malleability can be motivating for moderately skilled incremental theorists, but a fixed prime does not motivate entity theorists who are moderately skilled in the same way it did for the highly skilled entity theorists in Experiment 1.

For both experiments, the findings would have been strengthened if a math pretest had been administered before the treatment to see if there was any change in achievement based on participants' theory of intelligence and their reaction to being primed with a malleable or fixed view of intelligence. The researchers judged participants' math ability only on their SAT scores, which is a questionable move. Participants' scores could have inaccurately depicted their ability, or their skills could have improved after the SAT was taken.

In both experiment groups, the participants received course credit in exchange for their participation. This reward in and of itself may have influenced the motivation of the participants.

It is difficult to understand why the researchers changed parts of the treatment for Experiment 2, but still conducted the same difficult math test. A less difficult pre- and posttest for participants of moderate math skill might help determine if priming individuals with an incremental theory of intelligence would help improve their math performance. The researchers did not explain where these participants lived, and did not describe the ages or ethnicities of participants in Experiment 1. This made it difficult to compare the findings for the two

experiments, because the populations for each could have been quite different. For these reasons it is difficult to determine which populations these findings can be generalized to, and how these findings contribute to the research question. Research of a similar nature conducted with an adolescent population representative of various ability levels and ethnic backgrounds is needed, especially because intelligence theory treatments may be more influential on early adolescents than on adults. The findings do pose interesting questions about the interaction of priming students with a malleable theory of intelligence in mathematics and the students' pre-existing self-theory and their math skill level. Malleability may not be, as the researchers put it, a "one-size-fits-all" belief (2007, p. 61) when it comes to academic performance.

This section discussed the impact of teaching implicit theories of intelligence to students' academic achievement and motivation. Blackwell, Trzesniewski, and Dweck (2007) conducted a quasi-experimental study with 99 7th grade students to investigate the effects of teaching low-achieving students an incremental theory of intelligence on their mathematics achievement. Their findings showed that the intervention had a significant effect on students' personal theories of intelligence, and students' downward grade trajectory stopped. Students' teachers reported that many students demonstrated increased academic motivation as well. In a study by Burns and Isbell (2007) with female undergraduate students, they found that priming students with an entity or incremental theory of intelligence depended on the person's existing self-theory of intelligence and their mathematics skill level. Priming students with an incremental theory did not necessarily result in higher performance, as in the Blackwell et al. (2007) study. When entity theorists skilled in math were primed with a fixed theory of intelligence, they actually performed better than incremental theorists. Even though these two studies seem to show contrary findings, the reader should take note that the research methods in Blackwell et al. (2007) were much stronger than in Burns and Isbell (2007) and the study was conducted over a longer period of time. Likewise, the population in the first study was the target age group for the research question of this paper, unlike the female undergraduate students in the second study. Nonetheless, these two studies

demonstrate the great variation in individuals when discussing theories of intelligence and their influence on ability.

Summary

Chapter Three examined a broad review of research pertaining to influences on student self-efficacy and motivation in the middle school mathematics classroom. Using a social cognitive lens, each study was reviewed and critiqued to gain insight on factors that affect early adolescents' beliefs and behaviors in the math classroom. The research conducted on classroom environment and the transition to middle school demonstrated that teacher efficacy and classroom goal structure have an impact on self-efficacy and motivation, especially during the transition from elementary school to middle school and junior high. Research conducted on challenge, avoidance, affect, and self-efficacy indicated the complex interplay between self-efficacy, motivation, self-beliefs, and academic performance. Research conducted on self-efficacy and self-regulated learning in the transition to middle school indicated that goal theory, self-efficacy, and self-regulated learning were influential on student behavior and motivation. Research conducted on teacher discourse as a motivating factor in the math classroom showed that the context created by teacher discourse in the mathematics classroom has far-reaching effects on student motivation, self-efficacy, goal orientation, self-regulation, student autonomy, and affect. Research on classroom relationships, self-efficacy, and motivation in middle school demonstrated a relationship between classroom relations and students' attitudes, motivation, and value of academics. Finally, research on teaching implicit theories of intelligence indicated that teaching an incremental theory may increase motivation and achievement for low-achieving middle school students.

Chapter Four summarizes the findings of the research in this chapter, provides teaching implications for educators, and offers suggestions for future research.

CHAPTER FOUR: CONCLUSION

Introduction

Chapter One presented the rationale for self-efficacy and motivational research and established the research focus of this paper: factors influencing self-efficacy and motivation in the middle school mathematics classroom.

Chapter Two explored the history of motivation through the progression of student-centered teaching in American public schools. This chapter also discussed adolescent development and psychology influences on education.

