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Gender and Subject Area Differences in Academic Metacognition and Motivation

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Abstract

This study was a continuation of the ongoing Trinity metacognition project investigating the metacognitive awareness and skills of middle school students. The present study examined whether there were gender differences in the ways metacognition is used in two different subject areas: social studies and math. It also investigated whether gender has an effect on how students use metacognition in these two school subjects. Students in the sixth, seventh, and eighth grade were surveyed about their metacognitive and motivational awareness in math and social studies. Results showed that female students used metacognition more than male students in both math and social studies, and that male and female students both adopt a domain-general approach to metacognition, meaning that they use the same skills to help them learn in both school subjects. It was also found that male and female students are both motivated to learn in math and social studies, but female students showed higher engagement than male students in social studies. Female students also believed that they could enhance their abilities in social studies through time and effort more often than males. In math, males and females both believed that they could enhance their abilities through time and effort. These results suggest that female students are more likely than male students to use metacognitive skills to help them learn across school subjects, and that male and female students are usually motivated to the same degree, except female students are higher in engagement and ability beliefs than male students only in social studies.

Introduction

Self-Regulated Learning

Cognition, metacognition, and motivation are the three components of the process which guides one's cognitive engagement, known as self-regulated learning. Self-regulated learning allows individuals to monitor and adapt their learning strategies through setting goals, selective strategy use, and evaluating the effects of one's engagement (Butler & Winne, 1995). In an academic setting, self-regulated learning allows students to utilize cognitive tools to improve their academic performance and further their understanding of the course material. Self-regulated students initiate and direct their own efforts to acquire knowledge and skills rather than relying on teachers or parents to guide them (Zimmerman, 1989). In order for achievement through self-regulated learning to occur, the metacognitive strategies that allow students to plan, monitor, and modify their cognition must be accompanied by motivation to succeed (Pintrich & de Groot, 1990). All three components are important for self-regulation, as those who are motivated but do not possess cognitive and metacognitive skills, or those who possess the necessary cognitive and metacognitive skills but are unmotivated, often fail to achieve high levels of self-regulation (Schraw, Crippen, & Hartley, 2006).

Pintrich and de Groot (1990) studied the effect of self-regulated learning on the academic performance of middle school students. The study evaluated one hundred seventy-three seventh grade students in science and English classes, using measures targeting student motivation, cognitive strategy use, metacognitive strategy use, and management of effort. Measures of motivation were broken down into three factors: self-efficacy, intrinsic value, and test anxiety. The results showed that students who received high grades were more likely to report using self-regulatory strategies than low-achieving students. They also found that students high in self-

efficacy and intrinsic values were more likely to use cognitive strategies. These results suggest that high levels of motivation and high levels of self-regulation are predictors of academic success. As a result, it is suggested that self-regulated learning allows students to determine which metacognitive strategies work best for a specific problem and, when combined with the motivation to put in the effort to solve a problem, leads to greater academic success.

Cognition. Self-regulated students utilize cognitive strategies to learn, remember, and understand class material. Zimmerman (1989) proposes that self-regulated learning is influenced by personal, environmental, and behavioral processes. This aligns with social cognitive theory, that self-regulated learning is not determined by only by personal processes, but the reciprocal influence of the personal, environmental, and behavioral events. Zimmerman uses an example of how a student solves a math problem to demonstrate this interaction. A student's response to a problem is assumed to be determined not only by personal perceptions of efficacy but also by environmental stimuli, such as encouragement from a teacher or encouragement from obtaining correct answers to previous problems. This triadic formation also maintains that personal and environmental events can result from self-regulative responses (behaviors). Though this triadic relationship is reciprocal, it is not assumed that all three factors are equal in strength, nor is it assumed that all they all affect self-regulated learning at the same time. Environmental influences may be stronger than behavioral or personal ones in some contexts or at certain points during behavioral interaction sequences.

Social cognitive theory also suggests that motivational factors are key variables affecting self-regulated learning. Boekaerts & Corno (2005) support this theory as well as the reciprocal triadic model of self-regulated learning in Zimmerman (1989), suggesting that self-regulated learning is both a top-down and bottom-up cognitive process. Top-down self-regulation occurs

when strives for academic success are energized by motivational factors such as personal interest, values, expected satisfaction, and rewards. It is a top-down process because students' adopted learning goals steer the process. Bottom-up self-regulation occurs when strives for academic success are triggered by cues from the environment rather than students' pre-established goals. This can include feedback from the task and classroom reward structures which help to establish work ethic and cause changes in work styles.

Gender Differences in Cognition. Little research has been conducted to investigate gender differences in cognition in the context of self-regulated learning. Seegers and Boekarts (1996) investigated gender differences in self-referenced cognitions in mathematics. They describe self-referenced cognitions as subjective cognitive variables that refer to the perception individuals have of themselves, including their attitudes, feelings, and knowledge about their abilities and skills. Seegers and Boekarts studied the role of self-referenced cognitions in specific content areas and in actual task situations, as students' self-referenced cognitions are known to be situation and context dependent. They studied middle school students from the Netherlands and tested their performance on mathematics tasks in addition to academic self-concept of mathematics ability. Their results showed that boys scored significantly higher than girls on mathematics tasks and math-related self-concept. However, girls reported that they were more prepared to invest effort into the mathematics task than boys. These results support previous findings from Zimmerman and Martinez-Pons (1990) that girls were more actively engaged in the task and that they reported greater use of self-regulated learning strategies, though they judged themselves less self-efficacious than boys did. As a result, it is suggested that a lack of self-referenced cognitions of competence present during the start of a mathematics assignment may contribute to gender differences in performance on mathematics tasks, but does not affect

learning intention. Overall, these results suggest that though girls are more motivated than boys to do well on mathematics tasks, they perceive their abilities to perform well on mathematics task as being lower than boys.

Metacognition. Metacognition, one of the dimensions of self-regulated learning, is defined as one's ability to use skills to understand and monitor one's cognitive processes (Schraw et al., 2006). Metacognition enables learners to evaluate and adapt their learning strategies based on awareness over how they learn most effectively. In order to effectively use metacognition, individuals must be aware of their own cognition in order to regulate and adapt in a way that is effective for learning.

One approach to metacognition is the model developed by Ambrose, DiPietro, Bridges, Norman, and Lovett (2010). In this model, metacognition is thought to contain five steps: assessing the task, evaluating strengths and weaknesses, planning, applying strategies and monitoring progress, and reflecting and adjusting strategies when needed (Abrose et al. 2010). The first step, assessing the task, means that students will review what is asked of them to make sure they fully understand the task before they start working. Next, students evaluate their strengths and weaknesses in relation to the given task. This allows them to determine which aspects of the task may present challenges for them, and can modify their planning, the next step in the cycle, so that they exert more effort in their areas of weakness. Planning enables students to manage their time productively for the given task. Once they have planned out their approach, they apply the strategies that they have identified in the earlier steps and monitor their progress as they go. The last step, once the task is complete, is to reflect on the final product and, if necessary, adjust the strategies used for future tasks. All steps in this model are linked to motivation, as the learner must be motivated to engage in the steps necessary to change his or her

cognition. As discussed, cognition, metacognition, and motivation are all necessary for self-regulated learning.

Metacognitive Transfer. Students' use of metacognitive skills may transfer across school subjects. There are two theories of metacognition concerning the use of learning strategies across various school subjects: domain-general and domain-specific metacognition. When students adopt a domain-general theory of metacognition, they use the same metacognitive skills across school subjects. Students may also adapt and change their approaches to metacognition to fit their specific needs in different subject areas. This is known as domain-specific metacognition. Neuenhaus, Artelt, Lingel, and Schneider (2011) investigated the domain-generality/specificity of metacognition in fifth grade students by evaluating achievement, cognitive ability, and metacognitive knowledge in two school subjects, mathematics and reading. Neuenhaus et al. (2011) based their research on the previously established idea that the development of metacognition starts out domain-specific and becomes more domain-general with practice and experience. They hypothesized that students in this age group adopt a more domain-general theory of metacognition. Their results supported this hypothesis, and align with previous findings that the development of metacognitive knowledge begins highly domain- and situation-specific and becomes more general over time with practice and experience (Borkowski, Chan, & Muthukrishna, 2000). Overall, the results of this study support the theory that metacognition can be domain-general or domain-specific, and that younger students are more likely to adopt a domain-specific theory of metacognition than older students.

Gender Differences in Metacognition. Past research on gender differences in metacognition and self-regulation has been generally inconsistent. Niemivirta (1997) reported that boys use more superficial learning strategies than girls, while Bidjerano (2005) and

Zimmerman and Martinez-Pons (1990) reported that girls use self-monitoring, goal setting, and planning more often than boys. Niemivirta (1997) studied gender differences in metacognition in seventh graders by assessing students' use of learning strategies such as self-monitoring, planning, memorizing, elaborating, and rote-learning. Though not all of these strategies correspond to steps of the MC5 model, they are all strategies that are used by students to actively change their learning abilities. Their results showed boys being higher than girls in their use of rote-learning strategies and detail memorizing and no gender differences in any of the other superficial learning strategies. These results go against other findings that girls adopt a more superficial approach to learning, as observed in Bidjerano (2005). Bidjerano (2005) investigated gender differences in self-regulated learning by surveying college students' metacognition in addition to several other self-regulated learning strategies such as rehearsal, organization, time management, elaboration, and effort. Girls reported higher scores than boys in all of these measures of self-regulated learning, including metacognition. These results suggest that girls are more likely than boys to use self-regulating learning strategies such as metacognition to enhance their abilities to learn.

To address these inconsistencies, Liliana and Lavinia (2011) investigated gender differences in metacognitive skills by assessing metacognitive awareness in eighth grade students. Their results showed significant differences between how boys and girls use metacognitive skills, but only for specific skills, including perception of one's performance as a result of one's will and effort, perceptions of teachers' expectations, use of prior knowledge in problem-solving, planning, knowledge about one's own intellectual strengths and weaknesses, the use of various learning strategies and monitoring the learning process. However, the results do not report whether there is a gender difference pattern, nor do they report which gender

scored higher in each dimension of metacognition. Overall, these results reaffirm the findings of Niemivirta (1997), Zimmerman and Martinez-Pons (1990), and Bidjerano (2005), suggesting that both boys and girls use metacognition to help them learn, but differ in terms of which metacognitive skills they use.

Previous research from Zimmerman and Martinez-Pons (1990) and Wolters and Pintrich (1998) supporting gender differences in some areas of metacognition were the basis for the research of Mok, Fan, and Pang (2007). Zimmerman and Martinez-Pons (1990) showed that girls report higher levels of self-regulated learning than boys in grades 5, 8, and 11. Wolters and Pintrich (1998) showed that 7th and 8th grade girls exhibit higher levels of cognitive strategy use than boys, while the level of regulatory strategy use does not differ by gender. To assess the relationship between gender, age, and metacognition, Mok et al. (2007) studied students ranging in age from 9 to 17, and showed that there were significant gender effects on metacognition. Girls reported higher self-ratings than boys in their knowledge of metacognitive strategies, use of learning strategies, regulation of learning, and evaluation of learning. Boys and girls did not differ in self-efficacy or intrinsic value of learning. This study supports previous findings that boys and girls both use metacognitive strategies to help them learn, but girls use metacognitive strategies more often than boys.

Motivation. Motivation is a crucial aspect of self-regulated learning, as without a desire to adapt and improve cognition through metacognitive growth, self-regulation is not likely to successfully occur. Motivation includes beliefs and attitudes that affect the use and development of cognitive and metacognitive skills (Schraw et al., 2006). Motivation is made up of several components, including self-efficacy, test anxiety, achievement values, and engagement vs.

disaffection. These components are strong predictors of students' desires to improve their metacognitive abilities.

Self-Efficacy. Self-efficacy refers to the degree to which an individual is confident in his or her ability to perform a specific task or accomplish a specific goal (Schraw et al., 2006). When a student faces a challenge, self-efficacy affects the extent to which the student will persist or quit. A student high in self-efficacy is more likely to persist when presented with a challenging task than a student low in self-efficacy. Self-efficacy is tied to the triadic theory of social cognition, as students' selection and use of strategies depends directly on their perceptions of academic efficacy through a cybernetic loop: by monitoring progress students can observe a deficiency in performance, this may lead to a decrease in self-efficacy and then their subsequent motivation and choice of strategies may be affected (Zimmerman & Martinez-Pons, 1990).

