A STRUCTURAL MODEL ON 7th GRADE STUDENTS' MOTIVATIONAL BELIEFS, USE OF SELF-REGULATION STRATEGIES, AND MATHEMATICS ACHIEVEMENT

A THESIS SUBMITTED TO
THE GRADUATE SCHOOL OF SOCIAL SCIENCES
OF
MIDDLE EAST TECHNICAL UNIVERSITY

BY

FATMA KAYAN FADLELMULA

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR
THE DEGREE OF DOCTOR OF PHILOSOPHY
IN THE DEPARTMENT OF
ELEMENTARY EDUCATION

SEPTEMBER 2011

Approval of the Graduate School of Social Sciences

Prof. Dr. Meliha Altunışık

Director

I certify that this thesis satisfies all the requirements as a thesis for the degree of Doctor of Philosophy.

Assoc. Prof. Dr. Jale Çakıroğlu
Head of Department

This is to certify that we have read this thesis and that in our opinion it is fully adequate, in scope and quality, as a thesis for the degree of Doctor of Philosophy.

Assoc. Prof. Dr. Semra Sungur Co-Supervisor	Assoc. Prof. Dr. Erdinç Çakıroğlu Supervisor

Examining Committee Members

Assoc. Prof. Dr. Seniye Renan Sezer (Ankara Univ, ELE)

Assoc. Prof. Dr. Erdinç Çakıroğlu (M.E.T.U., ELE)

Assoc. Prof. Dr. Semra Sungur (M.E.T.U., ELE)

Assist. Prof. Dr. Yeşim Çapa Aydın (M.E.T.U., EDS)

Assist. Prof. Dr. Mine Işıksal Bostan (M.E.T.U., ELE)

I hereby declare that all information in this document has been obtained and presented in accordance with academic rules and ethical conduct. I also declare that, as required by these rules and conduct, I have fully cited and referenced all material and results that are not original to this work.

Name, Last name: Fatma Kayan Fadlelmula

Signature :

ABSTRACT

A STRUCTURAL MODEL ON 7th GRADE STUDENTS' MOTIVATIONAL BELIEFS, USE OF SELF-REGULATION STRATEGIES, AND MATHEMATICS ACHIEVEMENT

Kayan Fadlelmula, Fatma

Ph.D., Department of Elementary Education
Supervisor: Assoc. Prof. Dr. Erdinç Çakıroğlu
Co-Supervisor: Assoc. Prof. Dr. Semra Sungur

September 2011, 263 pages

This study was conducted in an attempt to integrate a number of cognitive, motivational and behavioral factors in elementary mathematics education, and to develop a theoretical model that explains the direct and indirect relationships among these concepts and their underlying dimensions. In particular, it was intended to examine the interrelationships among students' achievement goal orientations, perception of classroom goal structure, self-efficacy, use of self-regulatory strategies, and academic achievement in mathematics.

Participants were 1019 seventh grade students, enrolled in public elementary schools, located in four different urban and rural districts in Ankara. A self-report questionnaire and a mathematics achievement test were administered to the participants during their regular class periods. A pilot study was carried out with 250 seventh grade students, for conducting exploratory factor analysis.

Structural equation modeling technique was used for data analysis. First, confirmatory factor analyses were conducted for each factor in the questionnaire. Then, a structural equation model was developed for the whole sample. Results revealed that students' perceptions of classroom goal structure were directly linked to their adoption of achievement goal orientations. Among these goal orientations, only mastery goal orientation was associated with students' use of learning strategies, which, in turn, related to their mathematics achievement. Among the learning strategies, only elaboration was significantly related to students' mathematics achievement. Besides, self-efficacy was both directly and indirectly related to students' adoption of achievement goals, use of learning strategies, and mathematics achievement.

Keywords: Self-Regulation Strategies, Achievement Goal Orientation, Self-Efficacy, Elementary Mathematics Education, Structural Equation Modeling

ÖZ

İLKÖĞRETİM 7. SINIF ÖĞRENCİLERİNİN GÜDÜSEL İNANIŞLARI, ÖZ-DÜZENLEME STRATEJİLERİ VE MATEMATİK BAŞARILARINA İLİŞKİN BİR YAPISAL MODEL

Kayan Fadlelmula, Fatma

Doktora, İlköğretim Bölümü
Tez Yöneticisi: Doç. Dr. Erdinç Çakıroğlu
Ortak Tez Yöneticisi: Doç. Dr. Semra Sungur

Eylül 2011, 263 sayfa

Bu çalışmanın amacı ilköğretim matematik eğitimi ile ilgili bazı bilişsel, güdüsel ve davranışsal kavramları bir araya getirip bu kavramlar arasındaki doğrudan veya dolaylı ilişkileri açıklayan bir yapısal model oluşturmaktır. Bu bağlamda, öğrencilerin matematik öğrenmeye ilişkin hedef yönelimleri, derse yönelik hedef algıları, öz-yeterlik inanışları, öz-düzenleme strateji kullanımları ile matematik başarıları arasındaki ilişki incelenmiştir.

Katılımcılar, Ankara'nın farklı merkez ve kırsal ilçelerindeki devlet okullarına devam eden 1019 yedinci sınıf öğrencisinden oluşmaktadır. Veri toplama aracı olarak bir anket ve bir matematik başarı testi, katılımcıların normal ders saatleri sırasında uygulanmıştır. Ana çalışma öncesinde 250 yedinci sınıf öğrencisi ile bir pilot çalışma gerçekleştirilmiştir. Pilot çalışmadan elde edilen veriler, anket maddelerinin faktör yapılarını incelemek ve amacına uymayan maddeleri belirlemek üzere açımlayıcı faktör analizi yapmak için kullanılmıştır.

Ana çalışmada veri analizi için yapısal eşitlik modellemesi tekniği kullanılmıştır. Esas veri analizinden önce ölçekte yer alan her bir kavrama yönelik doğrulayıcı faktör analizi yapılmıştır. Sonra, tüm örnekleme yönelik yapısal eşitlik modellemesi çalışılmıştır. Elde edilen modele göre öğrencilerin matematik dersine yönelik hedef algıları, kişisel hedef yönelimleri ile doğrudan ilişkili bulunmuştur. Bu hedef yönelimlerinin arasında sadece öğrenme yönelimi, öğrencilerin strateji kullanımlarıyla ve dolaylı olarak matematik başarıları ile ilişkili bulunmuştur. Ayrıca öğrencilerin kullandıkları öğrenme stratejileri arasında sadece ayrıntılandırma strateji kullanımı matematik başarıları ile anlamlı ilişkili bulunmuştur. Bunun yanında öz-yeterlik hem doğrudan hem de dolaylı olarak öğrencilerin hedef yönelimleri, öğrenme strateji kullanımları ve matematik başarıları ile ilişkili bulunmuştur.

Anahtar Kelimeler: Öz-Düzenleme Statejileri, Hedef Yönelimi, Öz-Yeterlik, İlköğretim Matematik Eğitimi, Yapısal Eşitlik Modellemesi

To My Sweet Daughter Esra, My Husband, and Family;

I love you so much

This poem is from my dear husband;

Congratulations

Day after day everybody knows you can say you're taking steps along the great way.
Reading, writing and a lot more to say are what made you a great doctor today.
Faithfull, thoughtful, kind and respectful, or just let me say that you are wonderful.
A great wife, a great mother, you do always your best to please the others.
Talking to you, listening to you, even just watching you're the things we enjoy to do
May God bless you and keep you; we really can not do without you.
A lot of love from me and the little E.

Mohamed & Esra

ACKNOWLEDGMENTS

First of all, I would like to express my deepest gratitude to my supervisor Assoc. Prof. Dr. Erdinç Çakıroğlu and co-supervisor Assoc. Prof. Dr. Semra Sungur for their guidance, advice, criticism, encouragements and insight throughout this research.

I would like to thanks to the Scientific and Technological Research Council of Turkey for their financial support throughout all my doctoral study.

I would like to especially thank my dear husband Mohamed Fadlelmula and my parents for their great patience and constant understanding through all my study.

I also would like to thank Assist. Prof. Dr. Mine Işıksal Bostan, Meriç Özgeldi, Gönül Kurt, Şerife Seviş, Gamze Kurt, Fatmagül Emer, and Academic Writing Center at METU for their suggestions and comments on the thesis instrument. Specially, I am grateful to Utkun Aydın for her guidance in the LISREL software.

Also, I would like to express my deep gratitude to my friends Eda and Tolga Özgüneylioğlu, Mayada Osman, and Samir Hamid for their tremendous friendship, help, and understanding at all times.

Besides, I wish to express my sincere appreciation to all of the school administrators, teachers, and students who participated in this study. Their time, responses, and reflections provided a depth of information in the present study.

This study was supported by the METU Scientific Research Projects Grant No: BAP-07.03.2010.0012.

Finally, I thank the members of my committee for their willingness to serve on the committee and their valuable feedback. Thank you all very much indeed.

TABLE OF CONTENTS

PLAGIARISM iii
ABSTRACT iv
ÖZ vi
DEDICATION viii
ACKNOWLEDGMENTS ix
TABLE OF CONTENTS x
LIST OF TABLES xiv
LIST OF FIGURES xvii
LIST OF ABBREVIATIONS xviii
CHAPTERS

1. INTRODUCTION 1

1.1. Background of the Study 1
1.2. Purpose of the Study 6
1.3. Research Question 7
1.4. Hypothesis 8
1.5. Significance of the Study 9
1.6. Definitions of the Terms 11

2. LITERATURE REVIEW 15

2.1. Introduction 15
2.2. Self-Regulation 16
2.2.1. Self-Regulation and Mathematics Education 17

2.2.1.1. Self-Regulation and the New Mathematics Curriculum 19
2.2.3. Achievement Goals 22
2.2.3.1. Mastery versus Performance Goals 25
2.2.3.2. Approach versus Avoidance Goals 28
2.2.3.3. Multiple Goals 30
2.2.4. Classroom Goal Structure 32
2.2.5. Self-Efficacy 33
2.2.6. Strategy Use 35
2.3. RESEARCH ON THE RELATED CONSTRUCTS 36
2.3.1. Research on Achievement Goals 36
2.3.2. Research on Classroom Goal Structure 39
2.3.3. Research on Self-Efficacy 43
2.3.4. Research on Strategy Use 45
2.3.5. Related Research Conducted in Turkey 48
2.4. SUMMARY OF THE LITERATURE REVIEW 52
3. METHODOLOGY 54
3.1. PARTICIPANTS 54
3.2. INSTRUMENTATION 57
3.2.1. The Questionnaire 58
3.2.1.1. Achievement Goal Orientation Scale 60
3.2.1.2. Perception of Classroom Goal Structure Scale 61
3.2.1.3. Self-Efficacy Scale 62
3.2.1.4. Learning Strategies Scale 62
3.2.1.5. Summary of the Scales 64
3.2.2. Mathematics Achievement Test 66
3.3. DEVELOPMENT OF THE INSTRUMENT 70

3.3.1. Translation of the Scales 70

3.3.2. Expert Opinions 72

3.3.3. Pilot Study 73

3.4. CONFIRMATORY FACTOR ANALYSIS 83

3.4.1. CFA for Achievement Goal Orientation Scale 83

3.4.2. CFA for Perception of Classroom Goal Structure Scale 86

3.4.3. CFA for Self-Efficacy Scale 89

3.4.4. CFA for Learning Strategies Scale 91

3.5. PROCEDURES 95

3.5.1. Data Collection Procedures 95

3.5.2. Data Analysis Procedures 96

3.6. ASSUMPTIONS AND LIMITATIONS OF THE STUDY 97

4. RESULTS 99

4.1. PRELIMINARY DATA ANALYSIS 99

4.1.1. Data Screening Procedures 99

4.1.1.1. Accuracy of Data 100

4.1.1.2. Missing Data 100

4.1.1.3. Outliers 101

4.1.2. Descriptive Analyses 103

4.1.3. Assumptions 105

4.2. STRUCTURAL EQUATION MODELING ANALYSIS 110

4.2.1. Structural Equation Model 110

4.2.2. Effect Size 121

4.2.3. Power 122

5. DISSCUSSION, CONCLUSION, AND IMPLICATIONS 123

5.1. Major Findings 123

5.2. Discussions 124

5.3. Conclusion 135

5.4. Implications for Theory and Practice 136

5.5. Recommendations for Future Research 139

REFERENCES **141**

APPENDICES **160**

A. THE INSTRUMENT (TURKISH) 160

B. THE INSTRUMENT (ENGLISH) 170

C. EXPLORATORY FACTOR ANALYSIS BASED ON THE PILOT STUDY 180

D. CFA FOR ACHIEVEMENT GOAL ORIENTATION SCALE 187

E. CFA FOR CLASSROOM GOAL STRUCTURE SCALE 191

F. CFA FOR SELF-EFFICACY SCALE 195

G. CFA FOR LEARNING STRATEGIES SCALE 199

H. APPROVAL OF THE ETHICS COMMITTEE 203

I. PERMISSION OF MINISTRY OF NATIONAL EDUCATION 204

J. STRUCTURAL EQUATION MODEL 205

K. TURKISH SUMMARY 211

VITA 242

LIST OF TABLES

TABLES

Table 3.1 Selected Districts and Total Number of Schools and Students 55

Table 3.2 Summary of Demographic Information about the Participants................ 56

Table 3.3 The Scales Measured with the Questionnaire and their References......... 58

Table 3.4 Overall Information about the Measured Scales 65

Table 3.5 Number of Math Questions in Level Determination Examinations 66

Table 3.6 Content Analysis of the Questions 67

Table 3.7 Table of Specification for Mathematics Achievement Test..................... 69

Table 3.8 Demographic Information from the Pilot Study..................................... 73

Table 3.9 Reliability Analyses of the Subscales regarding the Pilot Study 74

Table 3.10 Pattern Matrix for Achievement Goal Orientation Scale....................... 76

Table 3.11 Pattern Matrix for Classroom Goal Structure Scale 78

Table 3.12 Pattern Matrix for Learning Strategies Scale 80

Table 3.13 Difficulty Levels of the Questions regarding the Pilot Study 82

Table 3.14 Model Fit Indices of Achievement Goal Orientation Scale 84

Table 3.15 Lambda ksi Estimates of Achievement Goal Orientation Items 85

Table 3.16 Phi Estimates of Achievement Goal Orientation Subscales................... 86

Table 3.17 Model Fit Indices of Classroom Goal Structure Scale........................... 87

Table 3.18 Lambda ksi Estimates of Classroom Goal Structure Items.................... 88

Table 3.19 Phi Estimates of Classroom Goal Structure Subscales.......................... 89

Table 3.20 Model Fit Indices of Self-Efficacy Scale 90

Table 3.21 Lambda ksi Estimates of Self-Efficacy Items 91

Table 3.22 Model Fit Indices of Learning Strategies Scale.................................... 92

Table 3.23 Lambda ksi Estimates of Learning Strategy Items 94

Table 3.24 Phi Estimates of Learning Strategy Subscales 95

Table 4.1 Residual Statistics of the Scales 102

Table 4.2 Descriptive Analysis of the Scales 104

Table 4.3 Descriptive Analysis of MAT Scores 105

Table 4.4 Test of Univariate Normality 107

Table 4.5 Test of Multivariate Normality for Continuous Variables.................... 108

Table 4.6 Test of Univariate Normality after Normalization 109

Table 4.7 Test of Multivariate Normality after Normalization............................. 109

Table 4.8 Model Fit Indices of SEM... 113

Table 4.9 Lowercase Gamma (γ) of SEM... 114

Table 4.10 Lowercase Beta (β) of SEM 114

Table 4.11 Phi Estimates of SEM 115

Table 4.12 Structural Equations of SEM.. 116

Table 4.13 Indirect Effects of Independent Variables on Dependent Variables..... 118

Table 4.14 Total Effects of Independent Variables on Dependent Variables 119

Table 4.15 Indirect Effects among Latent Dependent Variables 119

Table 4.16 Total Effects among Latent Dependent Variables 120

Table 4.17 Effect Size of Each Structural Equation 121

LIST OF FIGURES

FIGURES

Figure 1.1 Proposed Structural Model..9

Figure 3.1 Scatterplot for SBS and MAT Correct Answers....................................81

Figure 4.1 Matrix of Scatterplots among Variables..106

Figure 4.2 Structural Model with Standardized Solution.......................................112

LIST OF ABBREVIATIONS

ABBREVIATIONS

AGFI: Adjusted Goodness of Fit Index

CFA: Confirmatory Factor Analysis

CFI: Comparative Fit Index

CMGS: Classroom Mastery Goal Structure

CPAPGS: Classroom Performance-Approach Goal Structure

CPAVGS: Classroom Performance-Avoidance Goal Structure

EFA: Exploratory Factor Analysis

ELA: Elaboration

GFI: Goodness of Fit Index

IFI: Incremental Fit Index

KMO: Kaiser-Meyer-Oklin

KR-20: Kuder Richardson 20

MAT: Mathematics Achievement Test

MEB: Ministry of National Education

MGO: Mastery Goal Orientation

MSLQ: Motivated Strategies for Learning Questionnaire

MSR: Metacognitive Self-Regulation

NC: Normed Chi-Squared

NFI: Normed Fit Index

NNFI: Non-Normed Fit Index

ORG: Organization

PALS: Patterns of Adaptive Learning Survey

PAPGO: Performance-Approach Goal Orientation

PAVGO: Performance-Avoidance Goal Orientation

PCA: Principles Components Analysis

PGFI: Parsimony Goodness of Fit Index

PNFI: Parsimony Normed Fit Index

RFI: Relative Fit Index

RMR: Root Mean Square Residual

RMSEA: Root Mean Square Error of Approximation

SBS: Level Determination Examination

SE: Self-Efficacy for Learning and Performance

SEM: Structural Equation Modeling

SRL: Self-Regulated Learning

S-RMR: Standardized Root Mean Square Residual

CHAPTER I

1. INTRODUCTION

1.1. Background of the Study

There have been considerable changes in the nature of mathematics instruction as a result of ongoing changes in knowledge and skills needed both in school settings and workplaces (Heo, 1999). Previously, mathematics was considered to be a sequential, static body of facts and procedures, and mathematics learning was regarded as the passive acquisition and memorization of these concepts (Schoenfeld, 1992). Nowadays, the focus of mathematics education has shifted from mathematics content to how students can effectively learn mathematics (Pape, Bell, & Yetkin, 2003). In this regard, mathematics learning is viewed as an active and constructive process (Torrano & Gonzales, 2004), through which students construct their mathematical understandings, represent and communicate their ideas, use reasoning skills, and deal with challenging problems (Heaton, 2000). In this aspect, for successful learning in school and beyond, students are required to continually adapt their knowledge and skills to new circumstances, challenged to orchestrate their own learning (Mohr, 2005).

This new vision of school mathematics offers a set of expectations for change in mathematics education, and calls for both teachers and students to take on different roles than what they were used to do before (Kilpatrick, Swafford, & Findell, 2001). Mainly, a mathematics teacher is expected to be a model, a facilitator, and a coach, rather than the one who transmits information (NCTM, 2000). They are responsible for selecting suitable curricular materials, using appropriate instructional tools and techniques, and creating an intellectual environment where students can learn to think in mathematics (Steele & Widman, 1997). In this aspect, students are expected to be active participants in their learning process, such that they take control of their own learning, set goals for their learning, monitor their progress, evaluate and reflect on their thinking so that they can build deeper understanding of mathematical content (NCTM, 2000). However, these are not easy tasks to achieve for many teachers and students, and this calls for educational researchers to address "how students become masters of their own learning process" (Zimmerman, 2001, p.1); in other words, to understand how students become more self-regulated learners (Boekaerts, 1999).

Self-regulation serves as a comprehensive framework for understanding how students become active agents of their own learning process. From a broad aspect, self-regulation is defined as self generated thoughts, feelings, and actions that are planned and cyclically adapted to the attainment of personal goals" (Zimmerman, 2005, p.14). In this aspect, self-regulated learning refers to "an active, constructive process whereby learners set goals for their learning and then attempt to monitor, regulate, and control their cognition, motivation, and behavior, guided and constrained by their learning goals and the contextual features in the environment" (Pintrich, 2005, p.453).

Self-regulation enhances learning by helping students to become proactive participants in their own learning process (Zimmerman, 1994). Students are described as self-regulated to the degree that they know and use of a variety of learning strategies (Marcou & Philippou, 2005; Shin,1998), as well as deciding on when, why and how to use these strategies in appropriate contexts (Zimmerman, 1990). Especially, in the context of mathematics learning, when students deal with complex and challenging problems, their ability to use self-regulated learning strategies can be a significant predictor of their problem solving performance (Schwartz, Andersen, Howard, Hong, & McGee, 1998). In particular, within the realm of mathematical problem solving, self-regulation may lead to more effective problem solving (Marcou & Philippou, 2005; Howard, McGee, Shia, & Hong, 2001), mainly because it empowers students to actively engage in the learning strategies, and increase their autonomy and personal agency over their problem solving experiences (Zimmerman, 2001).

Self-regulation is a complex and multidimensional construct that involves a number of cognitive, motivational and behavioral aspects. This study was based on social cognitive perspective on self regulated learning, which construes human functioning with reciprocal interactions among personal variables, environmental factors, and behaviors (Schunk, 2001). In the literature, there are a number of different theoretical perspectives about how learning is self-regulated, such as "operant, phenomenological, information processing, social cognitive, volitional, Vygotskian, and cognitive constructivist" perspectives (Zimmerman & Schunk, 2001, p.1). Although each perspective on self-regulated learning puts emphasis on different constructs about regulation and learning, they possess several features in common. Specially, most of these theoretical perspectives consider motivational factors, including goal setting and self-efficacy, as important features in determining students' self-regulatory behaviors and academic achievement.

Among these motivational factors, goal setting is an integral part of the initial phases of self-regulatory processes. When students set appropriate goals for their mathematics learning, this can facilitate their self-regulation by enhancing their commitment to attaining them (Schunk, 2001) and by providing clear standards against which to monitor their progress (Winne, 2001). Specially, learning goals that are specific and challenging, are considered to motivate students and build a strong sense of self-efficacy toward learning mathematics (Schunk, 2001). In general, students' goal orientations are related to their beliefs about what is important in an achievement situation (Ames, 1992). For example, a student may pursue the goal of increasing his or her competence in an achievement situation, whereas another student may pursue the goal of displaying ability or avoiding unfavorable judgments about his or her competence (Elliott & Dweck, 1988). In this aspect, goal theorists have identified two major goal orientations that function in an achievement situation: ‘mastery goal orientation’ and ‘performance goal orientation’ (Ames, 1992; Dweck, 1986; Nicholls, 1984). The primary difference between these two types of goal orientations is whether learning is valued as an end in itself or as a means to reach some external goals (Meece, Blumenfeld, & Hoyle, 1988). In particular, research has indicated that students with mastery goals give value to learning for its own sake, and prefer situations where they can expand new skills and gain new knowledge (Ames, 1992). On the other hand, students with performance goals give value to ability, and prefer situations where they can demonstrate their ability and compare it with other students (Nicholls, 1989).

Later, mastery and performance goals have been divided into two distinct dimensions as ‘approach’ and ‘avoidance’ (Meece & Holt, 1993; Turner et al., 1998). Research based on this new division has shown that students with mastery approach goals focus on learning in order to achieve task mastery and improvement (Pintrich, 2000). On the other hand, students with mastery avoidance goals are concerned with not falling short of their own self-set standards, rather than being perfect or fully understanding the material (Pintrich, 2000). In a similar manner, students with performance approach goals are found to focus on outperforming other students and having favorable judgments about their competence, whereas students with performance avoidance goals focus on avoiding unfavorable judgments about their competence and looking incompetent (Elliot & Church, 1997).

Although a number of goal theorists believe that it is helpful to divide mastery and performance goals into approach and avoidance dimensions (Elliot, 1999; Pintrich, 2000; Pintrich & Schunk, 2002), some other goal theorists strongly argue that especially mastery avoidance goal orientation is a relatively new dimension, and its effects on academic outcomes has not been clearly understood (Barker, Dowson, & McInerney, 2002). Thus, so far, the one proposing mastery, performance approach, and performance avoidance goal orientations is assumed to be the most prevalent achievement goal framework, and has received the strongest empirical support (Elliot & Thrash, 2001).

Besides examining students' own goal orientations, research has also emphasized considering the goal messages conveyed in the social and psychological atmosphere in which students learn (Ames, 1992; Meece, 1991). Especially, it has been postulated that the goal structure of the learning environment and the way students perceive these goals are highly critical for their motivation and achievement related outcomes (Bong, 2001). In particular, research has revealed that students adopt achievement goals that are parallel to the goal structure of their learning environment (Patrick et al., 2001; Roeser, Midgley, & Urdan, 1996; Turner et al., 2002). For example, when students believe that their mathematics teachers focus on the mastery of the learning tasks and emphasize deep understanding of the material, they tend to hold similar attitudes toward learning mathematics and adopt mastery goal for that subject matter (Bong, 2001). On the other hand, when students feel that their mathematics teachers highly promote competition and reward better performance, they tend to internalize these values for their mathematics learning and adopt either performance approach or performance avoidance goals for that subject matter (Ryan, Gheen, & Midgley, 1998).

