JOURNAL OF CHANGDE TEACHERS UNIVERSITY-NATURAL SCIENCE EDITION
ISSN: 1009-3818
March 2016. PP. 41-51

Research Paper Received Dec. 15, 2015 Revised Feb. 15, 2016 Accepted Feb. 26, 2016

Goal Orientation, Motivation and Academic Achievement: A Review Study

Rao Lilin* and Zhang Kan

Beijing Normal University, Beijing, China

*Correspond author: Lilin R.

Abstract A mastery goal orientation focuses on the belief that effort and outcome can cover; one's sense of efficacy is based on the belief that effort will lead to success or a sense of mastery. With a mastery goal, individuals are oriented toward developing new skills, trying to understand their work, and improving their level of competence. In contrast, when a person adopts a performance goal, a perceived ability–outcome linkage guides his or her behavior so that the person's self-worth is determined by a perception of his or her ability to perform. As a consequence, the expenditure of effort can threaten self-concept of ability when trying hard does not lead to success. Classroom structures such as the design of tasks and learning activities, evaluation practices and use of rewards, and distribution of authority or responsibility also play a role in fostering mastery goal orientation in students. A person who is mastery goal oriented is focused on mastering and understanding content and demonstrating a willingness to engage in the process of learning. Portfolios can increase students' mastery goal orientation.

Keywords: Goal Orientation, Motivation, Academic Achievement

Introduction

Unfortunately, the students in my study did not approach mathematics with a desire to engage in and persist at academic tasks. In the beginning of the year, they avoided academic work by using a range of strategies. Cedric frequently seemed to purposefully withhold effort; Erika's public off-task comments would often be a disruptive influence in the classroom; Alan would sometimes avoid asking for help even though he recognized he needed assistance; and Jamaal would openly challenge my instructional decisions.

Certainly these behaviors and avoidance strategies are not unique to my context. The National Mathematics Advisory Panel (2008) recognizes that a challenge for most mathematics teachers is to instill in students the notion that effort and persistence are necessary components to mathematical problem solving. When faced with a non-routine mathematical task, it is common for students to quickly yield to a problem or not attempt it at all (Schoenfeld, 1987). Teachers who desire to implement what the *Standards* suggest is good to do in the classroom depend on students' cooperation and willingness to engage in challenging mathematical activity. I greatly underestimated the challenge of instilling in my students the idea that effort and persistence were an important part of problem solving. Results of my study suggest some factors which were influential in shaping my students' willingness to do mathematics. These findings can build on a wider research base regarding the question of how do students develop positive work habits in school.

Dweck (1986) notes that it "has long been known that factors other than ability influence whether children seek or avoid challenges, whether they persist or withdraw in the face of difficulty, and whether they use and develop skills effectively" (p. 1040). In educational research, "motivation theories are most often used to explain students' activity choice, engagement, persistence, help seeking, and performance in school" (Meece, Anderman, &

Anderman, 2006, p. 489). Contemporary theories view motivation as a social-cognitive construct (e.g., Ames, 1992; Bandura, 1986; Dweck & Leggett, 1988; Weiner, 1972). In a given context, motivations are mediated through how a student construes a situation, interprets events in the situation, and processes information about the situation (Dweck, 1986). Middleton and Spanias (1999) refer to motivations as simply "reasons individuals have for behaving in a given manner in a given situation" (p. 66); they guide student's decisions, and help determine whether or not students will engage in mathematical activity.

Over the past 25 years, achievement goal theory has emerged as one of the most prominent frameworks used by educational psychologists for understanding academic motivation. Ames (1992) explains that this theory describes "how different goals elicit qualitatively different motivational patterns and how these goals are reflected in the broader context of classroom learning environments" (p. 261). Goal theory assumes that students' motivational behavior can be influenced by the unique interaction between an individual's personal dispositions and beliefs and their classroom environment.