Test Anxiety. Test anxiety refers to the level of anxiety a student experience when taking a test. Test anxiety is an important component of motivation, as it has been shown to be related to perceptions of competence (Pintrich & De Groot, 1990). Research has also shown that test anxiety is linked to students' metacognition, cognitive strategy use, and effort management (Benjamin, McKeachie, Lin, & Holinger, 1981; Culler & Holahan, 1980; Tobias, 1985). Research in test anxiety has been inconsistent, in some cases showing that high-anxious students are not academically persistent or avoid difficult tasks (Hill & Wigfeld, 1984), while in other cases showing that high-anxious students are just as effortful and persistent as low-anxious students, but appear to be ineffective and inefficient learners who often do not use appropriate cognitive strategies for achievement (Benjamin et al., 1981).

Achievement Values. Achievement values refer to students' perceptions of the usefulness of the material they are learning, as well as their personal interest in the material. Past research

has shown that perceived usefulness and students' interest in the material enhances comprehension and is a strong predictor of increased metacognition (Wolters & Pintrich, 1998). Achievement-related behaviors such as striving for success, choice among achievement tasks, and persistence have been theorized to be linked to achievement motives, expectancies for success, and incentive values (Atkinson, 1957). In this theory, achievement tasks are defined as relatively stable dispositions that are characterized by a motive to gain success and a motive to avoid failure. Expectancies for success refer to an individual's expected probability for success on a specific task, and incentive value refers to the relative attractiveness of succeeding on such a task, inversely related to probability for success.

Engagement vs. Disaffection. Engagement vs. disaffection refers to whether a student is active or apathetic in his or her involvement in the course material. Eccles and Wigfield (2002) present the theory that engagement and disaffection are affected by three basic psychological needs: competence, autonomy, and relatedness. When these perceived needs are fulfilled, children are more likely to be engaged, whereas when one or more need is not fulfilled students will become disaffected and unmotivated (Connell & Wellborn, 1991). The extent to which these needs are fulfilled can depend on the characteristics of students' family, peer, and school contexts, in the amount of structure, degree of autonomy provided, and the level of involvement in the children's activities. Engagement and disaffection are also tied to perceived control, as individuals who believe that they have the agency and control to produce desired events they are more likely to be engaged in activities related to those desired events (Eccles & Wigfield, 2002).

Gender Differences in Motivational Variables. Research exploring gender differences in motivational variables is limited, but has been shown to differ by gender for certain aspects of motivation. Gender differences have most often been identified in self-efficacy and achievement

values. Mok et al. (2007) addresses self-efficacy and achievement values in relation to previous findings from Eccles et al. (1983) showing that though girls tend to show higher levels of self-regulated learning than boys during pre-adolescence, they decline in self-efficacy and achievement values more greatly than boys when they enter junior high school. Mok et al. (2007) investigated this decline in motivation, showing that the decline in self-efficacy and achievement values from late primary school years to junior secondary school years was greater for girls than for boys. Zimmerman and Martinez-Pons (1990) also reported that boys scored significantly higher than girls in verbal self-efficacy but reported no significant differences between boys and girls in mathematical self-efficacy.

Ability Beliefs

Ability beliefs are measured by students' perceptions of their own intelligence as fitting into one of two theories of intelligence: incremental and entity. Students may either view their intelligence as an unchangeable, fixed "entity" (entity theory) or a malleable quality that can be developed through time and effort (incremental theory) (Blackwell, Trzesniewski, & Dweck, 2007). Whether a student maintains an entity or an incremental view of intelligence can impact his or her responses to academic challenges. A student who maintains an incremental view is less likely to give up when presented with an academic challenge compared to an entity view student, allowing the student to further his or her academic achievement (Blackwell et al., 2007).

Incremental and entity theories of intelligence are tied to metacognition. In Schraw and Moshman (1995), these theories of intelligence are considered to fall under a "tacit" theory of metacognition, viewing metacognition as being acquired or constructed without explicit awareness that one is following a specific theory or model of metacognition. This theory contrasts with informal and formal theories of metacognition, the former of which is the

rudimentary awareness of one's metacognitive knowledge, and the latter of which is a highly-systemized awareness of one's metacognitive knowledge. Schraw and Moshman maintain that Dweck's implicit theories of intelligence fit into a tacit theory of metacognition, as children who adopt an incremental theory in this framework have established that theory based on observations about the nature of their intelligence and can make predictions based on those observations. These students are tacit in the sense that they do not explicitly report maintaining a "theory of intelligence," even though their beliefs align with such a theory.

Gender Differences in Ability Beliefs. Research by Carol Dweck (1986) led to the development of the two theories of intelligence. Dweck maintains that "bright" girls, or girls who show high levels of intelligence and academic achievement, are more likely than bright boys and less bright girls to display shakier expectancies, lower preference for novel or challenging tasks, more frequent failure attributions to lack of ability, and more frequent debilitation in the face of failure or confusion. As a result, bright girls tend to prefer tasks they are fairly certain they will do well on while bright boys are more attracted to tasks that pose a challenge. From this observation came the development of incremental and entity theories of intelligence. Girls, who prefer to complete tasks that they know they are likely to excel at, are likely to do so because view their intelligence as a fixed entity that cannot be changed. Boys, however, are more likely to view their intelligence as incremental, or adaptable, as they prefer to engage in tasks that challenge them.

Todor (2014) evaluated how gender affects ability beliefs. The aim of the study was to investigate gender differences in implicit theories of intelligence (incremental and entity) and mathematics self-efficacy beliefs. High school students were surveyed about their beliefs surrounding their intelligence in mathematics. Results showed that girls were more likely to

adopt an entity theory of intelligence in mathematics and boys were more likely to adopt an incremental theory of intelligence in mathematics. Compared to boys, girls were less likely to feel efficacious and competent in mathematics, and as a result were more likely to perceive their abilities in math as unchangeable. The overall implication of these results is that girls are more likely than boys to view themselves as being inherently unskilled in mathematics, and believe that no matter the effort they put in they are ultimately unable to change their skill level.

Effect of Sex-Stereotypes on Ability Beliefs. Chatard, Guimond, and Selimbegovic (2007) investigated the effects of gender stereotyping on how high school students view their abilities in mathematics and arts. The goal of this study was to assess self-stereotyping in a stereotypically masculine domain (math) and a stereotypically feminine domain (arts). The hypothesis that students who believed strongly in gender stereotyping would self-evaluate their grades in the two domains in a stereotype consistent way was supported, as boys viewed themselves as being more able in mathematics than girls, and girls viewed themselves as being more able in the arts than boys.

The effect of gender stereotyping on academic achievement in mathematics was also studied by Igbo, Onu, and Obiyo (2015). The researchers found that even though gender did not have an effect on the actual academic achievement of the students, gender stereotypes had a significant effect on the way students evaluated their academic achievement in mathematics. Gender stereotypes surrounding the heightened abilities of male students in mathematics had a positive effect on their ratings of academic achievement. Though female students had higher achievement scores than male students, male students evaluated their academic achievement in mathematics higher than female students.

Current Study

There are significant gaps in research relating to gender differences in various aspects of self-regulated learning. Research has shown that boys and girls differ in their metacognitive awareness, but little research has assessed whether these differences are consistent across domains. While there has also been research supporting gender differences in motivation, these studies typically only account for one or two dimensions of motivation (self-efficacy and achievement values). There are also few studies comparing gender differences in ability beliefs across domains. While Dweck (1986) and Blackwell et al. (2007) do address gender in relation to implicit theories of intelligences, the current study aimed to tie metacognitive and motivational factors to these theories of intelligence, especially in terms of gender differences across school subjects, by assessing gender effects in relation to steps of metacognition, metacognitive transfer, motivational variables, and theories of intelligence.

The current study evaluated the metacognitive and motivational traits present in a group of middle school students. Specifically, this study focuses on determining whether there are differences in how boys and girls use metacognition and motivation, and if those differences are consistent across domains. Variables such as school subject, perceptions of intelligence, and gender stereotypes were evaluated in terms of their effect on metacognition and motivation. Students were sampled from a local magnet school as a part of a larger ongoing research project investigating metacognition. Students were asked to complete questionnaires containing self-assessment measures of each variable. In the questionnaires, students were asked self-report aspects of their metacognition, motivation, ability beliefs, and gender stereotypes in two domains, math and social studies. The students' responses to the questionnaires were intended to address the following questions:

1. How do mean levels of metacognition differ between boys and girls in math and social studies?
2. To what extent is metacognition domain-general or domain-specific for girls versus boys?
3. How do mean levels of motivation differ between boys and girls in math and social studies?
4. How do boys and girls differ by whether they use an incremental or entity theory of intelligence in math and social studies?

The goal of this study was to fill gaps in research related to the domain-generality/specificity of metacognition, as well as gaps related to the gender-specific aspects of metacognition. While reviewing academic literature, it was difficult to find research targeting gender differences in adolescent metacognition and motivation. The findings of the study may help educators understand why some students are less motivated than others, which hopefully will allow them to provide their students with the right environment to succeed in.

Hypothesis 1: Boys will show higher levels of metacognition in math and girls will show higher levels of metacognition in social studies.

Hypothesis 2: Metacognition in boys and girls will not differ in terms of domain-generality vs. domain-specificity.

Hypothesis 3: Girls will show higher levels of motivation than boys in both math and social studies.

Hypothesis 4: Girls will adopt an entity theory of intelligence in math more than boys; girls will adopt an incremental theory of intelligence in social studies more than boys.

Method

Participants

Our sample consisted of 146 students from an inter-district magnet school in Hartford, Connecticut. The students were recruited into the study from social studies classes in the 6th, 7th, and 8th grade. For each grade level, one social studies teacher was recruited to have his or her students participate in the study. Among these participants, 50 were in the 6th grade, 57 were in the 7th grade, and 39 were in the 8th grade. Students ranged in age from 10 years and 11 months to 14 years and 6 months, with a mean age of 12 years and 5 months. Of the overall sample, 64% identified as female and 36% identified as male.

Because the sample was taken from a magnet school, the participants came from over 20 towns in the greater Hartford area. Hartford was the most common hometown, comprising 44% of the sample. The remaining 56% came from 22 other towns in districts surrounding Hartford. The participants varied in race/ethnicity, with 29% identifying as Hispanic, 25% identifying as White, 21% identifying as Black, 14% identifying as multi-racial/ethnic, and 1% identifying as Native American.

In accordance with Trinity College's Institutional Review Board, consent forms were sent home with the students containing a brief overview of the study's research goals and procedure (see Appendices A and B). Students could either consent or refuse to participate in the study with the approval of a signature from a parent or guardian. Only students who had given written consent were used in the study. The overall consent rate for this study was approximately 50%. The school's administration and the participating teachers were informed of the study's goals and procedures prior to the collection of data.

Measures

The participants completed several self-report scales about their perceived use of metacognition and motivation. Metacognition was measured using the MC5 scale, while motivation was measured using several scales evaluating self-efficacy, achievement values, engagement vs. disaffection, test anxiety, ability beliefs, and sex-stereotyping. Each measure was modified to address questions of perceived metacognition and motivation in two different school subjects: math and social studies. The answers given to corresponding questions for each subject were compared to identify the degree of generalizability across domains. These two subjects were selected for comparison due to the two courses containing no common material.

Demographic Information. Students were asked several demographic quesons regarding their date of birth, sex, race/ethnicity, and hometown at the beginning of the survey (see Appendix C).

Metacognition 5 (MC5). The Metacognition 5 (MC5), developed by Naratil, Howe, Reuman, and Anselmi (unpublished, 2013), was used to measure perceived use of metacognitive skills. The MC5 was based on Ambrose et al.'s (2010) model of metacognition, breaking the process of metacognition into five distinct steps: assess the task (Cronbach's alphas = .718 and .733 for social studies and math, respectively); evaluate strengths and weaknesses (Cronbach's alphas = .592 and .618 for social studies and math, respectively); plan (Cronbach's alphas = .606 and .619 for social studies and math, respectively); apply strategies and monitor performance (Cronbach's alphas = .737 and .707 for social studies and math, respectively); and reflect and adjust (Cronbach's alphas = .683 and .674 for social studies and math, respectively). The MC5 consists of 35 questions (Cronbach's alphas = .894 and .897 for social studies and math, respectively) with seven questions corresponding to each step. Responses to each question were

reported using a five-point Likert scale, ranging from "Never" to "Always" (see Appendices D and E).