Chapter Three provided a broad review of research pertaining to influences on student self-efficacy and motivation in middle school mathematics. Studies were reviewed and critiqued to gain insight on factors that affect early adolescents' beliefs and behaviors in the math classroom. The research conducted was arranged into six areas: classroom environment and the transition to middle school; challenge, avoidance, affect, and self-efficacy; self-efficacy and self-regulated learning in the transition to middle school; teacher discourse as a motivating factor in the math classroom; classroom relationships, self-efficacy, and motivation in middle school; and finally, teaching implicit theories of intelligence.

Chapter Four presents a summary of findings from Chapter Three, along with classroom implications for educators to consider in regard to student self-efficacy and motivation in middle school mathematics, and suggestions for future research.

Summary of Findings

Classroom environment and the transition to middle school

This section presented four studies that discussed the transition from elementary to middle school and classroom contextual factors, such as goal orientation and teacher efficacy,

that influence student self-efficacy and motivation. Midgley, Anderman, and Hicks (1995) conducted a correlational study to investigate goal orientations held by teachers and students in elementary school compared to middle school. In middle school, both teachers and students perceived a greater emphasis on performance goals over task-goals, even though task-goals were correlated with increased student and teacher efficacy in elementary settings. A larger, more diverse sample size would have increased generalizability of this study. Midgley, Feldlaufer, and Eccles (1989) conducted a longitudinal quasi-experimental time series study to investigate the relationship between students' motivational beliefs in math and their teachers' sense of self-efficacy during the transition to junior high. Teacher efficacy affected students' academic expectancies; students who moved from a high- to low-efficacy teacher held low expectancies for academic achievement, low perceived performance, and high perception of task difficulty in mathematics. However, even though the sample size in this study was large, the magnitude of the effects was small. Eccles et al. (1993) conducted a large-scale correlational study with a large sample size across 12 school districts in diverse communities. Their study examined early adolescents' mathematics achievement goals, values, behaviors and motivation after the transition to middle school. They also examined the relationship between teacher beliefs and student motivation. After the transition student control and autonomy decreased, along with teacher support and teacher efficacy. Finally, Middleton's (1995) qualitative case study examining intrinsic motivation of students and teachers in middle school shed light on the importance for teachers to understand their students' individual motivational constructs in order to create learning experiences that promote student autonomy and meet students' needs. These studies demonstrated a trend that students in middle school generally valued mathematics less and had lower performance than when they were in elementary school. Teachers and students reported a middle school environment that was more performance-goal oriented, which appeared to result in both teachers and students feeling less efficacious about their abilities. A common strength of these studies was their longitudinal nature; students were tracked over the course of their

transition to middle school to see how their behaviors and beliefs changed over time. Findings indicate that middle school environments are less supportive than those in elementary school, resulting in students developing more negative attitudes.

Challenge, Avoidance, Affect, and Self-Efficacy

This section provided insight into the complex interplay between self-efficacy, motivation, self-beliefs, and academic performance. Pajares and Graham (1999) conducted a correlational study with 6th graders in their first year of middle school to investigate the influence of motivational factors on students' math performance and found that self-efficacy was a strong predictor of performance. Over the course of the year, students valued math less and showed decreased effort. Chen and Zimmerman (2007) used a pretest/posttest design and discovered that when difficulty of mathematics increased, self-efficacy and effort of middle school students decreased. Turner, Thorpe, and Meyer (1998) conducted a correlational study on the relationship between upper elementary students' goal orientation and a negative affect about making mistakes in mathematics. When students had learning goals they were more willing to attempt difficult math problems and held higher self-efficacy. Usher and Pajares (2006) used an invitational theory lens and found a correlation between self-efficacy and sending inviting messages to oneself and others. In turn, Schweinle, Meyer and Turner (2006) took a flow theory stance and found that teachers could enhance student motivation and support student efficacy by creating a positive learning environment and balancing challenge with skill. While this study and Turner et al. (1998) were conducted with a mostly white, rural population, Chen & Zimmerman (2007) and Usher & Pajares (2006) used larger samples of diverse students in urban and suburban areas. The research suggests that even though mathematics students may experience a negative affect when their work becomes difficult, student efficacy and motivation can be strengthened when there is a focus on learning goals, a balance between ability and challenge, and a positive and supportive classroom environment.