Although different terminologies are employed, goal theorists believe students adopt either a *mastery goal orientation* or a *performance goal orientation.* Students possessing a mastery goal orientation seek to increase their competence, and are focused on learning as something valuable and meaningful in itself (Dweck, 1986). Students with a focus on mastery goals are more willing to take risks, and consistently demonstrate high levels of task engagement, effort and persistence (Grant & Dweck, 2003; Wolters, 2004). Mastery learning goals are associated with positive perceptions of academic ability and self-efficacy (Midgley et al. 1998; Wolters, 2004), and have been related to lower avoidance behaviors (Ryan, Pintrich, & Midgley, 2001). Students with a performance goal orientation seek favorable judgments of their academic ability from teachers, parents, and peers, or aim to avoid negative judgments of their competence (Dweck, 1986). In recent years, researchers have begun to parse performance goals into approach and avoidance components (Covington, 2000). Middleton and Midgley (2001) linked performance avoidance goals with maladaptive student behavior. Students with these goals often avoid asking questions if they feel that doing so would demonstrate a lack of knowledge or ability, are more likely to engage in projective coping, and are often disruptive in class in order to deflect attention from their difficulty.

Middle school is a particularly sensitive time for analyzing students' goal orientations. In early elementary grades, students tend to be highly motivated to learn mathematics and believe that working hard will enable them to be successful (Kloosterman, 1993). By middle school, however, many students perceive that learning mathematics is attributable to innate ability and that putting forth effort has little or no influence on their ability to succeed (Kloosterman & Gorman, 1990). In a review of research on motivation in the middle grades, Anderman and Maehr (1994) cite convincing evidence indicating that students often exhibit a disturbing downturn in motivation; they find an overall pattern which "supports the view of decreased investment in academic activities and increased investment in nonacademic activities during the middle grades" (p. 288). Tuner et al. (2002) note that, by adolescence, low-attaining students often deflect attention from their low ability by withdrawing effort and resisting novel approaches to learning.

Applying a goal theory lens to view my classroom shows how students consistently held onto a performance goal orientation. A normative expectation in the class was that I would verify the correctness of student solutions. Even when it was clear what a final answer would be, it was still important for students to seek my favorable judgment for their work. Students with a mastery goal orientation are intrinsically rewarded by improving their level of

competence or acquiring some new understanding and would not always need a teacher's endorsement for their work. The manner in which my students expressed a low self-worth of their own ability to do mathematics is central to a performance orientation (Dweck, 1986). The group's unsolicited competition regarding who could be the first to solve a problem and the way they constantly valued a correct answer are clear indicators of performance goals. Meece et al. (1988) found that public recognition that one has done better than others is especially important to a performance orientation. The students frequently were inspired to do work, or claimed they would be more willing to do work, if they were offered an award. Students with a mastery goal orientation would not need to seek out an external prize in exchange for their effort.

How students form goal orientations

Before exploring how achievement goal theory suggests that goal orientations can shift, it is important to consider how goal orientations are formed. Although it is reasonable to assume that the particular goal a student adopts may be influenced by past academic failures and achievement history (Wentzel, 1991), research by Dweck and colleagues (Dweck, 1975; Dweck & Leggett, 1988; Dweck & Reppucci, 1973) has demonstrated that students who avoid challenges and show impairment in the face of difficulty are initially equal in ability to students willing to seek challenges and show persistence. A critical question is why do individuals of equal ability adopt such marked goal orientations.

Dweck and Leggett (1988) present a model in which goals are mediated by individuals' beliefs and values. Likely influenced by parents' goals and beliefs (Ames & Archer, 1987), Dweck and Leggett argue that a child's implicit beliefs about ability are a consistent predictor of that child's goal orientation. Children who believe intelligence is incremental tend to adopt a mastery goal orientation, whereas those who believe intelligence is a fixed entity are more likely to possess a performance goal orientation. Dweck and Leggett's framework integrates cognitive and affective components of goal-directed behavior. Their framework suggests a cycle where students' self-conceptions foster their adoption of achievement goals; students' goal orientations set up a pattern of responding to academic challenges; the outcome of students' academic behavior, in turn, shapes their beliefs and values.

The impact of students' beliefs about mathematics and school is well-documented (e.g., Cooney, 1985; Schoenfeld, 1987; Thompson, 1984, 1985). Middle school appears to be an important time to account for student beliefs. Middleton and Spanias (1999) point to findings suggesting "students' beliefs, definitions, and attributions concerning ability change substantially during late childhood and early adolescence" (p. 290).