Self-Efficacy. Self-efficacy measures students' perceptions of their classroom performance in math and social studies. The self-efficacy scale was derived from the Motivated Strategies for Learning Questionnaire (MSLQ) developed by Pintrich and de Groot (1990). The scale consists of nine questions (Cronbach's alphas = .915 and .917 for social studies and math, respectively) on a seven-point Likert scale, ranging from "Not at all true of me" to "Very true of me" (see Appendices F and G).

Achievement Values. Achievement values refer to students' interest in and perceived usefulness of the course material in math and social studies. A scale derived from the Achievement Values measure developed by Wigfield and Eccles (2000) was used. The questionnaire consists of five questions (Cronbach's alphas = .849 and .727 for social studies and math, respectively) answered using a seven-point Likert scale (see Appendices H and I).

Engagement versus Disaffection. Engagement versus disaffection is measured using a 24-item scale (Cronbach's alphas = .903 and .900 for social studies and math, respectively) derived from Wellborn (1991), assessing students' emotional engagement (Cronbach's alphas = .821 and .826 for social studies and math, respectively), behavioral engagement (Cronbach's alphas = .840 and .765 for social studies and math, respectively), emotional disaffection (Cronbach's alphas = .780 and .824 for social studies and math, respectively), and behavioral disaffection (Cronbach's alphas = .691 and .737 for social studies and math, respectively) in math and social studies. The questions were answered using a four-point Likert scale ranging from "Not true at all" to "Very true" (see Appendices J and K).

Test Anxiety. The amount of anxiety that students experience when taking an exam in math or social studies was measured by a five-item scale (Cronbach's alphas = .837 and .815 for social studies and math, respectively) also derived from the MSLQ (Pintrich & de Groot, 1990). Responses were recorded on a seven-point Likert scale ranging from "Not at all true of me" to "Very true of me" (see Appendices L and M).

Sex Stereotyping. A subscale assessing students' beliefs about sex-stereotypes in math and social studies was developed for this study, using questions adapted from Smetakova (2014) and Chatard et al. (2007). The subscale includes five questions (Cronbach's alphas = .667 and .696 for social studies and math, respectively), each measured on a five-point Likert scale ranging from "Not true at all" to "Completely true" (see Appendices N and O).

Ability Beliefs. Whether students adopt an incremental or entity theory of intelligence was measured by eight questions (Cronbach's alphas = .840 and .750 for social studies and math, respectively), four related to entity theory and four related to incremental theory, measured on a six-point Likert scale ranging from "Agree strongly" to "Disagree strongly". The subscale was adapted from Blackwell et al. (2007) to address math and social studies (see Appendices P and Q).

Procedure

The surveys were spread out over six sessions for the 6th and 7th grade students and over four sessions for the 8th grade students. All students completed all questions, but they were condensed into four longer surveys for the 8th graders because it was decided that they would be able to stay focused for longer and complete the surveys faster than the 6th and 7th graders. The 6th and 7th grade students completed the surveys in their classrooms during social studies class while the 8th grade students completed their surveys during an advising period shared by the

entire grade. Trinity College student researchers administered each survey to the students, while a teacher was present in the classroom to ensure class orderliness. There was no time constraint on the surveys, but most students completed each questionnaire in about 20 to 40 minutes.

Each grade in the school is divided into five classes, or "blocks". The surveys were counterbalanced by giving approximately half of the blocks questionnaires asking about social studies first and questionnaires asking about math second. The remaining half were given the math questionnaires first and the social studies questionnaires second. For the 6th and 7th grade, the questionnaires given on days 1, 2, and 3 were asking about the first subject (either math or social studies, depending on block) and the questionnaires for days 4, 5, and 6 asked about the second subject. For the 8th grade, the questionnaires given on days 1 and 2 asked about the first subject (either math or social studies, depending on block) and the questionnaires for days 3 and 4 asked about the second subject. This counterbalancing was intended to control for any order effects that may have arisen if all subjects had completed the questionnaires in the same order. On each day of testing, a Trinity College researcher recorded any absences so that students who were missing questionnaires could complete them on a later date.

Results

Correlations among Measures

Correlations among social studies and math scales were determined for the MC5, the Motivational Scales, the Ability Beliefs Scale, and the Sex-Stereotyping Scale for both male and female students (see Table 1). For both genders, the social studies variables were all positively correlated to their equivalent math variables.

Effects on Metacognition 5

The MC5 data was analyzed using a repeated-measures ANOVA to determine effects of Gender, Subject area, and Step of the metacognition cycle. Significant effects were found for Gender (G), F (1, 136) = 7.18, $p < .01$, partial eta^2 = .050; Subject area (D), F (1, 136) = 4.21, $p < .05$, partial eta^2 = .030; and Step (S), F (4, 544) = 17.40, $p < .001$, partial eta ^{2}= .113. The interactions between Gender and Subject area (G x D), Subject area and Step (D x S), and Gender, Subject area, and Step (G x D x S) were not significant. However, a significant interaction was found between Gender and Step (G x S), F (4, 544) = 5.09, $p < .001$, partial eta^2 = .036 (see Table 2).

For the entire sample, metacognition ratings were higher in math (M=3.57, SE=.04) than in social studies (M=3.50, SE=.04). When broken down by Step, ratings of metacognition were higher for Assessing the Task (M=3.68, SE=.05) and Reflecting and Adjusting (M=3.66, SE=.05) than for Evaluating Strengths and Weaknesses (M=3.44, SE=.04), Planning (M=3.42, SE=.05), and Applying Strategies and Monitoring Performance (M=3.47, SE=.05). Overall, female students (M=3.64, SE=.05) scored significantly higher in metacognition than male students (M=3.42, SE=.07) in both math and social studies (see Figure 1). For the Step by Gender interaction, females were higher than males in Assessing the Task (Female M=3.83, SE=.06; Male M=3.52, SE=.08), Planning (Female M=3.49, SE=.06; Male M=3.35, SE=.08), Applying Strategies and Monitoring Performance (Female M=3.65, SE=.06; Male M=3.30, SE=.08), and Reflecting and Adjusting (Female M=3.79, SE=.06; Male M=3.53, SE=.08). Gender differences were not found for Evaluating Strengths and Weaknesses (Female M=3.45, SE=.05; Male M=3.42, SE=.07) (see Table 3 and Figure 2).

Motivational Measures

There were no significant differences between boys and girls in self-efficacy, achievement values, test anxiety, or sex-stereotyping. Gender effects were found in behavioral engagement and behavioral disaffection but not in emotional engagement or emotional disaffection. Behavioral engagement had a significant gender effect, F (1, 129) = 6.00, $p < .05$, partial eta^2 = .044, as female students scored significantly higher (M=3.45, SE=.05) than male students (M=3.24, SE=.07). These results were reaffirmed by behavioral disaffection, F (1, 129) = 4.63, $p < .05$, partial eta^2 = .035, with girls scoring significantly higher (M=3.01, SE=.05) than boys (M=2.82, SE=.07), showing higher engagement. Significant interactions between Gender and Subject area were found for behavioral disaffection, F (1, 129) = 7.12, $p < .01$, partial eta^2 = .052; emotional engagement, F (1, 129) = 7.04, $p < .01$, partial eta^2 = .052; and emotional disaffection, F (1, 129) = 10.72, $p < .001$, partial eta^2 = .077. No significant interaction was found for behavioral engagement. Lastly, an interaction between gender and subject area was observed for engagement vs. disaffection overall, F (1, 129) = 11.90, $p < .001$, partial eta^2 = .085, reporting significantly higher scores for female students (M=3.11, SE=.05) than male students (M=2.84, SE=.07) in Social Studies but not in Math (Female M=3.04, SE=.05; Male M=3.02, SE=.07) (see Table 4 and Figure 3).

Ability Beliefs

Ability beliefs were evaluated using a repeated-measures ANOVA. No significant effects were found for Gender or Subject area. However, a marginally significant interaction was observed, F (1, 126) = 3.39, p = .068, partial eta^2 = .026. This interaction showed that female and male students both adopt an incremental theory of intelligence in math (Female M=4.48, SE=.10; Male M=4.41, SE=.13), but female students adopt a more incremental theory of intelligence in

social studies (M=4.64, SE=.10) while boys adopt a more entity theory of intelligence in social studies (M=4.31, SE=.14) (see Table 5).

Test for Domain-Generality

A Principal Components analysis was conducted to determine gender effects in the domain-generality of metacognition in math and social studies. Domain-generality assumes that students use all five dimensions of metacognition to the same degree in both math and social studies. The analysis showed, for both male and female students, that out of ten possible dimensions there was one dimension underlying metacognition in both subject areas (see Figure 5). All scales showed strong correlations to the one elevated dimension, suggesting domain-generality for both male and female students.

Discussion

Studies have evaluated the effects of gender on metacognition and motivation with contradictory results. Though the majority of these studies have suggested gender differences in metacognition, some have shown girls being higher in metacognition (Bidjerano, 2005; Zimmerman & Martinez-Pons, 1990), and others have shown boys being higher in metacognition (Niemivirta, 1997). This study addressed this inconsistency by evaluating whether subject area had an effect on gender differences in metacognition. Research on gender differences in motivation has shown that girls tend to be higher in motivation than boys during pre-adolescence and decline in motivation more than boys do when they enter junior high (Mok et al., 2007). This study, due to the age range of the participants being approximately 10 to 14, mixed pre-adolescent and junior high school students to examine the relationship between motivation and gender as opposed to the relationship between motivation and age, which was addressed in Ramsay (unpublished, 2018). Todor (2014) investigated the effect of gender on ability beliefs in

mathematics, showing that boys adopted an incremental theory of intelligence in math more than girls. The current study assessed whether this gender difference was consistent across subject areas, as a review of research literature did not point to any studies that have evaluated subject area differences in metacognition and motivation between boys and girls.

Metacognition

My first hypothesis was partially supported, as girls scored higher in metacognition than boys in social studies. However, I found that girls also scored higher in metacognition than boys in math, showing an overall gender effect rather than the gender-by-domain interaction that I predicted. An interaction of gender-by-step was also observed, as girls scored higher than boys in Assessing the Task, Planning, Applying Strategies and Monitoring Performance, and Reflecting and Adjusting. There was no difference between boys and girls in Evaluating Strengths and Weaknesses. These results support previous trends that boys and girls differ in their use of metacognitive strategies, and support the findings of Bidjerano (2005), Zimmerman and Martinez-Pons (1990), and Liliana and Lavinia (2011) that girls are higher than boys in multiple dimensions of metacognition including self-monitoring, planning, and goal-setting. However, it remains to be seen under which conditions boys are higher in metacognition than girls as observed in Niemivirta (1997). Because the dimensions of metacognition used in Niemivirta (1997) where boys scored higher than girls (rote-learning strategies and detail memorizing) were not evaluated in this study, it is possible that boys are higher than girls in metacognitive strategies that are not included in the MC5 model. It is also possible that girls may be more reflective on their learning strategies and are thus more aware of their metacognitive skill use than boys. As a result, boys and girls may both use metacognitive skills to the same degree but girls may be more aware of their use of such skills, thus reporting higher scores than boys.

Domain-Specific vs. Domain-General Metacognition. There has been little to no research evaluating whether gender differences in metacognition are consistent across domains. Though I anticipated that boys and girls would differ in overall metacognition across domains, no previous research has indicated gender effects on theories of metacognition across domains, so I predicted that boys and girls would not differ in terms of whether they adopted a domain-general or domain-specific approach to metacognition. This hypothesis was also supported, as boys and girls were both shown to adopt a domain-general approach to metacognition, meaning that though boys and girls differ in their use of metacognitive skills, the skills each gender tends to use remain consistent across school subjects. These results suggest that gender does not have an effect on whether students use similar or different metacognitive skills across domains, and that age is a much better predictor of differences in students' approaches to metacognition, as Ramsay (unpublished, 2018) found that sixth graders adopt a more domain-specific approach to metacognition while seventh and eighth graders adopt a more domain-general approach to metacognition.