Self-Efficacy and Self-Regulated Learning in the Transition to Middle School

The transition to middle school brings with it new academic responsibilities that may feel overwhelming. This section of Chapter Three discussed how self-regulated learning influenced student behavior and motivation during the transition to middle school. In their correlational study, Usher and Pajares (2006) found that mastery experiences were the main influence for predicting academic and self-regulatory efficacy beliefs in entering middle school students. Schunk used a pretest/posttest design and (1996) found that with or without self-evaluation, learning goals led to greater self-efficacy, skill, and motivation. With self-evaluation, performance goals also had a positive effect on student self-efficacy in mathematics. Ryan and Pintrich (1997) found that adolescents' motivational, social, and cognitive characteristics were all related to their use or avoidance of help seeking, a characteristic of self-regulated learning. Pape, Bell, and Yetkin (2003) concluded from their qualitative study that mathematical learning experiences focusing on self-regulation strategies helped students recognize a connection between their use of strategies and their academic performance. Finally, Schunk (1984) found that combining rewards with proximal goals in mathematics increased student self-efficacy, task motivation, and achievement. These studies utilized a variety of experimental designs, from one-shot correlational studies to qualitative methods, but as a whole could have included larger samples with more diverse populations. Only Schunk (1996) used random sampling in his research methods. However, results of this body of research still indicate the value of mastery experiences and self-regulated learning on student self-efficacy. Teaching students to regulate their own individual learning through self-evaluation and goal-setting may support their growing need for autonomy and provide them with more opportunities to experience mastery in mathematics.

Teacher Discourse as a Motivating Factor in the Mathematics Classroom

This section addressed the importance of teacher discourse as a motivator in the middle school mathematics classroom. In an in-depth mixed methods study, Patrick et al. (2003) found that teacher discourse in the first days of school established the nature of the learning environment for the whole year. Walker (2008) conducted a two-phase study on teacher practice and discourse and found that an authoritative teaching style balanced demands with support and encouraged student autonomy. Turner et al. (2002) also conducted a mixed-method study on how the learning environment relates to students' avoidance behaviors in the transition to middle school. Motivational support from teachers and an emphasis on mastery goals were related to low reports of avoidance. In another mixed-methods study investigating teacher discourse and student affect, Turner et al. (2003) found that when a teacher holds high-performance and high-mastery goals but doesn't show a significant amount of supportive instructional and motivational discourse, students may have a negative affect toward making mistakes and exhibit self-handicapping behavior. In a mixed-methods study by Morrone et al. (2004) and a correlational study by Middleton and Midgley (2002), it was found that instructional discourse patterns such as press for understanding, scaffolding, and higher-order thinking promoted mastery goals among students. Turner et al. (1998) conducted a multi-method study on involvement in upper-elementary math classrooms to gain insight on the relationship between teacher discourse and students' quality of experience. Their findings corroborated with the previous studies and added that teachers in high-involvement classrooms provided opportunities for autonomy through gradual release of responsibility, accurately assessed students' needs, and were respectful toward mathematics as an interesting and valuable subject.

Mathematics teachers create the classroom context, both supportive and nonsupportive, as early as the first days of school. The research clearly indicates that teacher discourse affects student motivation, self-efficacy, goal orientation, self-regulation, student autonomy, and affect.

As a whole, the body of research covered on teacher discourse was strengthened by similar findings. Mixed-method designs were used by most of the researchers, offering the reader both quantitative and qualitative data. Of the research examined, only studies by Turner et al. (2002), Middleton and Midgley (2002), and Patrick et al. (2003) used diverse population samples.

The studies in this section consistently showed that supportive teacher discourse provided consistent cognitive and emotional support, respect, enthusiasm, humor, and high expectations for the learning of all students. Supportive and responsive discourse in each study was associated with positive student academic and social behavior.

Classroom Relationships, Self-Efficacy, and Motivation

This section discussed how the social framework of the classroom learning environment is created by students' relationships with their teachers and with one another. Consistent with Bandura's (1997) social cognitive theory, social persuasions are a source of self-efficacy, and both positive and negative social interactions can impact students' attitudes and behaviors toward academic achievement. When Berndt et al. (1990) examined the influence of friends on adolescents' academic motivation, it was discovered that discussions with close friends about academics had an influence on students' academic decisions. Through student interviews, Dowson & McInerney (2001) identified four social goals that affected student motivation and academic achievement: work avoidance, social affiliation, social responsibility, and social concern, suggesting that there are complex reasons as to why students are motivated at school, and more goal orientations than simply performance or mastery goals. Goodenow (1993) discovered a correlation between teacher support and student value of academics in 6th through 8th grade, and found that belonging and support were most significant in 6th and 7th grade. Combined with the quasi-experimental time series findings from Eccles et al. (1989), research suggested that there could be a decline in students' academic beliefs over the course of middle school in the absence of highly supportive teachers. In Wentzel's (1997) longitudinal study, student perception

of teacher caring was a predictor of motivational outcomes such as academic effort and social responsibility.