Success, or lack thereof, in mathematics is a powerful influence on the motivation to achieve (Middleton & Spanias, 1999). Because of repeated lack of success and the attribution of failure to lack of ability, students can develop a sense of learned helplessness and view success as unattainable (Dweck, 1986). Helpless individuals are more likely to adopt a range of maladaptive academic and social behaviors.

By the eighth grade, students in my class had received consistence evidence of their perceived incompetence. Each of the students had been enrolled in summer school prior to their eighth grade year, they performed at the lowest level on the state's standardized mathematics tests, and their report card data commented that they were below grade level. My students exhibited a range of helpless behaviors. For example, many times during the first quarter students would not even attempt to work on a problem until I approached them. They appeared to lack the confidence in their own ability to even read the problem. They

displayed defensive strategies for coping with failure like avoiding school work, blaming me for not adequately preparing them, and acting disruptively in class.

Seven of the eight students were participants in the school's alternative education program, indicating that they had a history of significant behavior and academic concerns. For many students with classroom behavioral issues, there exists an underlying academic cause. Finn (1989) argues that when a student becomes more and more "embarrassed and frustrated by school failure, he or she may exhibit increasingly inappropriate behavior that becomes more disruptive with age" (p. 119). Insubordinate behavior becomes the focus of a teacher's attention, further reducing learning opportunities, and in extreme cases, "problem behavior is exacerbated until the student withdraws or is removed entirely from participating in the school environment" (Finn, 1989, p. 122). To disrupt the cycle, Finn argues that schools are faced with the difficult challenge of "increasing students' performance, not to mention self-esteem, perhaps against high resistance on the student's part and a host of external influences" (p. 122). Although challenging, it appears that disengaged and academically withdrawn middle school students can develop more positive work habits.

Malleability of goal orientations

Middle school should be a time of urgency when addressing issues of student motivation and achievement. Middleton and Spanias (1999) argue that "[i]n the middle grades, students' motivations toward mathematics tend to crystallize into their adult forms" (p. 78); beliefs and values in the middle grades predict the courses taken and mathematics achievement in high school and college (Meyer & Fennema, 1985). Pintrich et al. (2003) observes that, although achievement goals were once seen along a single continuum, current research findings suggest that students can endorse multiple goals simultaneously, and may even actively select which type of goal to adopt depending on the affordances of the circumstance.

Dweck (1986) describes a situation where an overconcern with ability may lead students to avoid difficult tasks. Concerned that even a mere exertion of effort might threaten a student's demonstration of ability, a student with a strong performance-approach goal orientation can slip into an avoidance orientation. Through the use of longitudinal survey data, Middlton, Kaplan, and Midgley (2004) found that students who expressed high self-efficacy and performance-approach goals early in middle school shifted toward performance-avoidance goals later in middle school. Their findings suggest that there are cases when performance-approach and performance-avoidance orientations may be the same achievement goal, and the adoption of approach and avoidance orientations is merely a matter of the situation.

Utilizing a social-cognitive perspective to view goals, it should be expected that, as contexts change, students reevaluate their goals and actions. In fact, a change in school environment often fosters a change in students' goal orientation (Anderman & Midgley, 1997). Although the majority of adolescents make the transition from elementary to middle school without excessive trauma, the changes in environments can be profound to many students. In their *stage-environment fit* theory, Eccles and Midgley (1989) provides a plausible explanation for the declines in behavior and academic motivation by pointing out how the learning environment of typical middle school classrooms do not fit the developmental needs of young adolescents. For example, the shift to middle school is associated with an increase in practices such as whole-class task organization, between-classroom ability grouping, and public evaluation of the correctness of work at a time when young adolescents have a heightened concern about their status in relation to their peers. Adolescents' desires for

increased autonomy and participation in classroom decision making arise when many middle grade classrooms are characterized by a greater emphasis on teacher control and discipline. Using the lens of goal theory, Anderman and Anderman (1999) attests Eccles and Midgley's results by finding that mastery goals decreased and performance goals increased as students make the transition from elementary to middle school. Thus, it is plausible that mismatches between the psychological needs of students and the middle school environment contributes to a decline in the adolescents' motivation and interest towards school (Eccles et al., 1993).