Motivation

My prediction that girls would be higher than boys in motivation in both math and social studies was not supported. Boys and girls did not differ in motivational factors except in engagement, where girls were much higher than boys but only in social studies. It is unclear why this interaction appears only for social studies and only for this measure of motivation. These results can be framed in two different ways. First, the results can be interpreted that girls are higher in motivation because they were higher than boys in engagement in social studies and equal to boys in other measures of motivation. It is possible that girls were more engaged than boys because the three psychological needs, competence, autonomy, and relatedness, that

according to Eccles and Wigfield (2002) must be met in order for students to be engaged, may have been met in more of the female students. However, it is unclear why this difference only applied to social studies. Second, it can be argued that boys and girls do not differ in motivation because in all other dimensions of motivation there were no gender differences. The dimensions where most past studies observed gender differences were self-efficacy and achievement values. Mok et al. (2007) found that girls decline in motivation more than boys do from pre-adolescence to when they enter junior high school, so it is possible that age may have more of an effect on motivation than gender. Sixth grade students could be considered pre-adolescent, while seventh and eighth grade students could be the level of maturity where Mok et al. (2007) observed a decline in motivation. As a result, it is possible that the gender difference only existing in one dimension of motivation and for only one school subject could be a result of changes in motivation by gender over time. It is possible that sixth grade girls may be more motivated than sixth grade boys but by eighth grade girls may become less motivated than boys.

Ability Beliefs

Though ability beliefs are often considered a motivational variable, findings from this measure require separate consideration, since I had a specific hypothesis about boys and girls adopting different theories of intelligence in math and social studies. This hypothesis was based on findings from Todor (2014) showing that boys adopted an incremental theory of intelligence in math more than girls. I could not find a similar study which evaluated gender differences in theories of intelligence in social studies, but I predicted that social studies would show the opposite effect because it is a less stereotypically masculine domain than math, and as a result girls would be more motivated to increase their intelligence in a more "gender neutral" domain. This hypothesis was partially supported, as girls adopted an incremental theory of intelligence in

social studies more than boys. However, in contrast with the findings of Todor (2014), boys and girls both maintained an incremental theory of intelligence in math. These results, though only marginally significant, show the same pattern as engagement, suggesting a significant interaction between gender and subject with boys and girls only differing in motivation in social studies.

Limitations

The findings from this study should be considered in the context of several potential limitations which may have impacted the results. Of approximately 300 students in the classes from which I recruited participants, only 146 students elected to participate. Of that sample, nearly twice as many female students elected to participate as male students. Because of the large number of female participants, the results may have been skewed in favor of the female students, a difference which may have been less pronounced if the same number of male and female students had elected to participate. It is important to note that the fact that more female students than male students elected to participate in the study is consistent with my findings that girls are higher than boys in certain aspects of self-regulated learning. It is possible that more girls than boys returned the consent form to their social studies teacher because they are more engaged than boys in social studies class, and were thus more motivated to participate.

The results may also have been influenced by experimental confounds based on location. Participants in the sixth and seventh grade completed the surveys in their social studies classrooms during class time, while participants in the eighth grade completed the surveys in an advisory classroom during an advisory period. The majority of the participants completing the surveys during social studies class may have led to skewed findings in domain-related questions. Gender differences in engagement and ability beliefs may have been more pronounced for social studies than math because most of the participants took the surveys during social studies class.

Under these conditions, it may have been much easier to give accurate answers to the social studies-related questions and much more difficult to answer math-related questions. The answers to the math-related surveys may have been more accurate if the surveys had been taken in the students' math classrooms. To eliminate biases, all students should have completed the surveys under the same conditions. It would be most effective to administer the social studies surveys in social studies class and the math surveys in math class, or administer all surveys in a neutral environment, such as an advisory classroom.

Future Research

There are several recommendations that can be made for future research based on the findings of this study. These results are generally inconsistent, supporting some previous studies and contradicting others. Because existing research into gender differences in metacognition and motivation is limited, the inconsistent findings of this study emphasize how necessary it is to continue research in this area. A follow-up study should be conducted to address whether the results showing that girls are higher in metacognition apply to more school subjects than just math and social studies. Further research should also be conducted regarding the gender difference observed for engagement and ability beliefs in social studies to see if this difference applies to other school subjects. It would also be useful to examine a gender-by-age interaction in motivation, as suggested by Mok et al. (2007), to determine whether gender differences in motivation shift with age, as well as whether gender or age is a better predictor of differences in motivation. Gender differences in cognition should also be further investigated, as gender differences were found in metacognition and motivation. It may be possible that these differences can be tied to gender differences in cognition, as cognition, metacognition, and motivation make up the components of self-regulated learning. Lastly, future research should

address whether gender differences in metacognition and motivation are tied to academic performance by comparing students' grades to their use of metacognition and motivation.

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Tables

Table 1. Correlations among all Metacognition Measures, Motivational Measures, Ability Beliefs Measures, and Sex-Stereotype Measures in Math and Social Studies for Males and Females.

	Social Studies							Math						
Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Social Studies														
1) MC5	--	.44	.45	.47	.04	.42	.01	.59	.30	.41	.38	.02	.23	.07
2) SE	.65	--	.46	.42	-.13	.34	.04	.55	.68	.48	.48	-.23	.34	-.03
3) V	.41	.43	--	.61	.07	.34	.18	.20	.22	.45	.28	-.02	-.06	.15
4) E vs. D	.65	.60	.58	--	-.34	.39	-.10	.37	.23	.53	.62	-.32	.10	-.14
5) Anx	-.05	-.07	.04	-.36	--	-.18	.33	-.04	-.15	-.07	-.42	.60	-.08	.32
6) AB	.45	.50	.35	.55	.00	--	-.05	.37	.22	.27	.34	-.29	.43	-.07
7) SS	.12	.02	-.01	.02	.06	-.20	--	-.06	.14	-.12	-.21	.40	-.01	.46
Math														
8) MC5	.74	.50	.25	.48	-.01	.30	.16	--	.54	.52	.66	-.07	.47	-.06
9) SE	.49	.65	.15	.44	-.25	.34	.05	.54	--	.47	.60	-.23	.43	.07
10) V	.37	.43	.46	.33	.00	.34	-.01	.43	.52	--	.67	-.10	.24	.10
11) E vs. D	.51	.48	.26	.62	-.38	.38	.04	.60	.70	.56	--	-.42	.31	-.18
12) Anx	.04	-.04	.11	-.28	.79	.06	.07	.01	-.23	.10	-.34	--	-.09	.27
13) AB	.46	.52	.32	.53	-.02	.75	-.14	.38	.37	.38	.40	-.03	--	-.08
14) SS	.11	.00	.02	-.01	.15	-.10	.79	.16	.18	.11	.09	.13	-.12	--

Note. MC5 = Metacognition 5; SE = Self-Efficacy; V = Achievement Values; E vs. D = Engagement versus Disaffection, Anx = Test Anxiety; AB = Ability Beliefs; SS = Sex-Stereotyping.

N's for females range from 82 to 93. For females, critical values of *r* equal .217 and .283 for α = .05 and α = .01, respectively (assuming df = 80).
N's for males range from 44 to 51. For males, critical values of *r* equal .304 and .393 for α = .05 and α = .01, respectively (assuming df = 40).
Correlations for females are below the main diagonal; correlations for males are above the main diagonal.

Table 2. Test effects of Subject Area, Gender, and Step on Metacognition.

Effect	df	F	*p*	partial eta^2
Gender (G)	1, 136	7.18	.008	.050
Subject area (D)	1, 136	4.21	.04	.030
Step (S)	4, 544	17.40	< .001	.113
G x D	1, 136	1.85	.18	.013
G x S	4, 544	5.09	< .001	.036
D x S	4, 544	1.89	.11	.014
G x D x S	4, 544	0.05	.99	.000

Table 3. Effects of Gender and Step on Metacognition Frequency (averaged over Social Studies and Math).

Step in the Metacognition Cycle	Female (n=90)		Male (n=48)	
	M	*SE*	*M*	*SE*
AT*	3.83	.06	3.52	.08
ESW	3.45	.05	3.42	.07
P*	3.49	.06	3.35	.08
ASMP*	3.65	.06	3.30	.08
RA*	3.79	.06	3.53	.08

Note. AT = Assess the Task; ESW = Evaluate Strengths and Weaknesses; P = Planning; ASMP = Apply Strategies and Monitor Performance; RA = Reflect and Adjust. * indicates significant differences in gender means when $p < .05$.

Table 4. Test Effects of Subject Area and Gender on Motivational Measures.

Motivational Variable	df	F	*p*	partial eta^2
Self-Efficacy (N=138)				
Gender (G)	1, 136	1.03	.31	.008
Subject Area (D)	1, 136	1.25	.27	.009
G x S	1, 136	2.05	.15	.015
Achievement Values (N=138)				
Gender (G)	1, 136	0.04	.85	.000
Subject Area (D) *	1, 136	24.10	< .001	.151
G x S	1, 136	0.68	.41	.005
Behavioral Engagement (N=131)				
Gender (G) *	1, 129	6.00	.02	.044
Subject Area (D) *	1, 129	9.12	.003	.066
G x S	1, 129	2.63	.11	.020
Behavioral Disaffection (N=131)				
Gender (G) *	1, 129	4.63	.03	.035
Subject Area (D)	1, 129	1.56	.21	.012
G x S *	1, 129	7.12	.009	.052
Emotional Engagement (N=131)				
Gender (G)	1, 129	2.24	.14	.017
Subject Area (D)	1, 129	0.60	.44	.005
G x S *	1, 129	7.04	.009	.052

Emotional Disaffection (N=131)				
Gender (G)	1, 129	0.29	.59	.002
Subject Area (D)	1, 129	0.06	.81	.000
G x S *	1, 129	10.72	< .001	.077
Engagement vs. Disaffection Overall (N=131)				
Gender (G) †	1, 129	3.78	.054	.028
Subject Area (D)	1, 129	2.38	.13	.018
G x S *	1, 129	11.90	< .001	.085
Test Anxiety (N=138)				
Gender (G)	1, 136	0.48	.49	.003
Subject Area (D)	1, 136	0.46	.50	.003
G x S	1, 136	1.84	.18	.013
Sex-Stereotyping (N=128)				
Gender (G)	1, 126	0.36	.55	.003
Subject Area (D)	1, 126	0.07	.80	.001
G x S	1, 126	1.17	.28	.009
Ability Beliefs (N=128)				
Gender (G)	1, 126	1.81	.18	.014
Subject Area (D)	1, 126	0.26	.61	.002
G x S †	1, 126	3.39	.068	.026

Note. * indicates significant effects when $p < .05$. † indicates marginal significance when $p < .10$.

Table 5. Interaction between Gender and Subject Area on Ability Beliefs.

	Social Studies		Math	
	M	*SE*	*M*	*SE*
Female	4.64	.10	4.48	.10
Male	4.31	.14	4.41	.13

Figures

Figure 1. Mean levels of overall Metacognition by Gender (averaged over Social Studies and Math) (+*SE*).