Lastly, as another key motivational factor, students' self-efficacy beliefs are related to their perceptions of capabilities on a particular type of achievement situation (Bandura, 1986). Research has highlighted that students' self-efficacy beliefs are important predictors of their successful use of self-regulatory skills and strategies across different academic domains (Bandura, 1993; Bong, 2001; Zimmerman, Bandura, & Martinez-Pons, 1992), mainly because it affects the extent to which students engage in and persist at challenging tasks (Schraw, Crippen, & Hartley, 2006). In particular, students try to avoid situations that they believe to exceed their capabilities, whereas they try to approach to situations that they feel capable of handling (Bandura, 1993). A growing body of research has shown that student's self-efficacy beliefs are positively related to a number of adaptive academic patterns. Specifically, students with high self-efficacy beliefs tend to set more challenging goals and make stronger commitment to accomplish these goals compared to students with low self-efficacy beliefs (Schunk, 2000). Besides, they tend to use more self-regulation strategies, invest greater effort, and persist longer in the face of difficulties compared to students who doubt their capabilities (Schunk, 1991; Zimmerman, Bandura, & Martinez-Pons, 1992). On the other hand, students with low self-efficacy beliefs tend to exhibit more maladaptive academic behaviors, such as having more academic anxiety (Pajares & Graham, 1999; Zimmerman & Martinez-Pons, 1990), giving up more quickly in the face of difficulty and diminishing school interest and achievement (Usher & Pajares, 2008).

In conclusion, the theory of self-regulation suggests that in order to better understand how students become active agents of their own learning process, it is highly important to understand how a number of motivational factors relate to their self-regulatory behaviors and quality of academic engagements (Anderman & Maher, 1994; Elliot & Harackietwicz, 1996; Greene & Miller, 1996). In particular, it becomes highly crucial to understand the interplay among students' achievement goal orientations, perceptions of classroom goal structure, self-efficacy, and use of self-regulation strategies in order to better understand how students self-regulate their mathematics learning and attain academic achievement.

1.2. Purpose of the Study

The main purpose of this study was to examine a number of cognitive, motivational, and behavioral concepts in elementary mathematics education. In particular, it was intended to extend the empirical research by examining the interrelationships among students' self-efficacy beliefs, perception of classroom goal structure, achievement goal orientation, use of learning strategies, and academic achievement in elementary mathematics education. By examining these concepts, it was aimed to find out which factors have strong involvement on students' achievement in mathematics. Specially, it was intended to better understand how to maximize students' motivation to learn mathematics and to promote self-regulation in mathematics learning.

In addition, it was intended to extend the theoretical research by developing a structural model that might explain the direct and indirect relationships among these concepts as well as their underlying dimensions. By developing this model, it was intended to offer a comprehensive model in the field of self-regulation, which may enrich the previous models by clarifying how the interplay among motivational factors relate to self-regulation and to the quality of mathematics learning. Besides, this theoretical model was expected to give direction to future studies that will be conducted in this field.

1.3. Research Question

The following research question was the main focus of this study;

- What is the nature of direct and indirect relations among the underlying dimensions of 7^{th} grade students' self-efficacy beliefs, achievement goal orientations, perceptions of classroom goal structure, use of learning strategies, and achievements in mathematics?

In order to answer this research question, a self-report questionnaire and a mathematics achievement test were administered to 7^{th} grade students enrolled in public elementary schools. The questionnaire was used for assessing participants' self-efficacy beliefs, perceptions of classroom goal structure, achievement goal orientations, and use of learning strategies in mathematics. Besides, the achievement test was used for measuring participants' mathematics achievement, covering the topics in 7^{th} grade mathematics curriculum. Upon the data gathered, a structural equation model was developed in order to identify the interrelationships among these concepts and their underlying dimensions.

1.4. Hypothesis

The following structural model illustrates the expected relationships among the concepts, based on the theoretical and empirical evidences gathered from the results of the previous studies (see Figure 1.1). According to this model, it was proposed that students' self-efficacy beliefs and perceptions of classroom goal structure would contribute to their adoption of achievement goal orientations. In particular, it was proposed that students' perception of classroom mastery goal structure would be linked to their personal mastery goal orientation, their perception of classroom performance approach goal structure would be linked to their personal performance approach goal orientation, and their perception of classroom performance avoidance goal structure would be linked to their personal performance avoidance goal orientation.

Then, these achievement goal orientations were expected to be linked to students' use of learning strategies, which would mediate the link between students' goal orientations and mathematics achievement. So, it was expected that students' achievement goal orientations would be indirectly related to their mathematics achievement. Particularly, students' mastery and performance approach goal orientations were expected to be linked to their use of learning strategies and mathematics achievement.

In addition, it was expected that self-efficacy would contribute to students' adoption of achievement goal orientations, as well as their use of learning strategies and mathematics achievement. So, it would be both directly and indirectly related to students' mathematics achievement. Besides, all the learning strategies, including elaboration, organization, and metacognitive self-regulation, were expected to be associated with students' mathematics achievement.

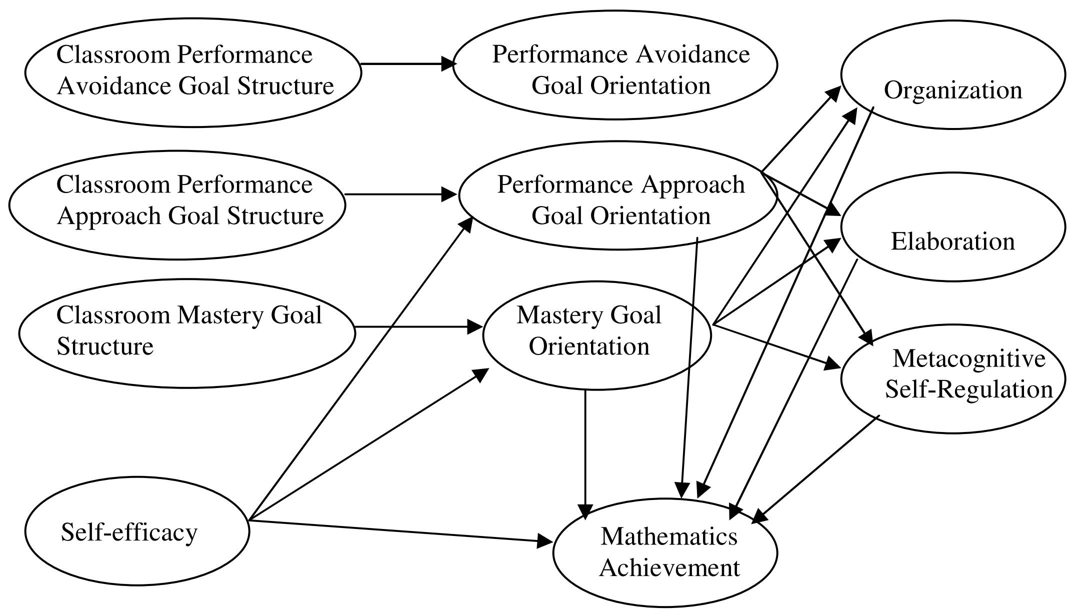


Figure 1.1 Proposed Structural Model

1.5. Significance of the Study

Nowadays, for successful learning in school and beyond, students are expected to take a proactive view of learning, in which their personal perceptions as learners and their use of various processes to regulate their learning are, critical factors for their academic achievements (Zimmerman, 1989). In this aspect, the aim of education has gone beyond the development of academic competence to prepare completely functioning and caring individuals who are capable of pursuing their academic goals (Pajares, 2001).

This study was conducted in an attempt to integrate several cognitive, motivational and behavioral aspects in elementary mathematics education, and to develop a theoretical model that might explain the direct and indirect relationships among these concepts and their underlying dimensions. Within this field, research has emphasized the need for developing more comprehensive and dynamic theoretical models for describing how the interplay between motivational factors may relate to students' self-regulation and to the quality of mathematics engagements (Ames, 1992; Anderman & Maher, 1994; Elliot & Harackietwicz, 1996; Greene & Miller, 1996).

First of all, the majority of the research conducted to date on self-regulation has considered students' self-efficacy beliefs as the major motivational factor for their learning (Bandura, 1997, Zimmerman, 2002). However, recent research has highlighted the importance of taking into account other motivational factors, such as students' achievement goal orientations and perception of classroom goal structure, when examining their motivation to learning (Pintrich, 2000; Schunk & Zimmerman, 1996). In this aspect, this study was important because it may contribute to the existing literature by examining students' self-efficacy beliefs, goal orientations, and perception of classroom goal structure to clarify the relationships among these three interacting aspects of motivation, as well as relating them to students' use of learning strategies and mathematics achievement.

Moreover, until recently self-regulation has been mainly considered as a relatively stable (Patrick & Middleton, 2002), and individual process (Perry, 1998). This view led to a lack of attention regarding understanding the role of classroom context in shaping students' cognition and motivation to self-regulate their learning (Blumenfeld et al., 1992; Brophy, 1999; Pape, Bell, & Yetkin, 2003; Perry et al., 2002). In essence, research has suggested that students develop knowledge, skill, and beliefs about a particular concept according to the social and psychological environment in which they learn (Ames, 1992; Meece, 1991). Therefore, it becomes highly important to consider classroom context, especially how students perceive their classroom goal structure, in order to better understand how these contextual perceptions relate to students' motivational beliefs, use of self-regulatory strategies, and academic achievement.

Especially, with regard to mathematics education, research has revealed that the nature of mathematical tasks, classroom norms, and the nature of teacher practices highly influence students' motivation to learn mathematics (Meyer & Turner, 2002; Pape, Bell, & Yetkin, 2003; Turner et al., 2002; Verschaffel et al., 1999). In fact, many educational psychologists choose to situate motivation research specifically in mathematics classroom, because the characteristics of many mathematics classrooms appear to facilitate maladaptive patterns of motivation, such as avoidance of challenge, low persistence, and worry about academic outcomes (Dweck & Leggett, 1988, Ryan & Patrick, 2001; Turner et al., 1998). Besides, research indicates that teachers tend to teach mathematics in the manner they were taught (Ball et al., 2001; Brown & Smith, 1997), and most were taught using traditional approaches that are performance oriented (Anderman et al., 1999; Nicholls et al., 1990). This study was undertaken to respond for more knowledge, understanding, and research in this field. The results of this study may have implications for educators and policymakers who seek to maximize students' motivation to learn mathematics, and for restructuring elementary mathematics education in order to promote more adaptive academic-related outcomes.

Lastly, when the literature was reviewed regarding the studies that examined students' achievement goal orientations in mathematics, self-efficacy towards learning mathematics, and use of learning strategies in mathematics, it was found that very few studies have been conducted in Turkey in these research contexts. Moreover, most of these studies were conducted only in the last few years, and they were mostly conducted with pre-service teachers or high school students. Clearly, more research is needed in Turkish context, especially in elementary school settings, in order to have better understanding about how these concepts develop and affect students' mathematics learning in elementary level.

1.6. Definitions of the Terms

The following selected terms were used throughout this study, and their definitions were provided for the purpose of clarification.

Achievement goals are integrated patterns of beliefs and attributions that effect the ways of approaching, engaging in and responding to achievement type activities and produce the intentions of achievement behavior (Ames, 1992).

Achievement goal orientations are students' reasons or purposes for engaging in academic behavior (Midgley et al., 1998). They include a set of behavioral intentions that determine how students approach to and engage in academic activities (Meece, Blumenfeld, & Hoyle, 1988).

In this study, the trichotomous achievement goal framework was employed, including mastery, performance approach, and performance avoidance goal orientations. In particular, students' achievement goal orientations were assessed with 14 items adopted from the Patterns of Adaptive Learning Survey (PALS; Midgley et al., 2000). Students indicated their level of agreement or disagreement to the items on a five-point Likert scale, and the means of these responses were used as measures that represent the corresponding goal orientations.

Mastery goal orientation is an orientation towards learning that promotes the value of learning for its own sake (Ames & Archer, 1988). It is an orientation in achievement pursuits in which individuals focus on the development of competence and mastery of new tasks (Elliot & Dweck, 1988). Students with these goals consider ability as manageable and expandable by investing effort (Midgley et al., 1998), and prefer situations where they can expand their knowledge and seek out confrontations with new problems (Dweck & Leggett, 1988).

Performance goal orientation is an orientation towards learning that values ability (Ames & Archer, 1988). Students with these goals consider ability as a fixed trait and regard their performance as reflecting their mental abilities (Dweck & Leggett, 1988). They try to avoid negative public evaluation and social comparisons, and seek out situations where they can demonstrate their abilities (Midgley et al., 1998). Recently, this orientation is divided into two approaches: performance approach and performance avoidance.

Performance approach is an orientation towards learning in which students' achievement behaviors are directed toward the attainment of favorable judgments of competence (Elliot & Church, 1997).

Performance avoidance is an orientation towards learning in which the main purpose of the student is to avoid unfavorable judgments of competence (Elliot & Church, 1997) and to get work done with a minimum amount of effort (Meece, Blumenfeld & Hoyle, 1988).

Classroom goal structure refers to the approach to instruction exhibited in a particular classroom (Ames & Archer, 1988). For example, a performance oriented classroom is a classroom that shows evidence of a performance approach to instruction, and a mastery oriented classroom demonstrate a mastery approach to instruction.

In this study, students' perception of classroom goal structure was measured under three categories as classroom mastery goal structure, classroom performance approach goal structures and classroom performance avoidance goal structures. In particular, students indicated their level of agreement or disagreement to 14 items adopted from PALS (Midgley et al., 2000), and the means of these responses were used as measures that represent the corresponding classroom goal structure.

Motivation refers to "process whereby goal-directed activity is instigated and sustained" (Pintrich & Schunk, 1996, p. 4). It is the reason one has for behaving in a particular way in a given situation (Middleton & Spanias, 1999).

Self-efficacy refers to “beliefs in one’s capabilities to organize and execute the courses of action required producing given attainments” (Bandura, 1997, p.3).

Academic self-efficacy is defined as students’ confidence and judgments about their ability to successfully accomplish an academic task (Pintrich et al., 1991).

In this study, students’ self-efficacy was assessed using 8 items from the Motivated Strategies for Learning Questionnaire (MSLQ; Pintrich et al., 1991). Particularly, students indicated their level of agreement or disagreement to these items on a seven point Likert scale, and the mean of these responses was used as a measure that represents their academic self-efficacy.

Self-regulated learning refers to academically effective forms of learning, through which learners set goals, monitor, control, and regulate their cognition, motivation, and behavior, and reflect on their learning process, while being guided and constrained by the contextual features in the learning environment (Pintrich, 2000).

Self-regulated learning strategies refer to “actions directed at acquiring information or skill that involve agency, purpose (goals), and instrumentality self-perceptions by a learner” (Zimmerman & Martinez-Pons, 1986, p.615).

In this study, students’ self-regulated learning strategies were examined under three learning strategies as use of elaboration strategies, organization strategies, and metacognitive self-regulation strategies. Particularly, students indicated their level of agreement or disagreement to 22 items adopted from MSLQ (Pintrich et al., 1991), and the means of these responses were used as measures that represent the corresponding learning strategy.

CHAPTER II

2. LITERATURE REVIEW

This chapter provides a detailed review of the literature to supplement and elaborate the ideas presented in the first chapter. It includes an in-depth description of the theory and research on students' achievement goal orientations, classroom goal structure, self-efficacy, and use of self-regulation strategies. Besides, the importance of self-regulation in mathematics education, as well as for the new mathematics curriculum is explained, including the research conducted in Turkey on the related concepts.

2.1. Introduction

The importance of mathematics education is of increasing value in today's contemporary life. Actually, today "to be non-mathematical" is just like being illiterate in the recent past (Kirby & Williams, 1991, p.107). Especially, for the last decades, the conception of what it means to learn mathematics has considerably changed as a result of ongoing changes in knowledge and skills needed both in school settings and workplaces (Heo, 1999; Pape & Smith, 2002). Previously, mathematics was considered to be a static body of facts and procedures, and mathematics learning was regarded as the passive acquisition and memorization of these facts and procedures (Schoenfeld, 1992). Nowadays, the focus in school mathematics has shifted from teaching facts and procedures to providing effective mathematics learning (Pape, Bell, & Yetkin, 2003). In this regard, mathematics learning is viewed as an active and constructive process (Torrano & Gonzales, 2004), through which students build their mathematical understandings, communicate their ideas, and deal with challenging situations (Heaton, 2000).

This new vision of school mathematics offers a set of expectations for change in mathematics education, and calls for both teachers and students to take on different roles than what they were used to do before (Kilpatrick, Swafford, & Findell, 2001). For example, a mathematics teacher has taken on the role of being a model, a facilitator, and a coach, rather than being the one who transmits information and regulates student learning (NCTM, 2000). Teachers are now responsible for selecting suitable curricular materials, using appropriate instructional tools and techniques, and proving an intellectual environment where students can engage in rich mathematical experiences (Pape & Smith, 2002) and reflect on their own understandings (Steele & Widman, 1997).

In these new learning contexts, students are expected to be more active participants in their learning process (NCTM, 2000), such that they set goals for their learning, monitor their progress toward these goals, and continually adapt their knowledge and skills to orchestrate their own learning (Mohr, 2005). Specially, in the domain of mathematics, students are expected to reason mathematically, discuss their mathematical reasoning, and construct their mathematical knowledge through problem solving and inquiry (Pape & Smith, 2002). Definitely, these are not easy tasks to attain for many teachers and students. It requires educational researchers to address "how students become masters of their own learning process" (Zimmerman, 2001, p.1); in other words, to understand how students become more self-regulated (Boekaerts, 1999).

2.2. Self-Regulation

Self-regulation serves as a comprehensive framework for understanding how students become active agents of their own learning process (Pape, Bell, & Yetkin, 2003). From a broad aspect, self-regulation can be defined as the ability to "develop knowledge, skills, and attitudes which can be transferred from one learning context to another" (Boekaerts, 1999, p.446). It includes "self generated thoughts, feelings, and actions that are planned and cyclically adapted to the attainment of personal goals" (Zimmerman, 2005, p.14). In this aspect, self-regulated learning refers to "an active, constructive process whereby learners set goals for their learning and then attempt to monitor, regulate, and control their cognition, motivation, and behavior, guided and constrained by their learning goals and the contextual features in the environment" (Pintrich, 2005, p.453).

Students can be described as self-regulated to the degree that they are proactive participants in their own learning process (Zimmerman, 1994). Zimmerman (1989) proposes that self-regulated learners are distinguished from other learners with three key characteristics they demonstrate. These characteristics are commitment to academic goals, high self-efficacy perceptions, and effective use of self-regulated learning strategies (Zimmerman, 1989). In this aspect, self-regulated learners are known as self-motivated individuals who can set challenging goals for their learning processes (Zimmerman & Martinez-Pons, 1992). They can plan, organize, and evaluate their learning for the attainment of their academic goals (Zimmerman & Martinez-Pons, 1992). Moreover, they have knowledge of several learning strategies, and they can decide on when, why and how to use these strategies in the appropriate context (Zimmerman, 1989).

2.2.1. Self-Regulation and Mathematics Education

Over three decades, there have been considerable changes in the nature of instruction as a result of ongoing changes in knowledge and skills needed both in school settings and workplaces (Heo, 1999). Nowadays, mathematics is regarded as not something which is passively learned, but as something which students do (Dilworth, 1996). In this aspect, mathematics learning is viewed as an active process (Torrano & Gonzales, 2004) through which students deal with novel problems (Brown, 2003), and develop self-regulatory skills that help them to plan, manage, and evaluate their actions, and resolve the difficulties (Boekaerts, 1997). Therefore, for successful mathematics learning in school and beyond it, students are required to become more “self-regulated problem solvers” (Wehmeyer et al., 2000, p.439).

Problem solving and self-regulated learning are two powerful and interrelated concepts in mathematics learning. In deed, “problem solving is perhaps the area of mathematics in which self-regulation is most apparent” (Pape & Smith, 2002, p.95). This is mostly because they emphasize similar processes (Cleary & Zimmerman, 2004). In particular, during an effective problem solving process, students perform a number of mental activities that involve identifying the problem components, understanding what information is missing, developing an effective solution strategy, carrying out the selected strategy, knowing when and how to try out an alternative strategy, and evaluating the appropriateness of the outcome (Shuel, 1990). In this aspect, Pape and Simith (2002) suggest that each of these activities necessitate students to pass through a number of self-regulatory processes, including “forethought and planning, monitoring the fidelity of solution process, and reflecting on the problem to determine whether the representation formed is accurate and whether the solution process is successful” (p.94). Therefore, an effective problem solving process requires students to be strategic and proactive learners who are aware of their own strengths and weaknesses, use their time and energy effectively, and monitor, regulate, and evaluate their efforts appropriately (Lester, 1994).

As a complex task and due to its’ cognitive and metacognitive aspects, problem solving offers a rich domain to study self-regulated learning (Marcou & Philippou, 2005). Within the realm of mathematical problem solving, using self-regulation strategies is found to be a crucial characteristic of, and an important predictor of effective problem solving experiences (Desoete, Roeyers, & Buysse, 2001; Howard, McGee, Shia, & Hong, 2001; Marcou & Philippou, 2005). Briefly, it is found that using self-regulation strategies increases students’ autonomy and personal agency over their problem solving experiences (Zimmerman, 2001). Especially, using metacognitive self-regulation strategies is found to be central to success in problem solving processes, because it helps students to manage and coordinate their own thinking processes (Daniel, 2003). Therefore, it becomes evident that developing students' problem solving experiences gets through enhancing their self-regulation skills and strategies. For this reason, mathematics education should foster utilizing self-regulation skills and strategies as an integral part of all mathematics learning.

2.2.1.1. Self-Regulation and the New Mathematics Curriculum

Mathematics is a highly important subject matter for individuals' both academic and professional achievements (Üredi &Üredi, 2005). Nowadays, understanding mathematics and using it in daily life has become crucially important. Specially, students with good mathematical knowledge and high levels of appropriate mathematics skills get better chances in shaping their futures and meeting the requirements of workplaces (MEB, 2008). Though it is important, many students perceive mathematics as difficult and irrelevant matter. It is regarded as one of the scariest subject matters that many students fail to succeed (Üredi &Üredi, 2005). So, what can be done to get our students focus on learning mathematics?

Especially for the last decades, the scientific and technologic developments achieved in the world, the recent changes made in pedagogy, and students' performances in international exams have shown the vital necessity for redefining mathematics teaching and learning in Turkey (MEB, 2005). Since 2005, major changes have been made in the elementary mathematics curriculum to improve the quality of the national education. The new mathematics curriculum is fundamentally based on the idea that every child can learn mathematics (MEB, 2005). Within the realm of the new curriculum, it is aimed to raise individuals who are capable of using mathematics in their daily lives, solving mathematical problems, constructing rich mathematical concepts, and having autonomy and self-confidence in their mathematical applications (MEB, 2005).

To do these, major changes have been made in the curriculum regarding the role of teachers and students in mathematics classrooms. According to this new perspective, students are expected to be active and responsible participants of their own learning processes. They are required to question the new information, think critically, discuss their point of views, solve problems, work cooperatively, and evaluate their own learning processes (MEB, 2008). Especially, skills such as independent thinking, decision making, and self-regulation have become highly essential parts of students' learning. In order to improve self-regulation skills, students are expected to motivate themselves for learning mathematics; adopt achievement goals for their learning and orient themselves towards these goals; do the required work regularly and on time; question themselves while learning mathematics; seek help from their parents, friends and teachers when needed; study mathematics effectively; appreciate sharing work, honesty and respect among their peers; keep planned and organized in mathematics lessons; and pay attention to academic material and use them efficiently (MEB, 2008).

In this aspect, teachers' role has changed to be a guide and a facilitator, rather than being the knowledge transmitter in the learning process (MEB, 2005). Personally, teachers are expected to have high self-efficacy for teaching mathematics, enjoy teaching, and improve their knowledge and skills continuously. In order to facilitate students' learning, they are expected to provide instructional practices that emphasize skills such as problem solving, communication, association, and implication. Especially, the learning practices that stress on students' cognitive skills as well as affective, self-regulatory and psychomotor skills are highly appreciated. During these instructional practices, teachers are expected to use a number of self-regulation skills, such as planning and regulating their instruction, monitoring students' learning, using time effectively, self-evaluating their own performances and improving their teaching accordingly (MEB, 2008).

In the new curriculum, it is also emphasized to teach mathematics in a way that enhances students' self-efficacy and positive attitudes towards learning mathematics. To do this, teachers are expected to prepare meaningful learning activities that encourage students to ask questions, think critically and discuss their point of views (MEB, 2008). Yet, it is stated that not all students are motivated in the same manner. Some students are motivated as they succeed; some students are motivated by playing games or solving interesting problems; and some students are motivated as they practically use their knowledge. For this reason, teachers are expected to take students' individual differences into consideration, and motivate them accordingly (MEB, 2008).

The new curriculum is also different regarding the ways student's performance is evaluated. Previously, students were mainly evaluated regarding their final outcomes on the written examinations. With the new curriculum, mathematics learning is regarded as a process, rather than being an end product (MEB, 2008). Similarly, students' learning is evaluated not only considering their final outcomes, but also considering all the learning process including their class discussions, presentations, projects, group works, and portfolios.

In particular, students are given chances to evaluate their own performances as well as their peers. For example, mathematics dairy writing is planned as an activity to increase students' awareness about what they know, and what they have been doing during their learning process (MEB, 2008). Especially, self-assessment forms and group work evaluation forms are prepared to promote students evaluate their own performances, compare their work with their peers, become aware of their own strengths and weakness, and accordingly to self-regulate their learning behaviors (MEB, 2008).

Besides these evaluations, the new curriculum also emphasizes to evaluate students' affective developments. Especially, teachers are expected to evaluate how students' attitudes, self-efficacy, and self-regulation skills have changed during the learning process (MEB, 2008). To do this, it is suggested to observe students' affective behaviors, and ask them several questions regarding their feelings and opinions. For example, it is suggested to ask what were the things that s/he did enthusiastically while learning the subject? What were the things that made him or her stressful? Could s/he overcome the difficulties that s/he faced? If so, how could s/he do that? Now, what does s/he think about mathematics? What would s/he like to learn more? Why? (MEB, 2008).