In theory, changes in context can influence students' goal orientations. There is limited research on students' motivation in reform-oriented mathematics settings (Middleton & Spanias, 1999). Most of the research in this area has seemed to focus on shifts from mastery to performance goals or changes in students' avoidance orientations. I was unable to find research documenting shifts in middle school students from performance to mastery goals. Overall, mastery and performance goals appear to be relatively stable during middle school (Middleton, Kaplan, & Midgley, 2004). Although my study did not include an a priori plan to examine students' goal orientations, a post-hoc analysis of the data reveals that the students clearly shifted from a performance-avoidance orientation to a performance-approach one. Over the course of the year, they demonstrated an increased willingness to engage and persist in solving cognitively demanding tasks. No evidence suggests my students had acquired a mastery goal orientation.

Teacher influences on goal orientations

My findings indicate that teacher dependent contextual factors can influence shifts in a student's goal orientation. The decisions and actions I made regarding task design, my style of instruction, and the quality of teacher-student interpersonal relationships appeared to be significant factors associated with the personal goals of students. Although research evidence suggests that students' achievement goals in mathematics are related to a combination of both student factors and features of the classroom context (e.g. Ames, 1992; Patrick, Turner, Meyer, & Midgley, 2003; Turner et al., 2002; Turner & Patrick, 2004), there "are few class-room based studies that have considered those specific teacher behaviors and classroom structures that are important in influencing students' perceptions of the classroom goal structure" (Pintrich, Conley, & Kepler, 2003, p. 328).

The need to provide students with a caring and supportive environment was a chief finding from my study. The students' motivation to meaningfully engage in a mathematics problem was linked with earning their trust and respect. Similar findings exist among goal theorists who have examined issues of affect in classrooms. Following 248 students from sixth to eighth grade, Wentzel (1997) explored whether adolescent students' motivation to participate changed in response to feelings of being supported and cared for by teachers. After controlling for previous motivation and beliefs, Wentzel's research provides strong evidence that students are more likely to engage in classroom activities if they feel supported and valued. Caring teachers in Wentzel's study were described as "demonstrating democratic interaction styles, developing expectations for student behavior in light of individual differences, modeling a 'caring' attitude toward their own work, and providing constructive feedback" (pp. 415-416). Similarly, Roeser, Midgley, and Urdan (1996) found that middle school students' goals toward mastery were positively correlated with their perception of caring, respectful teachers and positive student-teacher relationships. For Middleton and Spanias (1999), the most important conclusion drawn from the findings of several studies on motivation, is that a "supportive, authoritative teacher serving as a model and as a friend

gives children the confidence and feelings of self-worth necessary to be comfortable in mathematics" (p. 82).

Another key finding from my study was that the tasks and learning activities a teacher selects conveys messages to students about their ability, and affects students' willingness to apply effortful strategies. I found that ideal tasks should be at an appropriate level of difficulty based on knowledge of students' prior understanding and problem solving skills. Tasks should allow students control of choosing problem solving strategies by having multiple entry points. Tasks should be interesting, relevant and offer students a personal challenge. Similarly, Ames (1992) suggests that variety, diversity, challenge, and control are task dimensions shown to affect student perceptions of classroom goals and personal goal orientations. Meece (1991) reported on teachers who created highly mastery-oriented classrooms by adapting instruction to students' level of understanding, supported students' autonomy, and provided opportunities for collaboration.

In contrast, I found that tasks with a low cognitive demand were associated with less effort and more problematic student behaviors. This notion is supported by research suggesting that students more frequently display motivational patterns of avoiding challenging tasks if they are routinely presented with tasks that can be completed successfully with little effort (Jagacinski & Nicholls, 1984) or asked to solve problems which require the use of short term learning strategies, such as memorizing and rehearsing (Meece et al., 1988).

Tasks are embedded in the social organization of the classroom. Cognitive engagement patterns are shaped not only by the structure of the task, but how the task is implemented and how the class interacts with the task. In classrooms, "teachers employ an array of instructional practices that are, in high probability, a mixture of different messages and cues that can influence the endorsement of both mastery and performance goals" (Pintrich, Conley, & Kepler, 2003, p. 327).