Peer learning groups also had an effect on student motivation in math class. Summers' (2006) pretest/posttest investigation on the effects of peer learning groups on goal orientations found that 6th grade students working in groups that collectively value mathematics were more likely to adopt performance-avoid goals over time, suggesting that students working in groups may feel embarrassed to make mistakes in front of a group. However, Ross's (1995) multi-method pilot study found that when feedback was provided to students in cooperative work groups, their helpfulness and patience toward one another increased, along with their skills in asking for and giving help, suggesting that metacognitive opportunities during groupwork could have great benefits on social relationships in class.

Generalizability and transferability of these studies can be made to middle-income, predominantly white populations of students and teachers. Nonetheless, the research provides evidence that students, especially adolescents still developing accurate self-assessment skills, may be dependant on their peers and teachers to provide them with feedback and judgments on how they are doing in social and academic domains.

Teaching Implicit Theories of Intelligence

This section discussed the impact of teaching implicit theories of intelligence to students' academic achievement and motivation. Blackwell, Trzesniewski, and Dweck (2007) conducted a quasi-experimental study with 99 7th grade students to investigate how teaching low-achieving students an incremental theory of intelligence would affect their mathematics achievement. Their findings showed that the intervention had a significant effect on students' personal theories of intelligence, and students' downward grade trajectory stopped. The teachers of students who received the intervention reported that students demonstrated increased academic motivation as well. Findings from two one-shot case studies conducted by Burns and Isbell (2007) with female

undergraduate students showed that priming students with an entity or incremental theory of intelligence depended on the person's existing self-theory of intelligence and their mathematics skill level. Priming students with an incremental theory did not necessarily result in higher performance, as in the Blackwell et al. (2007) study. When entity theorists skilled in math were primed with a fixed theory of intelligence, they actually performed better than incremental theorists. Even though these two studies seem to show contrary findings, the research methods and internal validity of Blackwell et al. (2007) were much stronger than in Burns and Isbell (2007). Though the sample was small, the first study was conducted using random sampling and included a control group along with its intervention. The findings in the second study would have been strengthened by administration of a pretest to contrast pre- and post-treatment results. Nonetheless, these two studies demonstrate the great variation among individuals' theories of intelligence and the effects on ability and motivation.

Classroom Implications

What began as a question about what a teacher can do to raise student self-efficacy in the mathematics classroom developed into a much greater, more expansive study on the factors that impact self-efficacy and student motivation and how a teacher can support students academically, socially, and developmentally. For me, many of the findings were intuitive, as they may be for the readers of this paper. Now those instincts about what motivates young people in school are supported by educational theory and empirical research. The research in Chapter Three will be used to address implications for educators on how to support student efficacy and motivation in the middle school mathematics classroom using social cognitive theory, implicit theories of intelligence, self-determination, flow theory, and invitational theory.

Goal theory literature primarily focuses on learning goals and performance goals, but these orientations appear to lie on a complex continuum of goals. Dowson & McInerney (2001) identified additional social goals that affect student motivation and academic achievement.

Teachers should consider that some students are academically motivated for purely social reasons, such as responsibility to others or to maintain valuable friendships. While implementing a mastery-orientation in the classroom will likely benefit many, a teacher should not expect that her students will naturally adopt this orientation. Students' past classroom experiences with many different teachers have shaped the way they view learning and the kinds of goals they set for themselves. Students may need a great deal of support as they learn to appreciate and value learning for its own sake, rather than just proving they are good at math for the sake of appearing competent to others. While performance goals seem to work for some, they do not seem sustainable. The research indicates that students with performance goals exhibit avoidance behaviors such as avoiding help-seeking, withdrawing effort, or not attempting a task at all. These behaviors are not adaptive for successful experiences in or outside the classroom.

Middleton and Midgley (2002) believed a task goal orientation to be more adaptive than performance goals. Teachers may want to espouse task goals in their classroom, but they still must be aware that not all students will have a propensity for task goals, and may feel safe with performance goals. Teachers should meet their students where they are, and not try to change them, for this could have a negative effect on the teacher-student relationship. There is nothing wrong with supporting a student's personal beliefs while still encouraging them to learn for their own benefit. Emphasize to the entire class that learning is about individual progress and it is not necessary to make comparisons between other students.

Middle school environments have been shown to hold performance goals for teachers and students, resulting in decreased teacher efficacy (Eccles et al., 1993). Because middle school teachers are only with students for a short period each day, teachers may also feel less efficacious about having a meaningful influence on their students on an academic or personal level.

If a mathematics teacher is not confident in her abilities to teach her subject, her students may perceive the subject as difficult. Research also showed that students' perception of difficulty might result in avoidant behaviors and decreased efficacy—if their teacher can't be successful,

how can students expect to be successful? This could result in students missing out on academic and professional opportunities, and perhaps just as important, going through life feeling that they lack mathematical logic and problem solving skills; they're "just not a math person." Schools and teachers both must examine their school's framework and philosophy to ensure that both students and teachers are instilled with a sense of confidence in their abilities and receive the support they need to meet their educational goals.

