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Factors Impacting Students' Motivation and Learning Strategies

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Abstract
The purpose of this study was to investigate the relationship between age, sex, and ethnicity and the motivation and learning strategies of high school mathematics students in Central Kentucky, USA. The study involved the administration of the Motivated Strategies for Learning Questionnaire (MSLQ), first developed by Pintrich, Smith, Garcia, & McKeachie (1991), and finalized in 1990, and then published in 1993 (Pintrich, Smith, Garcia, & McKeachie, 1993). The survey was administered to 204 students in ten 9th grade mathematics classes at one high school. The quantitative research method was employed for collecting and analyzing data in this study. Data were analyzed using MANOVA, ANOVA, and descriptive statistics. The results indicate relationships between age, sex, and ethnicity and motivation and learning strategies. The usefulness of these findings for promoting a better understanding of student motivation and student learning strategies and ideas for future research are discussed.

Keywords: Education, Mathematics, Student Motivation, Learning Strategies.

1. Introduction

Proficiency in languages, science, and mathematics are considered requirements for individual success in today's modern society (French, Homer, & Robins, 2010). A society's ability to gain a competitive advantage in the global economy will depend on its success in developing a diverse, well-qualified, and sustainable supply of scientists and engineers. To achieve those objectives requires a system of schooling that produces students with advanced math and science skills. Increased scrutiny has been paid to the quality of public education in the United States and specifically the subject of mathematics. Reports compare assessments and mathematics literacy with the rest of the world and show only slight improvements since 1995 through 2009 (Hanushek, E. A., Peterson, P.E., & Woessmann, L., 2012).

The objective of this study was to investigate different factors (age, sex, and ethnicity) that might impact motivation and learning strategies of high school mathematics students in Central Kentucky, USA. The study involved the administration of the Motivated Strategies for Learning Questionnaire (MSLQ) to 204 students in ten 9th grade mathematics in six classes in one high school. The quantitative research method was employed by this study for collecting and analyzing data. Data were analyzed using descriptive statistics and correlation analysis.

1.1 Statement of the Problem

Data show that our United States schools are not supporting levels of math achievement that are competitive internationally and that represent a diverse population (National Center for Education Statistics, 2012). U.S. student performance in math is below the median score of all participating countries in the Program for International Student Assessment (PISA). The percentage of students in the U.S. Class of 2009 who were scored as highly accomplished in math is well below that of most the countries typically compared to the U.S. At least 30 of the 56 other countries that participated in the (PISA) math test had a larger percentage of students than the U.S. who scored at the international equivalent of the advanced level on the National Assessment of Educational Progress (NAEP) tests (Peterson, Woessmann, Hanushek & Lastra-Anadón (2011). The problem addressed in this study was to determine the impact of different factors (age, sex, and ethnicity) that influence motivation and learning strategies of high school mathematics students in Central Kentucky, USA.

1.2 Purpose of the Study

The purpose of the study was to gather information from ninth grade math students regarding their motivation and strategies to learn in their math classes. More specifically, the purpose was to examine the individual learner variables of age, sex, and ethnicity and their relationship with motivation and learning strategies. Information from the study will help increase teacher awareness about the relationship of the individual learner variables of age, sex, and ethnicity, and their relationship with student motivational and learning strategies.

1.2 Rationale

Student motivation and learning strategies for mathematics courses play an important role in the success of an individual and a society. It is important to understand motivators and strategies for learning mathematics and how they are impacted by age, sex, and ethnicity, so that educators can better prepare students for success in high school mathematics and their chosen careers. Most research in mathematics education has focused on student academic achievement in terms of grades, test scores, and other academic outcomes. Less attention has been devoted to studying age, sex, and ethnicity and their relationship with student motivation and learning strategies. However, over the past three decades, a growing body of research has emerged to regarding individual learner variables and their relationship with motivation and learning strategies.

1.3 Research Questions

Research Question 1: What are the levels of motivation and learning strategies demonstrated by ninth grade mathematics students in the United States among the categories of age, sex, and ethnicity?

Reason Question 2: What is the relationship between the factors of age, sex, and ethnicity of ninth grade mathematics students and their motivation to learn?

Research Question 3: What is the relationship between the factors of age, sex, and ethnicity of ninth grade mathematics students and their learning strategies?

1.4 Theoretical Framework

The theoretical framework of this study was to determine the motivation and learning strategies of high school mathematics students in the United States. This study examined the relationship of motivation and learning strategies with the factors of age sex, and ethnicity. The general theoretical model for this study in presented in Figure 1. The theoretical framework for this study was based on the work of Pintrich, Smith, Garcia, and McKeachie (1991) that included the development of an instrument that would measure motivation and learning strategies of students in specific classes. The final version of the MSLQ was completed in 1990 and presented in the *Journal Educational and Psychological Measurement* (Pintrich, Smith, Garcia, & McKeachie, 1993).

Research has shown that motivation and learning strategies are related to course outcomes in mathematics courses among school children (Linnenbrink & Pintrich, 2002; Metallidou & Vlachou, 2007). Furthermore, research indicates a relationship between individual learner variables and their impact on mathematics achievement (Santos, Ursini, Ramirez, & Sanchez, 2006; Ursini & Sanchez, 2008; Shannon, & Smith, 2010).

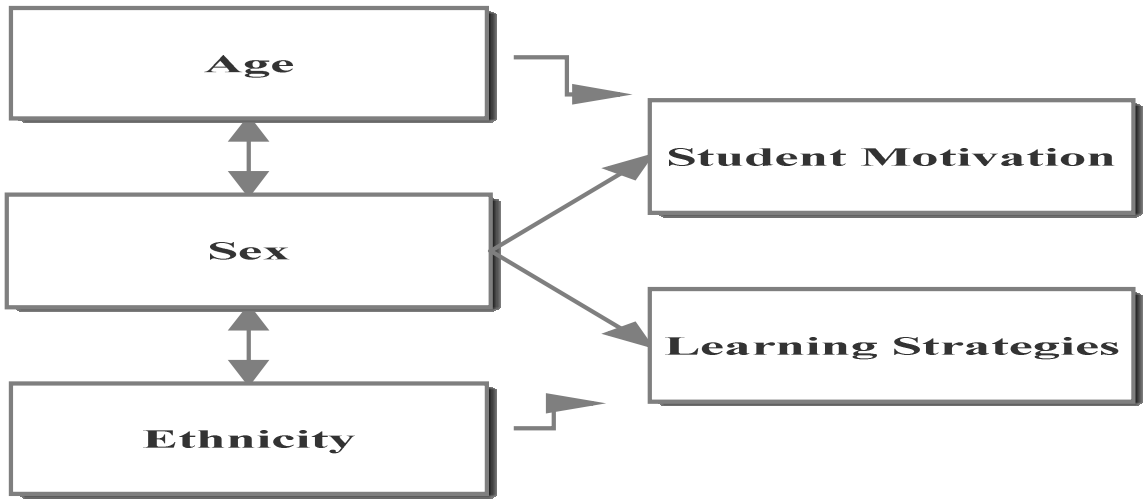

Figure 1: General theoretical model of the relationship between students' demographics, motives and learning strategies

1.5 Nature of the Study

This study utilized a descriptive quantitative method to evaluate the levels and relationships between the categories of age, sex, and ethnicity on high school math students' motivation and learning strategies. Descriptive quantitative research was designed to provide a picture of the current situation and the insights that it may provide for change and how best to accomplish it. Furthermore, quantitative research was used to determine the relationship between variables without attempt to prove causation. This study employed the Motivated Strategies for Learning Questionnaire (MSLQ), developed by Pintrich, Smith, Garcia, & McKeachie (1991), to gain information about student motivation and learning strategies. The study then tested the hypothesis that there is a relationship between the high school student demographic factors of age, sex, and ethnicity and student motivation and learning strategies.