When implementing tasks, a consistent observation from Sandy and Sue was the press I made to students to focus more on the process of solving a problem, and less on a final answer. Sue noted that I did not differentiate my responses to correct and incorrect answers, and that student mistakes were lauded as learning opportunities. She remarked how unusual it seemed not to praise students when they answered a question correctly. Sue frequently commented that the non-threatening environment of the classroom contributed to the students' willingness to engage in solving mathematics.

In an analysis of 65 sixth grade classrooms exploring the relationship between the classroom learning environment and students' use of avoidance strategies, Turner et al. (2002) found that teacher discourse patterns significantly impacted students' goals for achievement. Instructional discourse patterns that supported students both cognitively and motivationally were characteristic of low-avoidance classrooms. Lower incidences of avoidance strategies were evident in classrooms where teachers conveyed mastery messages to their students. Mastery messages were conveyed, in part, through explicit admonitions to students not to feel inadequate or ashamed when they did not understand something and by emphasizing that a necessary part of learning involved being unsure and learning from mistakes.

Research exists suggesting that attribution training can be effective in helping students develop positive motivational patterns; students who received attribution training displayed superior self-efficacy gains and fewer avoidance characteristics compared with students receiving no attribution training (Middlton & Spanias, 1999). According to Dweck (1986), "retraining children's attributions for failure (teaching them to attribute their failures to effort or strategy instead of ability) has been shown to produce sizable changes in persistence in the

face of failure, changes that persist over time and generalize across task" (p. 1046).
Ames (1992) reviewed evidence indicating that mastery orientations are promoted in classrooms that afford students' autonomy and decision-making in both the organization of the class and in developing strategies for task solutions. Ames suggests that students have a voice in the selection of tasks and materials, method of learning, and pace of learning.
Conversely, discourse patterns that emphasized cognitive aspects, such as final answers or sharing reasoning without adequate understanding, or did not explicitly address the motivation concerns of students were typical of high-avoidance classrooms (Turner et al., 2002). Additionally, telling students what to think or do limits their opportunity for autonomy. Turner et al. (2004) found that teacher use of nonsupportive instructional discourse patterns, such as telling, were typically characteristic of high avoidance settings. When teachers engaged students in supportive instructional discourse, or scaffolding, students demonstrated increased competence and ownership over their own learning.
According to Ames (1992), the "ways in which students are evaluated is one of the most salient classroom factors that can affect student motivation" (p. 264). Evaluation that emphasizes ability by stressing correct answers, grades, and social comparison likely promotes a performance orientation. Dweck (1999) points out that every time "teachers give feedback to students, they convey messages that affect students' opinion of themselves, their motivation, and their achievement" (p. 1).
A common fallacy among educators, contends Dweck (1999), is to think that giving students many opportunities to experience success and then praising them for their intelligence will increase a student's confidence and motivation to succeed. However, in a study with more than 400 fifth-grade students, Mueller and Dweck (1998) found that when children are praised for their intelligence, they become overly concerned about making mistakes and either choose simple tasks or avoid challenges altogether. Alternatively, children praised for their effort, their concentration, the effectiveness of their strategies, or their interesting ideas, demonstrated a desire to work on challenging tasks and held a higher sense of self-esteem. To that end, Middleton and Spainas (1999) recommends the practice of allowing children to struggle with challenging problems under the belief that when "children who have not experienced difficult problems in mathematics encounter a problem that cannot be solved in a routine fashion, they may have their confidence shattered unless they believe that occasional mistakes are a part of learning mathematics" (p. 70).
Another decision I made that appeared to positively affect my students' disposition was the routine use of graphing calculators and concrete reference. Sandy noted that over time students became more skilled at using manipulatives to monitor their own thinking strategies. Sue saw that students used a graphing calculator as a primary tool to help in solving problems. Research supplies ample evidence of the positive benefits graphing calculators has on both students' affect and their mathematical understandings (e.g. Dunham, 1996). In a meta-analysis of the effects of calculators on students' achievements and attitudes, Ellington (2003) found that students' operational skills and problem-solving skills improved when calculators were an integral part of testing and instruction, and that students using calculators had better attitudes toward mathematics than their non-calculator counterparts. No existing research was found relating goal orientations to calculator use.