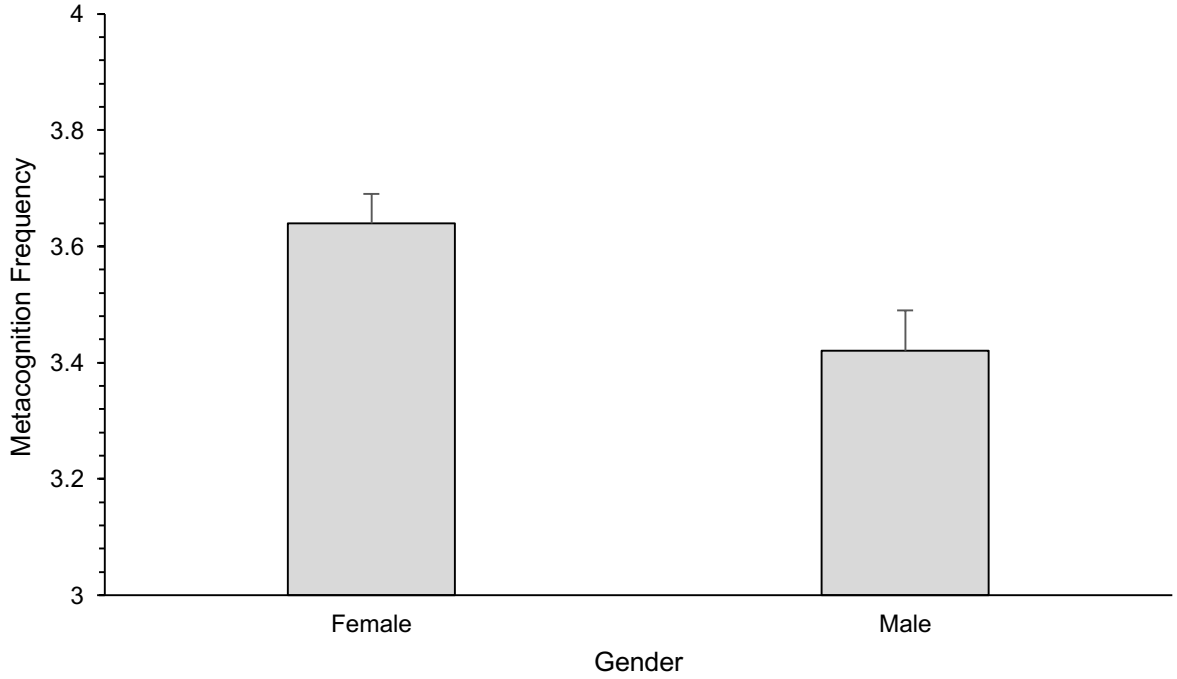
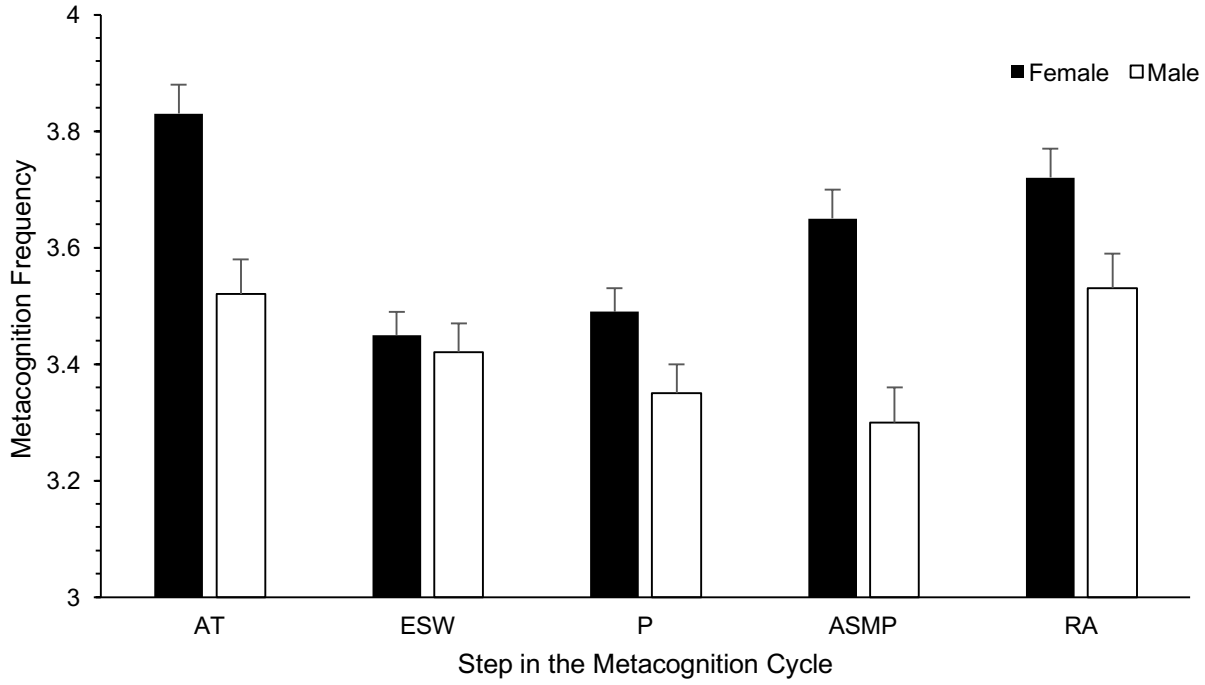


Figure 2. Effects of Gender and Step on Metacognition Frequency (+*SE*).



Note. AT = Assess the Task; ESW = Evaluate Strengths and Weaknesses; P = Planning; ASMP = Apply Strategies and Monitor Performance; RA = Reflect and Adjust.

Figure 3. Interaction between Gender and Subject Area on Overall Engagement (+/- *SE*)

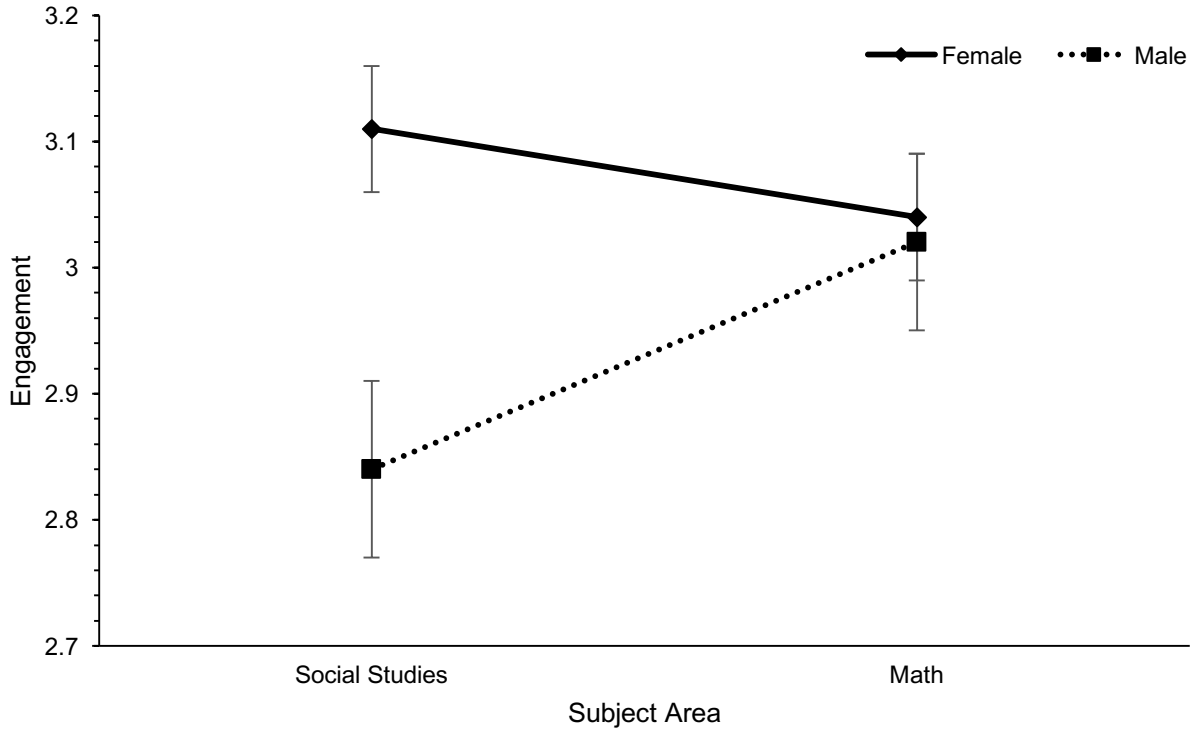


Figure 4. Interaction between Gender and Subject Area on Ability Beliefs. (+/- *SE*)

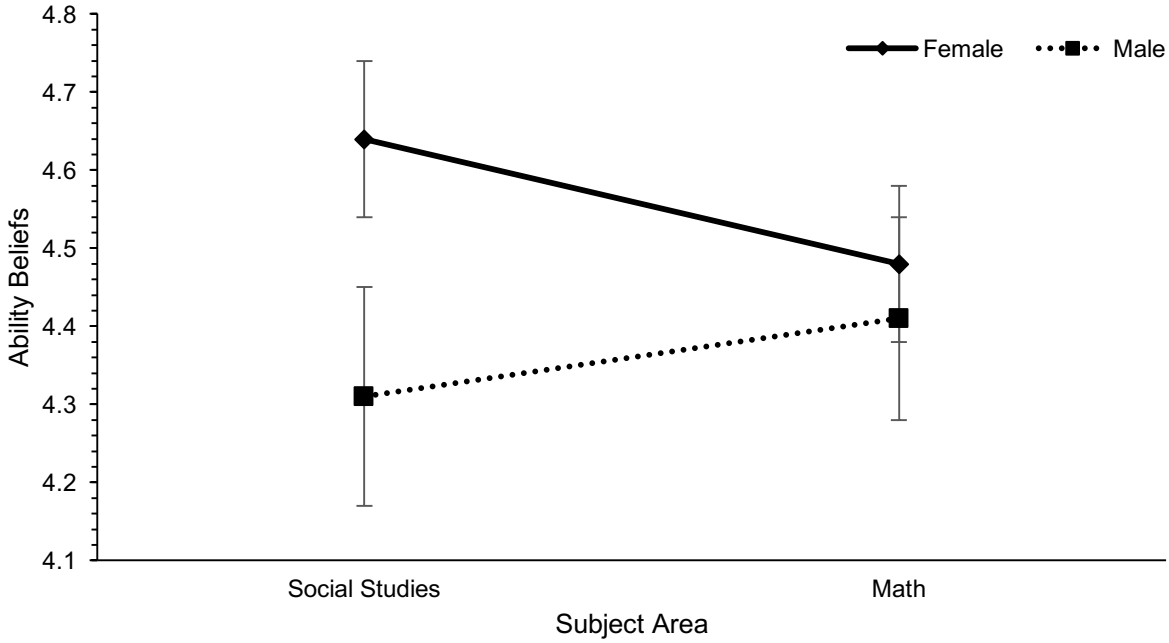
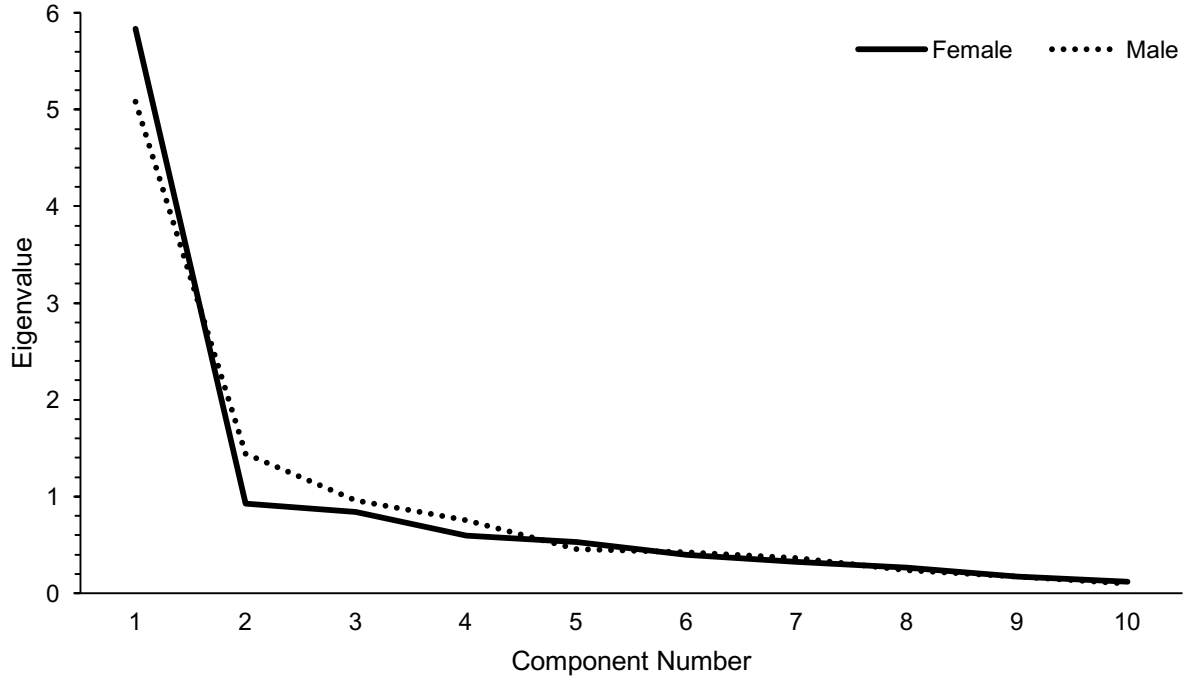


Figure 5. Principal Components Analysis of MC5 Scales in Social Studies and Math for Female and Male Students.



Appendices

Appendix A

HARTFORD MAGNET TRINITY COLLEGE ACADEMY
at The Learning Corridor
Sally A. Biggs, Principal

Dear Parent/Guardian,

As part of the Learning Corridor partnership and our relationship with Trinity College we have been invited to participate in an ongoing research project. Students will be asked about their learning strategies and academic motivation. The study, *Self-Regulated Learning in Middle School*, is designed to measure whether differences in age and gender affect students' motivational beliefs and ways in which students self-regulate their learning in social studies and math.