The study involved the administration of the MSLQ to 204 students in ten 9th grade mathematics classes in one high school. The surveys were distributed by the teachers to the students in each of the classes and the completed surveys were then collected by those teachers and returned to the researcher.

1.6 Significance of the Study

It is important to understand the level of motivation and learning strategies among the variables and to determine if there is a relationship between them as demonstrated by the high school math students to expand the existing empirical research on this topic for educators, parents, and students. The findings have significant implications for educators, educational administrators, and other stakeholders as the success of students in mathematics impacts their success in life and the success of our nation in a competitive global economy. The study provides an understanding of the relationship of age, sex, and ethnicity between student motivation and learning strategies, which may help educators, administrators, policy-makers, and parents improve student motivation and learning strategies in high school mathematics classes.

1.6 Organization of the Study

The remainder of this study was focused on the relationship between the demographic factors of age, sex, and ethnicity and motivation and learning strategy of high school math students. The literature review section presents a review of previous and current literature about the key variables examined in this studu. The methodology section presents the research methodology used in this study. The analysis of the results from the MSLQ data is then presented in the results section. The final section presents a discussion of the results of this research including the limitations of the measures and procedures, conclusions, and implications for future research.

2.0 Literature Review

Psychologists and educators alike have long studied the role of motivation in student achievement and learning. This early research focused on separated cognitive and motivation factors, but did not integrate cognition and motivation. The research then shifted to the integration of motivational and cognitive factors to social cognitive motivation models. The social cognitive models stress that motivation comes from a number of different sources and it is important to understand how and why students are motivated for school and classroom achievement. This implies that motivation is not global and that it is more situated, contextual, and domain specific versus being an individual trait of a student. Furthermore, student motivation varies as a function of subject matter and classroom. In addition, social cognitive motivation assumes that a students' own thoughts about their motivation and learning is an important mediating factor in engagement and achievement (Linnenbrink & Pintrich, 2002).

According to Grootenboer and Hemmings (2007), an assumption exists in the field of education that positive mathematical beliefs, attitudes, and feelings are foundations to increasing math achievement. However, the relationship between affective factors and learning in mathematics is not simple, but it is complex and multi-facted. Self-regulated learning constructs are based on a foundation that presupposes the fact that both the will and the skill for students are present for performing successfully in the classroom. Positive motivational beliefs and strategy are assumed to lead to better performance in the classroom. In addition, the students' confidence in their ability to be successful in the classroom is a key motivational construct for elementary and high school students (Green, Crowson, Duke, &

Akey (2004). According to Gottfried, Fleming, and Gottfried (2001), the optimistic view of younger students in regards to their intrinsic motivation for learning and their sense of competence, along with a decrease in motivation occur from childhood through adolescence. According to Meece, Glienke, and Burg (2006) across all theories, findings appear to indicat that girls' and boys' motivation related beliefs and behaviors continue to follow gender role stereotypes. Boys' scores indicate higher abilities and interest in mathematics and science, while females have more confidence and interest in language arts and writing. The gender affects appear to be moderated by ability, ethnicity, socioeconomic status, and classroom context. This research emphasizes the role that the home and school environment have on gendered patterns of motivation. The importance that context plays in changing differences is considered by this research along with why ethnic minority and low income students, according to gender, may lose confidence in their academic abilities and that may lead to the eventual devaluation of their futures.

Keklik & Erdem-Keklik (2012) examined a convenient sample of 318 volunteer students from an Ankara, Turkey, high school that included 9th graders, 10th graders, and 11th grade students. The purpose of this study was to test if high school students' motivation and learning strategy scores differed significantly according to their gender, grade level, mothers' level of education and father's level of education. The study used the self-reporting MSLQ and a demographic questionnaire. The data were analyzed using a two-way MANOVA and ANOVA as a follow-up. The results of data analysis showed that student scores on motivation differed only according to grade level. Their scores on learning strategy factors differed by both gender and grade levels. This study did not consider course grade achievement or more than one school. In addition to motivation and learning strategies, the consideration of the performance of mathematics students based on age, gender, and sex are important to the context.

2.1 Gender/Sex and Mathematics Performance

Fennema (2000) found that the study of gender and learning differences in mathematics is complex and the number of forces and environments that operate in Society that influence learning are complex. Research over the past 30 plus years has helped to define and understand this complexity, but there is much more to learn. It is known that females do not participate in math related careers as often as males. It is also known that there are differences in the learning of mathematics, but that many scholars believe these differences are being reduced and that these differences are not important. Males appear to be more positive about math than females, but evidence shows that these attitudes are changing. This is a more complex topic than it appears to be and the research in this subject is often incomplete and inadequate in terms of learning and calculating mathematics.

According to Shields (1975), the study of gender differences in abilities and behaviors began in the 1880s. It included investigations into sex differences in brain size and complexity and their implications for cognitive and affective behavior, the hypothesis of greater male variability and its social implications, and the expression of maternal instinct. Romanes (1887) reported that scientists of the age concluded that female's brains were smaller thus not as large and as capable as a male's. He further reported that mental abilities were sex characteristics that were attributed to the size of the brain.

Gender differences in mathematics performance have been well established in the literature. Maccoby and Jacklin (1974) were instrumental in summarizing extant literature on gender differences, encompassing the results of many previous works. These findings concluded that boys tended to score better than females at 12-13 years of age and this gap widened in high school mathematics due in part to their interest in the subject and to taking more math and science courses along with other supporting contemporary data of the day.

Hyde, Fennema, and Lamon (1990) reported on gender differences in a meta-analysis on the differences in gender and mathematics performance in 100 studies involving over 3 million individuals primarily in the US. They found only minimal difference between the genders. These findings were supported in a meta-analysis by Lindberg, Hibley, Peterson, and Linn (2007), that analyzed gender differences in studies of math performance in US adolescents between 1990-2007, that represented 242 studies and nearly 1.3 million people that indicated no gender difference at d=.05. They also analyzed US adolescents over the past 20 years from large datasets based on a probability sampling and these findings combined support that males and females perform similarly in math.