Socio-cultural and school influences on goal orientations

Even if a teacher adopts a range of actions that research says is related with student mastery behavior, the larger context of school and society may moderate students' selection of

adaptive goal orientations. Students' goal orientations are mediated through the climate of the school and their relationships with parents and peers. Ethnographic research findings demonstrate that cultural and social-class differences can significantly affect student behavior and their educational outcomes (Murrell, 1994).

The existing structure of many middle schools can create a climate that undermines both teacher and student motivation (Eccles et al., 1993). The shift to middle school typically involves an increased emphasis on testing and the assignment of grades. In the current educational climate of *No Child Left Behind*, middle schools are mandated to assess the yearly mathematical progress of every student. To prepare for these high stakes tests, many middle schools, like the one I worked in, opt to give local assessments intermittingly throughout the year. These assessments are used to make a judgment on student progress and teacher effectiveness. The focus on test scores is likely to increase social comparison, concerns about evaluation, and competitiveness, which, for young adolescents, are negatively related to intrinsic motivation and adaptive forms of behavior. The public scrutiny on test scores and evaluation, which make aptitude differences more salient to both teachers and students, places emphasis on performance rather than mastery (Eccles et al., 1993). Meece, Anderman, and Anderman (2006) note a "careful examination of the effects of NCLB on student achievement, motivation, and emotional well-being is needed" (p. 498).

In my study, I found that the social goals for my students seemed to interfere with their concerns for academic work. Summers, Schallert, and Ritter (2003) found that middle school mathematics students who expressed a low level of mastery goals were more influenced by comparisons to close friends than to other students in the class. The students in my class were from the same social clique. The tight cohesiveness and friendships in the group likely contributed to their miseducative behaviors. In particular, Erika and Keisha seemed to support and accentuate one another's behavior. Chris presented a unique case study of a student whose actions and behavior starkly changed when I moved him into an Algebra group.

In a case study examining patterns of defiant student behavior in two different schools, McFarland (2001) found that the density of one's friendship network and access to public discourse are associated with high levels of resistant efforts and disruptive behavior on the part of students. McFarland explains:

Students with dense friendship networks, rebellious friends, and prominence in the classroom friendship network are more likely to disrupt class tasks and enter disputes with the teacher. Dense networks buffer young people in conflicts and provide them with social support. Rebellious friends act as a reference group, to whose behavior the student is pressured to conform. Social prominence in classroom friendship networks affords the student support beyond his or her own clique and attributes status value to their actions. [p. 663]

For McFarland, when looking at disruptive acts of behavior, the unit of analysis is a student within a particular classroom. Changing either the classroom or student would change the decision to resist academic work. In addition to the characteristics of social networks, McFarland argues that the type of instruction a teacher delivers can contribute to student decisions to rebel. When students with dense friendship networks become disenchanted with the subject or alienated from the teacher, student-centered tasks affords students the opportunity to express and spread their discontent. Although not recommending teacher-centered tasks as a preferred form of instruction, McFarland suggests that "[t]eachers can use teacher-centered tasks to minimize student opportunities at voicing resistance. . . . it prevents dense cliques from expressing their discontent in collective fashion" (p. 666).

Students' beliefs about their academic situations can factor into how they behave in class. Like Jamaal and Cedric, students who associate their classrooms with academic stigmatization are likely to react against and avoid academic activities (Oakes, 1985; Schwartz, 1981). While not denying the powerful impacts of teachers, Schwartz (1981) ultimately concludes that "classroom behavior of student and teachers alike is organized by a powerful system of institutional expectations in which rank predominates" (p. 118). In an ethnographic study of four inner-city schools, Schwartz found that low-track social ties hindered and subverted participation in class work, and low-track students related to peers in an overt and disruptive manner. Other characteristics of low-track classrooms identified by Schwartz were that low-track students often tease one another, accuse each other of cheating and being stupid, move around the classroom, and use academic resources inappropriately.

In addition to the influence of schools, peer networks, and parents, cultural and social class differences can play a significant part in determining the actions and motivations of traditionally underserved students. In my study, I am aware that cultural and racial differences existed between me and the students. With a different, more critical lens, I recognize that a different interpretation can be posited regarding my students' disposition toward mathematics.