2.2.3. Achievement Goals

Many psychologists and educators have long considered student motivation as an important factor for school learning (Ryan & Connell, 1989). Since the early 1970s, there has been a sustained research focus on how motivation impact student learning and classroom performance (Linnenbrink & Pintrich, 2002). Research has pointed out that motivation predict both the quality of engagement in school learning (Ames, 1992), and the degree to which students seek or avoid challenging situations and persist in the face of obstacles in different learning situations (Elliott & Dweck, 1988). Especially, recent studies have revealed that students need both the cognitive skill and the motivational will to do well in school learning (Pintrich & Schunk, 2002).

A number of motivation theories have emerged since the 1970s. Particularly, the integration of motivational and cognitive factors has facilitated the shift in motivational theories from traditional achievement motivation models to social cognitive model of motivation (Pintrich & Schunk, 2002). According to this new model of motivation, motivation is viewed as a dynamic and multifaceted phenomenon, which cannot be characterized in a limited number of quantitative ways. Rather, students can be motivated in multiple ways, and the important point is to understand how and why students are motivated for school achievement (Linnenbrink & Pintrich, 2002). In addition, motivation is regarded not a stable characteristic of a student, but it is considered as a situated and domain specific variable depending on the instructional efforts and contextual characteristics of the learning environment (Linnenbrink & Pintrich, 2002). Moreover, it is not just the individual's cultural and personality characteristics or the contextual factors that influence students' motivation and achievement, but also their active regulation of motivation, thinking, and behavior mediate the relationships between the person, context and eventual achievement (Linnenbrink & Pintrich, 2002).

Achievement goal theory has developed within the social cognitive model of motivation (Dweck & Leggett, 1988; Maehr, 1989; Nicholls, 1989; Weiner, 1990), and become the most preeminent approaches to achievement motivation in recent decades (Covington, 2000; Pintrich, 1994; Pintrich & Schunk, 2002). It focuses on students' perceptions, thoughts and beliefs about learning (Dweck & Leggett, 1988), and tries to explain the primary reasons and underlying purposes learners accomplish when they engage in achievement related situations (Elliot & Harackiewicz, 1996; Pintrich, 2000). Achievement goal theory posits that students' behavior in achievement settings is guided by the goals they construe for learning (Ames, 1992; Pintrich, 2000), and these goals determine their approach to, engagement in, and evaluation of performance in school and learning (Dweck & Leggett, 1988; Schunk, 1996; Urdan, 1997).

Research has indicated that students perceive different achievement goals in different academic settings (Dweck & Elliott, 1983), and different kinds of achievement goals lead to different behaviors, attitudes, and beliefs (Nicholls, 1989). Students adopting different achievement goals can be seen as approaching a situation with different concerns, asking different questions, and seeking different information (Dweck & Elliott, 1983). For example, some students may pursue the goal of increasing their competencies, whereas others may pursue the goal of displaying their ability. Achievement goal theory sustains that achievement goals is what best explains students' cognitions, behaviors, and motivation in learning (Urdan & Maehr, 1995), such as their cognitive engagement, quality of involvement, and use of self-regulation strategies (Ames & Archer 1988). A large body of research has demonstrated the validity of using achievement goal theory to understand and promote adaptive beliefs about learning (Meahr & Anderman, 1993; Pintrich & Schunk, 1996), such as increasing competence, seeking challenge, and having high persistence (Dweck & Leggett, 1988).

Achievement Goal Theory was first formalized during the mid 1980s. Based on the pioneering research of Ames (1984), Nicholls (1984), and Dweck (1986), many researchers in the educational community began to consider not just what students learn, but also how they learn. Although their terminology differed, Ames, Nicholls, and Dweck each hypothesized two distinct learning orientations: (1) the goal to mastery knowledge, and (2) the goal to demonstrate ability. These two goals have alternatively been labeled as 'task-involvement goals' and 'ego-involvement goals' (Nicholls, 1984), 'learning goals' and 'performance goals' (Dweck, 1986), and 'mastery goals 'and 'performance goals' (Ames & Archer, 1988) respectively. Goal theorists generally agree on the terms 'performance goals' and 'mastery goals' to describe these two kinds of achievement goals. Basically, a student with mastery goal orientation focuses upon the task and individual improvement, whereas a student with performance goal orientation focuses upon the self and comparing favorably with others (Ames, 1992; Dweck, 1986; Nicholls, 1984).

By the late 1990s, many new educational researchers had entered into the field of achievement goal theory bringing about significant improvements to the theory (Anderman & Maehr, 1994; Elliot & Church, 1997; Elliot & Harackiewicz, 1996), such as splitting the performance goal orientation into two unique constructs - students who shy away from comparisons (performance avoid) and students who thrive on competition (performance approach) (Elliot & Harackiewicz, 1996; Harackiewicz, Barron, & Elliot, 1998; Pintrich & Garcia, 1991). Later, building on the success of performance approach versus performance avoid distinction, a number of researchers have also attempted to duplicate this division by bringing about a mastery approach versus mastery avoid distinction (Elliot, 1999; Elliot & McGregor, 2001). Although the mastery approach and avoidance distinction is quite new and to date, there have been few empirical studies that employ this distinction.

In recent studies, achievement goal theorists propose a multiple goal perspective, suggesting that students pursue more than one achievement goal at a time (Pintrich, 2000).Yet, they could not reach a consensus regarding the conceptualization of these multiple goals. For example, should multiple goals be understood as students having three to four separate learning goals at the same time, or as students holding achievement goals related and connected in some manner? (Ng, 1999). To date, the nature of multiple goals and their relation to educational outcomes remains as an important question (Midgley, Kaplan, & Middleton, 2001; Harackiewicz et al., 2002), and there is a lack of a theoretical framework as well as methodological practices guiding the treatment of multiple goals (Ng, 1999).

So far, among different theoretical accounts regarding the nature and number of achievement goals, the one proposing mastery, performance approach, and performance avoidance goals is assumed to be the most prevalent goal framework in achievement settings (Elliot, 1999; Elliot & Church, 1997), and has received the strongest empirical support. In the next section, each type of achievement goal was explained in detail including the theoretical and empirical studies regarding these goals and their relation to students' academic achievements.

2.2.3.1. Mastery versus Performance Goals

The goals individuals are pursuing "create a framework within which they interpret and react to events" (Dweck & Leggett, 1988, p. 256). According to achievement goal theorists, there are two main goals or reasons why students engage in achievement behavior: a mastery goal orientation and a performance goal orientation (Ames & Archer, 1988; Dweck, 1986; Nicholls, 1984). These two kinds of goal orientations differ primarily in terms of whether learning is perceived and valued as the end itself or as means to external ends including grades, acquiring approval of others, or avoiding negative evaluation of others (Ames, 1992).

In particular, mastery goals represent a concern with developing competence and skills (Harackiewicz et al, 2002), and they are generally considered to be evaluated using internal norms, such as Have I learned? Have I improved? (Pintrich, 2000). Students who adopt mastery goals focus on learning new things, improving their level of competence, and achieving a sense of mastery based on "self-referenced standards" (Ames, 1992, p. 262). On the other hand, performance goals represent a concern with demonstrating competence to others by appearing able or outperforming others (Harackiewicz et al, 2002), and they are usually evaluated using interpersonal norms, such as Did I do better than other students in the class? Do others think that I am smart? (Pintrich, 2000). Students with a performance goal orientation focus on demonstrating their ability in relation to others, seeking public recognition for high-level performance, and avoiding judgment for low ability (Dweck & Leggett, 1988).

Many researchers have investigated the relationships between mastery and performance goals and learning outcomes, including level of information seeking, cognitive engagement, self-regulation, persistence, and performance. The findings reveal that these two goal orientations are linked to different behavioral, cognitive, and affective learning outcomes (Brophy, 1987). Across a large number of studies, a mastery goal orientation has been associated consistently with adaptive pattern of achievement related outcomes (Middleton & Midgley, 1997; Urdan, 1997). In terms of beliefs and feelings, research reveals that mastery oriented students have higher interest and self-efficacy (Middleton & Midgley, 1997), positive attitudes in relation to tasks, the context, and the self, and attributions of success to effort (Kaplan & Maehr, 2002; Turner & Patrick, 2004). They show higher appraisal of challenge, task absorption, self-determination, and a feeling of autonomy (Butler, 1987). In addition, they perceive themselves to be competent (Elliot & Church, 1997), report more confidence and demonstrate less anxiety (Urdan et al., 1997). In terms of behaviors, research reveals students with mastery goals spend more time on learning tasks (Butler, 1987) and persist longer on difficult tasks (Elliott & Dweck, 1988). They select more challenging tasks, choose to pursue additional coursework, and report more frequent use of effort and persistence (Meece, Anderman, & Anderman, 2006). Moreover, students with mastery goals demonstrate deep processing of studying materials, show appropriate help seeking behaviors (King, 1992) and deeper metacognitive and self-regulation strategies (Harackiewicz et al, 2002; Urdan

& Midgley, 2003). A large number of studies have revealed that students with mastery goals show improvement in the quality of their engagement in learning, and have higher academic achievement (Urdan & Midgley, 2003).

Although research on the effects of pursuing mastery goals are clear and consistently show adaptive patterns of academic outcomes, the literature on performance goals has been mixed (Harackiewicz et al., 2002; Pintrich, 2000). A number of research findings consistently reveal that performance goals lead to less adaptive learning outcomes or even maladaptive outcomes (Ames & Archer, 1988; Ames, 1992; Elliot & Church, 1997; Linnenbrink & Pintrich, 2002; Pintrich & Schunk, 2002). Especially, research on low achievers shows that holding performance goals is associated with a constellation of negative cognitive, behavioral, and affective outcomes (Ames, 1992; Turner & Patrick, 2004). In this aspect, a number of researchers agree that when students hold performance goals, they exhibit a pattern of motivation characterized by the use of superficial or short term learning strategies such as rehearsal and memorizing (Turner & Patrick, 2004), and they minimally persist in the face of difficulty, avoid challenging tasks, and have low intrinsic motivation (Ames, 1992; Dweck, 1986).

On the other hand, there is also research evidence showing that holding a performance goal is not necessarily inimical to successful functioning in schooling (Elliot & Church, 1997; Harackiewicz et al., 2002; Pintrich, 2000). For instance, a number of research findings indicate that students with performance goals focus on their ability and self-worth, striving to outperform other students, looking smart, and trying to show that work can be done easily (Dweck, 1986; Kaplan, Middleton, Urdan, & Midgley, 2002). They view learning simply as a way to achieve external goals such as receiving teacher’s attention, reward, and judgments (Ames, 1992), and assess competence on the basis of their performance relative to others or external feedback (Dweck, 1986). So, it is clear that the argument about the meaning and purpose of performance goals, and the relative advantages and disadvantages on academic outcomes is still ongoing (Linnenbrink & Pintrich, 2002).

2.2.3.2. Approach versus Avoidance Goals

During the 1990s, many researchers in the field of achievement goal theory began to examine the somewhat problematic performance goal orientation in more detail. Upon noticing both the negative and positive impacts of performance goals, the goal theorists conducted a number of theoretical and empirical studies, and finally agreed on separating the original performance orientation into two different dimensions: performance approach and performance avoidance (Elliot & Church, 1997; Elliot & Harackiewicz, 1996; Harackiewicz Barron, & Elliot, 1998; Middleton & Midgley, 1997). This distinction fundamentally bases upon whether students want to look competent or avoid looking incompetent at their schoolwork (Harackiewicz, Barron, & Elliot, 1998). In particular, students who hold performance approach goals are found to be doing their academic work primarily because they want to outperform other students and have favorable judgments of their competence; on the other hand, students with performance avoidance goals do their academic work mainly because they want to avoid looking incompetent or unsatisfactory (Elliot & Church, 1997; Pajares, 2001).

The new perspective points out that performance approach goals do associate with adaptive beliefs and achievement behaviors (Elliot & Harackiewicz, 1996; Middleton & Midgley, 1997), including high levels of self-efficacy (Elliott & Harackiewicz, 1996), task persistence, strategy use, and help seeking behaviors (Wolters, 2004). However, there are also some negative outcomes associated with holding performance approach goals, such as having low retention of learned material (Elliot, 1999; Kaplan et al, 2002), a fear of failure (Elliott & Harackiewicz, 1996), and avoidance of challenging tasks (Wolters, 2004). Besides, in terms of academic outcomes, research relates performance approach goals to high levels of test performance (Linnenbrink, 2005), and academic achievement (Elliot & Church, 1997).

When research regarding performance avoidance goals is examined, it is found that holding performance avoidance goals is maladaptive, in that they are associated with a range of unfavorable behaviors and negative academic outcomes. In terms of beliefs and feelings, students who adopt performance avoidance goals are found to have low levels of self-efficacy (Elliott & Harackiewicz, 1996), and intrinsic motivation in their academic engagements (Elliot & Church, 1997). In terms of behaviors, as students with performance avoidance goals focus on not looking incompetent toward their peers, they use self-handicapping strategies and avoid seeking help from their peers (Kaplan et al, 2002). Besides, in terms of academic outcomes, as students develop avoidance behaviors, they demonstrate low competence expectancies, low task engagement (Elliot, 1999; Kaplan et al, 2002), and unsatisfactory academic achievement (Elliot & McGregor, 2001; Elliot & Church, 1997).

After the separation of performance goals into approach and avoidance dimensions, several researchers started to question if such a distinction should also be made regarding the mastery goal orientation (Elliot, 1999; Elliot & McGregor, 2001; Pintrich, 2000). Upon the findings of a number of theoretical and empirical studies, several goal theorists have pointed out that a performance orientation is based upon a comparison with others, whereas a mastery orientation could draw upon either a task focus or personal past experiences as a referent for student achievement (Elliot, 1999). These two different mastery foundations suggested that the mastery orientation could be divided into two different constructs: mastery approach and mastery avoidance (Elliot, 1999).

Students who hold mastery approach goals are found to focus on learning and understanding in order to achieve task mastery or improvement, whereas those who hold mastery avoidance goals are found to be concerned with not being perfect or fully understanding the material, but falling short of their own self-set standards for mastery (Elliot, 1999; Pintrich, 2000). In particular, mastery approach orientation is usually associated with a more adaptive pattern of learning, including frequent use of elaboration and organization strategies, effective adoption of self-regulatory strategies, effort attribution for failures, higher level of persistence, deeper learning levels, and subsequently a better performance (Pintrich & DeGroot, 1990; Pintrich & Garcia, 1991). On the other hand, mastery avoidance orientation can be associated with a more maladaptive pattern of learning. Actually, mastery avoidance distinction draws upon students' internal perceptions relating to the self or the task (Pintrich & Schunk, 2002). Students may adopt this type of goals as a way to express their internal negative attitudes toward schoolwork, to avoid failure and to cope with unmanageable constraints and demands of difficult learning situations (Pintrich & Schunk, 2002). Research reveals that mastery avoidance goals are negatively related to students' cognitive engagement and the use of deep processing strategies, however positively related to effort minimizing strategies, such as eliciting help from others, copying others' work, and guessing answers (Meece & Holt, 1993).

After the division of mastery goals into approach and avoidance constructs, several researchers have proposed a theoretical 2×2 conceptualization of achievement goal framework, which comprise four achievement goals: mastery approach, mastery avoidance, performance approach, and performance avoidance goals (Elliot, 1999; Pintrich, 2000). Although a number of goal theorists believe that it is helpful to classify the two achievement goals into approach and avoidance conceptions (Elliot, 1999; Pintrich, 2000; Pintrich & Schunk, 2002), some other goal theorists strongly argue that mastery avoidance goals are a relatively new dimension and their effects on academic outcomes have not clearly being established (Barker, Dowson, & McInerney, 2002).

2.2.3.3. Multiple Goals

The research in the field of achievement goal theory originally started with classifying students as mastery or performance goal oriented. To date, goal theorists no longer assume that students hold only one achievement goal orientation at a time (Pintrich & Garcia, 1991; Pintrich, 2000). Results of a number of theoretical and empirical studies indicate that achievement goals are somewhat independent but not mutually exclusive from each other, and students might hold these goals simultaneously (Ames & Archer, 1988; Harter & Jackson, 1992). This finding has led a number of achievement goal theorists to propose a multiple goal perspective (Barron & Harackiewicz, 2001; Pintrich, 2000). This possibility has led some achievement goal theorists to propose a multiple goal perspective, which suggests that students often pursue more than one achievement goal at schoolwork and the simultaneous pursuit of achievement goals has a more positive effect on students' achievement outcomes than the pursuit of a single achievement goal (Barron & Harackiewicz, 2001; Pintrich, 2000).

However, there is still no consensus regarding the conceptualization of these multiple goals. For example, it is not clear whether multiple goals should be considered as having three to four separate achievement goals together, or as having achievement goals related or connected in some manner (Ng, 1999). There are several goal theorists proposing that pursuing multiple goals refers to having either high on mastery and high on performance orientation, low on mastery and low on performance orientation, high on mastery but low on performance orientation, or low on mastery but high on performance orientation (Meece & Holt, 1993; Schraw, et al., 1995).

Studies have demonstrated support for both advantages and disadvantages of multiple goals. Regarding the positive outcomes, Bouffard and his colleagues (1995) found that having multiple goals are correlated with the highest scores in cognitive strategy use, self-regulation and course grade. Seifart (1995) found that students high on both mastery and performance goals demonstrate a preference for challenging tasks, positive affect, high perceived ability, high self-worth and adaptive attribution patterns. Similarly, Pintrich and Garcia (1991) found that students high on both mastery and performance goals show adaptive patterns of learning and cognitive engagement. On the other hand, regarding the negative outcomes, Wentzel (1993) found that students high on both mastery and performance goals are usually more anxious, and this leads to negative academic outcomes. Likewise, Meece and Holt (1993) found that students with mastery approach goals get higher course grades and better achievement test scores than students with a combined mastery approach and performance approach profile. The reason for the inconsistencies arisen from these research outcomes is probably due to the lack of a theoretical conceptual framework guiding the treatment of multiple goals and the differences in the methodological practices (Ng, 1999).

2.2.4. Classroom Goal Structure

Achievement goal theory strongly emphasizes that the reasons students engage in academic tasks have implications for how and what they learn (Stipek, 2002). Yet, it is important to realize that students "are not social isolates of the influence of those around them" (Bandura, 1997, p. 469). In fact, students adopt achievement goals in some way according to the broader social and psychological atmosphere in which they learn (Ames, 1992; Meece, 1991). Especially, the instructional context of a classroom forms a hidden curriculum that communicates to students what it means to learn a certain subject (NCTM, 2000).

Simply, classroom context refers to the ways teachers establish routines, set up rules, assign tasks, and evaluate academic performance (Bong, 2001). The structure of the learning environment provides certain cues about teachers' instructional practices and academic demands (Ames & Archer, 1988). However, even students in the same classroom may differ in the degree to which they focus on these certain cues as well as how they interpret them (Ryan & Grolnick, 1986). In this aspect, goal theorists state that more critical for the motivation of students is not their actual learning environment but rather how they individually perceive and interpret the goal messages conveyed in those contexts (Bong, 2001).

A growing body of research has demonstrated that students develop achievement goals that are parallel to the structure of the classroom context (Patrick et al., 2001; Roeser, Midgley, & Urdan, 1996; Turner et al., 2002). In particular, when students believe that their teachers focus on the mastery of the learning tasks and emphasize deep understanding of the material, they tend to hold similar attitudes toward learning and adopt mastery goal for that subject (Bong, 2001; Roeser, Midgley, & Urdan, 1996). On the other hand, when students feel that their teachers highly promote competition and reward better performance, students are likely to internalize these values and adopt either a performance approach or a performance avoidance goal for that subject matter (Ryan, Gheen, & Midgley, 1998). Especially, research shows that a perceived classroom performance goal structure is positively associated with students' reported use of avoidance strategies, including self-handicapping, avoidance of seeking help, and avoidance of novelty (Turner et al, 2002).

2.2.5. Self-Efficacy

In general, self-efficacy is defined as "people's judgments of their capabilities to organize and execute courses of action required to attain designated types of performance" (Bandura, 1986, p. 391). More specifically, it refers to individuals' beliefs about their performance in a particular context or for a specific task (Bandura, 1997). In academic settings, self-efficacy can be defined as students' judgment about their capabilities to successfully perform a school related activity or a task (Pintrich & Schunk, 1996). Specially, students' self-efficacy beliefs are their task specific judgments of academic abilities (Pintrich & Schunk, 2002).

Bandura (1986) proposed that the capability for self-regulation is an essential learner characteristic, and effective self-regulation depends on having an optimal level of self-efficacy belief for learning. Research shows that self-efficacy is positively related to a number of adaptive outcomes of schooling. Pajares (2001) indicated that students having high level of self-efficacy beliefs use their self-regulation skills more effectively. In particular, students with high efficacy beliefs tend to use more self-regulation strategies, invest greater effort, and persist longer in the face of difficulties compared to students who doubt their capabilities (Schunk, 1991; Zimmerman, Bandura, & Martinez-Pons, 1992). Especially, student's self-efficacy beliefs are found to be important determinant of their adoption of achievement goals (Bandura, 1986; Dweck & Leggett, 1988; Elliot, 1999), such that students with high self-efficacy beliefs tend to set more challenging tasks and make stronger commitment to accomplish these goals compared to students with low self-efficacy beliefs (Schunk, 2000). Research also shows that students with high self-efficacy beliefs work harder on learning tasks, get higher grades, and perform better on achievement tests compared to students with low self-efficacy beliefs (Schunk, 2000).

In general, students' self-efficacy beliefs depend heavily on their interpretation of abilities. However, there are a number of factors that may give students clue about their abilities and contribute to their adoption of self-efficacy beliefs. One of these factors is the task characteristics (Linnenbrink & Pintrich, 2003; Pintrich & Schunk, 2002). Research shows that students tend to avoid tasks that they believe to exceed their capacities (Bandura, 1982). Especially, when they feel that the task goes beyond their skills, they feel frustrated and tend to adopt low self-efficacy beliefs (Linnenbrink & Pintrich, 2003; Pintrich & Schunk, 2002). Therefore, it is suggested to provide tasks that are meaningful and challenging, but can be accomplished with some level of effort investment (Pintrich & Schunk, 2002). Another factor that may affect students' self-efficacy beliefs is their previous success on the related task (Stipek et al., 1998). Research shows that carrying out a task with continuous success promotes a feeling of mastery and the belief that similar tasks can be done easily (Stipek et al., 1998).

A third factor that may enhance students' adoption of self-efficacy beliefs is teacher's feedback on students' mastery and progress (Linnenbrink & Pintrich, 2003; Pintrich & Schunk, 2002). Research shows that when teachers provide regular, accurate and immediate feedback on students' progress, students develop more adoptive beliefs about their abilities (Zimmerman & Kitsantas, 1997). Lastly, the characteristic of the learning environment is found to be an important contributor on students' adoption of self-efficacy beliefs (Linnenbrink & Pintrich, 2003; Pintrich & Schunk, 2002). In this aspect, Bandura (1993) proposes that learning environments that emphasize ability as a skill to be acquired and de-emphasize competition and social comparisons are highly beneficial for building adoptive self-efficacy beliefs.

2.2.6. Strategy Use

Learning strategies are cognitive processes and behaviors that students use in order to achieve their academic goals (Garcia & Pintrich, 1994). They are learner's plans and "actions directed at acquiring information or skill that involve agency, purpose (goals), and instrumentality" (Zimmerman & Martinez-Pons, 1986, p.615). Strategy use involves engaging in "a recursive cycle of cognitive activities including analyzing tasks; selecting, adapting, or even inventing strategies; monitoring performance; and shifting approaches as required" (Butler, 1998, p.376).

In the literature, a number of different taxonomies have been presented to classify learning strategies (Pintrich & Garcia, 1991; Weinstein & Mayer, 1986). However, the most common classification includes dividing learning strategies into two categories: cognitive strategies and metacognitive strategies. Cognitive strategies, such as rehearsal, elaboration, and organization, help students to acquire new information, construct connections with prior knowledge, and retrieve the appropriate information when needed (Pintrich et al., 1991). Besides, metacognitive strategies, such as planning, monitoring, and regulating, help students to check and correct their behaviors as they proceed on a task, and effectively perform learning processes (Pintrich et al., 1991).

Strategy use is an essential part of self-regulated learning, mostly because they enhance learners to set strong control over their information processing (Weinstein & Mayer, 1986), and promote meaningful learning (Zimmerman, 1989). In particular, an effective use of self-regulation strategies helps students to regulate and monitor their time, effort, and understanding (Covington, 1985), and serves as an important predictor of academic performance (Pape & Wang, 2003; Pintrich &

DeGroot, 1990; Zimmerman & Martinez-Pons, 1990). Actually, all learners can use self- regulation strategies to some degree. However, self-regulated learners are the ones who are distinguished by their effective use of learning strategies to achieve their academic goals (Zimmerman & Martinez-Pons, 1992).

A number of studies have been conducted to examine the effect of training students to use self- regulation strategies effectively. In general, these studies have demonstrated positive effect of strategy instruction to overcome learning problems and enhance the degree and quality of student learning (Daniel, 2003; Marcou & Philippou, 2005; Shin, 1998). However, merely knowing a number of self-regulation strategies does not guarantee that students will use them autonomously. Indeed, being a strategic learner involves knowing, using, and transferring self-regulation strategies in different learning situations (Butler, 1998). In this regard, an effective strategy instruction includes a holistic perception of learning that focuses on both the whys of learning and the hows (Somuncuoğlu & Yıldırım, 1999).