Stage-environment fit theory (Hunt, 1975) argues that students whose environment does not match their developmental level will be less engaged and motivated at school. Schools and teachers should take students' development into account in order to have a positive effect on students' beliefs about their ability and their achievement. Teachers and administrators should work toward helping students adjust to the transition from elementary to middle school by providing resources and support to help them cope with this important change.

If teachers can better understand their students' motivational beliefs, they may begin to gain a deeper knowledge of what drives their students to achieve in mathematics. When designing lesson plans it is important for teachers to consider their highly motivated students as well as those who are less motivated. Middleton's (1995) work suggests the importance of math teachers to become more knowledgeable about motivation through reading and discussing current research, and even sharing findings with their students.

As mathematics becomes more difficult, student self-efficacy beliefs and accuracy of their perceived self-efficacy may decline. A supportive classroom environment and supportive teacher practices will be necessary to keep students feeling confident in their abilities and motivated to try more challenging math tasks. As difficulty of work increases, teacher practices that support self-efficacy may need to shift, because needs may be different for each student. Again, teachers must know their students' individual self-efficacy beliefs in order to make instructional decisions. Teachers should develop regular check-in methods, such as journaling, to find out students' thoughts and feelings about their math work.

It is important to consider that student perception of their ability is not always accurate. Recent studies (Chen, 2003; Pajares & Miller, 1997; as cited in Chen & Zimmerman, 2003) indicated that students are often overconfident with regard to their abilities. It isn't necessarily detrimental to overestimate one's ability, and it may have few repercussions on their achievement or motivation, especially if students hold mastery goals. However, if a student with performance goals perceives a high ability in math and then experiences failure, they may feel a stronger blow to their self-efficacy. Bandura (1997) suggested that level of task in a particular domain has an effect on self-efficacy. If a student inaccurately perceives a math task to be too demanding and they have low perceived efficacy in the mathematics domain, they may refuse to try, or may use avoidance behavior to escape a public failure.

Students may be more prepared to face new challenges in math if they are able to self-regulate their own learning. This has been shown to help students persevere when math becomes difficult without letting it affect their self-efficacy. Teachers can introduce different self-regulation strategies so that when the going gets rough, students will conclude that they need to try something different rather than decide they are unable and give up. They will likely experience greater success, learn new strategies along the way, and hopefully develop more intrinsic motivation and self-efficacy in their overall ability to attempt new things.

Students with greater self-efficacy about their academic ability are more likely to self-regulate learning through use of cognitive strategies (Pintrich & De Groot, 1990). Teachers who create a positive classroom environment and foster trusting relationships with students and between students can influence social and cognitive competence which may result in students being less afraid to ask for help of their teacher or peers when they have questions in math. Help seeking was seen as a characteristic of self-regulated learners (Newman, 1994) and if teachers can learn to cultivate a classroom environment that is conducive to help seeking, it may have a positive influence on student motivation to achieve in mathematics.

Ryan & Pintrich (1997) argued for the importance in considering what motivates students to seek help with their academic work in the mathematics classroom. As discussed, many factors are at play, and teachers should find out how students feel about their own social and cognitive competence, along with their achievement goals and attitudes about seeking help. This can help teachers find ways to support students' social and cognitive development to create a learning environment that encourages students to ask for help when they need it. One possibility is for teachers to collaborate, utilizing similar self-regulation strategies across multiple classrooms to give students more opportunities to practice.

Schunk (1996) found that either an orientation toward learning goals or performance goals, along with self-evaluation, had a significant effect on student self-efficacy and persistence. Self-reflection is theorized as the final phase of self-regulated learning. If teachers provide students with metacognitive opportunities in mathematics, students may adopt this strategy in their own learning. Not all students will choose to use the strategies introduced to them, and some will resonate with students more strongly than others (Pape et al., 2003).

Thus, teachers should not expect to see immediate results after teaching students self-regulation strategies. If more mathematics teachers, both elementary and secondary, adopt these instructional methods, perhaps over the course of their education students will better understand the personal benefits of self-regulation and espouse these learning strategies at the proper time. Also, providing opportunities for student autonomy will look different for each individual. Knowing students, talking with their past teachers, and providing varying levels of support will help teachers differentiate the necessary support for different students.

Metacognitive skills are improving as children move into adolescence (Keating, as cited by Ryan & Pintrich, 1997, p. 329). As adolescents are developing their ability to think abstractly, this may be the perfect time for middle level teachers to provide opportunities for their students to practice goal setting and self-reflection on their academic progress and strategies for achieving their goals.