During the 2nd marking period students will be surveyed about their learning strategies and academic motivation in social studies and math. We anticipate to complete the project in 4-5 sessions (typically 20 minutes each) spread out over the duration of one marking period. Trinity Professors Dina Anselmi and David Reuman will be overseeing the project. The surveys will be conducted by Trinity students under our direct supervision.

If you have any questions or concerns regarding this exciting opportunity, please feel free to contact one of us and/or Mrs. Biggs (860-695-7201). We look forward to sharing our research results in the spring. Please sign this consent form indicating you have read this letter and agree to have your child participate in this study.

Sincerely, Mr. Ewing, Miss Heller, and Mr. Roarty

Title of Project: *Self-Regulated Learning in Middle School*

Principal Investigators:
Dina Anselmi, Ph.D. (860) 297-2236 or Dina.Anselmi@trincoll.edu
Department of Psychology, Trinity College, Hartford, CT 06106

David Reuman, Ph.D. (860) 297-2341 or David.Reuman@trincoll.edu
Department of Psychology, Trinity College, Hartford, CT 06106

Chris Ewing coonc001@hartfordschools.org
Andrea Heller andrea.heller@hartfordschools.org
Tim Roarty timothy.roarty@hartfordschools.org
Hartford Magnet Middle School, Hartford, CT 06106

I acknowledge that I have received and read a letter explaining the *Self-Regulated Learning in Middle School* study. I understand that there are no known risks to participants in the study, that my child is free to withdraw from participation at any time, and that any questions that I may have about the study will be answered fully by the principal investigators.

☐ I grant permission for my son / daughter to participate.
☐ I do not grant permission for my child to participate.

Print Your Son's / Daughter's Name	Print Your Name
Your Son's / Daughter's Signature	Your Signature

Appendix B

HARTFORD MAGNET TRINITY COLLEGE ACADEMY
at The Learning Corridor
Sally A. Biggs, Principal

Dear Parent/Guardian,

As part of the Learning Corridor partnership and our relationship with Trinity College we have been invited to participate in an ongoing research project. Students will be asked about their learning strategies and academic motivation. The study, *Self-Regulated Learning in Middle School*, is designed to measure whether differences in age and gender affect students' motivational beliefs and ways in which students self-regulate their learning in social studies and math.

During the 2nd marking period students will be surveyed about their learning strategies and academic motivation in social studies and math. We anticipate to complete the project in 4-5 sessions (typically 20 minutes each) spread out over the duration of one marking period. Trinity Professors Dina Anselmi and David Reuman will be overseeing the project. The surveys will be conducted by Trinity students under our direct supervision.

In addition to the general experimental design, your child may be asked to join a subset of students who will answer questions related to their thought processes during an educational computer game. The responses will be audio recorded and each recording will be assigned a confidential ID number. Once the responses are transcribed the recordings will be destroyed.

If you have any questions or concerns regarding this exciting opportunity, please feel free to contact one of us and/or Mrs. Biggs (860-695-7201). We look forward to sharing our research results in the spring. Please sign this consent form indicating you have read this letter and agree to have your child participate in this study.

Sincerely, Mr. Ewing, Miss Heller, and Mr. Roarty

Title of Project: *Self-Regulated Learning in Middle School*

Principal Investigators: Dina Anselmi, Ph.D. (860) 297-2236 or Dina.Anselmi@trincoll.edu
Department of Psychology, Trinity College, Hartford, CT 06106

David Reuman, Ph.D. (860) 297-2341 or David.Reuman@trincoll.edu
Department of Psychology, Trinity College, Hartford, CT 06106

Chris Ewing coonc001@hartfordschools.org
Andrea Heller andrea.heller@hartfordschools.org
Tim Roarty timothy.roarty@hartfordschools.org
Hartford Magnet Middle School, Hartford, CT 06106

I acknowledge that I have received and read a letter explaining the *Self-Regulated Learning in Middle School* study. I understand that there are no known risks to participants in the study, that my child is free to withdraw from participation at any time, and that any questions that I may have about the study will be answered fully by the principal investigators.

☐ I grant permission for my son / daughter to participate.
☐ I do not grant permission for my child to participate.

I acknowledge that I have received and read a letter explaining that a specific subset student will be selected within the main *Self-Regulated Learning in Middle School* study and their responses will be audio recorded. I understand that there are no known risks to participants in the study, that my 8th grade child is free to withdraw from

participation at any time, and that any questions that I may have about the study will be answered fully by the principal investigators.

☐ I grant permission for my 8th grade son / daughter to participate in this extension of the main study.

☐ I do not grant permission for my child to participate in this extension of the main study.

Print Your Son's / Daughter's Name	Print Your Name
Your Son's / Daughter's Signature	Your Signature

Appendix C

1. What is your birth date? (month/date/year)

_____

2. What is your sex:

☐ FEMALE ☐ MALE

3. Which of the following groups best describes you?
(You may check more than one group, if appropriate.)

☐ ASIAN OR PACIFIC ISLANDER

☐ HISPANIC, REGARDLESS OF RACE

☐ BLACK / AFRICAN-AMERICAN, NOT OF HISPANIC ORIGIN

☐ WHITE / CAUCASIAN, NOT OF HISPANIC ORIGIN

☐ AMERICAN INDIAN OR ALASKAN NATIVE

4. In what city or town do you live?

_____

Appendix D

INSTRUCTIONS: ***We are interested in what you, as a learner, do when you work on and prepare for assignments or tests as a part of your social studies class.***

Please read the following sentences and choose the answer that relates to you and the way you are when doing work for class. Please answer as honestly as possible.

---

1. When I am given an assignment in my social studies class that asks me to remember a lot of information, I can tell what works best for me to remember everything.

1	2	3	4	5
NEVER	RARELY	SOMETIMES	OFTEN	ALWAYS

2. After completing a test or assignment in my social studies class, I think about what went well.

1	2	3	4	5
NEVER	RARELY	SOMETIMES	OFTEN	ALWAYS

3. When I have a test coming up in my social studies class, I do most of my studying at the last minute.

1	2	3	4	5
NEVER	RARELY	SOMETIMES	OFTEN	ALWAYS

4. I read directions more than once before I start working on a social studies assignment.

1	2	3	4	5
NEVER	RARELY	SOMETIMES	OFTEN	ALWAYS

5. I use skills – like taking notes, asking myself questions, and slowing down – when I read for my social studies class.

1	2	3	4	5
NEVER	RARELY	SOMETIMES	OFTEN	ALWAYS

6. I know what my strengths are on the work I do in my social studies class.

1	2	3	4	5
NEVER	RARELY	SOMETIMES	OFTEN	ALWAYS

7. After I get an assignment back in my social studies class, I try to figure out how I could improve my work for next time.

1	2	3	4	5
NEVER	RARELY	SOMETIMES	OFTEN	ALWAYS

8. When I start a social studies assignment I check that I have all the things I will need – for example, a textbook, a computer, my notes, or the assignment itself – to complete the assignment.

1	2	3	4	5
NEVER	RARELY	SOMETIMES	OFTEN	ALWAYS

9. I do not understand the purpose of assignments in my social studies class.

1	2	3	4	5
NEVER	RARELY	SOMETIMES	OFTEN	ALWAYS

10. I review my writing for my social studies class before I hand it into the teacher.

1	2	3	4	5
NEVER	RARELY	SOMETIMES	OFTEN	ALWAYS

11. I make an effort to examine my weaknesses on the work I do in my social studies class.

1	2	3	4	5
NEVER	RARELY	SOMETIMES	OFTEN	ALWAYS

12. I change my ways of completing a social studies assignment when I realize that they are not working.

1	2	3	4	5
NEVER	RARELY	SOMETIMES	OFTEN	ALWAYS

13. When I work on a writing assignment in social studies, I immediately start writing without making an outline or a graphic organizer.

1	2	3	4	5
NEVER	RARELY	SOMETIMES	OFTEN	ALWAYS

14. I read directions carefully to make sure I understand all the different parts of a social studies assignment.

1	2	3	4	5
NEVER	RARELY	SOMETIMES	OFTEN	ALWAYS

15. I ask my social studies teacher for help.

1	2	3	4	5
NEVER	RARELY	SOMETIMES	OFTEN	ALWAYS

16. I can tell just how much time it will take me to complete assignments in my social studies class.

1	2	3	4	5
NEVER	RARELY	SOMETIMES	OFTEN	ALWAYS

17. When I get a bad grade in my social studies class, I do not study any differently for the next assignment.

1	2	3	4	5
NEVER	RARELY	SOMETIMES	OFTEN	ALWAYS

18. When my social studies homework requires specific materials, I remember to bring them home from school.

1	2	3	4	5
NEVER	RARELY	SOMETIMES	OFTEN	ALWAYS

19. I understand directions for assignments in my social studies class.

1	2	3	4	5
NEVER	RARELY	SOMETIMES	OFTEN	ALWAYS

20. When I read for my social studies class I first focus on headings, bold words, and summaries and then read the material more carefully.

1	2	3	4	5
NEVER	RARELY	SOMETIMES	OFTEN	ALWAYS

21. My grades on assignments in my social studies class are different from what I expect them to be.

1	2	3	4	5
NEVER	RARELY	SOMETIMES	OFTEN	ALWAYS

22. After completing a test or assignment in my social studies class, I think about what did not work well.

1	2	3	4	5
NEVER	RARELY	SOMETIMES	OFTEN	ALWAYS

23. When I have a social studies assignment that will be due more than a week in the future, I start working on it as soon as possible.

1	2	3	4	5
NEVER	RARELY	SOMETIMES	OFTEN	ALWAYS

24. I rush through directions to get started on a social studies test as soon as possible.

1	2	3	4	5
NEVER	RARELY	SOMETIMES	OFTEN	ALWAYS

25. I compare my most recent grades in my social studies class to my earlier grades in order to see if
    I'm improving.

1	2	3	4	5
NEVER	RARELY	SOMETIMES	OFTEN	ALWAYS

26. I know what my weaknesses are on the work I do in my social studies class.

1	2	3	4	5
NEVER	RARELY	SOMETIMES	OFTEN	ALWAYS

27. When my teacher returns a social studies test, I try to figure out what I didn't understand.

1	2	3	4	5
NEVER	RARELY	SOMETIMES	OFTEN	ALWAYS

28. When I have a writing assignment due in social studies, I do most of my work at the last minute.

1	2	3	4	5
NEVER	RARELY	SOMETIMES	OFTEN	ALWAYS

29. After I read a social studies assignment, I make sure I know what the main goal of the assignment is.

1	2	3	4	5
NEVER	RARELY	SOMETIMES	OFTEN	ALWAYS

30. I use skills – like using flash cards, study guides, and working with a partner – when I prepare for a social studies test.

1	2	3	4	5
NEVER	RARELY	SOMETIMES	OFTEN	ALWAYS

31. I make an effort to examine my strengths on the work I do in my social studies class.

1	2	3	4	5
NEVER	RARELY	SOMETIMES	OFTEN	ALWAYS

32. When I get teacher comments or corrections on a writing assignment in my social studies class, I don't pay any attention to them.

1	2	3	4	5
NEVER	RARELY	SOMETIMES	OFTEN	ALWAYS

33. I make a "to do" list before I start working on a social studies assignment in this class.

1	2	3	4	5
NEVER	RARELY	SOMETIMES	OFTEN	ALWAYS

34. When I have nearly finished a social studies assignment, I read the directions one last time to make sure I have completed all parts of the assignment.

1	2	3	4	5
NEVER	RARELY	SOMETIMES	OFTEN	ALWAYS

35. I turn in tests for my social studies class without checking my answers.

1	2	3	4	5
NEVER	RARELY	SOMETIMES	OFTEN	ALWAYS

Appendix E

INSTRUCTIONS: ***We are interested in what you, as a learner, do when you work on and prepare for assignments or tests as a part of your math class.***

Please read the following sentences and choose the answer that relates to you and the way you are when doing work for class. <u>Please answer as honestly as possible.</u>

---

1. When I am given an assignment in my math class that asks me to remember a lot of information, I can tell what works best for me to remember everything.