Although a number of factors may affect students' use of learning strategies, the most important predictor of strategy use is whether students adopt a mastery or performance goal orientation (Ames & Archer, 1988; Eliott, 1999; Elliot & McGregor, 2001). Research reveals that students have a tendency to think about how to do a task when they are oriented toward learning, and focus on their mastery (Eliott, 1999). In general, having mastery goal orientation leads students to present greater use of self-regulated learning strategies and academic engagement (Elliot & McGregor, 2001). This might be due to the fact that achievement goal orientations explain the whys of students' engagement.

2.3. Research on the Related Constructs

2.3.1. Research on Achievement Goals

Until recently, a large body of research has been conducted on achievement goals, mostly because it has been regarded as an important factor for enhancing students' motivation and achievement (Ames, 1992; Elliot, 1999; Pintrich &

DeGroot, 1990). Achievement goals have been related to a broad array of cognitive, affective and behavioral outcomes, including self-efficacy, feelings about school, perception of classroom goal structure, the use of learning strategies, attributions for success and failure, and academic performance. Regarding the purpose of this study, studies only related to self-efficacy, perception of classroom goal structure, and the use of self-regulation strategies were reviewed in this part of the literature.

Considering the research on goal orientation and self-efficacy, previous studies have revealed that students' goal orientations are highly related to their self-efficacy beliefs. In particular, studies show that students who have high self-efficacy beliefs tend to adopt mastery goals for learning (Elliott & Dweck, 1988). For example, Nicholls (1984) found that students who adopt mastery goals perceive themselves as highly competent while working on difficult tasks. On the other hand, students who adopt performance goals do not perceive themselves as capable until they really score above average students. Actually, most of the research shows a reciprocal relationship between self-efficacy and goal orientation, such that students who have high levels of self-efficacy tend to adopt mastery goals, and those who adopt mastery goals possess confidence to do future tasks (Seifert, 1995; Urdan, 1997).

Research also shows a parallelism between students' goal orientations and perception of classroom goal structure (Dweck & Legget, 1988; Skinner & Belmont, 1993). In particular, when students believe that their teachers focus on the mastery of the learning tasks and emphasize deep understanding of the material, they tend to have mastery orientation toward that subject matter (Bong, 2001). On the other hand, when students feel that their teachers highly promote competition, and reward better performance, they tend to have performance orientation toward that subject matter (Ryan, Gheen, & Midgley, 1998). In addition, those students in performance oriented classrooms tend to show a variety of maladaptive learning behaviors, including spending less effort, avoiding difficult tasks, feeling negative toward learning, and avoiding help seeking from their peers (Dweck & Legget, 1988; Turner et al, 2002). Similarly, in a recent experimental study, Song and Grabowski (2006) investigated the relationship among students' goal orientation, classroom goal structure and problem solving skills. The study was conducted with 96 sixth grade students. The results revealed that students in the mastery oriented classroom context had significantly higher mastery goal orientation than students in the performance oriented context. Moreover, students in the mastery oriented classroom had higher scores on monitoring and evaluating problem solving skills than those in the performance oriented classroom.

Regarding the research on goal orientation and strategy use, previous studies show a positive relationship between students' use of learning strategies and having mastery orientation toward learning. For example, Diener and Dweck (1980) conducted research on 5th grade students, and examined the differences between performance oriented and mastery oriented students' strategy use when they make mistakes during problem solving tasks. The results of the study showed that performance oriented students regarded mistakes as a threat to their ability, decreased their use of strategies, and believed that they would fail in the future tasks. On the other hand, mastery oriented students were more optimistic after failure; they increased their strategy use, and reported that they were enjoying the challenge. Similarly, Pintrich and Garcia (1991) examined 365 college students' goal orientation and use of metacognitive strategies. They found a positive relation between having mastery goal orientation and frequent use of rehearsal, organization, metacognition, and effort management strategies. On the other hand, having performance goals were more related to showing maladaptive outcomes, such as lack of persistence, spending less effort, using less metacognitive strategies, and showing little interest in the learning tasks.

In a recent study, Pintrich (2000) examined 250 eight and ninth grade students' goal orientation and its relation to strategy use and performance. In general, the results showed that mastery oriented students demonstrated more adaptive learning behaviors than performance oriented students. For example, they were more likely to use elaboration strategies and organizational strategies, and they were more metacognitive and self-regulating. Besides, the learning behaviors of performance oriented students when coupled with mastery orientation were also adaptive, suggesting that there is not necessarily decay in students' cognitive engagement as a function of adopting performance orientation.

In another study, Pajares (2001) examined how students' achievement goals, self-efficacy, and self-regulation relate to each other. The study was conducted with 529 elementary school students. The results revealed that mastery goals were positively associated with self-efficacy and strategy use, whereas performance avoidance goals were negatively associated. In particular, students that value school work, view learning as an end in itself and believe that the purpose of learning is to master ideas, engaged in tasks with positive self-feelings toward learning and demonstrated more self-regulatory practices. Lastly, with respect to academic achievement, it was found that mastery orientation is important for academic achievement, and it is mediated by self-regulation to increase achievement (Greene & Miller, 1993).

2.3.2. Research on Classroom Goal Structure

Research over the past decades has addressed how classroom goal structure affect the achievement behaviors students adopt. For example, in an experimental study conducted with fifth and sixth grade students, Ames (1984) investigated how classroom goal structure relates to students' attribution for success or failure. She gave students puzzles to solve and manipulated the classroom goal structure by changing the instructions she gave to students. Some instructions emphasized competition, such as "Let's see who is better at solving the puzzles," and other instructions emphasized challenge, such as "Try to solve as many puzzles as you can." The findings revealed that in competition oriented context, students ascribe their success or failure more on ability attributions; whereas in challenge oriented context, they ascribe their success or failure on the effort they invest.

In a further study, Ames and Archer (1988) examined how students' perceptions of classroom goal structure influence their learning strategies, task preferences, attitudes, and attributions. The data were collected through questionnaires from 176 students in grades 8 to11. The pattern and strength of the findings suggested that a perceived mastery goal orientation in classroom promote the maintenance of adaptive motivation patterns. In particular, the findings indicated that when students perceived their classroom as mastery oriented, they reported using more effective strategies, preferred challenging tasks, had a more positive attitude toward the class, and had a stronger belief that success follows from one's effort. On the other hand, when students perceived their classroom as performance oriented, they tended to focus on their ability, and attributed their failure to lack of ability and difficulty of the tasks.

From that time on, goal theorists started to examine how classroom goal orientation affects a number of other achievement variables. For example, Nicholls and his colleagues (1990) examined how mathematics teachers' instructional approaches relate to students' adoption of achievement goals. They collected data from 102 second grade students in their mathematics classrooms throughout one year. The findings suggested that teaching practices have substantial effect over the type of goals students adopt. Particularly, the results revealed that when the teacher used a problem solving approach, students hold more mastery goals, and adopt the beliefs that success in mathematics is fostered by effort, attempts to make sense of things, and cooperation with the peers. On the other hand, when the teacher used a traditional approach, students focused more on performance goals, and adopt the beliefs that success depends on superior ability and attempts to pass the others.

In a similar study, Wood and Sellers (1997) studied the differences between using a problem centered instruction or a traditional textbook instruction on students' beliefs and motivations in mathematics. The data were collected over two years from three groups of elementary students. The groups were assigned according to those students who had received two years of problem centered instruction, those who had received one year of problem centered instruction, and those who had received only traditional textbook instruction. The findings indicated that students who received problem centered instruction were more interested in finding their own ways to solve problems, and they were not as likely to be motivated by competition as the students who received a traditional textbook instruction. In two other studies on the goal structure of mathematics classrooms, both Turner et al. (1998) and Anderman et al. (1999) reported that mathematics classrooms are traditionally more performance oriented, and encourage the adoption of performance goals by students.

In another study, Meece (1991) examined how teachers' instructional discourse relates to students' adoption of mastery goals. He collected data from fifth and sixth grade students in science classrooms. The findings revealed that students were more likely to adopt mastery goals when the teacher designed instruction in accordance with students' interests, advocated positive peer relationships, and emphasized meaningful learning rather than rote learning and performance. In a similar study, Turner and his colleagues (2002) examined how teachers' motivational discourse relates to students' adoption of mastery goals in mathematic classrooms. Using survey measures, they found that the extent to which students adopt and maintain mastery goals depend heavily on the amount of cognitive and emotional support teachers provide, including a strong emphasis on learning, frequent encouragement, collaboration, promoting intrinsic interest, and recognition with genuine praise.

Likewise, Patrick and his colleagues (2001) investigated students' perception of classroom goal structure and the kind of instructional practices and teacher discourse emphasized. They collected data from fifth grade teachers, using both survey measures and observations. The results of the study revealed that in classrooms where students perceived mastery goal orientation, teachers focused more on student effort, promoted active participation, and student collaboration. In a recent study, Schweinle, Meyer and Turner (2006) investigated how teachers' discourse relates to students' motivation in mathematics classroom. The data were collected using qualitative measure, in fifth and sixth grade mathematics classrooms. In general the following teacher practices were found to be related to student motivation: an emphasis on learning for its own sake, clarification of concepts, support for autonomy and cooperation, and provision of substantive feedback. Especially, when the teacher built a balance between challenge and skill, supported self-efficacy, and fostered positive affect, this enhanced positive student motivation in mathematics classroom.

In another study, Ryan and his colleagues (1998) investigated the relationship between teachers' achievement goal orientation and students' help seeking behaviors. The data were collected through questionnaires from 516 sixth grade students and their teachers. The findings suggested that students' perception of classroom goal orientation is highly related to their help seeking behaviors. In particular, students who perceived a mastery oriented classroom were more likely to ask for help from their teachers than students who perceived a performance oriented classroom. Similarly, Kaplan, Gheen, and Midgley (2002) examined the impact of perceived classroom goal orientation on students' disruptive behaviors. The data were collected through questionnaires, from 388 ninth grade students in their mathematics classrooms. The results suggested that students' perception of teacher goal orientation is a significant predictor of their disruptive behavior. In particular, they found that students who perceived their classroom as more mastery oriented reported less disruptive behavior than students who perceived a performance oriented classroom.

In a similar study, Stipek and her colleagues (1998) examined the relationship among teaching practices, student motivation, and mathematics achievement. They collected data 624 fourth through sixth grade students and their teachers in different schools. Using both qualitative and quantitative measures, they found that the more teachers demonstrated positive affect and mastery orientation in the classroom, the more students reported positive attitudes, learning for understanding, and help seeking behaviors. In addition, students in these classrooms received higher grades on achievement tests regarding the items on conceptual knowledge.

In a recent study, Butler (2006) examined the effect of teachers' evaluation practices on students' initial goal adoptions. He collected data from 312 secondary school students at ages 13 to 15. Students were told before they worked on a series of challenging problems that they would later receive either their final percentile score (normative evaluation condition) or their scores on each problem (temporal evaluation condition), or no score at all. The results of the study confirmed that students' perception of evaluation practices convey strong messages about their goal adoptions. In particular, the results showed that anticipation of temporal evaluation enhanced initial mastery goals, anticipation of normative evaluation enhanced performance goals and the no-evaluation condition undermined both.

2.3.3. Research on Self-Efficacy

Until recently, various research studies have been conducted on how academic self-efficacy relates to students' learning in school settings. Especially, researchers have focused on the ways self-efficacy beliefs influence learning and motivation, and, in turn, affect academic performance (Bong, 2001; Linnenbrink & Pintrich, 2002; Wolters, 2004). Considering the research studies on the relation between self-efficacy and goal orientation, findings suggest that self-efficacy beliefs have a strong influence on students' adoption of achievement goals (Bell & Kozlowski, 2002; Holladay & Quinones, 2003; Karabenic, 2004; Middleton & Midgley, 1997; Wolters, 2004). For example, in a survey study conducted with 703 sixth grade students, Middleton and Midgley (1997) found that students' self-efficacy beliefs were positively related to mastery goal orientation, negatively related to performance avoidance goal orientation, and not related to performance approach goal orientation. Similarly, Schunk (1996) conducted a study with 40 fourth grade students, and found that students' self-efficacy beliefs with respect to solving a set of fraction problems were positively related to their adoption of mastery goals, and negatively related to their adoption of performance goals. Likewise, most of the recent studies show a positive relationship between self-efficacy and mastery goal orientation across all grade levels, including elementary school, high school, and college level (Bell & Kozlowski, 2002; Holladay & Quinones, 2003; Karabenic, 2004; Wolters, 2004).

Besides, considering the research studies on students' self-efficacy beliefs and perception of classroom goal structure, findings also suggest that students' self-efficacy beliefs are significantly related to their perception of classroom goal structure. In this regard, in a survey study conducted with 341 elementary school students, Anderman and Midgley (1997) found a positive relationship between student's self-efficacy beliefs and their perception of classroom goal structure in mathematics classrooms. Especially, students with high self-efficacy reported their classroom environment as having a strong emphasis on mastery oriented outcomes. In a similar vein, Greene et al. (2004) conducted a survey study with 220 high school students in their English classrooms, and found that students with high self-efficacy perceived their classroom environment as supporting autonomy and having mastery oriented evaluations.

Previous studies on self-efficacy have also focused on the relation between self-efficacy and use of self-regulation strategies. For instance, in a correlational research study, Zimmerman and Martinez-Pons (1990) examined 180 elementary and high school students' mathematical efficacy and use of self-regulated learning strategies. The results of the study revealed that students' self-efficacy beliefs were positively related to their use of a number of self- regulation strategies, such as monitoring, record keeping, and self-evaluating. In another correlational study, Linnenbrink and Pintrich (2002) found that elementary school students' self-efficacy beliefs were positively related to their cognitive engagement and use of self-regulation strategies. Similarly, in a survey study, Garcia and Pintrich (1991) examined 367 college students' self-efficacy, goal orientation, and use of self-regulation strategies. In general, the findings revealed that goal orientation and self-efficacy had significant effects on students' use of self- regulation strategies. In particular, the results suggested that mastery orientation to learning resulted in higher levels of self-efficacy and deeper cognitive engagement, and these self-efficacy beliefs, in turn, lead to more use of self- regulation strategies.

As clearly seen from previous studies, the ways students perceive their capabilities influence their learning and motivation, and this in turn affect their academic performance. Actually, research also shows that self-efficacy is related to academic achievement directly as well as through learning and motivation. Specially, research related with mathematics achievement reveal that there is a positive relation between students' self-efficacy beliefs and persistence in solving problems during mathematics learning (Schunk, 1991). In particular, students who expect to have less difficulty in solving problems tend to solve more problems than students who expect to have difficulty (Schunk & Hanson, 1985). Research also reveal that self-efficacy is positively related to higher levels of academic achievement as well as a wide variety of adaptive outcomes, including higher levels of effort and increased persistence on difficult tasks (Bandura, 1997: Pintrich & Schunk, 2002). In this aspect, Pajares and Graham (1999) found that mathematical self-efficacy was a key variable in predicting students' mathematics performance in elementary school setting. Particularly, students with high self-efficacy were more successful in their mathematical computations, and showed greater persistence in difficult problems than do students with less self-efficacy. Furthermore, numerous research studies show a positive relationship between self-efficacy and academic achievement across all grade levels, including elementary school, high school, and college level (Senko & Harackiewicz, 2005; Wentzel, 1996; Wolters, Yu & Pintrich 1996).

2.3.4. Research on Strategy Use

In the literature, there is numerous research studies conducted on self-regulated learning, some of which focus on the different components of self-regulated learning such as cognitive, motivational, and behavioral aspects of self-regulation, whereas some others focus on the factors that enhance students' self-regulatory competence. Regarding the focus of this study, this part of the literature concentrated more on the factors, including self-efficacy, goal orientation, and classroom goal structure, which may influence students' use of a variety of self-regulated learning strategies.

Considering the research on self-efficacy and strategy use, studies reveal a positive relation between students' self-efficacy beliefs and use of a variety of self-regulation strategies. For instance, Wolters and Pintrich (1998) conducted a correlation study on elementary school students across different subject matters including mathematics, science, English, and social studies. They found that students with high self-efficacy beliefs reported use of more cognitive and metacognitive strategies than students with low self-efficacy beliefs. Actually, studies showed that there is not only a positive relation but also a reciprocal relation between strategy use and self-efficacy. In particular, it was found that student's self-efficacy beliefs affect their choice of activities, persistence, and goal settings (Pajares, 2002; Schunk, 2000; Zimmerman, 2000). Then, as students work toward the learning task and note progress toward their goals, they enhance their self-efficacy beliefs for the future activities (Schunk, 2000).

There are numerous research studies in the literature that highlight the importance of integrating both self-efficacy and goal orientation in the self-regulation studies (Lau and Lee, 2008; Pintrich & De Groot, 1991; Sungur, 2007). For example, in a path analysis, Garcia and Pintrich (1991) examined the relationship between college students' self-efficacy beliefs and self-regulated learning strategies. Using structural equation modeling, they found a significant path from self-efficacy to self-regulated learning, which was mediated through the influence of goal orientation. In a similar study, Zimmerman, Bandura, and Martinez-Pons (1992) found that students with high self-efficacy beliefs set more mastery oriented goals for their learning, and this in turn enhance their use of a variety of self-regulated learning strategies. Moreover, in a more recent study, Sungur (2007) examined 391 high school students' motivational beliefs, metacognitive strategy use, and effort regulation in science classrooms. The results of the study revealed that students' goal orientation and self-efficacy beliefs were predictors of their metacognitive strategy use. In addition, the effect of motivational beliefs on effort regulation was mediated through metacognitive strategy use, which suggested that students need motivation to effectively use self- regulation strategies and spend effort in academic tasks.

Pintrich (1989) indicate that while student's goal orientation does not necessarily enhance academic performance, it appears to have an indirect effect on performance through its strong relationships with self-efficacy and self-regulated learning. In a correlation study, Pintrich and De Groot (1990) examined the relation between students' use of self-regulation strategies such as self-regulation and cognitive strategy use and their motivational beliefs such as their self-efficacy and goal orientations. The results of the study revealed that self-regulation was significantly related to self-efficacy and mastery goal orientation. In addition, they found that students' use of self-regulation strategies was significantly related to their academic performance. In another study conducted with 519 tenth-grade students, Yumusak, Sungur, and Cakiroglu (2007) found that goal orientation and a number of strategy use, including rehearsal, organization, management of time and study environment, significantly contributed to students' academic achievement in biology education. In addition, there are many research studies showing that self-regulated learning positively affects academic achievement in mathematics as well as in other subject matters (Pape & Wang, 2003; Pintrich & DeGroot, 1990; Zimmerman & Martinez-Pons, 1990). Especially, research reveals that students' use of self-regulation strategies is the best predictor of their academic performance among other variables such as self-efficacy and goal orientation (Pintrich & De Groot, 1990).

Considering the research on strategy use and classroom context, although previous research have highlighted the importance of integrating classroom context in self-regulation studies, to date only a few studies have focused on the ways that classroom context enhances or hinders students' strategy use. In an experimental study, Ames (1984) examined 5th and 6th grade students' use of self-regulation strategies both in mastery oriented and performance oriented classroom contexts. He found that when students were encouraged to solve as many problems as they could, they used more effective strategies to solve the problems than children who were told that the goal was to solve more problems than their classmates. Similarly, Lyke and Young (2006) examined the relation among college students' goal orientations, perceptions of classroom environment, and use of cognitive strategies. They found that mastery goal orientation was related to use of deep cognitive strategies, whereas performance goal orientation was related to use of more rehearsal strategies. In addition, students' perceptions of classroom environment were significantly related to their goal orientations. Lastly, in a recent study conducted with 925 eight grade students, Lau and Lee (2008) found that students' perceived classroom environment was significantly related to their achievement goal orientations and strategy use. Besides, mastery goals were found to be the strongest predictor of strategy use, while performance approach goals also had positive relations with mastery goals and strategy use.

2.3.5. Related Research Conducted in Turkey

When the literature was reviewed regarding the Turkish publications on students' self-regulation and achievement goals, only a small number of studies were found, most of which were conducted in the last years. In particular, most of these studies were conducted with pre-service teachers and high school students, and focused on students' self-regulatory skills, achievement goal orientations, and their relation to academic achievement.

Regarding the studies conducted with Turkish students, Üredi and Üredi (2005) investigated how self-regulation strategies and motivational beliefs predicted elementary school students' mathematic achievement. The participants were 515 eighth grade students studying in an elementary school, in Istanbul. The data were collected using self-regulation and metacognitive dimensions of the MSLQ (Pintrich & De Groot, 1990), and final grades were used as a measure of students' mathematic achievement. The findings of the study revealed that self-regulation strategies and motivational beliefs explained nearly 30% of the variance on mathematic achievement, and the most powerful predictive variable was the cognitive strategy use.

In a similar study, Öztürk, Bulut, and Koç (2007) examined how self-regulated learning and motivation predicted high school students' mathematics achievement. The participants of the study were 752 ninth grade students enrolled in six public high schools in a medium size city of Turkey. The participants were administered the MSLQ (Pintrich et al., 1991) and a mathematics achievement test in their regular classroom settings. Regression analysis indicated that self-efficacy, test anxiety and extrinsic goal orientation together significantly explained nearly 10% of the variances in students' mathematics achievement. Especially, self-efficacy was the strongest significant predictor of students' mathematics achievement, accounting for 7.4 % of the variance in mathematics achievement. Therefore, the results suggested that motivational beliefs had a considerable influence on Turkish students' mathematics achievement.

In a further study, Sungur and Tekkaya (2006) investigated the effect of problem-based learning (PBL) on students' motivation and use of learning strategies in science education. They conducted a quasi-experimental study on 61 tenth-grade students from a large urban district of Ankara. During the study, experimental group students received PBL, whereas control group students received traditional instruction with traditional textbooks. The results of the study revealed that PBL students tended to participate in a task for reasons such as challenge, curiosity, and mastery. In general, they had higher levels of intrinsic goal orientation, and task value, as well as use of elaboration strategies, critical thinking, metacognitive self-regulation, effort regulation, and peer learning strategies compared with control group students.

In a recent study, Akyol, Tekkaya and Sungur (2010) examined the differences in elementary school students' cognitive and metacognitive strategy use and how these strategies contributed to their science achievement. The participants were 1517 seventh grade students enrolled in 15 public elementary schools in Keçiören district of Ankara. The data were collected through the use of Background Characteristics Survey, Motivated Strategies for Learning Questionnaire and Science Achievement Test. The results of the study revealed that there were significant differences in students' cognitive and metacognitive strategy use. Specially, elaboration and metacognitive self-regulation strategy use were the most influential strategies on students' science achievement.

Regarding the studies conducted with teachers and pre-service teachers in Turkey, the focus of the studies was, in general, on teachers' self-efficacy beliefs, use of learning strategies, and achievement goal orientations. For example, Somuncuoğlu and Yıldırım (1999) examined pre-service teachers' use of different types of learning strategies in relation to their achievement goal orientations. The participants were 189 pre-service teachers taking the Educational Psychology course at Middle East Technical University in Turkey. The data were collected during the spring semester of 1996 academic year, through a survey questionnaire on goal orientations and learning strategies. The results of the study indicated that most of the pre-service teachers were close to mastery goal orientation and somewhat to performance goal orientation. Regarding their use of learning strategies, although most of the pre-service teachers used rehearsal and metacognitive strategies to a similar extent, elaboration and organization strategy use were more dominant than the other two strategies. When the relationship between achievement goal orientations and the use of learning strategies was examined, the results revealed that mastery goal orientation predicted the use of elaboration, organization, and metacognitive strategies, whereas performance goal orientation predicted only rehearsal strategy use. On the other hand, work avoidant goal orientation was negatively related to elaboration, organization, and metacognitive strategy use.

In a further study, Dede (2008) examined mathematics teachers' self-efficacy beliefs toward teaching mathematics. He administered a questionnaire to 60 mathematics teachers who were randomly selected from 15 primary schools and 12 high schools located in Sivas, Turkey. The results of the study revealed that both teachers in primary schools and high schools believed that they can teach mathematics effectively. However, they did not hold strong beliefs about helping students to overcome their difficulties and motivating them towards mathematics.

In a similar attempt, Orhan (2008) examined pre-service teachers' perception of self-regulation strategies, and the effects of these strategies on their teaching self-efficacy. The participants were 39 pre-service computer teachers studying at the Department of Computer Education and Instructional Technologies at Yıldız Technical University in Istanbul. The researcher conducted a pre-experimental study, and integrated a number of self-regulation strategies, including setting goals, writing reflective summaries, journal keeping, conducting collaborative group work and self-reflection, into a teaching practice course. After the one semester course, pre-service teachers perceived themselves as being more motivated on the course and having a higher level of teacher self-efficacy as a computer teacher.

Lastly, in a recent study, Polat and Bulut (2009) examined the effects of problem solving approaches on pre-service teachers' mathematics achievement, problem solving performance and self regulated learning. They conducted a quasi-experimental study on 110 pre-service elementary school teachers at a public university in the Central Anatolia Region of Turkey. During the study, experimental group was instructed by questioning problem solving approach, whereas control group was instructed by traditional problem solving approach. The results of the study revealed that the questioning problem solving approach had a statistically significant effect on pre-service teachers' basic mathematics achievement, problem solving performance, task value, learning beliefs, metacognitive self-regulation and effort regulation.

2.4. Summary of the Literature Review

Until recently, a large body of research has been conducted in the literature for examining how self-regulatory processes affect students' academic achievement, and which factors have influence on these self-regulatory processes. In general, self-regulation studies have been linked to a broad array of cognitive, affective and behavioral aspects of learning. Specially, most of these studies have emphasized the importance of integrating self-regulation with motivational factors, including students' goal orientations and self-efficacy, for better determining self-regulatory behaviors and academic achievement. Among these motivational factors, the review of research on achievement goal orientations has highlighted mastery goals as the most adaptive goal orientation for academic outcomes. In particular, holding mastery goals have been associated with having high perception of self-efficacy, perceiving classroom context as mastery oriented, selecting challenging tasks, demonstrating deep processing of studying materials, deeper use of self-regulation strategies, and high academic performance. Similarly, the review of research on self-efficacy has revealed that having high self-efficacy beliefs are positively related to a number of adaptive academic outcomes, such as adopting mastery goal orientations, setting challenging tasks, persisting longer in the face of difficulties, effective use of self-regulatory strategies, and showing high academic performance.