Students who demonstrate a performance goal orientation may benefit from adding self-evaluation processes to their work. This may be an effective strategy for helping students who are low ability but have high performance goals. If students don't get the opportunity to evaluate their own progress against their previous work, they may instead compare their work to that of their classmates to determine their ability, which may result in a reduced sense of self-efficacy. This may especially be true if students see themselves struggle more than their peers with a task or concept.

The messages that teachers send to students may be messages that students internalize and later send to themselves, which connects principles of invitational theory and social cognitive theory. If this is true, encouraging and supportive language in the classroom can have a positive impact on students' personal and academic self-efficacy and their academic achievement. Invitations may indeed be a fifth source of self-efficacy (Usher & Pajares, 2006).

What students hear from their teacher during the first days of school can set the stage for their motivation toward learning for the entire school year. It is important that teachers incorporate supportive messages to students, acknowledge their learning progress, and provide scaffolded instruction whenever possible. Students should be the meaning-makers of their own knowledge, with a balance of challenge and support from their teacher. Adopting these elements of a high-mastery classroom may lead students to seek help when they need it, attempt more challenging work, and self-regulate their own behavior.

Teachers must practice when to provide support, when to demand autonomy, and to consistently show students the value in what they are learning. Modeling interest and enthusiasm for mathematics demonstrates intrinsic motivation, and in a classroom with mastery goals, mistakes can be valued learning experiences rather than evidence of failure.

Middleton and Midgley (2002) suggested that teachers must go beyond simply creating a classroom environment with mastery goals and challenge students by demanding higher levels of cognitive demand. Teachers should make sure that they are pressing for understanding rather than

pressing for performance and make this distinction clear to their students. Pressing for understanding can be a useful tool, especially in mathematics where students should be expected to provide their justification and reasoning. Press can be used as a scaffolding strategy to help students focus their attention and efforts.

However, in pressing students for understanding a teacher should be aware that students who are not accustomed to this kind of challenge might not react positively. As research showed, it is important that instructors provide support and safety when challenging students. Supportive teachers illustrated in the research were careful not to criticize or use sarcasm. Middleton & Midgley (2002) proposed that press for understanding may become a practice that students internalize over time, a practice of self-regulation that seems likely to have a positive effect on self-efficacy. Pressing oneself for understanding is a sign that learning and comprehension are important goals. Pressing students while providing support could encourage internalization.

Students in the Morrone et al. (2004) study expressed some frustration for the constructivist practices, such as press, that were used in the classroom. One student explained, "I did not like being left hanging for an answer—I know that we wanted to think but I did not like not knowing if I was even headed in the right direction" (p. 28). Teachers should be aware that students may not feel comfortable with co-constructing their learning and may want or expect their teacher to tell them the right answer when they are struggling. Students come to the classroom with previous expectations about what mathematics instruction is supposed to be. Changing their attitudes may not be an easy task. Explaining intentions to students will help them understand that as their teacher you have justifiable reasons for your methods, even if they do not agree with them at first. Teachers must account for students who may feel defeated if they experience prolonged discomfort, and provide the appropriate scaffolding.

Because students may be unfamiliar with discourse characteristics of socioconstructivist practices, using these practices may provide a challenge to middle school teachers. However, the teacher discourse illustrated in Morrone et al. (2004), although used at the collegiate level, was

appropriate for use in the middle school classroom. For example, “Let’s have some conversation. Who would like to share what they did and how they went about thinking?” (p. 32). This question could seem daunting at first, but through scaffolding and press for understanding a teacher can create a supportive dialogue with her students and give them practice with this type of discourse.

As Walker (2008) and Patrick et al. (2003) demonstrated, teachers in authoritative and supportive classrooms set high expectations for student learning and behavior, hold students accountable, let students know when they are learning, encourage students to keep trying when they encounter struggle, and tell all students that they have the capacity to learn and achieve. Supportive teachers provide cognitive support through scaffolding and bring humor and fun into the classroom. Teachers who are supportive with their students from the very first day of school and remain consistent throughout the school year may be more likely to have a positive impact on student motivation and self-efficacy.

Social relationships in the classroom are important, and teachers can use these developing relationships between students as a means for learning. Being aware of the way students interact with one another and their individual social goals may help teachers to understand what motivates their students to engage in mathematics class. Students are already ultra self-focused at this time of early adolescence, so a de-emphasis on competition and social comparisons should be considered. An instructional focus on performance goals could lead to a breakdown in motivation if students’ personal self-efficacy is vulnerable.