1	2	3	4	5
NEVER	RARELY	SOMETIMES	OFTEN	ALWAYS

2. After completing a test or assignment in my math class, I think about what went well.

1	2	3	4	5
NEVER	RARELY	SOMETIMES	OFTEN	ALWAYS

3. When I have a test coming up in my math class, I do most of my studying at the last minute.

1	2	3	4	5
NEVER	RARELY	SOMETIMES	OFTEN	ALWAYS

4. I read directions more than once before I start working on a math assignment.

1	2	3	4	5
NEVER	RARELY	SOMETIMES	OFTEN	ALWAYS

5. I use skills – like taking notes, asking myself questions, and slowing down – when I solve problems for my math class.

1	2	3	4	5
NEVER	RARELY	SOMETIMES	OFTEN	ALWAYS

6. I know what my strengths are on the work I do in my math class.

1	2	3	4	5
NEVER	RARELY	SOMETIMES	OFTEN	ALWAYS

7. After I get an assignment back in my math class, I try to figure out how I could improve my work for next time.

1	2	3	4	5
NEVER	RARELY	SOMETIMES	OFTEN	ALWAYS

8. When I start a math assignment I check that I have all the things I will need – for example, a textbook, a computer, my notes, or the assignment itself – to complete the assignment.

1	2	3	4	5
NEVER	RARELY	SOMETIMES	OFTEN	ALWAYS

9. I do not understand the purpose of assignments in my math class.

1	2	3	4	5
NEVER	RARELY	SOMETIMES	OFTEN	ALWAYS

10. I review my solutions to math problems before I hand them into the teacher.

1	2	3	4	5
NEVER	RARELY	SOMETIMES	OFTEN	ALWAYS

11. I make an effort to examine my weaknesses on the work I do in my math class.

1	2	3	4	5
NEVER	RARELY	SOMETIMES	OFTEN	ALWAYS

12. I change my ways of completing a math assignment when I realize that they are not working.

1	2	3	4	5
NEVER	RARELY	SOMETIMES	OFTEN	ALWAYS

13. When I work on a problem set in math, I immediately start solving the problem without figuring out all the steps I will need to take.

1	2	3	4	5
NEVER	RARELY	SOMETIMES	OFTEN	ALWAYS

14. I read directions carefully to make sure I understand all the different parts of a math assignment.

1	2	3	4	5
NEVER	RARELY	SOMETIMES	OFTEN	ALWAYS

15. I ask my math teacher for help.

1	2	3	4	5
NEVER	RARELY	SOMETIMES	OFTEN	ALWAYS

16. I can tell just how much time it will take me to complete assignments in my math class.

1	2	3	4	5
NEVER	RARELY	SOMETIMES	OFTEN	ALWAYS

17. When I get a bad grade in my math class, I do not study any differently for the next assignment.

1	2	3	4	5
NEVER	RARELY	SOMETIMES	OFTEN	ALWAYS

18. When my math homework requires specific materials, I remember to bring them home from school.

1	2	3	4	5
NEVER	RARELY	SOMETIMES	OFTEN	ALWAYS

19. I understand directions for assignments in my math class.

1	2	3	4	5
NEVER	RARELY	SOMETIMES	OFTEN	ALWAYS

20. I focus on key concepts, formulas, and methods for solving problems in math class.

1	2	3	4	5
NEVER	RARELY	SOMETIMES	OFTEN	ALWAYS

21. My grades on assignments in my math class are different from what I expect them to be.

1	2	3	4	5
NEVER	RARELY	SOMETIMES	OFTEN	ALWAYS

22. After completing a test or assignment in my math class, I think about what did not work well.

1	2	3	4	5
NEVER	RARELY	SOMETIMES	OFTEN	ALWAYS

23. When I have a math assignment that will be due more than a week in the future, I start working on it as soon as possible.

1	2	3	4	5
NEVER	RARELY	SOMETIMES	OFTEN	ALWAYS

24. I rush through directions to get started on a math test as soon as possible.

1	2	3	4	5
NEVER	RARELY	SOMETIMES	OFTEN	ALWAYS

25. I compare my most recent grades in my math class to my earlier grades in order to see if I'm improving.

1	2	3	4	5
NEVER	RARELY	SOMETIMES	OFTEN	ALWAYS

26. I know what my weaknesses are on the work I do in my math class.

1	2	3	4	5
NEVER	RARELY	SOMETIMES	OFTEN	ALWAYS

27. When my teacher returns a math test, I try to figure out what I didn't understand.

1	2	3	4	5
NEVER	RARELY	SOMETIMES	OFTEN	ALWAYS

36. When I have a math worksheet or set of problems due, I do most of my work at the last minute.

1	2	3	4	5
NEVER	RARELY	SOMETIMES	OFTEN	ALWAYS

37. After I read a math assignment, I make sure I know what the main goal of the assignment is.

1	2	3	4	5
NEVER	RARELY	SOMETIMES	OFTEN	ALWAYS

38. I use skills – like reviewing practice problems and notes, following study guides, and working with a partner – when I prepare for a math test.

1	2	3	4	5
NEVER	RARELY	SOMETIMES	OFTEN	ALWAYS

39. I make an effort to examine my strengths on the work I do in my math class.

1	2	3	4	5
NEVER	RARELY	SOMETIMES	OFTEN	ALWAYS

40. When I get teacher comments or corrections on math problems, I don't pay any attention to them.

1	2	3	4	5
NEVER	RARELY	SOMETIMES	OFTEN	ALWAYS

41. I make a “to do” list before I start working on a math assignment in this class.

1	2	3	4	5
NEVER	RARELY	SOMETIMES	OFTEN	ALWAYS

42. When I have nearly finished a math assignment, I read the directions one last time to make sure I have completed all parts of the assignment.

1	2	3	4	5
NEVER	RARELY	SOMETIMES	OFTEN	ALWAYS

43. I turn in tests for my math class without checking my answers.

1	2	3	4	5
NEVER	RARELY	SOMETIMES	OFTEN	ALWAYS

Appendix F

Self-Efficacy

1. Compared with other students in my social studies class I expect to do well.

1	2	3	4	5	6	7
NOT AT ALL TRUE OF ME						VERY TRUE OF ME

2. I'm certain I can understand the ideas taught in my social studies class.

1	2	3	4	5	6	7
NOT AT ALL TRUE OF ME						VERY TRUE OF ME

3. I expect to do very well in my social studies class.

1	2	3	4	5	6	7
NOT AT ALL TRUE OF ME						VERY TRUE OF ME

4. Compared to others in my social studies class, I think I'm a good student.

1	2	3	4	5	6	7
NOT AT ALL TRUE OF ME						VERY TRUE OF ME

5. I am sure I can do an excellent job on the problems and tasks assigned for my social studies class.

1	2	3	4	5	6	7
NOT AT ALL TRUE OF ME						VERY TRUE OF ME

6. I think I will receive a good grade in my social studies class.

1	2	3	4	5	6	7
NOT AT ALL TRUE OF ME						VERY TRUE OF ME

7. My study skills are excellent compared with others in my social studies class.

1	2	3	4	5	6	7
NOT AT ALL TRUE OF ME						VERY TRUE OF ME

8. Compared with other students in my social studies class, I think I know a great deal about the subject.

1	2	3	4	5	6	7
NOT AT ALL TRUE OF ME						VERY TRUE OF ME

9. I know I will be able to learn the material for my social studies class.

1	2	3	4	5	6	7
NOT AT ALL TRUE OF ME						VERY TRUE OF ME

Appendix G

Self-Efficacy

1. Compared with other students in my math class I expect to do well.

1	2	3	4	5	6	7
NOT AT ALL TRUE OF ME						VERY TRUE OF ME

2. I'm certain I can understand the ideas taught in my math class.

1	2	3	4	5	6	7
NOT AT ALL TRUE OF ME						VERY TRUE OF ME

3. I expect to do very well in my math class.

1	2	3	4	5	6	7
NOT AT ALL TRUE OF ME						VERY TRUE OF ME

4. Compared to others in my math class, I think I'm a good student.

1	2	3	4	5	6	7
NOT AT ALL TRUE OF ME						VERY TRUE OF ME

5. I am sure I can do an excellent job on the problems and tasks assigned for my math class.

1	2	3	4	5	6	7
NOT AT ALL TRUE OF ME						VERY TRUE OF ME

6. I think I will receive a good grade in my math class.

1	2	3	4	5	6	7
NOT AT ALL TRUE OF ME						VERY TRUE OF ME

7. My study skills are excellent compared with others in my math class.

1	2	3	4	5	6	7
NOT AT ALL TRUE OF ME						VERY TRUE OF ME

8. Compared with other students in my math class, I think I know a great deal about the subject.

1	2	3	4	5	6	7
NOT AT ALL TRUE OF ME						VERY TRUE OF ME

9. I know I will be able to learn the material for my math class.

1	2	3	4	5	6	7
NOT AT ALL TRUE OF ME						VERY TRUE OF ME

Appendix H

Achievement Values

1. In general, how useful is what you learn in social studies?

1	2	3	4	5	6	7
NOT AT ALL USEFUL						VERY USEFUL

2. How useful do you think the social studies you are learning will be for what you want to do in the future?

1	2	3	4	5	6	7
NOT AT ALL USEFUL						VERY USEFUL

3. For me, being good at social studies is

1	2	3	4	5	6	7
NOT AT ALL IMPORTANT						VERY IMPORTANT

4. In general, I find working on social studies assignments

1	2	3	4	5	6	7
VERY BORING						VERY INTERESTING

5. Would you take more social studies if you didn't have to? (Check one answer.)

_____ 1) I very definitely would take more social studies.

_____ 2) I probably would take more social studies.

_____ 3) Maybe I would take more social studies.

_____ 4) I'm not sure.

_____ 5) Maybe, but not that likely.

_____ 6) I probably would not take any more social studies.

_____ 7) I very definitely would not take any more social studies.

Appendix I

Achievement Values

1. In general, how useful is what you learn in math?

1	2	3	4	5	6	7
NOT AT ALL USEFUL						VERY USEFUL

2. How useful do you think the math you are learning will be for what you want to do in the future?

1	2	3	4	5	6	7
NOT AT ALL USEFUL						VERY USEFUL

3. For me, being good at math is

1	2	3	4	5	6	7
NOT AT ALL IMPORTANT						VERY IMPORTANT

4. In general, I find working on math assignments

1	2	3	4	5	6	7
VERY BORING						VERY INTERESTING

5. Would you take more math if you didn't have to? (Check one answer.)

_____ 1) I very definitely would take more math.

_____ 2) I probably would take more math.

_____ 3) Maybe I would take more math.

_____ 4) I'm not sure.

_____ 5) Maybe, but not that likely.

_____ 6) I probably would not take any more math.

_____ 7) I very definitely would not take any more math.

Appendix J

Engagement versus Disaffection

INSTRUCTIONS: Below are statements about your everyday experience in your social studies teacher's classroom. Using the scale below, please indicate how untrue or true the statements apply to you. Please answer according to what really reflects your experience rather than what you think your experience should be. Please answer as honestly as possible.