Most of the prior research has examined students' achievement goal orientation, self-efficacy, use of self-regulation strategies, and academic achievement in combinations, such as achievement goal orientation and self-efficacy, self-efficacy and self-regulation, or achievement goal orientation and self-regulation. However, in order to better understand the dynamic relationships among these factors, there is a need for further research that integrates all these factors in a single model. Furthermore, regarding the research conducted in Turkey, very few studies have been found on these concepts. Besides, most of these studies were conducted only in the last few years, and they were mostly conducted with pre-service teachers or high school students. Thus, more research is needed in Turkish context in order to have better understanding about how these concepts relate to each other and to students' mathematics learning, especially in elementary school settings. For these reasons, the present study aims to examine the nature of direct and indirect relations among elementary school students' self-efficacy beliefs, perceptions of classroom goal structure, achievement goal orientation, use of learning strategies, and academic achievement in mathematics, and to develop a comprehensive model that aims to explain these relationships.

CHAPTER III

3. METHODOLOGY

This chapter specifies the methods that were employed for gathering and analyzing data in this study. Specifically, the chapter addresses details about the characteristics of the participants, the processes undertaken for the development of the instrument, as well as the procedures that were employed for data collection and analysis.

3.1. Participants

In this study, Structural Equation Modeling (SEM) technique was used for data analysis. In SEM analysis, the minimum sample size needed is affected by the normality of the data and estimation method that researchers use (Schreiber et al, 2006). However, the generally agreed on value is 10 participants for every free parameter estimated (Sivo et al, 2006) or a critical sample size of 200 (Garver & Mentzer, 1999; Hoelter, 1983) to provide sufficient statistical power for data analysis. In this study, the sample size was 1019, which was a satisfactory number for insuring power issues.

The participants of this study were 7^{th} grade students, enrolled in public elementary schools, located at different urban and rural districts in Ankara. According to the 2008-2009 statistics of the Ministry of National Education, there were approximately 890 elementary schools in Ankara, located at 24 different rural and urban districts (MEB, 2008). In this study, data were collected from four different districts in Ankara. These districts were Çankaya, Etimesgut, Keçiören, and

Yenimahalle. They were selected conveniently from both rural and urban areas, regarding their means of accessibility. Table 3.1 summarizes the number of schools and students in each selected district. Briefly, there were 346 public elementary schools in these four districts. Among these schools, 126 schools (36.5%) were located in Çankaya, 38 schools (11%) were located in Etimesgut, 94 schools (27.1%) were located in Keçiören, and 88 schools (25.4%) were located in Yenimahalle.

Table 3.1 Selected Districts and Total Number of Schools and Students

Selected Districts	Number of Schools	Number of Students
Çankaya	126 (36.5%)	70,376
Etimesgut	38 (11%)	40,871
Keçiören	94 (27.1%)	97,206
Yenimahalle	88 (25.4%)	63,004
Total	346	271,457

Before the administration of the instrument, both the number of schools selected for data collection and the target sample size for each district were determined according to the number of elementary schools in each district. Table 3.2 summarizes the demographic information regarding the sample of the main study. It includes the number of schools visited in each district, the number of classrooms visited in each school, and the number of male and female students in each classroom, as well as the total number of students participated in each classroom, school, and district.

Table 3.2 Summary of Demographic Information about the Participants

Districts	Schools	Classes	Gender		Class Total	School Total	District Total
			Male	Female			
Çankaya	School A	Class A	7	6	13	29	360
		Class B	10	6	16		
	School B	Class A	9	12	21	21	
		Class A	21	18	39	113	
	School C	Class B	19	15	34		
		Class C	33	7	40		
	School D	Class A	12	10	22	71	
		Class B	9	10	19		
		Class C	18	12	30		
	School E	Class A	10	5	15	15	
	School F	Class A	14	13	27	111	
		Class B	16	12	28		
		Class C	13	15	28		
		Class D	14	14	28		
Etimesgut	School G	Class A	21	18	39	84	203
		Class B	23	22	45		
	School H	Class A	14	16	30	119	
		Class B	16	15	31		
		Class C	13	14	27		
		Class D	15	16	31		
Keçiören	School I	Class A	15	10	25	151	283
		Class B	15	16	31		
		Class C	15	16	31		
		Class D	10	23	33		
		Class E	16	15	31		
	School J	Class A	22	18	40	132	
		Class B	18	13	31		
		Class C	18	14	32		
		Class D	17	12	29		
Yenimahalle	School K	Class A	15	17	32	173	173
		Class B	17	19	36		
		Class C	18	18	36		
		Class D	20	14	34		
		Class E	15	20	35		
Total	11 schools	34 classes	538	481	1019	1019	1019

In summary, the sample of this study consisted of 1019 seventh grade students, attending to 11 public elementary schools, located at Çankaya, Etimesgut, Keçiören, and Yenimahalle districts in Ankara. The data were collected from a total of 34 classrooms during their regular class periods. The number of students in each classroom ranged between 13 and 45, with an average of 30 students. In addition, the number of students in each school ranged between 15 and 173, with an average of 93 students. Among the participating students, 360 students (35.3%) were attending to 6 elementary schools in Çankaya district, 203 students (20%) were attending to 2 elementary schools in Etimesgut district, 283 students (27.7%) were attending to 2 elementary schools in Keçiören district, and 173 students (17%) were attending to 1 elementary school in Yenimahalle district. Besides, the number of male students was 538 (52.8%), and the number of female students was 481 (47.2%).

3.2. Instrumentation

The data collection instrument was formed as a collection of previously developed instruments in the related field, with several modifications in the light of Turkish context and elementary mathematics education. The instrument consisted of three parts: (1) Demographic Information; (2) Self-Report Questionnaire; and (3) Mathematics Achievement Test (see Appendix A and B). In the first part, participants were asked several demographic questions, including their gender, school, class, class number, and the results of Level Determination Exam (Seviye Belirleme Sınavı; SBS) for the previous year. The data gathered from these demographic questions were used both for providing demographic information about the participants and for associating these characteristics with the data collected from other parts of the instrument. In the second part, participants were asked their level of agreement or disagreement to a number of questionnaire items. These items assessed several constructs including participants' achievement goal orientations, perception of classroom goal structure, self-efficacy, and use of learning strategies in elementary mathematics. In the last part of the instrument, participants were asked a number of mathematics problems that covered the topics in their mathematics curriculum. The problems were prepared considering the problems asked in SBS administered by the Ministry of National Education and their mathematics textbook. The problems were in multiple choice format, and the number of correct answers was used to measure students' mathematics achievement.

3.2.1. The Questionnaire

The self-report questionnaire included four scales that intended to measure students' personal achievement goal orientations, perception of classroom goal structure, self-efficacy, and use of learning strategies in the context of mathematics. The first two scales were prepared by using a number of subscales from the Patterns of Adaptive Learning Survey (PALS: Midgley et al., 2000), and the last two scales were prepared by using a number of subscales from the Motivated Strategies for Learning Questionnaire (MSLQ: Pintrich et al., 1991). The scales measured with the self-report questionnaire, the instruments used for the development of these scales, and the number of items used is presented in Table 3.3.

Table 3.3 The Scales Measured with the Questionnaire and their References

The Scales Used in the Study	The Original Instruments	Number of Items
Achievement Goal Orientation	The Patterns of Adaptive Learning Scale (PALS: Midgley et al., 2000)	14
Perception of Classroom Goal Structure	The Patterns of Adaptive Learning Scale (PALS: Midgley et al., 2000)	14
Self-Efficacy	The Motivated Strategies for Learning Questionnaire (MSLQ: Pintrich et al., 1991)	8
Learning Strategies	The Motivated Strategies for Learning Questionnaire (MSLQ: Pintrich et al., 1991)	22
Total		58

The Patterns of Adaptive Learning Survey (PALS) was originally developed by Midgley and her colleagues in 1997, and has been refined since then, to examine the relationship between the nature of learning environments and students' motivation, affect, and behavior. The instrument has been widely used at various grade levels from fourth grade to college level. It consists of two main scales; one for students and one for teachers. The student scale includes 94 items. It measures five areas concerning students' achievement goal orientations, their perception of teachers' goals, perception of classroom goal structures, academic related perceptions, beliefs, and strategies, and perceptions of parents, home life, and neighborhood, each with their own subcategories. Besides, the teacher scale contains 29 items, and measures three areas regarding teachers' perceptions of the school goal structure for students, their personal goal related approaches to instruction, and personal teaching efficacies, each with their own subcategories. Participants respond to the items on a five-point Likert scale ranging from 1 (not at all true) to 5 (very true). Statistical evidences reveal that the scales have high internal consistencies, with Cronbach's alpha ranging from 0.70 to 0.80 (Midgley et al., 2000). Besides, it is possible to use different scales together or individually. Regarding the purpose of this study, items in the student scale that pertain students' achievement goal orientations and their perception of classroom goal structure were used in this study.

The Motivated Strategies for Learning Questionnaire (MSLQ) was originally developed by Pintrich and his colleagues in 1986, and has been refined and revised from that time on. The instrument has been widely used in the area of motivation and self-regulation, mostly at college level. It consists of two main scales; one for motivation and one for learning strategies. The motivation scale includes 31 items that measure value components, expectancy components and affective components of academic motivation, each with their own subcategories. Besides, the learning strategies scale includes 50 items regarding the use of cognitive and metacognitive strategies and resource management strategies, each with their own subcategories. Participants respond to the items on a seven-point Likert scale ranging from 1 (not at all true of me) to 7 (very true of me). Statistical evidences show that the scales have reasonable internal consistencies, with Cronbach's alpha ranging from 0.52 to 0.93 (Pintrich et al., 1991). Besides, the scales are designed modular, so that it is possible to use different scales together or individually. Regarding the purpose of this study, several items from both motivation scale and learning strategies scale were used in this study. From the motivation scale, items in the expectancy components subscale concerning students' self-efficacy for learning and performance were used. In addition, from the learning strategies scale, items in the cognitive and metacognitive strategies subscale concerning students' use of elaboration, organization, and metacognitive self-regulation strategies were used in this study. In the following sections, each component of the self-report questionnaire was explained in more details.

3.2.1.1. Achievement Goal Orientation Scale

In this study, the achievement goal orientation scale contained 14 items from the Patterns of Adaptive Learning Scale (PALS) (Midgley et al., 2000). On the whole, the scale assesses students' reasons or purposes for engaging in academic behavior. In the PALS manual (Midgley et al.), the scale items were categorized into three subscales as students' adoption of mastery goal orientation (5 items), performance approach goal orientation (5 items), and performance avoidance goal orientation (4 items) (see Appendix B).

In particular, mastery goal orientation subscale assesses students' reasons for developing competence and extending their understanding (e.g., "It's important to me that I learn a lot of new concepts this year", "It's important to me that I thoroughly understand my class work). Besides, performance approach goal orientation subscale assesses students' reasons for demonstrating competence (e.g., "It's important to me that other students in my class think I am good at my class work", "One of my goals is to show others that I'm good at my class work"). Lastly, performance avoid goal orientation subscale assesses students' reasons for avoiding the demonstration of incompetence (e.g., “It’s important to me that I don’t look stupid in class”, “One of my goals in class is to avoid looking like I have trouble doing the work”).

In the original PALS (Midgley et al., 2000), internal consistency reliability of each subscale, was measured through Cronbach’s alpha, and reported as 0.85, 0.89, and 0.74 for mastery, performance approach, and performance avoidance goal orientations, respectively. In the present study, the internal consistency reliabilities of the subscales were calculated as 0.82, 0.86, and 0.61 for mastery, performance approach, and performance avoidance goal orientations, respectively.

3.2.1.2. Perception of Classroom Goal Structure Scale

In this study, the perception of classroom goal structure scale contained 14 items from the Patterns of Adaptive Learning Scale (PALS) (Midgley et al., 2000). On the whole, the scale assesses students’ perceptions of the purposes for engaging in academic behavior that are emphasized in their mathematics classroom. In the PALS manual, the scale items were categorized into three subscales as students’ perception of classroom goals as mastery oriented (6 items), performance approach oriented (3 items), and performance avoidance oriented (5 items) (see Appendix B).

In particular, classroom mastery goal structure subscale assesses students’ perceptions that the purpose of engaging in academic work in the classroom is to develop competence (e.g., “In our class, really understanding the material is the main goal”, “In our class, it’s OK to make mistakes as long as you are learning”). Besides, classroom performance-approach goal structure scale assesses students’ perceptions that the purpose of engaging in academic work in the classroom is to demonstrate competence (“In our class, getting good grades is the main goal”, “In our class, it’s important to get high scores on tests”). Lastly, classroom performance-avoid goal structure scale assesses students’ perceptions that the purpose of engaging in academic work in the classroom is to avoid demonstrating incompetence (e.g., “In our class, showing others that you are not bad at class work is really important", "In our class, it's important that you don't make mistakes in front of everyone").

In the original PALS (Midgley et al., 2000), internal consistency reliability for each subscale was measured through Cronbach's alpha, and reported as 0.76, 0.70, and 0.83 for perception of classroom mastery goal structure, performance approach goal structure, and performance avoidance goal structure, respectively. In the present study, the internal consistency reliabilities of the subscales were calculated as 0.71, 0.67, and 0.80 for perception of classroom mastery goal structure, performance approach goal structure, and performance avoidance goal structure, respectively.

3.2.1.3. Self-Efficacy Scale

In this study, the self-efficacy scale contained 8 items from The Motivated Strategies for Learning Questionnaire (MSLQ) (Pintrich et al., 1991). It assesses students' performance expectations and judgments about their ability to accomplish a learning task (e.g., "I believe I will receive an excellent grade in this class", "I'm confident I can do an excellent job on the assignments and tests in this course") (see Appendix B). In the original MSLQ (Pintrich et al., 1991), internal consistency reliability of the corresponding subscale was measured through Cronbach's alpha, and reported as 0.93. In the present study, the internal consistency reliability of this subscale was calculated as 0.92.

3.2.1.4. Learning Strategies Scale

In this study, the learning strategies scale contained 22 items from The Motivated Strategies for Learning Questionnaire (MSLQ) (Pintrich et al., 1991). On the whole, the scale assesses students' use of different cognitive and metacognitive strategies. Originally, the learning strategies scale of the MSLQ includes 50 items, and is comprised of two subscales; one for the use of cognitive and metacognitive strategies (31 items) and the other for resource management strategies (19 items).

The use of cognitive and metacognitive strategies subscale involves learning strategies, including rehearsal (4 items), elaboration (6 items), organization (4 items), critical thinking (5 items), and metacognitive self-regulation (12 items). The use of resource management strategies subscale involves learning strategies related with time and study environment (8 items), effort regulation (4 items), peer learning (3 items), and help seeking (4 items) (see Appendix B).

In the present study, items only in the cognitive and metacognitive strategies subscale concerning students' use of elaboration, organization, and metacognitive self-regulation strategies were used. In particular, elaboration subscale assesses students' use of learning strategies such as paraphrasing, summarizing, creating analogies, and generative note taking (e.g., "I try to relate ideas in this subject to those in other courses whenever possible", "When reading for this class, I try to relate the material to what I already know"). Besides, organization subscale assesses students' use of learning strategies such as clustering, outlining, and selecting main ideas in reading passages (e.g., "When I study for this course, I go through the readings and my class notes and try to find the most important ideas", "I make simple charts, diagrams, or tables to help me organize course material"). Lastly, metacognitive self-regulation subscale assesses students' use of learning strategies such as planning, monitoring and regulating cognitive activities (e.g., "Before I study new course material thoroughly, I often skim it to see how it is organized", "I ask myself questions to make sure I understand the material I have been studying in this class"). For the purpose of this study, the items belonging to these subscales were paraphrased concerning mathematics learning and elementary education (see Appendix A).

In the original MSLQ (Pintrich et al., 1991), internal consistency reliability of each subscale was measured through Cronbach's alpha, and reported as 0.76, 0.64, and 0.79 for elaboration, organization, and metacognitive self-regulation, respectively. In the present study, the internal consistency reliabilities of the subscales were calculated as 0.83, 0.78, and 0.84 for elaboration, organization, and metacognitive self-regulation, respectively.

3.2.1.5. Summary of the Scales

The summary of the scales used in the self-report questionnaire is provided in Table 3.4. Briefly, the self-report questionnaire included four scales. The first two scales were prepared using 28 items from the Patterns of Adaptive Learning Survey (PALS: Midgley et al., 2000), and the last two scales were prepared using 30 items from the Motivated Strategies for Learning Questionnaire (MSLQ: Pintrich et al., 1991). The total number of items on the self-report questionnaire was 58. For the first two scales, participants responded to the items on a five-point Likert scale ranging from 1 (not at all true) to 5 (very true). For the last two scales, participants responded to the items on a seven-point Likert scale ranging from 1 (not at all true of me) to 7 (very true of me).

Particularly, achievement goal orientation scale contained 14 items from PALS (Midgley et al., 2000). The scale assessed students' reasons or purposes for engaging in academic behavior. Originally, the scale items were categorized into three subscales as students' adoption of mastery goal orientation (5 items), performance approach goal orientation (5 items), and performance avoidance goal orientation (4 items). Similarly, perception of classroom goal structure scale contained 14 items from PALS (Midgley et al., 2000). The scale assessed students' perceptions of the purposes for engaging in academic behavior that are emphasized in their classroom. Originally, the scale items were categorized into three subscales as students' perception of classroom goals as mastery oriented (6 items), performance approach oriented (3 items), and performance avoidance oriented (5 items). In addition, self-efficacy scale contained 8 items from MSLQ (Pintrich et al., 1991), and assessed students' performance expectations and judgments about their ability to accomplish a learning task. Lastly, learning strategies scale contained 22 items from MSLQ (Pintrich et al., 1991). The scale assessed students' use of different cognitive and metacognitive strategies. In the present study, items only concerning students' use of elaboration (6 items), organization (4 items), and metacognitive self-regulation (12 items) strategies were used. Originally, the internal consistency reliability of the indicated subscales ranged between 0.64 and 0.93. In the present study, the internal consistencies of the indicated subscales ranged between 0.61 and 0.92, having similar values with the original instruments.

Table 3.4 Overall Information about the Measured Scales

Scale Name	Total Number of Items	Subscales	Number of Items	Reliability (Alpha)	
				Originally	Present Study
Achievement Goal Orientation	14	Mastery Goal Orientation (MGO)	5	0.85	0.81
		Performance-Approach Goal Orientation (PAPGO)	5	0.89	0.85
		Performance-Avoid Goal Orientation (PAVGO)	4	0.74	0.61
Perception of Classroom Goal Structure	14	Classroom Mastery Goal Structure (CMGS)	6	0.76	0.71
		Classroom Performance-Approach Goal Structure (CPAPGS)	3	0.70	0.66
		Classroom Performance-Avoid Goal Structure (CPAVGS)	5	0.83	0.80
Self-Efficacy	8	Self-Efficacy for Learning and Performance (SE)	8	0.93	0.92
Learning Strategies	22	Elaboration (ELA)	6	0.76	0.82
		Organization (ORG)	4	0.64	0.78
		Metacognitive Self-Regulation (MSR)	12	0.79	0.84

3.2.2. Mathematics Achievement Test

A 10 item multiple choice test was used to assess students' mathematics achievements. The test included mathematics problems that cover the topics in the first semester of the 7^{th} grade mathematics curriculum. The problems were prepared taking into the consideration the problems posed in the Level Determination Examination administered by the Ministry of National Education. The number of correct answers was used to measure students' mathematics achievements.

As illustrated in Table 3.5, students are asked 80 questions for the 6^{th} grade level, 90 questions for the 7^{th} grade level, and 100 questions for the 8^{th} grade level in the Level Determination Examinations. The percentage of mathematics questions to the total number of questions is 20 (one fifth of the questions) for each grade level. In this aspect, students have 18 minutes to answer 16 mathematics questions in the 6^{th} grade level, 20 minutes to answer 18 mathematics questions in the 7^{th} grade level, and 24 minutes to answer 20 mathematics questions in the 8^{th} grade level.

Table 3.5 Number of Math Questions in Level Determination Examinations

Grade Level	Total Number of Questions	Number of Math Questions	Percentage to Total Questions	Time Allocated
6^{th} Grade	80	16	20 %	18 min
7^{th} Grade	90	18	20 %	20 min
8^{th} Grade	100	20	20 %	24 min

Table 3.6 Content Analysis of the Questions

Learning Areas	Topics	Questions in 2007-2008 Examination	Questions in 2008-2009 Examination	Questions in Mathematics Achievement Test
Numbers	Multiplication and Division with Integers	1	1	1
	What is Rational Number? and Ordering Rational Numbers	1	0	1
	Computation with Rational Numbers	1	1	2
	Ratio and Proportion	1	2	0
Geometry	Lines and Angles	2	1	1
	Circles and Arcs	0	1	1
	Polynomials	0	0	0
	Congruence and Similarity	0	0	0
Algebra	Algebraic Expressions	1	0	2
	Equations	0	1	2
Total		7	7	10

As this study was held at the beginning of the spring semester, students were asked only the topic covered during the first semester. Table 3.6 illustrates the learning areas and topics covered during the first semester of the 7^{th} grade mathematics curriculum, as well as the content analysis of the questions asked in the Level Determination Examination for the corresponding topics. Three main learning areas, namely Numbers (12 objectives), Geometry (15 objectives), and Algebra (7 objectives) are covered during the first semester. The first learning area, Numbers, includes multiplication and division with integers (3 objectives), rational numbers (3 objectives), computation with rational numbers (4 objectives), and ratio and proportion (2 objectives). Both during 2007-2008 and 2008-2009 school years Level of Determination Examinations, four questions were asked regarding numbers. The second learning area, Geometry, includes lines and angles (6 objectives), circles and arcs (5 objectives), polynomials (2 objectives), and congruence and similarity (2 objectives). Both during 2007-2008 and 2008-2009 school years Level of Determination Examinations, two questions were asked regarding geometry. Lastly, the third learning area, Algebra, includes algebraic expressions (2 objectives), and equations (5 objectives). Both during 2007-2008 and 2008-2009 school years Level of Determination Examinations, one question was asked regarding this learning area.

While preparing the Mathematics Achievement Test (MAT), the number of questions asked in the Level Determination Examination for the corresponding topics were taken into consideration (see Table 3.6), as well as the questions asked in the7th grade mathematics textbook. No question regarding ratio and proportion was not included in the Mathematics Achievement Test. This is because the pilot study was implemented at the end of the first semester and these topics were not covered yet during the pilot study. In this aspect, students were asked 10 mathematics questions and given approximately 20 minutes to answer these questions.

Table 3.7 illustrates the topics and objectives covered with each question, as well as the cognitive complexity levels of each question in the Mathematics Achievement Test, using a widely used classification system developed by Webb (1999) at the University of Wisconsin. According to this classification, cognitive complexity level of an item is related with its depth of knowledge level, not related with ability of students (Webb, 1999). In general, there are three complexity levels; as low complexity, moderate complexity, and high complexity, that a question may demand of students.

Table 3.7 Table of Specification for Mathematics Achievement Test

Question Number	Learning Areas	Topics and Objectives	Complexity Levels		
			Low	Moderate	High
1st	Numbers	Multiplication and Division with Integers (to multiply and divide integers)		x	
2nd	Numbers	What is Rational Number? and Ordering Rational Numbers (to explain rational numbers and show them on number line)		x	
3rd	Numbers	Computation with Rational Numbers (to make multi-step operations with rational numbers)	x		
4th	Numbers	Computation with Rational Numbers (to solve and write problems using rational numbers)			x
5th	Algebra	Algebraic Expressions (to add and subtract algebraic expressions)		x	
6th	Algebra	Algebraic Expressions (to add and subtract algebraic expressions)		x	
7th	Algebra	Equations (to solve one-step equations)		x	
8th	Algebra	Equations (to solve problems using one-step equations)			x
9th	Geometry	Lines and Angles (to identify the position of lines on the same plane and construct lines)	x		
10th	Geometry	Circles and Arcs (to determine the relationship between inscribed and central angles in a circle)		x	
Total			2	6	2

Simply, a low complexity question requires students to recall a previously learned concept or principle. It may involve solving a one-step problem or computing a sum, difference, product, or quotient. Besides, a moderate complexity question requires more critical thinking or choice among alternatives than low complexity questions. Students are expected to use reasoning and problem solving strategies, and bring together skill and knowledge from various domains. Lastly, a high complexity question requires more abstract reasoning, planning, analysis, and judgment. It may involve solving a non-routine problem, or having multiple steps or multiple decision points.

The percentage of points by cognitive complexity level differs according to the grade level of students. For instance, for grades between 6 and 8, 10 to 20 percent of the mathematics questions are recommended to be prepared in low complexity level; 60 to 80 percent of the mathematics questions are recommended to be prepared in moderate complexity level; and 10 to 20 percent of the mathematics questions are recommended to be prepared in high complexity level. In this study, 20% of the questions were prepared in low complexity level, 60% of the questions were prepared in moderate complexity level, and 20% of the questions were prepared in high complexity level.