In Wentzel (1997), the student responses to the *Who Cares* questionnaire were striking. These were real answers from students rather than a score on a Likert scale. Students perceived caring when their teacher recognized students’ unique qualities, were concerned with student lives outside of school, showed trust in students, kept promises, called on students in class, took time for students, and cared about students as people. These behaviors may seem intuitive, but it is important that teachers continuously reflect on their pedagogical practices to ensure that they are modeling truth and integrity and make a conscious effort to show students the personal

attention they need. Bandura (1986) believed that modeling was an important source of self-efficacy for students, and a 1995 study by Wentzel and Asher (cited in Wentzel, 1997) indicated that students who had few friends but who were well liked by their teacher were highly motivated to achieve in school.

Berndt et al. (1990) found that when friends shared and discussed decisions regarding academic achievement, they influenced one another's decisions. While teachers are unable to control what their students choose to do when faced with academic dilemmas, it may be helpful to note the close friendships of students in the classroom and support these friendships along with supporting each individual's academic achievement.

It is also important for a teacher to consider that putting students together in collaborative groups does not mean that collaboration will happen. Students may not have the skills to communicate with one another, share tasks, take on new roles, and work toward a common goal. If a teacher expects her students to have these skills, she must help her students develop them. Research has shown that the quality of interaction between students in groupwork was pivotal to learning. When students were friendly toward one another, helpful, collaborative, and showed concern for the needs of others, high student participation was associated with positive outcomes. When peer concern was low, even high participation had a negative effect on student learning (Battistich, Solomon, & Delucchi, as cited in Ross, 1995, p. 126).

Students who struggle in math may be hesitant to participate in groupwork because they have low self-efficacy in this domain. Bandura (1986) found that students' willingness to engage in a task, the effort they put forth, and their persistence in the face of adversity all depend on the student's past successes and failures. Vicarious experience is another factor influencing self-efficacy. If a student listens to a peer talk about their ability to be helpful and the benefits of receiving help, they may believe in their own ability to assist others. They may also feel more comfortable in asking for help.

An effective strategy for teachers could be providing students with metacognitive opportunities to reflect on their interactions with one another along with the tools to assess those interactions. This may encourage respectful dialogue, improve question-asking skills, and develop positive attitudes toward help-seeking and help-giving. Students may become aware of patterns in their behavior: perhaps they always take the role of leader, or perhaps they always feel like they are bossed around or their ideas are dismissed. If students can communicate these issues with each other they may develop strategies to work out their issues in a constructive way. Adolescents sometimes have difficulty stepping outside of their own selves and could benefit from a chance to see how their actions affect others. As a result, peer relations between students in and outside of the classroom could improve.

The personal relationships students have with one another may have an impact on student motivation in the classroom. Some students may do their best academic work in the presence of their close friends, while others do not. Understanding the social dynamic of the students in a classroom is an important part of teaching and an important part of learning how to motivate individual students. Finding students with shared goals may still be another way to motivate students in math.

Social goals reflect a person's social aims as well as the demands of the social context. Self-efficacy is also influenced by vicarious experiences provided by social models; when you see people like you succeed, you believe that you are able to master similar tasks. A key to the impact of vicarious experiences is the *perceived* similarity to a model. A student who has social status goals and perceives herself to be similar to those in her social group, or desired social group, may follow the goals of that group even if they are different from her own personal goals. Students may follow the crowd to fit in, and adopt uncharacteristic academic goals as a result.

Teaching an incremental theory of intelligence seems of particular use when considering students who are struggling academically and those who lack self-efficacy in mathematics. Teachers may have an impact on these students by helping them put forth effort, pointing out

progress made, and continuing work with an emphasis on improvement. Teachers may also have in their class students who already hold an incremental view and are high achieving. What challenges and motivates these students must also be considered.

It is possible that students will respond negatively to information that violates their own theory of self-intelligence. A math teacher who believes in encouraging students to adopt an incremental intelligence theory may have a negative impact on students who hold strong entity beliefs (Burns & Isbell, 2007). If those students are also highly skilled and high achieving, this could send a message to the student that threatens their intelligence or the teacher's credibility. Perhaps malleability interventions are more useful for those who have room to grow in their abilities.

Overall, the elements influencing self-efficacy and motivation do not act independently of one another. The classroom is a dynamic environment influenced by many factors: goal orientations of teacher and student, personal and social affect, support of student competence and autonomy, value of mathematics, and relationships between teacher and student and amongst peers. These elements are all at play, in different ways, at any given moment. When making pedagogical decisions teachers must consider these factors along with students' individual histories. Discovering what makes each student feel motivated and efficacious takes time, effort, and patience. However, it is a teacher's responsibility to take the time, put forth the effort, and develop the patience to reach each student. A successful teacher is one who helps her students find and believe in their abilities as a learner.

Suggestions for Further Research

There did not appear to be a shortage in the research literature on student motivation and self-efficacy. However, there are suggestions for further research to extend educational and psychological knowledge in these areas.