1. I try hard to do well in social studies.

1	2	3	4
NOT AT ALL TRUE	NOT VERY TRUE	SORT OF TRUE	VERY TRUE

2. I enjoy learning new things in social studies.

1	2	3	4
NOT AT ALL TRUE	NOT VERY TRUE	SORT OF TRUE	VERY TRUE

3. When I'm in social studies class, I can't wait for it to be over.

1	2	3	4
NOT AT ALL TRUE	NOT VERY TRUE	SORT OF TRUE	VERY TRUE

4. When we work on something in social studies class, I feel discouraged.

1	2	3	4
NOT AT ALL TRUE	NOT VERY TRUE	SORT OF TRUE	VERY TRUE

5. In social studies class, I do just enough to get by.

1	2	3	4
NOT AT ALL TRUE	NOT VERY TRUE	SORT OF TRUE	VERY TRUE

6. Social studies class is fun.

1	2	3	4
NOT AT ALL TRUE	NOT VERY TRUE	SORT OF TRUE	VERY TRUE

7. In social studies class, I work as hard as I can.

1	2	3	4
NOT AT ALL TRUE	NOT VERY TRUE	SORT OF TRUE	VERY TRUE

8. When I'm in social studies class, I feel bad.

1	2	3	4
NOT AT ALL TRUE	NOT VERY TRUE	SORT OF TRUE	VERY TRUE

9. When I'm in social studies class, I listen very carefully.

1	2	3	4
NOT AT ALL TRUE	NOT VERY TRUE	SORT OF TRUE	VERY TRUE

10. When I'm in social studies class, I feel worried.

1	2	3	4
NOT AT ALL TRUE	NOT VERY TRUE	SORT OF TRUE	VERY TRUE

11. When we work on something in social studies class, I get involved.

1	2	3	4
NOT AT ALL TRUE	NOT VERY TRUE	SORT OF TRUE	VERY TRUE

12. I don't care if I miss social studies class.

1	2	3	4
NOT AT ALL TRUE	NOT VERY TRUE	SORT OF TRUE	VERY TRUE

13. When I'm in social studies class, I think about other things.

1	2	3	4
NOT AT ALL TRUE	NOT VERY TRUE	SORT OF TRUE	VERY TRUE

14. When we work on something in social studies class, I feel interested.

1	2	3	4
NOT AT ALL TRUE	NOT VERY TRUE	SORT OF TRUE	VERY TRUE

15. Social studies class is not all that fun for me.

1	2	3	4
NOT AT ALL TRUE	NOT VERY TRUE	SORT OF TRUE	VERY TRUE

16. When I'm in social studies class, I just act like I'm working.

1	2	3	4
NOT AT ALL TRUE	NOT VERY TRUE	SORT OF TRUE	VERY TRUE

17. When I'm in social studies class, I feel good.

1	2	3	4
NOT AT ALL TRUE	NOT VERY TRUE	SORT OF TRUE	VERY TRUE

18. When I'm in social studies class, my mind wanders.

1	2	3	4
NOT AT ALL TRUE	NOT VERY TRUE	SORT OF TRUE	VERY TRUE

19. I work on other things when I'm in social studies class.

1	2	3	4
NOT AT ALL TRUE	NOT VERY TRUE	SORT OF TRUE	VERY TRUE

20. When I'm in social studies class, I participate in class discussions.

1	2	3	4
NOT AT ALL TRUE	NOT VERY TRUE	SORT OF TRUE	VERY TRUE

21. When we work on something in social studies class, I feel bored.

1	2	3	4
NOT AT ALL TRUE	NOT VERY TRUE	SORT OF TRUE	VERY TRUE

22. I don't try very hard in social studies class.

1	2	3	4
NOT AT ALL TRUE	NOT VERY TRUE	SORT OF TRUE	VERY TRUE

23. I pay attention in social studies class.

1	2	3	4
NOT AT ALL TRUE	NOT VERY TRUE	SORT OF TRUE	VERY TRUE

24. When I can't answer a question in social studies class, I feel frustrated.

1	2	3	4
NOT AT ALL TRUE	NOT VERY TRUE	SORT OF TRUE	VERY TRUE

Appendix K

Engagement versus Disaffection

INSTRUCTIONS: Below are statements about your everyday experience in your math teacher's classroom. Using the scale below, please indicate how untrue or true the statements apply to you. Please answer according to what really reflects your experience rather than what you think your experience should be. Please answer as honestly as possible.

1. I try hard to do well in math.

1	2	3	4
NOT AT ALL TRUE	NOT VERY TRUE	SORT OF TRUE	VERY TRUE

2. I enjoy learning new things in math.

1	2	3	4
NOT AT ALL TRUE	NOT VERY TRUE	SORT OF TRUE	VERY TRUE

3. When I'm in math class, I can't wait for it to be over.

1	2	3	4
NOT AT ALL TRUE	NOT VERY TRUE	SORT OF TRUE	VERY TRUE

4. When we work on something in math class, I feel discouraged.

1	2	3	4
NOT AT ALL TRUE	NOT VERY TRUE	SORT OF TRUE	VERY TRUE

5. In math class, I do just enough to get by.

1	2	3	4
NOT AT ALL TRUE	NOT VERY TRUE	SORT OF TRUE	VERY TRUE

6. Math class is fun.

1	2	3	4
NOT AT ALL TRUE	NOT VERY TRUE	SORT OF TRUE	VERY TRUE

7. In math class, I work as hard as I can.

1	2	3	4
NOT AT ALL TRUE	NOT VERY TRUE	SORT OF TRUE	VERY TRUE

8. When I'm in math class, I feel bad.

1	2	3	4
NOT AT ALL TRUE	NOT VERY TRUE	SORT OF TRUE	VERY TRUE

9. When I'm in math class, I listen very carefully.

1	2	3	4
NOT AT ALL TRUE	NOT VERY TRUE	SORT OF TRUE	VERY TRUE

10. When I'm in math class, I feel worried.

1	2	3	4
NOT AT ALL TRUE	NOT VERY TRUE	SORT OF TRUE	VERY TRUE

11. When we work on something in math class, I get involved.

1	2	3	4
NOT AT ALL TRUE	NOT VERY TRUE	SORT OF TRUE	VERY TRUE

12. I don't care if I miss math class.

1	2	3	4
NOT AT ALL TRUE	NOT VERY TRUE	SORT OF TRUE	VERY TRUE

13. When I'm in math class, I think about other things.

1	2	3	4
NOT AT ALL TRUE	NOT VERY TRUE	SORT OF TRUE	VERY TRUE

14. When we work on something in math class, I feel interested.

1	2	3	4
NOT AT ALL TRUE	NOT VERY TRUE	SORT OF TRUE	VERY TRUE

15. Math class is not all that fun for me.

1	2	3	4
NOT AT ALL TRUE	NOT VERY TRUE	SORT OF TRUE	VERY TRUE

16. When I'm in math class, I just act like I'm working.

1	2	3	4
NOT AT ALL TRUE	NOT VERY TRUE	SORT OF TRUE	VERY TRUE

17. When I'm in math class, I feel good.

1	2	3	4
NOT AT ALL TRUE	NOT VERY TRUE	SORT OF TRUE	VERY TRUE

18. When I'm in math class, my mind wanders.

1	2	3	4
NOT AT ALL TRUE	NOT VERY TRUE	SORT OF TRUE	VERY TRUE

19. I work on other things when I'm in math class.

1	2	3	4
NOT AT ALL TRUE	NOT VERY TRUE	SORT OF TRUE	VERY TRUE

20. When I'm in math class, I participate in class discussions.

1	2	3	4
NOT AT ALL TRUE	NOT VERY TRUE	SORT OF TRUE	VERY TRUE

21. When we work on something in math class, I feel bored.

1	2	3	4
NOT AT ALL TRUE	NOT VERY TRUE	SORT OF TRUE	VERY TRUE

22. I don't try very hard in math class.

1	2	3	4
NOT AT ALL TRUE	NOT VERY TRUE	SORT OF TRUE	VERY TRUE

23. I pay attention in math class.

1	2	3	4
NOT AT ALL TRUE	NOT VERY TRUE	SORT OF TRUE	VERY TRUE

24. When I can't answer a question in math class, I feel frustrated.

1	2	3	4
NOT AT ALL TRUE	NOT VERY TRUE	SORT OF TRUE	VERY TRUE

Appendix L

Test Anxiety

1. When I take a social studies test, I think about how poorly I am doing compared with other students.

1	2	3	4	5	6	7
NOT AT ALL TRUE OF ME						VERY TRUE OF ME

2. When I take a social studies test, I think about items on other parts of the test I can't answer.

1	2	3	4	5	6	7
NOT AT ALL TRUE OF ME						VERY TRUE OF ME

3. When I take a social studies test, I think of the consequences of failing.

1	2	3	4	5	6	7
NOT AT ALL TRUE OF ME						VERY TRUE OF ME

4. I have an uneasy, upset feeling when I take a social studies test.

1	2	3	4	5	6	7
NOT AT ALL TRUE OF ME						VERY TRUE OF ME

5. I feel my heart beating fast when I take a social studies test.

1	2	3	4	5	6	7
NOT AT ALL TRUE OF ME						VERY TRUE OF ME

Appendix M

Test Anxiety

1. When I take a math test, I think about how poorly I am doing compared with other students.

1	2	3	4	5	6	7
NOT AT ALL TRUE OF ME						VERY TRUE OF ME

2. When I take a math test, I think about items on other parts of the test I can't answer.

1	2	3	4	5	6	7
NOT AT ALL TRUE OF ME						VERY TRUE OF ME

3. When I take a math test, I think of the consequences of failing.

1	2	3	4	5	6	7
NOT AT ALL TRUE OF ME						VERY TRUE OF ME

4. I have an uneasy, upset feeling when I take a math test.

1	2	3	4	5	6	7
NOT AT ALL TRUE OF ME						VERY TRUE OF ME

5. I feel my heart beating fast when I take a math test.

1	2	3	4	5	6	7
NOT AT ALL TRUE OF ME						VERY TRUE OF ME

Appendix N

Sex-Stereotyping Scale

1. Boys are usually better in social studies than girls.

1	2	3	4	5
NOT AT ALL TRUE				COMPLETELY TRUE

2. Girls work harder in social studies than boys.

1	2	3	4	5
NOT AT ALL TRUE				COMPLETELY TRUE

3. Girls and boys differ in their abilities in social studies.

1	2	3	4	5
NOT AT ALL TRUE				COMPLETELY TRUE

4. In general, boys have high ability in social studies.

1	2	3	4	5
NOT AT ALL TRUE				COMPLETELY TRUE

5. In general, girls have high ability in social studies.

1	2	3	4	5
NOT AT ALL TRUE				COMPLETELY TRUE

Appendix O

Sex-Stereotyping Scale

1. Boys are usually better in math than girls.

1	2	3	4	5
NOT AT ALL TRUE				COMPLETELY TRUE

2. Girls work harder in math than boys.

1	2	3	4	5
NOT AT ALL TRUE				COMPLETELY TRUE

3. Girls and boys differ in their abilities in math.

1	2	3	4	5
NOT AT ALL TRUE				COMPLETELY TRUE

4. In general, boys have high ability in math.

1	2	3	4	5
NOT AT ALL TRUE				COMPLETELY TRUE

5. In general, girls have high ability in math.

1	2	3	4	5
NOT AT ALL TRUE				COMPLETELY TRUE

Appendix P

Ability Beliefs Scale

1. I don't think I personally can do much to increase my ability in social studies.

1	2	3	4	5	6
AGREE STRONGLY					DISAGREE STRONGLY

2. My ability in social studies is something about me that I personally can't change much.

1	2	3	4	5	6
AGREE STRONGLY					DISAGREE STRONGLY

3. To be honest, I don't think I can really change how much ability I have in social studies.

1	2	3	4	5	6
AGREE STRONGLY					DISAGREE STRONGLY

4. I can learn new things, but I can't really change my basic ability in social studies.

1	2	3	4	5	6
AGREE STRONGLY					DISAGREE STRONGLY

5. With enough time and effort, I think I could significantly improve my ability in social studies.

1	2	3	4	5	6
AGREE STRONGLY					DISAGREE STRONGLY

6. I believe I can always substantially improve my ability in social studies.

1	2	3	4	5	6
AGREE STRONGLY					DISAGREE STRONGLY

7. Regardless of my current ability level in social studies, I think I have the capacity to change it quite a bit.

1	2	3	4	5	6
AGREE STRONGLY					DISAGREE STRONGLY

8. I believe I can change my ability in social studies considerably over time.

1	2	3	4	5	6
AGREE STRONGLY					DISAGREE STRONGLY

Appendix Q

Ability Beliefs Scale

1. I don't think I personally can do much to increase my ability in math.

1	2	3	4	5	6
AGREE STRONGLY					DISAGREE STRONGLY

2. My ability in math is something about me that I personally can't change much.

1	2	3	4	5	6
AGREE STRONGLY					DISAGREE STRONGLY

3. To be honest, I don't think I can really change how much ability I have in math.

1	2	3	4	5	6
AGREE STRONGLY					DISAGREE STRONGLY

4. I can learn new things, but I can't really change my basic ability in math.

1	2	3	4	5	6
AGREE STRONGLY					DISAGREE STRONGLY

5. With enough time and effort, I think I could significantly improve my ability in math.

1	2	3	4	5	6
AGREE STRONGLY					DISAGREE STRONGLY

6. I believe I can always substantially improve my ability in math.

1	2	3	4	5	6
AGREE STRONGLY					DISAGREE STRONGLY

7. Regardless of my current ability level in math, I think I have the capacity to change it quite a bit.

1	2	3	4	5	6
AGREE STRONGLY					DISAGREE STRONGLY

8. I believe I can change my ability in math considerably over time.

1	2	3	4	5	6
AGREE STRONGLY					DISAGREE STRONGLY