2.2 Sex Differences versus Gender Differences in Mathematics Achievement

Santos, Ursini, Ramirez, and Sanchez (2006) investigated the relationship among achievement in math, sex, and gender differences in 12-13 years old in a population of 1,056 students in Mexico. The study found that when sex is considered no significant differences in students' mathematics achievement occurs, confirming other recent studies. However, when gender is taken into account without considering sex, significant differences occur between genders favoring students with masculine undifferentiated traits followed by students with masculine traits. When sex is considered a specific gender trait, significant differences appear between sexes. The boys performed better only when considered undifferentiated and both sees performed equally when gender was masculine-undifferentiated. These results stress the importance of doing research in which socio-cultural issues that define student gender traits are considered in addition to biological differences. Furthermore, those gender-math studies should consider socio-cultural aspects and how they impact boys and girls related to mathematics achievement. This may be considered the new paradigm.

Effects of Age, Grade Level, Gender and Ethnicity in High School Mathematics

Hoang (2008) investigated the different factors of grade level, gender, and ethnicity that impact the attitudes and learning environment of high school mathematics students in Los Angeles County, California. The study involved 600 students in grades 9 and 10 mathematics in 30 classes of one high school using. The theoretical framework for this study was based on recent research in mathematics education that focused on student academic achievement to studying the learning environment as a determinant of learning outcomes. The results indicated that males consistently reported slightly higher positive perceptions of classroom environment and attitudes than females. Scores among Anglo students were consistently higher than Hispanic student's scores. A strong association appeared between student attitudes and the learning environment.

Jabo, Machtmes, Kunga, and Buntat (2011) studied the factors of age and gender and how they influence achievement in high school mathematics. Their study compared students' grade point average (GPA) for mathematics during high school years and achievement in the U.S. by age, gender, and achievement in mathematics. The results of the study attempted to provide some evidence of age and gender as predictors to student math achievement. The conclusions of the findings were that the majority of high school students were between 17-18 years old and female and most had a grade of C or better. Female students had higher GPA scores in math than scores of males. The results indicated statistically significant evidence for females to score better than males on GPA and achieve more school and post-school qualifications. They recommended more studies on age, gender, and achievement that include the additional factors of cognitive ability, classroom behavior, biological factors, and other school factors.

3.0 Methodology

A number of research design options were considered to measure the relationship between age, sex, and ethnicity and their impact on motivation and learning strategies among high school mathematics students. The option that was determined to be most compatible with the purpose of this study was the descriptive quantitative. According to Reaves (1992), descriptive research is designed to provide a picture of the situation now and offer insights into how it might change in the future and how to accomplish this change.

3.1 Target Population

The target population for this study was limited to high school mathematics students in United States. This sample represented one high school in Central Kentucky, United States. A total of 204 ninth grade mathematics students participated in the study.

3.2 Selection of Participants

A convenience sample of 204 students from ten 9th grade mathematics classes of one public high school in Central Kentucky, USA, was selected for this study. Parents were sent a consent form to grant their children permission to participate in the study or to not allow permission without reprisal. Those students granted permission by their parents were given the survey with instructions that were also read by the teachers. Students were also read an informed consent script and given the option to opt out. The students then completed the surveys and turned them in to their teachers who then gave them to the researchers.

3.3 Procedure

School administration's permission was obtained during the first semester of the school year. Data was then obtained from students present at the school during the day that the surveys were administered. Parents were informed about the nature and purpose of the study and their consent was obtained. Students who volunteered to participate in study were given the survey and informed about its purpose during their respective class sessions. The survey consisted of the MSLQ scale and a demographic questionnaire. Completion of the instruments took between 20-30 minutes and the classroom teacher collected the completed surveys for the researchers.

3.4 Instrument

The instrument used for this study was the *Motivated Strategies for Learning Questionnaire (MSLQ), d*eveloped by Pintrich, Smith, Garcia and McKeachie in 1991. The MSLQ was developed as a self-report instrument designed to assess college students' motivational orientation and their use of different learning strategies for a college course. The MSLQ items are reports of what learning strategies a student uses (behaviors) or beliefs a student holds (attitudes). The questionnaire includes 15-factors and 81-items containing a motivation and a learning strategy section. This version was designed for use in the college classroom and among adult learners, but has also been used in the high school setting. The participants responded to these items on a 7-point Likert scale (1 = not at all true of me to 7 = very true of me) in terms of their behavior in mathematics classes. Participants were also asked to complete a demographic information section on the survey inquiring information pertaining to age (three categories), sex (female or male), and ethnicity (six categories),

The MSLQ was composed of two primary scales: motivation scales and learning strategy scales. The overall questionnaire is composed of fifteen subscales: (1) Intr: Intrinsic Goal

Orientation, (2) Extr: Extrinsic Goal Orientation, (3) Tsky: Task Value, (4) Cont: Control Beliefs about Learning, (5) Slfef: Self Efficacy for Learning & Performance, (6) Tanx: Test Anxiety, (7) Reh: Rehearsal, (8) Elab: Elaboration, (9) Org: Organization, (10) Crit: Critical Thinking, (11) Meg; Metacognitive Self-Regulation, (12) Tsdy: Time and Study Environment, (13) Eff: Effort Regulation, (14) Hsk: Help Seeking, (15) Prln: Peer Learning. Table 1 presents the scales and their corresponding subscales.

Table 1: Components of the MSLQ

Motivation Scales		Learning Strategy Scales	
Subscale	# of items	Subscale	# of items
1. Intrinsic Goal Orientation	4	1. Rehearsal	4
2. Extrinsic Goal Orientation	4	2. Elaboration	6
3. Task Value	6	3. Organization	4
4. Control of Learning Beliefs	4	4. Critical Thinking	5
5. Self-Efficacy for Learning & Performance	8	5. Metacognitive Self-Regulation	12
6. Test Anxiety	5	6. Time/Study Environmental Management	8
		7. Effort Regulation	4
		8. Peer Learning	3
		9. Help Seeking	4
Total Number of Items	31	Total Number of Items	50

The Cronbach reliability coefficient of the six motivation scales determined in this study was $\alpha = .73$ for Intrinsic Goal Orientation, $\alpha = .78$ for Extrinsic Goal Orientation, $\alpha = .73$ for Task Value, $\alpha = .68$ for Control Beliefs about Learning, $\alpha = .92$ for Self Efficacy for Learning & Performance, and was $\alpha = .73$ for Test Anxiety. The Cronbach reliability coefficient of the learning strategy scales was $\alpha = .73$ for Rehearsal, $\alpha = .79$ for Elaboration, $\alpha = .60$ for Organization, $\alpha = .75$ for Critical Thinking, $\alpha = .75$ for Metacognitive Self-Regulation, $\alpha = .14$ for Time and Study Environment, $\alpha = .73$ for Effort Regulation, $\alpha = .49$ for Help Seeking, and $\alpha = .45$ Peer Learning.

According to Pintrich, Smith, Garcia, and Mckeachie (1993), the correlations between the subscales are valid measures of the motivational and cognitive constructs. The results of research also suggest that the MSLQ has relatively good reliability in terms of internal consistency. The subscales also appear to show good predictive validity. In the researcher's conclusion regarding the MSLQ, it represents a useful, reliable, and valid means for assessing college student's motivation and use of learning strategies.