3.3. Development of the Instrument

3.3.1. Translation of the Scales

The items of the self-report questionnaire were translated into Turkish language by utilizing the Turkish adaptation of the Patterns of Adaptive Learning Survey (Taş & Tekkaya, 2008) and the Turkish adaptations of the Motivated Strategies for Learning Questionnaire (Karadeniz, Büyüköztürk, Akgün, Çakmak, & Demirel, 2008; Sungur, 2004). In particular, 28 items from the Turkish adaption of PALS, related with students' personal achievement goal orientations and perception of classroom goal structure, were used in this study. The Turkish adaption of PALS was developed by Taş and Tekkaya (2008) as a part of a master's thesis. They were investigating the relationship among 7th grade students' personal goal orientations, perceptions of classroom goal structure, and science achievement. The overall internal consistency reliability of the adapted instrument was found to be 0.81, and the reliabilities of the subscales ranged between 0.67 and 0.81, for the corresponding scales. Besides, the fit statistics of CFA for Turkish adaptation of PALS were as follows; the chi-squared to degrees of freedom ratio (χ^2/df)= 4.89, goodness-of-fit index (GFI)= 0.91, and standardized root mean square residuals (S-RMR)= 0.04, indicating reasonable fits with respect to the original instrument.

In addition, 30 items from the Turkish adaptations of MSLQ, related with students' self-efficacy beliefs and use of learning strategies, were used in this study. One of the Turkish adaption of MSLQ was developed by Sungur (2004) as a part of a doctoral thesis. She investigated the effect of problem based learning on 10th grade students' academic achievement, performance skills, perceived motivation, and perceived use of learning strategies in biology learning. The internal consistency reliabilities of the corresponding scales ranged between 0.71 and 0.81. Besides, the fit statistics of CFA for the motivation section were found as χ^2/df= 5.3, GFI= 0.77, and RMR= 0.11; and fit statistics for the learning strategies section were found as χ^2/df= 4.5, GFI= 0.71, and RMR= 0.08, having similar values with the original instrument.

Another Turkish adaption of MSLQ was developed by Karadeniz, Büyüköztürk, Akgün, Çakmak, and Demirel in 2008. The instrument was administrated to 1100 students from 3 elementary schools and 3 high schools in Ankara in Turkish language, science, mathematics and social science courses. The internal consistency reliabilities of the corresponding scales ranged between 0.74 and 0.92. Besides, the fit statistics of CFA for the motivation section were found as χ^2/df= 3.20, GFI= 0.92, and RMR= 0.16; and fit statistics for the learning strategies section were found as χ^2/df= 3.42, GFI= 0.89, and RMR= 0.17, indicating reasonable values with respect to the original instrument.

After the utilization of these instruments, the selected items were paraphrased regarding their appropriateness for mathematics learning and elementary school level. Finally, to verify the accuracy of the translation and determine unclear instructions and vocabulary, both the Turkish and English versions of the items were reviewed by a language expert in Academic Writing Center, in Middle East Technical University. Then, in the light of the expert criticism, necessary changes were made on the Turkish version of the instrument.

3.3.2. Expert Opinions

After the translation process, the first draft of the self-report questionnaire was given to four research assistants in the Elementary Mathematics Education program, in Middle East Technical University, as a number of changes were made on the original questionnaire items. The research assistants were asked to judge both the appropriateness of the items for the use with elementary school level and mathematics education, as well as the clarity of the language. Upon their suggestions, necessary changes were made on the wording of a number of items. Then, this corrected draft of the questionnaire was given to an expert in the department of Elementary Education, in Middle East Technical University. The expert was asked to judge both the appropriateness of the items for the use with elementary school level, and the items' relevance to the constructs being measured. Then, in the light of expert criticism, the questionnaire was further refined.

In addition, expert opinions were taken for the Mathematics Achievement Test both from an elementary mathematics teacher having five years' experience in public elementary schools, and an expert in the department of Elementary Education in Middle East Technical University. Both experts were asked to judge the appropriateness of the content, format, and difficulty level of the questions for the use with 7th grade students. Then, in the light of their criticism, some of the questions were further refined.

3.3.3. Pilot Study

Prior to main data collection, a pilot study was carried out with 250 seventh grade students studying at three public elementary schools, located at different parts of Çankaya district in Ankara. Table 3.8 summarizes the demographic information regarding the sample of the pilot study. In each school, data were collected from three 7th grade classrooms during their regular class periods. Similar number of students participated in the pilot study (School A= 79; School B= 80; and School C=91). Besides, nearly half of the data were gathered from male students (N= 128), and the other half of the data were gathered from female students (N= 122).

Table 3.8 Demographic Information from the Pilot Study

Schools	Districts	Classrooms	Gender		Total
			Male	Female	
School A	Çankaya-Çukurambar	Class A	15	15	79
		Class B	9	17	
		Class C	8	15	
School B	Çankaya-Çiğdem	Class A	19	9	80
		Class B	17	12	
		Class C	10	13	
School C	Çankaya-Balgat	Class A	18	9	91
		Class B	14	15	
		Class C	18	17	
Total			128	122	250

The data were transformed into PASW Statistics 18.0 software program following the indicated procedures; preparing a codebook, creating data file and entering data, screening and cleaning the data, reversing negative questionnaire items, transforming mathematics achievement test responses to numerical variables, checking the reliability of each subscale, conducting factor analysis for each scale, conducting correlation analysis between students' correct answers in Level of Determination Examination and Mathematics Achievement Test, identifying difficulty levels of each question in the Mathematics Achievement Test, and exploring several descriptive statistics for explaining the pilot sample.

Table 3.9 Reliability Analyses of the Subscales regarding the Pilot Study

Scale Name	Subscale Name	Number of Items	Cronbach's Alpha	Mean Inter-Item Correlations
Achievement Goal Orientation	MGO	5	0.83	0.505
	PAPGO	5	0.75	0.372
	PAVGO	4	0.54	0.224
Classroom Goal Structure	CMGS	6	0.78	0.413
	CPAPGS	3	0.73	0.477
	CPAVGS	5	0.78	0.416
Self-Efficacy	SE	8	0.92	0.595
Learning Strategies	ELA	6	0.82	0.435
	ORG	4	0.71	0.381
	MSR	12	0.82	0.281

Table 3.9 summarizes internal consistency analyses of each subscale regarding the pilot study. In general, internal consistency refers to "the degree to which the items that make up the scale hang together" (Pallant, 2007, p.95), and it is suggested to have Cronbach alpha coefficient (α) that is above 0.7. However, for scales with less than 10 items, it is recommended to report mean inter-item correlations, for an optimal range of 0.2 to 0.4 (Briggs & Cheek, 1986). For the pilot study, Cronbach alpha coefficients were calculated as 0.83, 0.75, and 0.54 for mastery, performance approach, and performance avoidance goal orientations; 0.78, 0.73 and 0.78 for perception of classroom mastery goal structure, performance approach goal structure, and performance avoidance goal structure; 0.92 for self-efficacy; and 0.82, 0.71, and 0.82 for elaboration, organization, and metacognitive self-regulation, respectively. The results of the subscale analyses indicated that only

‘performance avoidance goal orientation’ subscale had α value less than 0.70, suggesting unsatisfactory internal consistency among the items.

In addition to checking internal consistency values of each subscale, each item’s inter-item correlations were checked for values less than 0.2, corrected item-total correlation values were checked for values less than 0.3, and “alpha if item deleted” values were checked for values higher than the subscale’s alpha coefficient (Pallant, 2007). The result of item analyses indicated that if a number of items were deleted from the instrument, it would have more valid and reliable scores. These items were as follows; Item 9 (“It’s important to me that I don’t look stupid in class”) from ‘performance avoidance goal orientation’ subscale, Item 18 (“In our class, it’s OK to make mistakes as long as you are learning”) from ‘classroom performance approach goal structure’ subscale, and Item 42 (“During class time I often miss important points because I’m thinking of other things”) and Item 54 (“I often find that I have been reading for class but don’t know what it was about”) from ‘metacognitive self-regulation’ subscale.

Next, Exploratory Factor Analysis (EFA) was conducted for each scale, by the data gathered from the pilot study. As Pallant (2007) suggests, exploratory factor analyses are conducted in the early stages of research to gather information about the interrelationships among a set of items, and to identify a small set of factors that represents those underlying relationships. However, for the main study, Confirmatory Factor Analyses (CFA) were conducted to test the construct validity of the instrument, and to confirm the underlying structure of the questionnaire items.

To start with, the 14 items of the Achievement Goal Orientation Scale were subjected to Principle Components Analysis (PCA) using PASW Statistics 18.0 (see Appendix C). Prior to performing PCA, the suitability of data for factor analysis was assessed. The correlation matrix revealed the presence of many coefficients of 0.3 and above. The Kaiser-Meyer-Oklin (KMO) value was 0.822, exceeding the recommended value of 0.6 for a good factor analysis; and Bartlett’s Test of Sphericity reached statistical significance ($p<0.05$) supporting the factorability of the correlation matrix. Principle components analysis revealed the presence of three components with eigenvalues exceeding 1, explaining 26.4%, 20%, and 7.4% of the variance, respectively. The three components explained 53.7% of the variance, in cumulative. Yet, an inspection of the screeplot revealed a clear break after the second component.

Table 3.10 Pattern Matrix for Achievement Goal Orientation Scale

Items	Components		
	1	2	3
Item 14	0.784		
Item 8	0.759		
Item 11	0.697		
Item 2	0.679		
Item 3	0.582		
Item 5	0.533		
Item 12	0.385		0.336
Item 13		0.818	
Item 1		0.807	
Item 10		0.787	
Item 4		0.750	
Item 7		0.693	
Item 9			0.840
Item 6	0.426		0.477

When the factor loadings of the items were examined by the Pattern Matrix (see Table 3.10), it was found that the items loading on Component 1 (items 2, 5, 8, 11, 14) were belonging to Performance Approach Goal Orientation subscale; the items loading on Component 2 (items 1, 4, 7, 10, 13) were belonging to Mastery Goal Orientation subscale; and the items loading on Component 3 (items 6, 9, 12) were belonging to Performance Avoidance Goal Orientation subscale as in the original PALS (Midgley et al., 2000). However, several items (items 6 and 12) loading on Component 3 were also loading on Component 1; indicating that items in the Performance Avoidance Goal Orientation subscale were mixing with the items in the Performance Approach Goal Orientation subscale.

Next, the 14 items of the Classroom Goal Structure Scale were subjected to principle components analysis (see Appendix C). Prior to performing PCA, the suitability of data for factor analysis was assessed. The correlation matrix revealed the presence of many coefficients of 0.3 and above. The KMO value was 0.840, exceeding the recommended value of 0.6 for a good factor analysis; and Bartlett's Test of Sphericity reached statistical significance ($p<0.05$) supporting the factorability of the correlation matrix. Principle components analysis revealed the presence of three components with eigenvalues exceeding 1, explaining 30.6%, 18.1%, and 9.1% of the variance, respectively. The three components explained 57.7% of the variance, in cumulative. Yet, an inspection of the screeplot revealed a clear break after the second component.

When the factor loadings of the items were examined by the Pattern Matrix (see Table 3.11), it was found that the items loading on Component 1 (items 15, 21, 24, 26, and 27) were belonging to Classroom Mastery Goal Structure subscale; the items loading on Component 2 (items 17, 20, 23, 25, and 28) were belonging to Classroom Performance Avoidance Goal Structure subscale; and the items loading on Component 3 (items 16, 19, and 22) were belonging to Classroom Performance Approach Goal Structure subscale as in the original PALS (Midgley et al., 2000). However, item 18 which was originally belonging to Classroom Mastery Goal Structure subscale in PALS, loaded together with the items on the Classroom Performance Approach Goal Structure subscale. Also, the communality value of this item was 0.212 (less than 0.3), indicating that it does not fit well with the other items in its component.

Table 3.11 Pattern Matrix for Classroom Goal Structure Scale

Items	Components		
	1	2	3
Item 26	0.858		
Item 24	0.829		
Item 27	0.812		
Item 15	0.778		
Item 21	0.735		
Item 25		0.806	
Item 28		0.776	
Item 23		0.759	
Item 20		0.684	
Item 17		0.624	
Item 16			-0.775
Item 22	0.357		-0.700
Item 19			-0.593
Item 18			0.414

Then, the 8 items of the Self-Efficacy Scale were subjected to principle components analysis (see Appendix C). Prior to performing PCA, the suitability of data for factor analysis was assessed. The correlation matrix revealed the presence of many coefficients of 0.3 and above. The KMO value was 0.920, exceeding the recommended value of 0.6 for a good factor analysis; and Bartlett's Test of Sphericity reached statistical significance ($p<0.05$) supporting the factorability of the correlation matrix. Principles components analysis revealed the presence of only one component with eigenvalue exceeding 1, explaining 64.92% of the variance in cumulative. An inspection of the screeplot revealed a clear break after the first component. No item in the Self-Efficacy Scale had communality value less than 0.3, indicating that all the items fit well with the other items in this scale.

Lastly, the 22 items of the Learning Strategies Scale were subjected to principle components analysis (see Appendix C). Prior to performing PCA, the suitability of data for factor analysis was assessed. The correlation matrix revealed the presence of many coefficients of 0.3 and above. The KMO value was 0.926, exceeding the recommended value of 0.6 for a good factor analysis; and Bartlett's Test of Sphericity reached statistical significance ($p<0.05$) supporting the factorability of the correlation matrix. Principle components analysis revealed the presence of three components with eigenvalues exceeding 1, explaining 38.8%, 6.94%, and 5.6% of the variance, respectively. The three components explained 51.3% of the variance in cumulative. Yet, an inspection of the screeplot revealed a clear break after the first component.

When the factor loadings of the items were examined by the Pattern Matrix (see Table 3.12), it was found that the items loading on Component 1 (items 39, 45, 48, 50, 52, 55, 56, 57, and 58) were belonging to Metacognitive Self-Regulation subscale; the items loading on Component 2 (items 42, 53, and 54) were again belonging to Metacognitive Self-Regulation subscale; and the items loading on Component 3 (items 38, 41, and 47) were belonging to Organization subscale as in the original MSLQ (Pintrich et al., 1991). No component was formed that represents the items in the Elaboration subscale. Two items that were originally belonging to Elaboration subscale loaded on Organization subscale, and the rest of the items loaded on the Metacognitive Self-Regulation subscale.

According to the results of the reliability analyses and factor analyses, no item was deleted from the instrument or rephrased for more reliable and valid scores. Concerning the Mathematics Achievement Test, students' responses were transformed into numerical variables, and then several statistical analyses were conducted to determine the appropriateness of the questions for the use with the present study. Data regarding the last question, which was related with Circles and Arc, was not included in the data analyses, because this topic was not totally covered during the pilot study. However, this question was used in the main study, as the related topic was already covered before the main data collection period. With multiple-choice questions that are scored as correct or incorrect (scored as 0 or 1), the Kuder-Richardson 20 (KR-20) formula is often used to calculate the internal consistency reliability, with acceptable range 0.60 to 1.00 (Haladyna, 1999). Regarding the Mathematics Achievement Test questions, KR-20 measure was calculates as 0.768, indicating satisfactory internal consistency among the questions.

Table 3.12 Pattern Matrix for Learning Strategies Scale

Items	Components		
	1	2	3
Item 45	0.766		
Item 40	0.759		
Item 49	0.748		
Item 56	0.729		
Item 43	0.724		
Item 55	0.709		
Item 51	0.626		
Item 52	0.614		
Item 48	0.578	-0.318	
Item 50	0.569		
Item 58	0.538		
Item 57	0.520		
Item 39	0.461		
Item 44	0.389		
Item 54		0.757	
Item 42		0.751	
Item 53		-0.470	
Item 38			-0.796
Item 47			-0.780
Item 46			-0.726
Item 41	0.358		-0.449
Item 37	0.394		-0.415

In addition, the relationship between students' correct answers in Level of Determination Examination and Mathematics Achievement Test was investigated using Pearson product-moment correlation coefficient (r). Preliminary analysis was performed by inspecting the scatter plot between the two variables (see Figure 3.1). The scatter plot ensured no violation of the assumptions of normality, linearity and homoscedasticity. Also, the direction of the points on the scatterplot determined a positive, linear relationship between the two variables. The result of the Pearson Product-Moment correlation revealed a strong, positive correlation between the number of correct answers in Level of Determination Examination and Mathematics Achievement Test, $r= 0.598$, $N= 242$, $p< 0.01$. Besides, the coefficient of determination was calculated as 35.76, indicating nearly 36% of shared variance between the two variables.

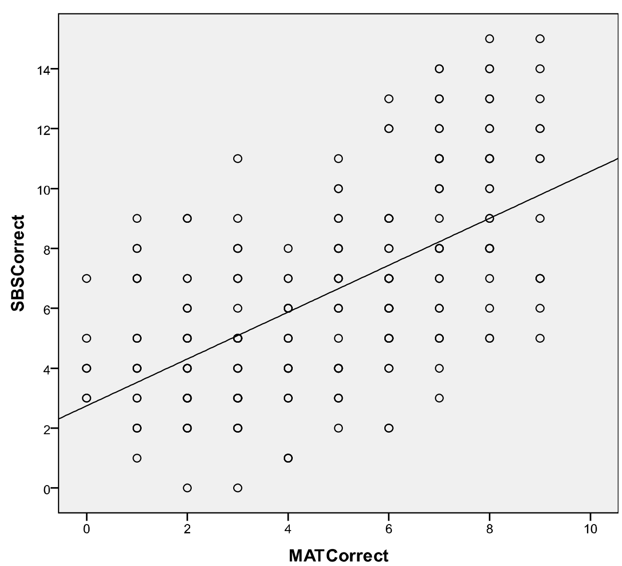


Figure 3.1 Scatterplot for SBS and MAT Correct Answers

Table 3.13 Difficulty Levels of the Questions regarding the Pilot Study

Question Number	Learning Areas	Topics	Difficulty Levels (%)		
			Easy (>70%)	Average (40%-70%)	Challenging (<40%)
1st	Numbers	Multiplication and Division with Integers		59.2	
2nd	Numbers	Rational Numbers		49.6	
3rd	Numbers	Computation with Rational Numbers		53.6	
4th	Numbers	Computation with Rational Numbers			34.8
5th	Algebra	Algebraic Expressions		48.8	
6th	Algebra	Algebraic Expressions		56.0	
7th	Algebra	Equations		48.0	
8th	Algebra	Equations			35.2
9th	Geometry	Lines and Angles	74.4		

Lastly, Table 3.13 illustrates the difficulty levels of each question in the Mathematics Achievement Test, considering the percentage of students who chose the correct answer. According to Webb (1999)'s classification system, questions for which the correct answer is chosen by more than 70% of the students are considered 'easy'; questions for which the correct answer is chosen by 40-70% of the students are considered 'average'; and questions for which the correct answer is chosen by less than 40 % of the students are considered 'challenging'. In this regard, question 9 can be considered as an easy question (74.4% correct answer); question 4 (34.8% correct answer) and question 8 (35.2 % correct answer) can be considered as challenging questions; and the rest of the questions can be considered as average questions. The findings also revealed that the difficulty levels of the questions were highly in line with their cognitive complexity levels. Only the third question was expected to be having a low complexity level (expected to be over 70%), whereas it was regarded as an average level question by students (53.6%).

3.4. Confirmatory Factor Analysis

The factor validity of the instrument was tested by running four separate confirmatory factor analyses; one for the set of achievement goal orientation items, one for the set of classroom goal structure items, one for the set of self-efficacy items, and the other set for learning strategies items. These analyses were done in order to examine the underlying dimensions of 7th grade elementary school students' achievement goal orientation, perceptions of classroom goal structure, self-efficacy, and use of learning strategies for learning mathematics in Turkey.

While conducting the confirmatory factor analyses, each item in the instrument was constrained to fall on one specific factor. First, 14 items belonging to achievement goal orientation scale (PALS; Midgley et al., 2000) were tested to see how well they fit three latent factors: (1) mastery goal orientation, (2) performance approach goal orientation, and (3) performance avoidance goal orientation. Next, 14 items belonging to classroom goal structure scale (PALS; Midgley et al., 2000) were tested to see how well they fit three latent factors: (1) classroom mastery goal structure, (2) classroom performance approach goal structure, and (3) classroom performance avoidance goal structure. After that, 8 items belonging to self-efficacy scale (MSLQ; Pintrich et al., 1991) were tested to see how well they fit a single latent factor. Lastly, 22 items belonging to learning strategies scale (MSLQ; Pintrich et al., 1991) were tested to see how well they fit three latent factors: (1) elaboration, (2) organization, and (3) metacognitive self-regulation. LISREL 8.80 for Windows (Linear Structural Relations Statistics Package Program) was used to estimate and test the models. All CFA model tests were based on asymptotic covariance matrix and Robust Maximum Likelihood was used by default as the estimation technique.

3.4.1. CFA for Achievement Goal Orientation Scale

Confirmatory factor analysis was conducted on the 14 achievement goal orientation items (PALS; Midgley et al., 2000), to examine how well they fit three latent factors: mastery goal orientation, performance approach goal orientation, and performance avoidance goal orientation. For the original PALS (Midgley et al., 2000), it was indicated that no item loaded on two different latent factors, and they all confirmed the expected model (GFI= 0.97, AGFI= 0.95). When the fit indices of the corresponding items were examined for this study, it was found that χ^2= 145.67, df= 64, χ^2/df = 2.27, GFI= 0.98, and AGFI= 0.96. A χ^2/df ratio less than 5 is an indicative of a good fit between observed and reproduced correlation matrices. Besides a GFI and AGFI of 0.9 or greater also suggest that the model fit the data.

Table 3.14 Model Fit Indices of Achievement Goal Orientation Scale

Fit Indices	Criterion	Present Study
Chi-Squared (χ^2)	Non-significant	145.67 (**p = 0.00**)
Normed Chi-Squared (NC)	NC<5	2.27
Goodness of Fit Index (GFI)	GFI>0.90	0.98
Adjusted Goodness of Fit Index (AGFI)	AGFI>0.90	0.96
Root Mean Square Error of Approximation (RMSEA)	0.05<RMSEA<0.10 (moderate fit) RMSEA<0.05 (a very good fit)	0.03 (very good fit)
Root Mean Square Residual (RMR)	RMR<0.05	0.05
Standardized Root Mean Square Residual (S-RMR)	S-RMR<0.05	0.04
Parsimony Goodness of Fit Index (PGFI)	Higher values	0.59
Parsimony Normed Fit Index (PNFI)	Higher values	0.69
Normed Fit Index (NFI)	NFI>0.90	0.98
Non-Normed Fit Index (NNFI)	NNFI>0.90	0.99
Comparative Fit Index (CFI)	CFI>0.90	0.99
Incremental Fit Index (IFI)	IFI>0.90	0.99
Relative Fit Index (RFI)	RFI>0.90	0.98

Table 3.14 illustrates a number of goodness of fit indices and their criteria belonging to this scale. As the chi square is sensitive to sample size (such as above 200) (Kelloway, 1998; Schumacker & Lomax, 2004), it was typical to obtain a significant probability level (p= 0.00). Considering the RMSEA value (0.03), it was possible to state that the achievement goal orientation items suggested a very good fit for the indicated latent factors. Specifically, the overall fit indices indicated that there was a good fit between the scale and the data, and they suggested an acceptable model (Jöreskog & Sörbom, 1993).

Table 3.15 Lambda ksi Estimates of Achievement Goal Orientation Items

Latent Variables	Observed Variables	LX Estimates
Mastery Goal Orientation (MGO)	mgo1	0.72
	mgo2	0.65
	mgo3	0.64
	mgo4	0.67
	mgo5	0.73
Performance-Approach Goal Orientation (PAPGO)	papgo1	0.70
	papgo2	0.67
	papgo3	0.75
	papgo4	0.73
	papgo5	0.74
Performance-Avoid Goal Orientation (PAVGO)	pavgo1	0.67
	pavgo2	0.56
	pavgo3	0.43
	pavgo4	0.43

Table 3.15 illustrates the Lambda ksi estimates of the achievement goal orientation items. Lambda ksi estimates are similar to factor loadings in explanatory

factor analysis (Pintrich et al., 1991). They indicate the correlations between each observed variable and the latent factor. The higher the values, the more relevant they are to define the factor's dimensionality, such that values of 0.8 or higher indicate "well-defined constructs" (Pintrich et al., 1991, p.79). Besides, a negative value indicates an inverse impact on the corresponding factor. When the Lambda ksi estimates of the achievement goal orientation items were examined, most of the items were found to have high estimate values, indicating high correlations with the corresponding subscales.

Table 3.16 summaries the Phi values of the achievement goal orientation subscales. These values are estimates for the covariances between the latent constructs. Considering the results of the study, it was possible to conclude that there was a strong positive correlation between performance approach and performance avoidance goal orientation (r= 0.91); a positive small correlation between mastery and performance approach goal orientation (r= 0.26); and a positive small correlation between mastery and performance avoidance goal orientation (r= 0.28) subscales. The final SIMPLIS syntax of the confirmatory factor analysis and LISREL estimates of parameters with coefficients both in standardized value and t-values are provided in Appendix D.

Table 3.16 Phi Estimates of Achievement Goal Orientation Subscales

	PAPGO	PAVGO
MGO	0.26	0.28
PAPGO	-	0.91

3.4.2. CFA for Perception of Classroom Goal Structure Scale

Confirmatory factor analysis was conducted on the 14 classroom goal structure items (PALS; Midgley et al., 2000), to see how well they fit three latent factors: classroom mastery goal structure, classroom performance approach goal structure, and classroom performance avoidance goal structure. For the original

PALS study (Midgley et al., 2000), it was indicated that no item loaded on two different latent factors, and they all confirmed the expected model (GFI= 0.96, AGFI= 0.94).