Mainstream, middle-class teachers are increasingly being called upon to teach mathematics in urban school contexts to schoolchildren of color who do not share their same assumptions about learning and teaching (e.g., Delpit, 1988; Heath, 1983). Ogbu (1991) theorizes that, as involuntary minorities, African American students tend to view education as a system controlled by the group that subjugated and oppressed them and their ancestors. Many African American students have developed a belief system that discounts formal education as a tool for social mobility. Suffering from "low effort syndrome" (p. 437), Ogbu argues that many African American students do not see any point in working hard or maintaining their efforts long enough to achieve academically.

In a critical ethnography of middle school mathematics classrooms, Murrell (1994) sought to account for reasons why *Standards*-based teaching practices, meant to promote deeper understanding of mathematics, actually diminish African American students opportunities to learn. Focusing on one of NCTM's (2000) five process standards, communication, Murrell looked at patterns of classroom discourse. The NCTM standards are based on the expectation that key mathematics will be developed through eliciting thoughtful student explanations and justifications of their solutions to problems. In analyzing the discourse patterns and speech events in mathematics classrooms, Murrell showed that the African American male students in the study framed the instructional intent of discourse differently than their teachers. While the teachers' goal for discourse was to use the rationales of student solutions to build conceptual understanding of mathematics, the African American male students tended to engage in superficial aspects of math talk. These students placed a high emphasis on their verbal adroitness as a criterion for doing well in mathematics class. Applying suggestions from Delpit (1988), Murrell argues that "making explicit the rules, codes, and expected performances of classroom discourse is essential to helping non-mainstream students develop reasoning competence in discourse" (p. 567).

Conclusion

Teachers do not choose whom they teach. On any given day, a teacher is certain to come across students who are resistant to participate in any kind of mathematical activity. Even worse, the behavior of these students can divert the teacher's and class attention away from

their important work. Motivating students so that they are willing to engage and persist in solving challenging mathematical tasks can be a daunting challenge, especially for teachers of students who have consistently had negative experiences and persistent failures in mathematics classes. There are a myriad of complex, intertwining reasons why students fail to put forth effort. Ames (1992) hypothesizes that structures of task selection, evaluation, and authority are mutually dependent on each other and interact in a multiplicative manner. Mathematics education research, from an achievement goal theory lens, may provide important insights regarding how specific teaching behaviors and structure can influence students' motivation to engage in mathematics.

References

Anderson, J. R. and Lebiere, C. (Eds.) (1998) *Atomic Components of Thought*. Mahwah, N. J.: Lawrence Erlbaum Associates.

Bong, M. and Clark, R. E. (1999) Comparison between self-concept and self-efficacy in academic motivation research. *Educational Psychologist, 34*(3), 139-153.

Clark, R.E. (1999). Yin and yang cognitive motivational processes operating in multimedia learning. In J. van Merriënboer (Ed.), *Cognition and multimedia design* (pp. 73-107). Heerlen, Netherlands: Open University Press.

Clark, R.E., Howard, K., Early, S. (2006). Motivational challenges experience in highly complex learning environments. In J. Elen & Clark, R.E. (Eds.), *Handling Complexity in Learning Environments: Theory and Research*.

Cowan, N. (2001). The magical number 4 in short-term memory: A reconsideration of mental storage capacity. *Behavioral and Brain Sciences, 24*, 87-114.

Custers, R., Aarts, H. (2005). Positive affect as implicit motivator: On the nonconscious operation of behavioral goals. *Journal of Personality and Social Psychology, 89*(2), 129-142.

deCroock, M.B.M., Paas, F., Schlanbusch, H., & van Merriënboer, J.J.G. (2002). ADAPT-it: Tools for training design and evaluation. *Educational Technology, Research and Development, 50*(4), 47-58.

Flad, J. A. (2002). The impact of increasing cognitive load and dual task measures of mental effort during problem solving. Unpublished doctoral dissertation, University of Southern California, Los Angeles.

Ford, M.E. (1992). *Motivating humans: Goals, emotions and personal agency beliefs*. Thousand Oaks, CA: Sage.