3.5 Data Collection

All completed questionnaires were collected by the teachers and returned to the researchers without reference to the student's name or identification. The data were then coded numerically and entered first into a spreadsheet created in EXCEL and SPSS for the purpose of data entry and storage.

3.6 Data Analysis

The MSLQ questionnaire including demographic questions yielded quantitative data. The reported scores for each of the fifteen MSLQ subscales were averaged to determine mean scores and standard deviations. Scores on the fifteen subscales demonstrated the level of motivation and learning strategies of the high school students. The eight-one questions of the MSLQ were also analyzed for mean score and standard deviation scores. The subscales and individual questions scores were then cross tabbed by each category of age, sex, and ethnicity to compare mean differences. MANOVA was then used to test if ninth grade mathematics students' scores on the motivation and learning strategies sections of the MSLQ differed significantly according to their age, sex, and ethnicity. In addition, analysis of variance (ANOVA) was examined for each independent variable.

4.0 Results

The purpose of this study was to determine the level of motivation and learning strategies among the variables and to determine if there is a relationship between them as demonstrated by high school mathematics students.

4.1 Characteristics of Respondents

The age of the participants were distributed among two categories. The age fourteen and under category made up 43% or 88, while the over fourteen category totaled 57% or 114 of the total number of 204 participants for this study. The sex of this study was made up of 52% or 106 males and 48% or 98 females. Ethnicity was measured using two categories. The Caucasian category was 83% or 169 the other category was 17% or 35 of the total participants. The sample consisted of two teachers who were teaching the classes from which the participating students were surveyed.

4.2 Research Question 1

This question investigated the levels of motivation and learning strategies demonstrated by ninth grade mathematics students in the United States among the categories of age, sex, and ethnicity. The highest mean scores for the fourteen and under category and over fourteen was the extrinsic motivation subscale, which also represented the largest mean difference between the two groups in the motivation scale, also. The lowest mean scores were seen in text anxiety among both age groups, too, with the next highest mean difference on the motivation subscales. In the learning strategies subscales effort regulation produced the highest mean scores and mean differences between the age groups. The difference between peer learning also represented a large comparative difference between age groups. Table 2 presents the age categories and mean scores for the motivation and learning strategies subscales.

Table 2: Mean Scores, SD, and Mean Differences for Motivation and Learning Scales by Age Categories

	Age				
	14 and Under		Over 14		Mean
	Mean	SD	Mean	SD	Difference
Motivation Scales					
1. Intrinsic Goal Orientation	4.01	1.68	4.00	1.67	0.01
2. Extrinsic Goal Orientation	5.11	1.62	5.37	1.59	-0.26

3. Task Value	4.01	1.73	4.05	1.71	-0.04
4. Control of Learning Beliefs	4.24	1.69	4.14	1.84	0.10
5. Self-Efficacy for Learning & Performance	4.17	1.72	4.14	1.70	0.03
6. Test Anxiety	4.03	1.92	4.28	1.95	-0.25
Totals	25.57		25.98		-0.41
Learning Strategies Scales					
1. Rehearsal	3.53	1.78	3.62	1.86	-0.09
2. Elaboration	3.58	1.76	3.62	1.74	-0.04
3. Organization	3.20	1.64	3.22	1.74	-0.02
4. Critical Thinking	3.41	1.59	3.61	1.64	-0.20
5. Metacognitive Self-Regulation	3.73	1.74	3.78	1.79	-0.05
6. Time/Study Environmental Management	3.94	1.98	3.85	2.05	0.09
7. Effort Regulation	4.66	1.69	4.34	1.85	0.32
8. Peer Learning	3.45	1.80	3.76	1.84	-0.31
9. Help Seeking	4.35	1.85	4.52	1.91	-0.17
Totals	33.85		34.32		-0.47

The highest mean score for male and females was the extrinsic motivation subscale. The largest mean difference between the two groups was in the self-efficacy for learning and performance motivation scale followed by test anxiety. The lowest mean scores were seen in test anxiety among both age groups, too, with the next highest mean difference on the motivation subscales. In the learning strategies subscales, effort regulation, produced the highest mean scores and mean differences between the age groups. The difference between peer learning also represented a large comparative difference between age groups. Table 3 presents the sex categories and mean scores for the motivation and learning strategies subscales.

Table 3: Mean Scores, SD, and Mean Differences for Motivation and Learning Scales by Sex

	Sex				
	Male		Female		Mean
	Mean	SD	Mean	SD	Difference
Motivation Scales					
1. Intrinsic Goal Orientation	4.11	1.71	3.93	1.65	0.18
2. Extrinsic Goal Orientation	5.22	1.59	5.28	1.60	-0.06
3. Task Value	4.05	1.72	4.02	1.76	0.03
4. Control of Learning Beliefs	4.16	1.8	4.19	1.78	-0.03
5. Self-Efficacy for Learning & Performance	4.45	1.65	3.98	1.75	0.47
6. Test Anxiety	4.01	1.96	4.40	2.01	-0.39
Totals	26.00			25.80	0.20
Learning Strategies Scales					
1. Rehearsal	3.54	1.79	3.71	1.94	-0.17
2. Elaboration	3.66	1.78	3.63	1.8	0.03
3. Organization	3.17	1.69	3.34	1.79	-0.17
4. Critical Thinking	3.61	1.66	3.48	1.65	0.13

5. Metacognitive Self-Regulation	3.71	1.75	3.86	1.84	-0.15
6. Time/Study Environmental Management	3.99	2.03	3.90	2.06	0.09
7. Effort Regulation	4.45	1.78	4.43	1.88	0.02
8. Peer Learning	3.60	1.80	3.74	1.94	-0.14
9. Help Seeking	4.35	1.92	4.57	1.85	-0.22
Totals	34.08		34.66		0.58

The highest mean scores for ethnicity on the motivation subscales were found in the extrinsic goal orientation subscale. The largest mean difference between the two groups was seen in the self-efficacy for learning and performance motivation scale followed by test anxiety. In the learning strategies subscales effort regulation represented the highest mean scores. Organization and elaboration produced the highest mean differences between the ethnicity groups on the learning strategies subscales. Table 4 presents the ethnicity categories and mean scores for the motivation and learning strategies subscales.