Table 3.17 Model Fit Indices of Classroom Goal Structure Scale

Fit Indices	Criterion	Present Study
Chi-Squared (χ^2)	Non-significant	148.31 **(p = 0.00)**
Normed Chi-Squared (NC)	NC<5	2.31
Goodness of Fit Index (GFI)	GFI>0.90	0.97
Adjusted Goodness of Fit Index (AGFI)	AGFI>0.90	0.96
Root Mean Square Error of Approximation (RMSEA)	0.05<RMSEA<0.10 (moderate fit) RMSEA<0.05 (a very good fit)	0.03 (very good fit)
Root Mean Square Residual (RMR)	RMR<0.05	**0.06**
Standardized Root Mean Square Residual (S-RMR)	S-RMR<0.05	0.04
Parsimony Goodness of Fit Index (PGFI)	Higher values	0.59
Parsimony Normed Fit Index (PNFI)	Higher values	0.69
Normed Fit Index (NFI)	NFI>0.90	0.98
Non-Normed Fit Index (NNFI)	NNFI>0.90	0.98
Comparative Fit Index (CFI)	CFI>0.90	0.99
Incremental Fit Index (IFI)	IFI>0.90	0.99
Relative Fit Index (RFI)	RFI>0.90	0.97

When the fit indices of the corresponding items were examined for the present study, it was found that χ^2= 148.31, df= 64, χ^2/df= 2.31, GFI= 0.97, and AGFI= 0.96. A χ^2/df ratio less than 5 is an indicative of a good fit between observed and reproduced correlation matrices. Besides, a GFI and an AGFI of 0.9 or greater also suggest that the model fit the data well. In addition, considering the other fit indices and their criteria (see Table 3.17), it was possible to conclude that there was a very good fit between the scale and the data, and the overall fit indices suggested an acceptable model (Jöreskog & Sörbom, 1993). The significant probability level of chi square was expected as it is sensitive to sample size (Kelloway, 1998; Schumacker & Lomax, 2004).

Table 3.18 Lambda ksi Estimates of Classroom Goal Structure Items

Latent Variables	Observed Variables	LX Estimates
Classroom Mastery Goal Structure (CMGS)	Item 15	0.78
	Item 18	0.18
	Item 21	0.62
	Item 24	0.59
	Item 26	0.66
	Item 27	0.75
Classroom Performance-Approach Goal Structure (CPAPGS)	Item 16	0.68
	Item 19	0.56
	Item 22	0.75
Classroom Performance-Avoid Goal Structure (CPAVGS)	Item 17	0.47
	Item 20	0.66
	Item 23	0.68
	Item 25	0.78
	Item 28	0.81

Table 3.18 illustrates the Lambda ksi estimates of the classroom goal structure items. The table shows that most of the items have high estimate values; indicating high correlations with the corresponding subscales. Only Item 18 belonging to classroom mastery goal structure subscale indicated a low estimate

value. Yet, when the item's alpha if item deleted value was checked for values higher than the corresponding subscale's alpha coefficient, it was found that if this items was deleted from the corresponding subscale it would result in lower reliabilities. So, it was not extracted from the subsequent analyses.

In addition, Table 3.19 summaries the Phi values of the classroom goal structure subscales. Considering the calculated Phi values, it was possible to conclude that, there was a medium positive correlation between classroom performance approach goal structure and classroom performance avoidance goal structure (r= 0.45); a positive medium correlation between classroom mastery goal structure and classroom performance approach goal structure (r= 0.36); and a positive small correlation between classroom mastery goal structure and classroom performance avoidance goal structure (r= 0.16) subscales. The final SIMPLIS syntax of the confirmatory factor analysis and LISREL estimates of parameters with coefficients both in standardized value and t-values are provided in Appendix E.

Table 3.19 Phi Estimates of Classroom Goal Structure Subscales

	CPAPGS	CPAVGS
CMGS	0.36	0.16
CPAPGS	-	0.45

3.4.3. CFA for Self-Efficacy Scale

Confirmatory factor analysis was conducted on the 8 self-efficacy items (MSLQ; Pintrich et al., 1991), to examine how well they fit a single latent factor. For the original MSLQ study (Pintrich et al., 1991), the following fit indices were provided for the overall motivation items: the chi-squared to degrees of freedom ratio (χ^2/df= 3.49); the goodness of fit index (GFI= 0.77); and the root mean residual (RMR= 0.07). Considering these values, it was indicated that the goodness of fit indices were not within acceptable limits. However, on the whole, the model showed sound structures and one could reasonably claim the factor validity for the MSLQ scales (Pintrich, et al., 1991). When the fit indices of the corresponding items were examined for the present study, it was found that χ^2= 17.22, df=13, χ^2/df=1.30, GFI= 0.99, and RMR=0.03. For the present study, χ^2/df ratio was less than 5, and both GFI and RMR values suggested a better fit than the original MSLQ.

Table 3.20 Model Fit Indices of Self-Efficacy Scale

Fit Indices	Criterion	Present Study
Chi-Squared (χ^2)	Non-significant	17.22 **(p= 0.00)**
Normed Chi-Squared (NC)	NC<5	1.30
Goodness of Fit Index (GFI)	GFI>0.90	0.99
Adjusted Goodness of Fit Index (AGFI)	AGFI>0.90	0.98
Root Mean Square Error of Approximation (RMSEA)	0.05<RMSEA<0.10 (moderate fit) RMSEA<0.05 (a very good fit)	0.01 (very good fit)
Root Mean Square Residual (RMR)	RMR<0.05	0.03
Standardized Root Mean Square Residual (S-RMR)	S-RMR<0.05	0.01
Parsimony Goodness of Fit Index (PGFI)	Higher values	0.36
Parsimony Normed Fit Index (PNFI)	Higher values	0.46
Normed Fit Index (NFI)	NFI>0.90	1.00
Non-Normed Fit Index (NNFI)	NNFI>0.90	1.00
Comparative Fit Index (CFI)	CFI>0.90	1.00
Incremental Fit Index (IFI)	IFI>0.90	1.00
Relative Fit Index (RFI)	RFI>0.90	1.00

Table 3.20 illustrates a number of goodness of fit indices and their criteria belonging to this scale. As the chi square is sensitive to sample size (such as above

200) (Kelloway, 1998; Schumacker & Lomax, 2004), it was typical to obtain a significant probability level (p= 0.00). Next, considering the other fit indices, it was possible to conclude that there was a very good fit between the scale and the data, and the overall fit indices suggested an acceptable model (Jöreskog & Sörbom, 1993). The final SIMPLIS syntax of the confirmatory factor analysis and LISREL estimates of parameters with coefficients both in standardized value and t-values are provided in Appendix F.

Table 3.21 Lambda ksi Estimates of Self-Efficacy Items

		LX Estimates	
Latent Variables	Observed Variables	Original MSLQ	Present Study
Self-Efficacy for Learning and Performance (SE)	Item 29	0.83	0.78
	Item 30	0.70	0.76
	Item 31	0.63	0.76
	Item 32	0.71	0.77
	Item 33	0.86	0.82
	Item 34	0.89	0.85
	Item 35	0.77	0.79
	Item 36	0.87	0.60

When the Lambda ksi estimates of the self-efficacy items were examined (see Table 3.21), all of the items were found to have high estimate values; indicating high correlations with the self-efficacy scale.

3.4.4. CFA for Learning Strategies Scale

Confirmatory factor analysis was conducted on the 22 learning strategy items (MSLQ; Pintrich et al., 1991), to see how well they fit three latent factors: elaboration, organization, and metacognitive self-regulation. For the original MSLQ study (Pintrich et al., 1991), the following fit indices were provided for the overall learning strategies items: the chi-squared to degrees of freedom ratio (χ^2/df= 2.26); the goodness of fit index (GFI= 0.78); and the root mean residual (RMR= 0.08). Considering these values, it was indicated that although the goodness of fit indices were not stellar; overall, the model showed sound structures and one could reasonably claim factor validity for the corresponding MSLQ scales (Pintrich et al., 1991).

Table 3.22 Model Fit Indices of Learning Strategies Scale

Fit Indices	Criterion	Present Study
Chi-Squared (χ^2)	Non-significant	355.11 **(p=0.00)**
Normed Chi-Squared (NC)	NC<5	1.83
Goodness of Fit Index (GFI)	GFI>0.90	0.96
Adjusted Goodness of Fit Index (AGFI)	AGFI>0.90	0.94
Root Mean Square Error of Approximation (RMSEA)	0.05<RMSEA<0.10 (moderate fit) RMSEA<0.05 (a very good fit)	0.02 (very good fit)
Root Mean Square Residual (RMR)	RMR<0.05	**0.12**
Standardized Root Mean Square Residual (S-RMR)	S-RMR<0.05	0.03
Parsimony Goodness of Fit Index (PGFI)	Higher values	0.73
Parsimony Normed Fit Index (PNFI)	Higher values	0.83
Normed Fit Index (NFI)	NFI>0.90	0.99
Non-Normed Fit Index (NNFI)	NNFI>0.90	0.99
Comparative Fit Index (CFI)	CFI>0.90	1.00
Incremental Fit Index (IFI)	IFI>0.90	1.00
Relative Fit Index (RFI)	RFI>0.90	0.99

When the fit indices of the corresponding items were examined for the present study, it was found that χ^2= 355.11, df= 193, χ^2/df= 1.83, GFI= 0.96, and RMR= 0.12. The χ^2/df ratio was less than 5, and GFI and RMR values suggested a better fit comparing to the original scale. Besides, Table 3.22 illustrates the other fit indices and their criteria belonging to this scale. Considering the other fit indices, it was possible to conclude that there was a very good fit between the scale and the data, and the overall fit indices suggested an acceptable model.

When the Lambda ksi estimates of the learning strategies items were examined (see Table 3.23), most of the items were found to have high estimate values; indicating high correlations with the corresponding subscales. Only Msr2 and Msr 8 (negatively worded items) indicated low estimate values. Yet, when these items' alpha if item deleted value were checked for values higher than the corresponding subscale's alpha coefficient, it was found that if these items were deleted from the corresponding subscale they would result in lower reliabilities. So, they were not extracted from the subsequent analyses.

Table 3.23 Lambda ksi Estimates of Learning Strategy Items

Latent Variables	Observed Variables	LX Estimates	
		Original Study	Present Study
Elaboration	Ela1	0.60	0.66
(ELA)	Ela2	0.60	0.58
	Ela3	0.74	0.71
	Ela4	0.42	0.64
	Ela5	0.71	0.74
	Ela6	0.65	0.68
Organization	Org1	0.57	0.65
(ORG)	Org2	0.55	0.73
	Org3	0.45	0.56
	Org4	0.75	0.67
Metacognitive Self-Regulation	Msr1	0.44	0.66
	Msr2	0.40	0.14
(MSR)	Msr3	0.47	0.53
	Msr4	0.54	0.51
	Msr5	0.53	0.66
	Msr6	0.58	0.71
	Msr7	0.43	0.52
	Msr8	0.35	0.14
	Msr9	0.60	0.71
	Msr10	0.61	0.74
	Msr11	0.55	0.70
	Msr12	0.50	0.68

Besides, Table 3.24 summaries the Phi values of the learning strategies subscales for both original MSLQ and the present study. Considering the reported Phi values, it was possible to conclude that there was a strong positive correlation between elaboration and metacognitive self-regulation (r= 0.96); between organization and elaboration (r= 0.96); and between organization and metacognitive self-regulation (r= 0.94) subscales. The final SIMPLIS syntax of the confirmatory factor analysis and LISREL estimates of parameters with coefficients both in standardized value and t-values are provided in Appendix G.

Table 3.24 Phi Estimates of Learning Strategy Subscales

		ORG	MSR
ELA	Original MSLQ	0.65	0.85
	Present Study	0.96	0.96
ORG	Original MSLQ	-	0.75
	Present Study	-	0.94

3.5. Procedures

3.5.1. Data Collection Procedures

The data were collected during the spring semester of the 2009-2010 academic year. In the fall semester of the 2009-2010 academic year, the researcher prepared the instrument through the use of previously developed instruments in the related field, with several modifications in the light of Turkish context and elementary mathematics education. Next, the researcher translated the instrument into Turkish language and took expert opinions about the appropriateness of the instrument regarding elementary school level, as well as its relevance to the constructs being measured. Afterward, the researcher conducted a pilot study at three public elementary schools in Ankara, having similar characteristics with the schools selected for the main study. Then, the researcher submitted information about the details of the study to the Human Subjects Ethics Committee at the Middle East Technical University. After the approval of the Ethics Committee (see Appendix H), the researcher took the permission of Ministry of National Education (see Appendix I) for collecting data from a number of elementary schools in Ankara during the spring semester of the 2009-2010 academic year. Lastly, for the ease of data collection and data entry, the Turkish instrument was designed into optical form and the data was collected using these forms.

In the beginning of the spring semester of 2009-2010 academic years, the researcher visited all the selected schools in the study, and administered the instrument to 7th grade students during their regular class periods. Before administering the instrument, the researcher introduced herself to the students. She explained the purpose of the study and asked for their participation. Then, she distributed the instruments to the students, and assured that their responses would remain anonymous and confidential. Also, she declared that participation in this study would not influence their grade or relation with the teacher in any way.

During the administration of the instrument, the researcher gave instructions about what was requested in the instrument, how to respond to the items in the questionnaire, and how to answer the questions in the achievement test. The classroom teachers were present in the classrooms while the instrument was administered. However, the teachers remained seated and unobtrusive during the data collection period, and were not allowed to view any of the student responses. It took approximately 20 minutes for students to respond to the items in the questionnaire, and 20 minutes to answer 10 questions in the mathematics achievement test. So, on the whole, the instrument took about 40 minutes, which was approximately one lesson hour, for students to complete.

3.5.2. Data Analysis Procedures

In this study, Structural Equation Modeling (SEM) technique was used for the data analysis and hypothesis testing. SEM is a powerful technique that permits the measurement of several variables and their interrelationships simultaneously. It "combines measurement model or confirmatory factor analysis (CFA) and structural model into a simultaneous statistical test" (Hoe, 2008, p.76). Confirmatory factor analysis in SEM is used as a technique to test the construct validity of the scores of a psychological instrument, while the regression component of SEM is used to test the theory (Pedhazur & Pedhazur, 1991).

In this study, SEM was used both for addressing questions concerning the psychometric properties of the data collection instrument and the validity of the hypothesized model. Prior to running the primary data analysis, a number of data screening procedures were carried out, including checking for data entry errors, assessing patterns of missing data, and identifying outliers, in order to promote the accuracy of the data sets. In addition, a number of preliminary analyses were carried out to control for possible threats to the validity of the findings. For the primary analyses, a number of confirmatory factor analyses were conducted for each scale, and a structural equation model was developed for the whole sample.

Two statistical packages; (1) PASW Statistics 18.0 (Predictive Analytics Software Statistics Program) and (2) LISREL 8.80 for Windows (Linear Structural Relations Statistics Package Program), were used in this study for the data analysis. Preliminary analysis, including missing data, outliers, correlations, reliability analysis and assumptions were carried out by using the PASW Statistics. Besides, confirmatory factor analysis and Structural Equation Modeling were carried out by using LISREL software.

3.6. Assumptions and Limitations of the Study

There were several limitations to this study. First of all, measurement of the variables was based on a self-report questionnaire. Therefore, it was assumed that the participants would give careful attention to each item in the questionnaire, their responses were honest and based on their own personal beliefs and opinions rather than on what they believe to be acceptable. Also, it was assumed that the participants' beliefs and opinions could be truly measured using the selected self-report questionnaires.

Besides, the definition of self-regulation was limited to only students' motivational beliefs and use of several learning strategies. However, self-regulation is a broader concept that includes other cognitive, motivational, and affective aspects. Although, it would be highly imperative to include more concepts in the measurement, this would make the proposed model too diffuse and the interrelations too complicated to interpret.

Another limitation was that students' mathematics achievement was measured through a 10-item multiple choice test, which covered the topics in the first semester. Although, it would be more valid and reliable to ask more problems in the test or to focus on only one learning area instead of including all the first semester topics, due to implementation problems it was not possible. First of all, if more problems were asked in the test, participants would not be able to complete the questionnaire items and the achievement test in one lesson hour. In this case, either the instrument would be implemented in two lesson hours or the researcher would need to visit the same classrooms for the second time. Yet, these would either affect the participants' attitude toward the study or result in loss of participants. In a similar vein, if only one learning area was chosen from the first semester's topics, then the achievement test would not measure students' mathematics achievement, but it would measure only their achievement in the related topic. Then, this would affect both the significance of the study and the interpretation of the model.

Another limitation was about the sampling procedure. The participants in this study were selected from 7^{th} grade elementary school students in Ankara. There are 24 different rural and urban districts in Ankara, and the data were collected from schools at only four rural and urban districts, by taking into consideration the convenience in their means of access. So, any generalization was limited to a population that reflected this convenience.

CHAPTER IV

4. RESULTS

This chapter presents the results obtained from the data analyses of this study. The data analyses mainly consist of preliminary data analyses, confirmatory factor analyses, and structural equation model analysis. In particular, preliminary data analyses address details about the data screening procedures including accuracy of data, missing data, and outliers, as well as a number of descriptive analyses. Next, confirmatory factor analyses include the factor analyses of each scale. Lastly, structural equation model analysis includes the development and testing procedures of the structural model as well as the effect size and power analyses.

4.1. Preliminary Data Analysis

4.1.1. Data Screening Procedures

One of the most important initial stages in the preliminary data analysis process consists of data screening procedures. The purpose of this analysis was to provide supporting information about whether the data set is appropriate to perform the statistical analysis. In this study, data screening procedures involved checking data set for mistakes that might occurred during data entry, inspecting data set for missing values, and examining cases with values well above or below the majority of other cases.

4.1.1.1. Accuracy of Data

This step involved checking both categorical and continuous variables in the data set for values out of range. First, the frequency distribution of each categorical variable was examined. Then, the maximum and minimum values of each continuous variable were examined. The results revealed that all data were reasonable. That is, there was no categorical or continuous variable out of range.

4.1.1.2. Missing Data

This step involved inspecting the data set for missing values. There are different statistical techniques for dealing with missing data, according to the amount of missing values. Some of these techniques involve list wise deletion of cases, pair wise deletion of cases, mean substitution, regression imputation, maximum likelihood parameter estimation, and matching response pattern (Schumacker & Lomax, 2004). For SEM analysis, both list wise deletion and pair wise deletion techniques are not recommended, due to the reduction in the sample sizes. Instead, it is recommended to use mean substitution technique for data sets with small amount of missing values; regression imputation technique for data sets with moderate amount of missing values; and maximum likelihood technique for data sets with large amount of missing values (Schumacker & Lomax).

In this study, missing data analysis was performed for all of the items in the questionnaire. Each item was analyzed to identify the missing data percentages. Descriptive analyses of each item revealed highly small percentages (all less than 3%) of missing data. So, mean substitution technique was used by replacing each missing value with the mean of the corresponding item. There were also missing values in the data regarding students' Mathematics Achievement Test. This is mostly because a number of students left the questions that they could not solve, without making any marking. In order not to distort the result of the analysis, these missing data were left as missing without doing any replacement.

4.1.1.3. Outliers

This step involved examining the data set for values well above or below the majority of other cases. In this study, outlier analysis was performed by examining histograms, box plots, 5% trimmed mean values, and standardized residual values of each subscale in the instrument. Histograms were examined by looking at the tails of the distributions for data points sitting on their own (Pallant, 2007). Next, box plots were examined by checking the data points with asterisks, for the cases that extend more than three box lengths from the edge of the boxes (Pallant, 2007). Also, 5% trimmed mean values of each subscale were examined for values very different than the mean values of the corresponding subscales (Pallant, 2007). The results revealed no extreme data points that should be excluded from the data set.

Besides, in order to identify multivariate outliers, standardized residual values were checked for each subscale in the instrument. Table 4.1 presents the residual statistics of each subscale. According to Tabachnick and Fidell (2007), outliers are the data points with standardized residual values above about 3.3 or less than -3.3. According to these values, there were a number of outliers in the mastery goal orientation, classroom mastery goal structure, self-efficacy, elaboration, and metacognitive self-regulation subscales, with standardized residual values of -4.83, -5.42, -3.78, -3.45, and -3.39 respectively. In order to check whether these outliers were influential or not, Cook's distances were examined for values greater than 1 (Stevens, 2002). The results revealed no influential cases in the data set, given that all measures of Cook distances were less than 1. So, it was concluded that the detected outliers were not influential, and they could be retained in the subsequent analysis.

Table 4.1 Residual Statistics of the Scales

Scale Name	Subscales	Residual Statistics	Min	Max	Mean	Std. Deviation
Achievement Goal Orientation	MGO	Std. Residual	**-4.83**	1.14	0.02	0.99
		Mahal. Distance	0.00	12.16	0.99	1.58
		Cook's Distance	0.00	0.03	0.00	0.00
	PAPGO	Std. Residual	-1.96	1.76	0.00	1.00
		Mahal. Distance	0.00	12.16	0.99	1.58
		Cook's Distance	0.00	0.02	0.00	0.00
	PAVGO	Std. Residual	-2.31	1.88	0.00	1.00
		Mahal. Distance	0.00	12.16	0.99	1.58
		Cook's Distance	0.00	0.02	0.00	0.00
Classroom Goal Structure	CMGS	Std. Residual	**-5.42**	1.27	0.02	0.98
		Mahal. Distance	0.00	12.16	0.99	1.58
		Cook's Distance	0.00	0.03	0.00	0.00
	CPAPGS	Std. Residual	-3.26	1.25	0.00	1.00
		Mahal. Distance	0.00	12.16	0.99	1.58
		Cook's Distance	0.00	0.05	0.00	0.00
	CPAVGS	Std. Residual	-2.41	1.61	0.00	1.00
		Mahal. Distance	0.00	12.16	0.99	1.58
		Cook's Distance	0.00	0.03	0.00	0.00
Self-Efficacy	SE	Std. Residual	**-3.78**	1.86	0.01	0.99
		Mahal. Distance	0.00	12.16	0.99	1.58
		Cook's Distance	0.00	0.03	0.00	0.00
Learning Strategies	ELA	Std. Residual	**-3.45**	1.82	0.01	0.99
		Mahal. Distance	0.00	12.16	0.99	1.58
		Cook's Distance	0.00	0.02	0.00	0.00
	ORG	Std. Residual	-2.60	1.71	0.00	1.00
		Mahal. Distance	0.00	12.16	0.99	1.58
		Cook's Distance	0.00	0.01	0.00	0.00
	MSR	Std. Residual	**-3.39**	2.11	0.01	0.99
		Mahal. Distance	0.00	12.16	0.99	1.58
		Cook's Distance	0.00	0.02	0.00	0.00

4.1.2. Descriptive Analyses

In this part, a number of descriptive analyses were performed in order to provide preliminary insights into the nature of responses obtained. These analyses involved examining minimum and maximum values, mean, standard deviation, variance, and skewness and kurtosis values, relating to each subscale in the instrument. Also, descriptive analysis regarding Mathematics Achievement Test was provided.

Table 4.2 summarizes the descriptive analyses of each subscale used in the instrument. The results revealed that for mathematics learning, students pursued mastery goal orientation (M= 4.40, SD= 0.70) more than performance approach (M=3.11, SD= 1.08) and performance avoidance (M= 3.23, SD= 0.97) goal orientations. Similarly, they perceived their mathematics classroom goal structure as more mastery oriented (M= 4.33, SD= 0.61) than performance approach (M= 3.92, SD= 0.90) and performance avoidance (M= 3.41, SD= 1.01) oriented. Moreover, students generally held high self-efficacy beliefs (M= 5.17, SD= 1.36) for mathematics learning. Besides, they used elaboration strategies (M= 5.00, SD= 1.33) more than organization (M= 4.63, SD= 1.48) and metacognitive self-regulation (M=4.90, SD= 1.12) strategies.

The results also revealed that all of the subscales had negative skewness values, indicating clustering of scores at the high end (right hand side of the graph), ranging between -0.12 and -1.77. In addition, most of the kurtosis values were negative, ranging between -0.75 and 4.71, indicating rather peaked distributions (see Table 4.2). According to Tabachnick and Fidell (2007), with reasonably large samples (200 or more cases), these values would not make a substantive difference in the analysis.

Table 4.2 Descriptive Analysis of the Scales

Scale Name	Subscales	Sample	Min	Max	Mean (M)	Std. Deviation (SD)	Variance	Skewness		Kurtosis	
								Statistic	Std. Error	Statistic	Std. Error
Achievement Goal Orientation	MGO	1019	1	5	4.40	0.70	0.49	-1.51	0.07	2.48	0.15
	PAPGO	1019	1	5	3.11	1.08	1.17	-0.21	0.07	-0.75	0.15
	PAVGO	1019	1	5	3.23	0.97	0.96	-0.12	0.07	-0.60	0.15
Classroom Goal Structure	CMGS	1019	1	5	4.33	0.61	0.37	-1.77	0.07	4.71	0.15
	CPAPGS	1019	1	5	3.92	0.90	0.81	-0.91	0.07	0.59	0.15
	CPAVGS	1019	1	5	3.41	1.01	1.02	-0.44	0.07	-0.50	0.15
Self-Efficacy	SE	1019	1	7	5.17	1.36	1.86	-0.69	0.07	-0.16	0.15
Learning Strategies	ELA	1019	1	7	5.00	1.33	1.77	-0.60	0.07	-0.10	0.15
	ORG	1019	1	7	4.63	1.48	2.21	-0.39	0.07	-0.50	0.15
	MSR	1019	1	7	4.90	1.12	1.26	-0.52	0.07	-0.03	0.15

Table 4.3 summarizes the descriptive analysis belonging to Mathematics Achievement Test (MAT). Mean scores revealed that students had more correct answers (M= 4.96, SD= 2.82) than incorrect (M= 3.92, SD= 2.65) and blank (M=1.12, SD= 1.66) answers.