Gimino, A.E. (2002). Factors that influence students' investment of mental effort in academic tasks: A validation and exploratory study. Unpublished doctoral dissertation, University of Southern California, Los Angeles.

Hassin, R.R. (2005). Nonconscious control and implicit working memory. In: R.R. Hassin, J.S. Uleman, & J.A. Bargh, (Eds.), *The New Unconscious* (pp. 196-222). New York: Oxford University Press.

Iani, C., Gopher, D., Lavie, P. (2004). Effects of task difficulty and invested mental effort on peripheral vasoconstriction. *Psychophysiology, 41*, 789-798.

Iqbal, S.T., Zheng, X.S., & Bailey, B.P. (2004). Task-evoked pupillary response to mental workload in computer-human interaction. Paper presented at Conference on Human Factors in Computing Systems, Vienna, Austria.

Kawada, C.L.K., Oettingen, G., Gollwitzer, P.M., & Bargh, J. (2004). The projection of implicit and explicit goals. *Journal of Personality and Social Psychology, 86*(4), 545-559.

Keller, J.M. (1987). Strategies for stimulating motivation to learn. *Performance and Instruction, October*, 1-7.

Keller, J.M., & Suzuki, K. (2004). Learner motivation and e-learning design: a multinationally validated process. *Journal of Educational Media, 29*(3), 229-239.

Lefcourt, H.M. (1982). *Locus of control* (2nd ed.). Hillsdale, NJ: Lawrence Erlbaum.

Paas, F., Tuovinen, J. E., Tabbers, H., & van Gerven, P. (2003). Cognitive load measurement as a means to advance cognitive load theory. *Educational Psychologist, 38*, 63-71.

Paas, F., Tuovinen, J.E., van Merriënboer, J.J.G., & Darabi, A.A. (2005). A motivational perspective on the relation between mental effort and performance: Optimizing learner involvement in instruction. *Educational Technology, Research and Development, 53*(3), 25-34.

Paas, F.G.W.C., & van Merriënboer, J. J. G. (1993). The efficiency of instructional conditions: An approach to combine mental effort and performance measures. *Human Factors, 35*, 737-743.

Paas, F.G.W.C., & van Merriënboer, J. J. G. (1994). Measurement of cognitive load in instructional research. *Perceptual and Motor Skills, 79*, 419-430.

Pintrich, P.R., & Schunk, D.H. (2002). *Motivation in education: Theory, research, and applications* (2nd ed.). Englewood Cliffs, NJ: Prentice-Hall.

Salomon, G. (1984). Television is "easy" and print is "tough": The differential investment of mental effort in learning as a function of perceptions and attributions. *Journal of Educational Psychology, 76(4)*, 647-658.

Snow, R., Corno, L., & Jackson, D. (1996). Individual differences in affective and cognitive functions. In D. Berliner and R. Calfee (Eds.), *Handbook of Educational Psychology* (pp. 243-310). New York, NY: Simon & Schuster Macmillan.

Song, S.H., & Keller, J.M. (2001). Effectiveness of motivationally adaptive computer-assisted instruction on the dynamic aspects of motivation. *Educational Technology, Research and Development, 49*(2), 5-22.

van Merriënboer, J. (1997) Training Complex Cognitive Skills. Englewood Cliffs, NJ: Educational Technology Publications

van Merriënboer, J.J.G., & Sweller, J. (2005). Cognitive load theory and complex learning: Recent developments and future directions. *Educational Psychology Review, 17*(2), 147-177.

van Merriënboer, J.J.G., Clark, R.E., & de Croock, M.B.M. (2002). Blueprints for complex learning: The 4C/ID model. *Educational Technology, Research and Development, 50*(2), 39-64.

Wegner, D.M. (1997). When the antidote is the poison: Ironic mental control processes. *Psychological Science, 8*(3), 148-150.

Zimmerman, B.J. (2000). Self-efficacy: An essential motive to learn. *Contemporary Educational Psychology, 25*, 82-91.

Zimmerman, B.J., Bandura, A., & Martinez-Pons, M. (1992). Self-motivation for academic attainment: The role of self-efficacy beliefs and personal goal setting. *American Educational Research Journal, 29*(3), 663-676.