Table 4: Mean Scores, SD, and Mean Differences for Motivation and Learning Scales by Ethnicity

	Ethnicity				
	Caucasion		Other		Mean
	Mean	SD	Mean	SD	Difference
Motivation Scales					
1. Intrinsic Goal Orientation	3.98	1.67	4.08	1.86	-0.1
2. Extrinsic Goal Orientation	5.30	1.57	5.08	1.70	0.22
3. Task Value	4.00	1.71	4.18	1.76	-0.18
4. Control of Learning Beliefs	4.13	1.75	4.37	1.85	-0.24
5. Self-Efficacy for Learning & Performance	4.05	1.71	4.56	1.60	-0.51
6. Test Anxiety	4.31	1.92	3.68	1.94	0.63
Totals	25.77		25.95		-.018
Learning Strategies Scales					
1. Rehearsal	3.59	1.82	3.57	1.86	0.02
2. Elaboration	3.53	1.72	3.84	1.84	-0.31
3. Organization	3.14	1.66	3.49	1.80	-0.35
4. Critical Thinking	3.50	1.60	3.59	1.72	-0.09
5. Metacognitive Self-Regulation	3.71	1.74	3.94	1.86	-0.23
6. Time/Study Environmental Management	3.96	2.01	3.90	2.05	0.06
7. Effort Regulation	4.48	1.78	4.47	1.83	0.01
8. Peer Learning	3.58	1.80	3.75	1.93	-0.17
9. Help Seeking	4.46	1.86	4.41	1.94	0.05
Totals	33.95		34.96		-1.01

4.3 Research Question 2

This question investigated the relationship between the factors of age, sex, and ethnicity of ninth grade mathematics students' and their motivation to learn. First, Kendall's tau_b rank coefficient was used to determine statistical dependence between the independent variables (IVs) and dependent variables of the items comprising the motivation scales. Next, multivariate analysis of variance (MANVOVA) was utilized to look for an effect of the independent variables of age, sex, and ethnicity on the overall group of dependent variable items comprising the motivation scales of the MSLQ. The goal of the MANOVA was to look for an effect of one or more IVs on several DVs at the same time. The criteria was ALPHA= (.05), with the design using the IVs and combinations of IVs as follows: sex, age, ethnicity; sex * age; sex * ethnicity; age * ethnicity; sex * age * ethnicity. The significant findings are presented in terms of motivation and learning strategies scales and the demographics of age, sex, and ethnicity. A list of the items are presented in Appendix B.

4.3.1 Kendall's Tau_b

The MSLQ is made up of six motivation scales. Motivation scale one is the intrinsic goal orientation scale made up of four items. In the results from the survey only item one produced significant results. Sex was correlated with item one at a correlation coefficient of -0.125 at a .044 significance level (2-tailed). Ethnicity was correlated with item one at the correlation level of -.126 with a .039 significance level (2-tailed).

The motivation extrinsic value scale is made up of four items. Only item seven produced significant results. Ethnicity was found to be correlated to item seven with a -.149 coefficient at the .005 significance level (2-tailed). The motivation scale self-efficacy for learning and performance is comprised of eight items. Three items were found to produce significant results. Sex was found to be correlated to item fifteen with a -.118 coefficient at the .055 significance level (2-tailed). Sex was correlated to item twenty at the .157 coefficient at a .035 level of significance (two-tailed). Age was found to be correlated to item twenty nine with a coefficient of -.17 at the .005 significance level (two-tailed).

The motivation scale text anxiety is made up of five scales. Three items presented significant results. Age correlated to item twenty eight at .115 at a significance level of .005 (two-tailed). Sex also correlated to item twenty eight with a .144 coefficient at the .019 significance level. Ethnicity was correlated to item three at-.149 coefficient at the .014 significance level (two-tailed). Sex correlated to question fifteen with a .157 coefficient at the .011 significance level (two-tailed).

4.3.2 MANOVA

The analysis utilized the criteria that ALPHA= (.05), with the design examining IVs and combinations of IVs as follows: sex, age, ethnicity; sex * age; sex * ethnicity; age * ethnicity; sex * age * ethnicity. The p-values for the each of the four different multivariate tests of MANOVA did not yield significant results for the effect of the independent variables on the overall group of dependent variables comprising the motivation scales.

ANOVAs were then conducted as a "step down analysis" to analyze IVs and the individual dependent variable items of the motivation scales. The ANOVA for each of the IVs yielded some statistically significant results. Overall, the results indicated few results with F values that were statistically significant. However, the age category yielded item thirty-four with an F statistic higher than the critical value at a significant level. The category of sex yielded five items with F values greater than the critical value. Items 41, 66, 67, 71, and 73 were significantly significant in the analysis of sex. Ethnicity did not yield any items. The sex * age

analysis produced F values on items 46, 48, 66, and 78 that were greater than critical value and that were statistically significant. Sex * ethnicity produced three items; 49, 67, and 71, with an F value greater than critical value and that were significantly significant. Sex * Age * Ethnicity did not produce any items that were significant.

4.4 Research Question 3

This question investigated the relationship between the factors of age, sex, and ethnicity of ninth grade mathematics students' and their learning strategies. First, Kendall's tau_b rank coefficient was used to determine statistical dependence between the independent variables (IVs) and dependent variables of the items comprising the learning strategies scales. Next, multivariate analysis of variance (MANVOVA) was utilized to look for an effect of the independent variables of age, sex, and ethnicity on the overall group of dependent variable items comprising the learning strategies scales of the MSLQ. The goal of the MANOVA was to look for an effect of one or more IVs on the DVs at the same time. The criteria utilized was ALPHA= (.05), with the design using the IVs and combinations of IVs as follows: sex, age, ethnicity; sex * age; sex * ethnicity; age * ethnicity; sex * age * ethnicity. The significant findings are presented in terms of learning strategies scales and the demographics of age, sex, and ethnicity.

4.4.1 Kendall's Tau_b

The learning strategies scale of the MSLQ is made up of nine items. The first scale that produced significant results was the elaboration scale, which is made up of six items. The elaboration scale presented only one item with significant results. Age was correlated to item sixty nine with a -.117 coefficient at a .055 level of significance (two-tailed). The second scale of the learning strategies scale that produced significant results was organization, which is made up of four items. Ethnicity correlated to item forty-nine of the organization scale with a -.132 at a significance level of .03 (two-tailed).

The learning strategies critical thinking scale is made up of five items. Two items produced significant results from this scale. Ethnicity was correlated to item fifty one at -.118 at the .053 significance level (two-tailed). Age was correlated to item sixty-six with a.137 coefficient at a two-tailed significance level of .026. The learning strategies metacognitive self-regulation scale is made up of twelve items. Only two items produced significant results in this scale. Sex was correlated to question with a .126 coefficient at a .041 level of two-tailed significance. Sex was correlated to item sixty six with a .137 coefficient at a .026 significance level (two-tailed).

The learning strategies peer learning scale is comprised of three items. Item thirty four was found to produce significant results. Age was correlated to item thirty four with a coefficient of .175 at a .004 two-tailed significance. The learning strategies help seeking scale is made up of four times. Only one item produced significant results. Ethnicity was found to be correlated to item forty with .123 coefficient at a .041 significance level of .041 (two-tailed).

4.4.2 MANOVA

The p-values for the each of the four different multivariate tests of MANOVA did not yield significant results for the effect of the independent variables on the overall group of dependent variables comprising the learning strategies scales. Utilizing the criteria that ALPHA= (.05), with the design examining IVs and combinations of IVs as follows: sex, age, ethnicity; sex * age; sex * ethnicity; age * ethnicity; sex * age * ethnicity. ANOVAs were then conducted as a "step down analysis" to analyze IVs and the individual dependent variable items of the motivation strategies scales.