Further research in the areas of motivation and self-efficacy in middle school should include more diverse populations of students. The predominant research found was conducted with mostly white teachers and students in middle-income areas. It would be beneficial to conduct research with students and teachers of color, along with students and teachers from diverse socio-economic backgrounds across the United States. This would be especially useful for teachers who work in diverse settings and low-income or urban areas.

Because self-efficacy and motivation are *feelings*, and feelings change so often, it is difficult to quantify such data. It would be beneficial to conduct more longitudinal studies that track students' beliefs and behaviors over the course of their transition to middle school and even their transition to high school.

Similarly, more research conducted using mixed methods would be helpful. Not only do these types of studies offer quantifiable data from surveys and tests, they also offer personal accounts of teachers and students and often give more concrete examples of actions and practices that teachers can immediately utilize in their classrooms.

In light of our rapidly advancing digital age, it would be useful to conduct research on how the use of technology affects student motivation and self-efficacy in the mathematics classroom. Additionally, how might the use of technology affect low-income students who do not have ready access at home? Confidence and success with current technology could have a very positive impact on student self-efficacy and motivation.

Further research using flow theory and invitational theory in middle school would be beneficial to creating optimal learning experiences in the mathematics classroom. Greater knowledge in these areas could lead to more inclusive classroom environments where skill and challenge are balanced and students are learning in their proximal zone of development.

Finally, it would be helpful to conduct further research on metacognition for math students working in collaborative peer groups, and the benefits of student discussion and reflection on practices that help them work better with others.

Conclusion

Chapter One introduced the focal question of the research and provided rationale that emphasized the importance of maintaining self-efficacy in early adolescence, especially during the transition from elementary school to middle school. Different theoretical perspectives were introduced as lenses through which the research was viewed.

Chapter Two provided a brief review of the history of the visionaries of early schooling such as Rousseau, Pestalozzi, and Herbart, who believed in a nurturing education that centered on students' natural curiosities and interests. With the emergence of adolescent development as an area of study, it was determined that schools should prepare this demographic for the workforce. Dewey agreed that education should have a social objective, but also advocated for the social and cognitive development of the student. Since the 1940s psychology has greatly influenced educational practices. Maslow, Erikson, Vygotsky, and Bandura all contributed to the body of research and writings on motivation, adolescent development, socially constructed learning, and self-efficacy. Motivation in mathematics has been influenced by a history of fluctuation in mathematics education and reform.

Chapter Three included a broad review of research pertaining to influences on student self-efficacy and motivation in the middle school mathematics classroom. Using a social cognitive lens, each study was reviewed and critiqued to gain insight on factors that affect early adolescents' beliefs and behaviors. The research conducted on classroom environment and the transition from elementary to middle school demonstrated that teacher efficacy and classroom goal structure have an impact on self-efficacy and motivation during this time of change. The research investigating challenge, avoidance, affect, and self-efficacy indicated the complex interplay between self-efficacy, motivation, self-beliefs, and academic performance. Research conducted on self-efficacy and self-regulated learning in the transition to middle school indicated that during the transition, goal theory, self-efficacy, and self-regulated learning were influential

on student behavior and motivation. Research examining teacher discourse as a motivating factor in the math classroom showed that the context created by teacher discourse has far-reaching effects on student motivation, self-efficacy, goal orientation, self-regulation, autonomy, and affect. Research conducted on middle school classroom relationships, self-efficacy, and motivation demonstrated a correlation between classroom relations and students' attitudes, motivation and value of academics. Finally, research on teaching implicit theories of intelligence indicated that teaching an incremental theory may increase motivation and achievement for low-achieving middle schools students.

Chapter Four presented a summary of findings from Chapter Three, along with classroom implications for educators in regard to student self-efficacy and motivation in middle school mathematics. Finally, suggestions for future research were given for consideration.

Teachers have an immense influence on the way their students perceive their own abilities and how they approach learning. All teachers, not just those in middle school mathematics, should convey to students positive messages about their potential, provide encouraging words about their efforts and progress, and challenge students to set goals and take control of their learning, because their learning truly belongs to *them*. Adolescents need practice in doing things on their own, and deserve to feel competence and success. A teacher should trust her students with greater autonomy while always providing the necessary support. A teacher's power is best put to use when it is shared with her students, helping them to see they are capable, intelligent, and efficacious individuals truly valued for who they are.

From the Tao Te Ching of Lao Tzu:

The best leader is one whose existence
is barely known.
Next best is one who is loved and praised.
Next is one who is feared.
Worst of all is a leader who is despised.

If you fail to trust people,
they won't turn out to be trustworthy.

Therefore, guide others by quietly relying on Tao.
Then, when the work is done, the people can say,
"We did this ourselves."

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