ANOVAs were then conducted as a "step down analysis" to analyze IVs and the individual dependent variable items of the learning strategies scales. The ANOVA for each of the IVs did yield some statistically significant results. Overall, the results indicated few results with F values that were statistically significant. However, the demographic category of sex yielded one item with F values greater than the critical value, which was item thirty-five. The age category yields item nineteen with an F statistic higher than the critical value at a significant level. Ethnicity yields item three as an item with an F value greater than the critical value that was statistically significant. The sex * age analysis produced F values on item nineteen that was greater than critical value and was statistically significant. Sex * Ethnicity produced no items with an F value greater than critical value and that were significantly significant. Sex * Age * Ethnicity yielded items nineteen and twenty-four, whose value was greater than critical and were statistically significant.

5.0 Discussion

The connections between age, sex, and ethnicity and high school math student's motivation and learning strategies should be explored in greater depth. Evidence from the current study suggests that relationships exist between the constructs, as presented in the theoretical model shown in Figure 1. Furthermore, a greater understanding of motivation and learning strategies can assist teachers and students alike with realizing that mathematics success is a function of desire, effort, commitment, and learning strategies.

Developing a better understanding of motivation and learning strategies in young mathematics students is important for educators because of its importance in improving mathematics education and learning along with improving test scores relative to the rest of world, and the impact that it has on their lifelong success. With declining test scores in mathematics in the United States, education professionals and the public are concerned with improving the factors that affect student success. Developing interventions to assist students with challenges that impact mathematics learning as related to age, sex, ethnicity, motivation, learning strategies, and other factors are necessary early in a student's academic career.

Results from question one indicate the levels of motivation and learning strategies in total and for each category sorted by age, sex, and ethnicity in this population of 9^{th} grade mathematics students. These scores presented some differences based on the factors of age, sex, and ethnicity in terms of total mean scores for the scales of motivation and learning strategies and for the scale scores.

A significant finding occurred regarding age and summary scores for motivation and learning strategies. The total mean scores were higher for the group of students over fourteen years of age in the motivation for learning scale. In addition, scores for students over fourteen were higher for the total mean score for strategies for learning. In addition, there were several motivation and learning category scale category differences that require further research. These results may signify that age and maturity may indeed be a factor in motivation and learning strategies. However, the academic motivation and learning strategies for older and younger students at this age level has not been compared in previous studies using the MSLQ. At the college level, no significant differences in course performance or motivation and learning strategies occurred due to age or class (Justice and Dornan, 2001; Santarosa, 2011).

Additionally, the very small age span for students in this study for 9^{th} grade mathematics students may be a limiting factor. It is recommended that further research be conducted among a larger age span of students and possibly in a longitudinal study to determine change. An additional weakness of cross-sectional research is that the researcher cannot confidently make certain inferences about what the data means. While the researcher may find a

significant difference or correlations between groups in the study, there is no way of knowing with certainty why that difference is present.

The findings from the study concerning sex and the differences in male and female mean scores for motivation and learning strategies provide interesting results. The overall mean scores for motivation between male and females were virtually the same considering the overall mean score, but several individual item or scale results produced differences. Self-efficacy for learning and performance along with test anxiety mean scores were higher for females than males. It appears that in this study, females are slightly more confident about completing tasks and possibly more anxious about their mathematics courses. The differences between males and females on these items should be investigated further. Females scored slightly higher on the overall learning strategies mean scores than did male participants. It appears that females in this study, overall, utilize learning strategies more than males.

The findings from the study concerning the two groups considered for ethnicity, also yield interesting results. The "other than" Caucasian category produced higher overall mean scores for both motivation and learning strategies. Self-efficacy for learning and performance along with test anxiety mean scores were higher for the other than Caucasian group. It appears that in this group that they may be more confident than Caucasians about completing tasks and possibly more anxious about their mathematics courses. The individual items that yielded the largest mean score differences were elaboration and organization in learning strategies with the other group producing higher scores indicating greater use of these strategies in their classes.

For research question 2, correlations were found between age, sex, ethnicity, and motivation strategies. Correlations were examined by item rather than by scale to determine specific relationships. Age, sex, and ethnicity were found to be correlated to specific items, but not to overall scales. Correlations between learner variables and mathematics achievement have been found in numerous studies (Walker and Plato, 2000; Shores, Shannon, and Smith, 2010; Jabor, Kungu, Machtemes, Buntat, and Nordin, 2011). However, little research has been conducted in high school mathematics students to examine the relationships age, sex, and gender and motivation as measured by the MSLQ. The scales of the MSLQ are made up of various items, as presented in Appendix A, Table 5. The specific item correlations are presented in Appendix A, Table 6. The MSLQ items are presented in Appendix A, MSLQ Survey-Items List. Further research is needed to examine these correlations in other studies and longitudinally to see if there is a pattern in a larger population.

In the MANOVA for age, sex, and ethnicity and the various combinations of variables the motivation scales, no significant differences were determined. However, the ANOVA for individual dependent variable items of the motivation strategies scales, found a few statistically significant results. In terms of sex, sex * age, and sex * ethnicity for individual motivation items as part of overall scales several produced significant results with F values greater than critical, so it appears that the category of sex and its combinations with other IVs should be further investigated. In addition, more research is needed to determine results in more than one high school, and in larger populations, and longitudinally to generalize findings. It may also be beneficial to conduct further research with motivation strategies, high school math students, and course grades or outcomes.

For research question 3, correlations were found between age, sex, ethnicity, and learning strategies. Correlations were examined by item rather than by scale to determine specific relationships. Age, sex, and ethnicity were found to be correlated to specific items, but not to overall scales. However, little research has been conducted among high school mathematics students to examine the relationships age, sex, and gender and learning strategies, as measured by the MSLQ. The scales of the MSLQ are made up of various items, as presented in Appendix A, Table 5. The specific item correlations are presented in Appendix A, Table 6.

The MSLQ items are presented in Appendix A, MSLQ Survey-Items List. Further research is needed to examine these correlations in other studies and longitudinally to see if there is a pattern in a larger population.

In the MANOVA for age, sex, and ethnicity and the various combinations of variables the learning scales, no significant differences were determined. However, the ANOVA for individual dependent variable items of the learning strategies scale found a few statistically significant results, but more research is needed to determine what these results mean in more than one high school, and in larger populations, and longitudinally, in order to generalize findings. It may also be beneficial to conduct further research with learning strategies, high school math students, and course grades or outcomes.

Additional, study limitations include the self-report method, voluntary agreement to participate, and no randomization. Students are assigned to classrooms, thus no randomization occurs and this present s difficulty in generalizing results to other populations. Since the parents authorized participations and students agreed to participate, means that they were not randomly selected for this study. In addition, only one school was used for this study, so generalization to other populations is further hampered.

6.0 Conclusions

There are many factors that impact success in high school mathematics from socioeconomic factors to the teaching approach taken by the instructor. However, the motivational and learning strategies that students utilize are just as important as many of the other factors considered. This study examined the motivation and learning strategies of high school mathematics students in one Central Kentucky High School, considering the factors of age, sex, and ethnicity. Despite the limitations of the study, findings indicate relationships between age, sex, ethnicity, and student motivation and learning strategies in mathematics classes.
The success of students in high school and mathematics courses is related to student success in college and market earnings in adulthood (French, Homer and Robins, 2010). If educators can identify successful motivation and learning strategies among their students and share these findings to others along with developing intervention strategies, it is possible to raise the bar in mathematics performance among students in the United States. Low performance among certain ages, sex, and gender may ultimately rest in whether or not teachers are able to incorporate culturally sensitive teaching techniques and employing innovative teaching approaches that integrate math into real world situations (Walker and Plata, 2000). Improving math performance includes developing motivation skills and learning strategies. Improving math performance through inspiration, incentives, and motivation to invest more time and effort in their mathematics high school coursework will benefit the students, the teaching profession, and society.

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Appendix A

Table 5: Questions Compromising the 15 MSLQ Scales and Subscales

Motivation Subscales	Questions Comprising the Scale
1. Intrinsic Goal Orientation	1, 16, 22, 24
2. Extrinsic Goal Orientation	7, 11, 13, 30
3. Task Value	4, 10, 17, 23, 26, 27
4. Control of Learning Beliefs	2, 9, 18, 25
5. Self-Efficacy for Learning & Performance	5, 6, 12, 15, 20, 21, 29, 31
6. Test Anxiety	3, 8, 14, 19, 28
Learning Strategies Subscales	
1. Rehearsal	39, 46, 59, 72
2. Elaboration	53, 62, 64, 67, 69, 81
3. Organization	32, 42, 49, 63
4. Critical Thinking	38, 47, 51, 66, 71
5. Metacognitive Self-Regulation	33, 36,41,44, 54, 55, 56, 57,
	61, 76, 78, 79
6. Time/Study Environmental Management	35, 43, 52, 65, 70, 73, 77, 80
7. Effort Regulation	37, 48, 60, 74
8. Peer Learning	34, 45, 50
9. Help Seeking	40, 58, 68, 75

Table 6. Correlations Between Demographics and MSLQ Questions

	Age			Sex			Ethnicity		
	Correlation	Sig.		Correlation	Sig.		Correlation	Sig.	
Question	Coefficient	(2-tailed)	N	Coefficient	(2-tailed)	N	Coefficient	(2-tailed)	N
1	-.047	.454	204	*-.125	.044	204	*-.126	.039	204
2	.061	.322	204	.014	.815	204	-.032	.596	204
3	-.018	.767	204	.066	.285	204	**-.171	.005	204
4	-.037	.548	204	-.013	.834	204	-.093	.126	204
5	-.073	.236	204	-.115	.063	204	-.093	.125	204
6	-.029	.638	204	-.163	.009	204	-.082	.178	204
7	.064	.304	204	.020	.751	204	.046	.451	204
8	-.023	.709	204	.051	.407	204	.057	.347	204
9	-.102	.099	204	.047	.447	204	-.052	.394	204
10	-.072	.251	204	.086	.169	204	.068	.266	204
11	.082	.193	204	.030	.638	204	.072	.245	204
12	-.016	.793	204	-.068	.275	204	-.073	.230	204
13	.105	.095	204	-050	.424	204	-.019	.762	204
14	*.137	.027	204	-.020	.743	204	.014	.086	204
15	.013	.832	204	-.118	.055	204	-.149	.014	204
16	.013	.829	204	-.111	.071	204	.020	.738	204
17	.087	.160	204	-.084	.177	204	-.045	.466	204
18	.022	.727	204	.042	.499	204	-.065	.29	204
19	.089	.147	204	*.157	.011	204	*.119	.049	204
20	-.024	.698	204	*-.131	.035	204	.093	.127	204
21	.014	.819	204	-.084	.173	204	-.062	.306	204
22	-.005	.940	204	.045	.467	204	.044	.475	204
23	.032	.613	204	-.016	.802	204	-0.85	.168	204
24	.019	.761	204	-.057	.361	204	-.028	.644	204
25	-.067	.281	204	-.052	.404	204	-.029	.628	204
26	.060	.333	204	-.067	.281	204	-.080	.186	204
27	.018	.775	204	-.005	.935	204	.014	.813	204
28	.084	.170	204	*.144	.019	204	.115	.057	204
29	.037	.544	204	-.064	.302	204	**-.170	.005	204
30	.059	.342	204	.106	.088	204	.080	.190	204
31	-.017	.780	204	-.063	.305	204	-.109	.071	204
32	-.030	.627	204	.012	.842	204	-.088	.149	204
33	-.054	.378	204	-.031	.611	204	-.033	.526	204
34	**.175	.004	204	-.006	.926	204	-.020	.744	204
35	.105	.089	204	.024	.694	204	.007	.902	204
36	.073	.246	204	-.047	.454	204	.037	.547	204
37	-.090	.144	204	.013	.835	204	.018	.770	204
38	-.004	.952	204	-.008	.899	204	.054	.377	204
39	.047	.449	204	.033	.587	204	.020	.738	204

40	-.059	.340	204		.041	.501	204		*.123	.041	204
41	.083	.178	204		*.126	.041	204		.048	.434	204
42	-.041	.504	204		.006	.929	204		-.019	.758	204
43	-.077	.214	204		.035	.575	204		-.045	.460	204
44	.025	.689	204		.048	.436	204		-.089	.142	204
45	.035	.570	204		.057	.358	204		-.036	.549	204
46	-.063	.308	204		.083	.180	204		-.008	.894	204
47	.001	.981	204		.004	.951	204		.027	.660	204
48	-.089	.149	204		.076	.218	204		-.026	.664	204
49	-.010	.876	204		.079	.203	204		*-.132	.030	204
50	.004	.943	204		.007	.912	204		-.035	.571	204
51	.060	.331	204		-.006	.929	204		-.118	.053	204
52	.083	.178	204		-.088	.151	204		.061	.308	204
53	.010	.869	204		.043	.487	204		-.064	.291	204
54	-.008	.901	204		.014	.824	204		-.022	.722	204
55	.024	.703	204		.050	.421	204		-.073	.228	204
56	.035	.570	204		.073	.233	204		-.020	.742	204
57	-.059	.338	204		-.132	.032	204		-.090	.135	204
58	.075	.223	204		.061	.324	204		-.082	.173	204
59	.011	.853	204		-.023	.705	204		.018	.760	204
60	-.078	.207	204		-.007	.909	204		.005	.937	204
61	-.045	.471	204		**.204	.001	204		-.022	.714	204
62	-.002	.981	204		-.073	.240	204		-.066	.280	204
63	.078	.207	204		-.016	.795	204		-.047	.440	204
64	.009	.890	204		-.051	.407	204		-.028	.639	204
65	.116	.060	204		-.051	.412	204		.067	.267	204
66	*.137	.026	204		-.101	.103	204		-.001	.986	204
67	.019	.763	204		-.033	.602	204		-.046	.450	204
68	.069	.266	204		.073	.236	204		-.010	.871	204
69	.025	.690	204		-.039	.530	204		-.117	.055	204
70	-.062	.315	204		.020	.742	204		-.037	.542	204
71	.065	.296	204		-.090	.147	204		-.027	.663	204
72	.088	.155	204		-.031	.615	204		-.034	.577	204
73	-.009	.890	204		.009	.895	204		.044	.494	204
74	-.026	.681	204		-.016	.799	204		.009	.885	204
75	.071	.252	204		-.012	.851	204		.027	.655	204
76	-.028	.651	204		.089	.151	204		-.016	.794	204
77	-.033	.593	204		-.019	.761	204		.007	.908	204
78	.112	.070	204		.006	.924	204		-.048	.432	204
79	.059	.339	204		.019	0.752	204		-.110	.069	204
80	-.101	.101	204		-.077	0.211	204		-.042	.491	204
81	.015	.809	204		-.096	.120	204		-.047	.442	204
Note. * Correlation is significant at the 0.05 level				** Correlation is significant at the 0.01 level (2-tailed)							

Appendix B

MSLQ Survey-Items List

The following is a list of the 81 items that make up the MSLQ (from Pintrich et al., 1991):

The following questions ask about your learning strategies and study skills for this class. Again, there are no rights or wrong answers. Answer the questions about how you study in this class as accurately as possible. Use the same scale to answer the remaining questions. If you think the statement is very true of you, circle 7; if a statement is not at all true of you, circle 1. If the statement is more or less true of you, find the number between 1 and 7 that best describes you.

1	2	3	4	5	6	7
Not at all true of me						Very true of me

Part A. Motivation

1. In a class like this, I prefer course material that really challenges me so I can learn new things.
2. If I study in appropriate ways, then I will be able to learn the material in this course.
3. When I take a test I think about how poorly I am doing compared with other students.
4. I think I will be able to use what I learn in this course in other courses.
5. I believe I will receive an excellent grade in this class.
6. I'm certain I can understand the most difficult material presented in the readings for this course.
7. Getting a good grade in this class is the most satisfying thing for me right now.
8. When I take a test I think about items on other parts of the test I can't answer.
9. It is my own fault if I don't learn the material in this course.
10. It is important for me to learn the course material in this class.
11. The most important thing for me right now is improving my overall grade point average, so my main concern in this class is getting a good grade.
12. I'm confident I can learn the basic concepts taught in this course.
13. If I can, I want to get better grades in this class than most of the other students.
14. When I take tests I think of the consequences of failing.
15. I'm confident I can understand the most complex material presented by the instructor in this course.
16. In a class like this, I prefer course material that arouses my curiosity, even if it is difficult to learn.
17. I am very interested in the content area of this course.
18. If I try hard enough, then I will understand the course material.
19. I have an uneasy, upset feeling when I take an exam.
20. I'm confident I can do an excellent job on the assignments and tests in this course.
21. I expect to do well in this class.
22. The most satisfying thing for me in this course is trying to understand the content as thoroughly as possible.
23. I think the course material in this class is useful for me to learn.
24. When I have the opportunity in this class, I choose course assignments that I can learn from even if they don't guarantee a good grade.

25. If I don't understand the course material, it is because I didn't try hard enough.
26. I like the subject matter of this course.
27. Understanding the subject matter of this course is very important to me.
28. I feel my heart beating fast when I take an exam.
29. I'm certain I can master the skills being taught in this class.
30. I want to do well in this class because it is important to show my ability to my family, friends, employer, or others.
31. Considering the difficulty of this course, the teacher, and my skills, I think I will do well in this class.

Part B. Learning Strategies

32. When I study the readings for this course, I outline the material to help me organize my thoughts.
33. During class time I often miss important points because I'm thinking of other things. (reverse coded)
34. When studying for this course, I often try to explain the material to a classmate or friend.
35. I usually study in a place where I can concentrate on my course work.
36. When reading for this course, I make up questions to help focus my reading.
37. I often feel so lazy or bored when I study for this class that I quit before I finish what I planned to do. (Reverse coded)
38. I often find myself questioning things I hear or read in this course to decide if I find them convincing.
39. When I study for this class, I practice saying the material to myself over and over.
40. Even if I have trouble learning the material in this class, I try to do the work on my own, without help from anyone. (Reverse coded)
41. When I become confused about something I'm reading for this class, I go back and try to figure it out.
42. When I study for this course, I go through the readings and my class notes and try to find the most important ideas.
43. I make good use of my study time for this course.
44. If course readings are difficult to understand, I change the way I read the material.
45. I try to work with other students from this class to complete the course assignments.
46. When studying for this course, I read my class notes and the course readings over and over again.
47. When a theory, interpretation, or conclusion is presented in class or in the readings, I try to decide if there is good supporting evidence.
48. I work hard to do well in this class even if I don't like what we are doing.
49. I make simple charts, diagrams, or tables to help me organize course material.
50. When studying for this course, I often set aside time to discuss course material with a group of students from the class.
51. I treat the course material as a starting point and try to develop my own ideas about it.
52. I find it hard to stick to a study schedule. (reverse coded)
53. When I study for this class, I pull together information from different sources, such as lectures, readings, and discussions.
54. Before I study new course material thoroughly, I often skim it to see how it is organized.
55. I ask myself questions to make sure I understand the material I have been studying in this class.
56. I try to change the way I study in order to fit the course requirements and the instructor's teaching style.
57. I often find that I have been reading for this class but don't know what it was all about. (Reverse coded)

58. I ask the instructor to clarify concepts I don't understand well.
59. I memorize key words to remind me of important concepts in this class.
60. When course work is difficult, I either give up or only study the easy parts. (Reverse coded)
61. I try to think through a topic and decide what I am supposed to learn from it rather than just reading it over when studying for this course.
62. I try to relate ideas in this subject to those in other courses whenever possible.
63. When I study for this course, I go over my class notes and make an outline of important concepts.
64. When reading for this class, I try to relate the material to what I already know.
65. I have a regular place set aside for studying.
66. I try to play around with ideas of my own related to what I am learning in this course.
67. When I study for this course, I write brief summaries of the main ideas from the readings and my class notes.
68. When I can't understand the material in this course, I ask another student in this class for help.
69. I try to understand the material in this class by making connections between the readings and the concepts from the lectures.
70. I make sure that I keep up with the weekly readings and assignments for this course.
71. Whenever I read or hear an assertion or conclusion in this class, I think about possible alternatives.
72. I make lists of important items for this course and memorize the lists.
73. I attend this class regularly.
74. Even when course materials are dull and uninteresting, I manage to keep working until I finish.
75. I try to identify students in this class whom I can ask for help if necessary.
76. When studying for this course I try to determine which concepts I don't understand well.
77. I often find that I don't spend very much time on this course because of other activities. (reverse coded)
78. When I study for this class, I set goals for myself in order to direct my activities in each study period.
79. If I get confused taking notes in class, I make sure I sort it out afterwards.
80. I rarely find time to review my notes or readings before an exam. (Reverse coded)
81. I try to apply ideas from course readings in other class activities such as lecture and discussion.