Table 4.3 Descriptive Analysis of MAT Scores

		Sample	Min	Max	Mean	Std. Deviation	Variance
MAT	Correct	1019	0	10	4.96	2.82	7.98
	Incorrect	1019	0	10	3.92	2.65	7.04
	Blank	1019	0	10	1.12	1.66	2.76

4.1.3. Assumptions

The assumptions underlying SEM analyses include independence of observations, random sampling of respondents, linearity of the relationships among variables, univariate normality, multivariate normality, appropriate level of measurement, and a reasonable sample size (Reisinger & Turner, 2003; Tabachnick & Fidell, 1989). To start with, independence of observations is a basic requirement for nearly all kind of hypothesis testing. It means that each observation or measurement was independent of any other observation or measurement (Gravetter & Wallnau, 2007). In this study, data were collected from participants during their regular classroom periods, and it was assumed that each participant responded to the instrument independent of one another.

The assumption of random sampling suggests that the participants were selected randomly, without any certain criteria of selection. This assumption helps to ensure that “the sample is representative of the population and that the results can be generalized to the population” (Gravetter & Wallnau, 2007, p.248). In this study, data were collected from four different districts, which were selected conveniently from both rural and urban areas in Ankara, regarding their means of accessibility.

In SEM analysis, the assumption of linearity implies to the presence of a straight line relationship between each pair of variable, both latent and observed (Kunnan, 1998). Violation of the linearity assumption suggests that estimates of model fit and standard error were biased (Pallant, 2007). In this study, linearity was checked by generating a matrix of scatterplots among each pair of variable. Figure 4.1 illustrates the matrix of scatterplots. According to the figure, most of the plots did not show any obvious evidence of non-linearity, and it was assumed that the assumption of linearity was satisfied.

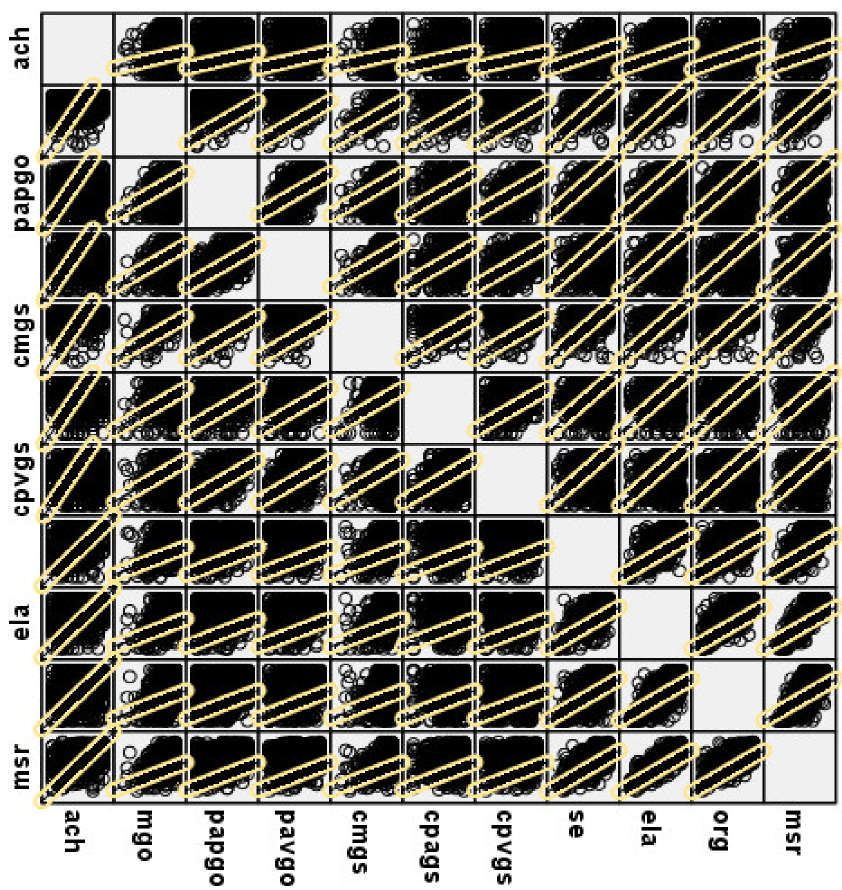


Figure 4.1 Matrix of Scatterplots among Variables

In SEM analysis, checking the assumptions of univariate normality and multivariate normality are highly important for determining the estimation method that will be used during hypothesis testing. LISREL uses Maximum Likelihood (ML) estimation by default (Jöreskog & Sörbom, 1993). However, when the variables are not normally distributed, it is not recommended to use ML (Byrne, 1998; Kline, 2011; Schumacker & Lomax, 2004), as the chi-square statistic could be biased toward Type 1 error (rejecting a true null hypothesis). In the absence of multivariate normality, it is recommended to use alternative methods such as Weighted Least Squares (WLS) or Robust Maximum Likelihood (RML), which are asymptotically distribution free methods and do not require normal scores (Du Toit & Du Toit, 2001; Mels, 2003).

Table 4.4 Test of Univariate Normality

	Skewness			Kurtosis			Skewness and Kurtosis	
	Statistic	z-Score	P-Value	Statistic	z-Score	P-Value	Chi-Square	P-Value
MGO	-1.51	**-5.02**	**0.00**	2.48	**16.25**	**0.00**	**289.39**	**0.00**
PAPGO	-0.21	**-2.36**	**0.01**	-0.75	**-4.93**	**0.00**	**29.39**	**0.00**
PAVGO	-0.12	-1.68	0.09	-0.60	**-3.96**	**0.00**	**18.56**	**0.00**
CMGS	-1.77	**-5.23**	**0.00**	4.71	**30.61**	**0.00**	**964.57**	**0.00**
CPAGS	-0.91	**-4.32**	**0.00**	0.59	**3.88**	**0.00**	**33.84**	**0.00**
CPVGS	-0.44	**-3.33**	**0.00**	-0.50	**-3.25**	**0.00**	**21.65**	**0.00**
SE	-0.69	**-3.95**	**0.00**	-0.16	-1.05	0.29	**16.76**	**0.00**
ELA	-0.60	**-3.75**	**0.00**	-0.10	-0.66	0.50	**14.53**	**0.00**
ORG	-0.39	**-3.18**	**0.00**	-0.50	**-3.35**	**0.00**	**21.36**	**0.00**
MSR	-0.52	**-3.55**	**0.00**	-0.03	-0.22	0.82	**12.66**	**0.00**
MAT	0.15	1.95	0.05	-1.04	**-6.83**	**0.00**	**50.55**	**0.00**

In particular, univariate normality is related with the skewness and kurtosis values of the variables in the model. It is violated when the skewness and kurtosis values exceed the range of -2 and +2 (George & Mallery, 2003). Table 4.4 illustrates the skewness and kurtosis values of the variables in this study. The results indicated that most of the variables had statistically significant z-score values for skewness and kurtosis ($p<0.05$), and all the variables had statistically significant chi-square values ($p<0.05$), indicating nonnormality.

In addition, the assumption of multivariate normality implies that (1) "all the individual univariate distributions are normal", (2) "each variable is normally distributed for each value of every other variable", and (3) "all bivariate scatterplots are linear, and the distribution of residuals is homoscedastic" (Kline, 2011, p.60). LISREL provides a chi-square test of multivariate normality, which indicates the skewness and kurtosis values for all the measured variables in the model (Kunnan, 1998). The result of the multivariate normality test is illustrated in Table 4.5. As the table illustrates, the multivariate normality test revealed a significant chi-square value of 1172.25 ($p<0.05$), with significant multivariate skewness of 10.47 (z-score= 30.11), and significant multivariate kurtosis of 26.64 (z-score= 16.28), indicating violation of multivariate normality.

Table 4.5 Test of Multivariate Normality for Continuous Variables

Skewness			Kurtosis			Skewness and Kurtosis	
Value	z-Score	P-Value	Value	z-Score	P-Value	Chi-Square	P-Value
10.47	30.11	**0.00**	26.64	16.28	**0.00**	1172.25	**0.00**

One way to deal with nonnormality is to normalize the data by converting the original scores into new ones that may be more normally distributed (Kline, 2011). In LISREL, normal scores can be obtained from 'Statistics' menu, selecting 'Normal Scores' dialog box. Table 4.6 illustrates the results of univariate normality, and Table 4.7 illustrates the results of multivariate normality after normalizing the data. The results revealed that although univariate normality was improved to some degree, still the data did not follow a multivariate normal distribution after the normalizing attempt. Therefore, asymptotically distribution free estimation methods were explored for the subsequent analyses, using the original raw data.

Table 4.6 Test of Univariate Normality after Normalization

	Skewness			Kurtosis			Skewness and Kurtosis	
	Statistic	z-Score	P-Value	Statistic	z-Score	P-Value	Chi-Square	P-Value
MGO	-0.42	**-3.28**	**0.01**	-0.60	**-3.93**	**0.00**	**2.24**	**0.00**
PAPGO	0.01	0.16	0.86	-0.34	**-2.24**	**0.02**	5.04	0.08
PAVGO	-0.03	-0.56	0.57	-0.26	-1.72	0.08	3.29	0.19
CMGS	-0.15	-1.93	0.05	-0.37	**-2.42**	**0.01**	**9.61**	**0.01**
CPAGS	-0.17	**-2.12**	**0.03**	-0.50	**-3.25**	**0.01**	**15.10**	**0.01**
CPVGS	-0.03	-0.65	0.51	-0.28	-1.85	0.06	3.87	0.14
SE	-0.05	-0.89	0.37	-0.23	-1.47	0.14	2.97	0.22
ELA	-0.04	-0.68	0.49	-0.19	-1.26	0.20	2.05	0.35
ORG	-0.03	-0.53	0.59	-0.23	-1.53	0.12	2.62	0.26
MSR	-0.01	-0.06	0.95	-0.02	-0.13	0.89	0.02	0.99
MAT	-0.02	-0.37	0.70	-0.36	**-2.35**	**0.01**	5.69	0.05

Table 4.7 Test of Multivariate Normality after Normalization

Skewness			Kurtosis			Skewness and Kurtosis	
Value	z-Score	P-Value	Value	z-Score	P-Value	Chi-Square	P-Value
4.37	13.45	**0.00**	16.69	11.69	**0.00**	317.74	**0.00**

Regarding the assumption of level of measurement, all levels of measurement (categorical, ordinal, interval or ratio) can be used in SEM analysis. However, it is recommended not to include different levels of measurement in the same correlation or covariance matrix (Kunnan, 1998). In LISREL program, when the variables have fewer than 15 categories, automatically they are treated as ordinal. Therefore, before conducting the model analyses, all the variables were defined as continuous in order not to have different level of measurements.

Lastly, regarding the assumption of sample size, SEM analysis is based on large samples (Kelloway, 1998). It is mostly because small samples influence the violation of non-normality, decrease the accuracy and stability of parameter estimates (Schumacker & Lomax, 2004), affect the power of significance tests, and produce biased goodness of fit indices (Curran, West, & Finch, 1996). In the literature, there are a number of different recommendations for sample size depending upon the complexity of the specified model. In general, recommendations range from 10 to 20 cases per estimated parameter (Mitchell; 1993; Stevens, 1996) with overall sample size preferred to exceed 200 cases (Garver & Mentzer, 1999; Hoelter, 1983). In this study, the sample size was 1019, which was a highly satisfactory number for insuring the sample size issues stated.

4.2. Structural Equation Modeling Analysis

4.2.1. Structural Equation Model

Developing the structural model began with hypothesizing an initial model (presented in Chapter 1) on the basis of substantive theory. The data file containing the raw variables was imported into LISREL 8.80. Then, the SIMPLIS command language was used for formulating the structural model, which was tested on the basis of asymptotic covariance matrix, using Robust Maximum Likelihood as the estimation technique. While developing the model, a number of structural equations were tested considering the theory, as well as the chi square values, standard errors, t- values, standardized residuals, and modification indices. The final SIMPLIS syntax and the structural models with estimates, standardized solution and t-values are provided in Appendix J.

Figure 4.2 represents the structural model with standardized solution. The final model consisted of four latent independent variables (exogenous) and seven latent dependent variables (endogenous). The independent latent variables were

Classroom Mastery Goal Structure (CMGS), Classroom Performance Approach Goal Structure (CPAPGS), Classroom Performance Avoidance Goal Structure (CPAVGS) and Self-Efficacy (SE). Besides, the latent dependent variables were Mastery Goal Orientation (MGO), Performance Approach Goal Orientation (PAPGO), Performance Avoidance Goal Orientation (PAVGO), Elaboration (ELA), Organization (ORG), Metacognitive Self-Regulation (MSR), and Mathematics Achievement (ACH).

In SEM analysis, there is a modification index for each fixed parameter in the model, which estimates the decrease in chi square that will be obtained if that particular parameter is added to the model (Jöreskog & Sörbom, 1993). In LISREL, the default value for alpha (α) is taken as 0.05 and "modification indices larger than 7.882 are considered to be large" (Jöreskog & Sörbom, 1993, p.108). In this study, regarding the modification indices among the latent variables, one path from PAPGO (Performance Approach Goal Orientation) to PAVGO (Performance Avoidance Goal Orientation) (decrease in chi-square was 158.7), and one path from PAVGO to PAPGO (decrease in chi-square was 10.4) were added to the model syntax based on the suggestions made by the program. Besides, regarding the modification indices among the observed variables, a number of error covariances were added in the model syntax.

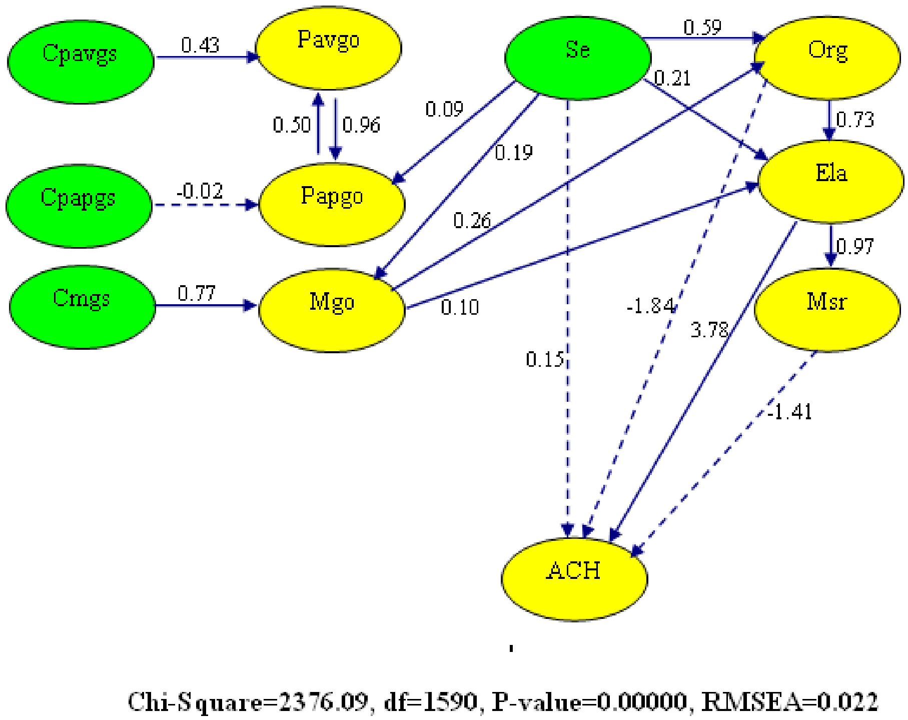


Figure 4.2 Structural Model with Standardized Solution

Table 4.8 summarizes the model fit indices belonging to the final structural model. The model demonstrated a chi-square value of χ^2= 2376.09, with degrees of freedom, df= 1590. As the chi square is sensitive to sample size, such as above 200 (Kelloway, 1998; Schumacker & Lomax, 2004), it was typical to obtain a significant probability level (p= 0.00). In SEM analysis, a χ^2/df ratio less than 5 is an indicative of a good fit between observed and reproduced correlation matrices, and a GFI, AGFI and CFI of 0.9 or greater suggest that the model fits the data well. For this model, it was found that χ^2/df= 1.49, GFI= 0.91, AGFI= 0.90, and CFI= 0.99, indicating a very good fit to the data. Specially, the RMSEA value of 0.022 can be regarded as an evidence for a very good fit for the indicated variables. Moreover, considering the other fit indices and their criteria, it was possible to conclude that the fit of the model was very good, and the specified model was highly supported by the sample data.

Table 4.8 Model Fit Indices of SEM

Fit Indices	Criterion	Sample
Chi-Squared (χ^2)	Non-significant	2376.09 **(p= 0.00)**
Normed Chi-Squared (NC)	NC<5	1.49
Goodness of Fit Index (GFI)	GFI>0.90	0.91
Adjusted Goodness of Fit Index (AGFI)	AGFI>0.90	0.90
Root Mean Square Error of Approximation (RMSEA)	0.05<RMSEA<0.10 (moderate fit) RMSEA<0.05 (a very good fit)	0.02 (very good fit)
Root Mean Square Residual (RMR)	RMR<0.05	**0.11**
Standardized Root Mean Square Residual (S-RMR)	S-RMR<0.05	0.04
Parsimony Goodness of Fit Index (PGFI)	Higher values	0.81
Parsimony Normed Fit Index (PNFI)	Higher values	0.91
Normed Fit Index (NFI)	NFI>0.90	0.98
Non-Normed Fit Index (NNFI)	NNFI>0.90	0.99
Comparative Fit Index (CFI)	CFI>0.90	0.99
Incremental Fit Index (IFI)	IFI>0.90	0.99
Relative Fit Index (RFI)	RFI>0.90	0.98

The structure coefficients (γ and β) indicate the relationships among latent variables in the model. In particular, γ (lowercase gamma) refers to the strength and direction of the relationship among latent dependent variables and latent independent variables (Schumacker & Lomax, 2004). Table 4.9 indicates the lowercase gamma values.

Table 4.9 Lowercase Gamma (γ) of SEM

Dependent Variables	Independent Variables			
	CMGS	CPAPGS	CPAVGS	Self-Efficacy
MGO	0.77	-	-	0.19
PAPGO	-	-0.02	-	0.09
PAVGO	-	-	0.43	-
ELA	-	-	-	0.21
ORG	-	-	-	0.59
MSR	-	-	-	-
ACH	-	-	-	0.42

Besides, Lowercase beta (β) indicates the strength and direction of the relationship among latent dependent variables (Schumacker & Lomax, 2004). Table 4.10 summarizes the lowercase beta (β) values.

Table 4.10 Lowercase Beta (β) of SEM

	MGO	PAPGO	PAVGO	ELA	ORG	MSR	ACH
MGO	-	-	-	-	-	-	-
PAPGO	-	-	0.96	-	-	-	-
PAVGO	-	0.50	-	-	-	-	-
ELA	0.10	-	-	-	0.73	-	-
ORG	0.26	-	-	-	-	-	-
MSR	-	-	-	0.97	-	-	-
ACH	-	-	-	3.78	-1.84	-1.41	-

In addition, the elements of Phi correspond to "the variances and covariances of the independent variables" (Jöreskog & Sörbom, 1993, p.139). Table 4.11 represents the Phi values.

Table 4.11 Phi Estimates of SEM

	CMGS	CPAPGS	CPAVGS	SE
CMGS	1.00			
CPAPGS	0.30	1.00		
CPAVGS	0.20	0.50	1.00	
SE	0.59	0.19	0.19	1.00

Table 4.12 shows the summary of structure coefficients, standard errors, and t-values of each set of structural equations in the model. In particular, t-values are the ratios between each estimate and its standard error, and a significant t-value indicates that the variable considerably influence the corresponding dependent variable (Jöreskog & Sörbom, 1993). In LISREL, the default value for alpha (α) is taken as 0.05, and t values "smaller than 1.96 in magnitude" are considered to non-significant (Jöreskog & Sörbom, 1993, p.107). In this model, four paths indicated nonsignificant t values; one path from Classroom Performance Approach Goal Structure to Performance Approach Goal Orientation (t= -1.07), one path from Organization to Mathematics Achievement (t= -1.84), one path from Metacognitive Self-Regulation to Mathematics Achievement (t=-1.52), and one path from Self-Efficacy to Mathematics Achievement (t= 1.80).

Table 4.12 also illustrates the squared multiple correlation (R^2) values for each structural equation. In SEM analysis, R^2 is used as a measure of strength of each relationship in the model (Jöreskog & Sörbom, 1993), which indicates the amount of variance explained by the set of independent variables for the corresponding dependent variable. R^2 values in SEM are interpreted in the same way as R^2 values in regression analysis (Kelloway, 1998). According to the results, the presented model was able to explain 98% of the variance in Performance Approach Goal Orientation; 94% of the variance in Metacognitive Self-Regulation; 94 % of the variance in Elaboration; 92% of the variance in Performance Avoidance Goal

Orientation; 80% of the variance in Mastery Goal Orientation; 62% of the variance in Organization; and 19 % of the variance in Mathematics Achievement.

Table 4.12 Structural Equations of SEM

Paths To	From	Structure Coefficients	Std.Error	t-value	R^2
MGO	CMGS	0.77 (γ)	0.06	11.20	0.80
	SE	0.19 (γ)	0.05	3.35	
PAPGO	PAVGO	0.96 (β)	0.05	16.70	0.98
	CPAPGS	-0.02 (γ)	0.02	-1.07*	
	SE	0.09 (γ)	0.03	2.70	
PAVGO	PAPGO	0.50 (β)	0.20	2.55	0.92
	CPAVGS	0.43 (γ)	0.16	2.76	
ELA	MGO	0.10 (β)	0.03	3.19	0.94
	ORG	0.73 (β)	0.08	8.71	
	SE	0.21 (γ)	0.05	3.84	
ORG	MGO	0.26 (β)	0.05	5.00	0.62
	SE	0.59 (γ)	0.05	13.35	
MSR	ELA	0.97 (β)	0.04	20.28	0.94
ACH	ELA	3.78 (β)	1.54	2.45	0.19
	ORG	-1.84 (β)	1.00	-1.84*	
	MSR	-1.41 (β)	0.93	-1.52*	
	SE	0.42 (γ)	0.23	1.80*	

* Non-significant paths

Regarding both the squared multiple correlations and structure coefficients, results related with motivational factors revealed that students' perception of Classroom Mastery Goal Structure and Self-Efficacy accounted for 80% of the variability in their Mastery Goal Orientations. Specially, Mastery Goal Orientation was highly associated with Classroom Mastery Goal Structure (γ = 0.77, t= 11.20). Next, students' perception of Classroom Performance Approach Goal Structure, Self-efficacy, and Performance Avoidance Goal Orientations accounted for 98% of the variability in their Performance Approach Goal Orientations. Among these variables, Performance Approach Goal Orientation was highly associated with Performance Avoidance Goal Orientation (β = 0.96, t= 16.70). In a similar vein, students' perception of Classroom Performance Avoidance Goal Structure and Performance Approach Goal Orientations accounted for 92% of the variability in their Performance Avoidance Goal Orientations. Specially, Performance Avoidance Goal Orientation was highly associated with Performance Approach Goal Orientation (β = 0.50, t=2.55).

Besides, results related with learning strategies revealed that students' adoption of Mastery Goals, use of Organization strategies, and Self-Efficacy accounted for 94% of the variability in their use of Elaboration strategies. Among these variables, Elaboration was highly associated with Organization (β = 0.73, t= 8.71). Similarly, students' adoption of Mastery Goals and Self-Efficacy accounted for 62% of the variability in their use of Organization strategies. Specially, Organization was highly associated with Self-Efficacy (γ = 0.59, t= 13.35). Unlike other variables, use of Metacognitive Self-Regulation strategies was only associated with use of Elaboration strategies (β =0.97, t= 20.28), and Elaboration accounted for 94% of the variability in Metacognitive Self-Regulation. Lastly, use of Elaboration, Organization, and Metacognitive Self-Regulation strategies, together with Self-Efficacy accounted for 19% of the variability in students' Mathematics Achievement. Among these variables, Mathematics Achievement was only significantly associated with Elaboration strategies (β = 3.78, t= 2.45).

In addition to the direct effects, LISREL program also provides results regarding indirect and total effects among the latent variables. In SEM, indirect effect is defined as the effect between two latent variables when no single straight line or arrow directly connects them, but one latent variable is reached from another latent variable through one or more mediating variables (Raykov & Marcoulides, 2006). In this manner, total effect is defined as the sum of direct and indirect effects between two latent variables. Therefore, when there is no direct effect between the latent variables, total effects are equal to the indirect effects (Jöreskog & Sörbom, 1993). Table 4.13 indicates indirect effects of latent independent variables on the latent dependent variables.

Table 4.13 Indirect Effects of Independent Variables on Dependent Variables

Dependent Variables	Independent Variables			
	CMGS	CPAPGS	CPAVGS	Self-Efficacy
MGO	-	-	-	-
PAPGO	-	-0.02*	0.79	0.08
PAVGO	-	-0.02*	0.40	0.09
ELA	0.23	-	-	0.49
ORG	0.20	-	-	0.05
MSR	0.22	-	-	0.67
ACH	0.18	-	-	0.49

* Non-significant indirect effects

Similarly, Table 4.14 illustrates the total effects of these independent variables on the latent dependent variables.

Table 4.14 Total Effects of Independent Variables on Dependent Variables

Dependent Variables	Independent Variables			
	CMGS	CPAPGS	CPAVGS	Self-Efficacy
MGO	0.77	-	-	0.19
PAPGO	-	-0.04*	0.79	0.18
PAVGO	-	-0.02*	0.83	0.09
ELA	0.23	-	-	0.69
ORG	0.20	-	-	0.64
MSR	0.22	-	-	0.67
ACH	0.18	-	-	0.91

* Non-significant total effects

In addition, Table 4.15 indicates the indirect effects among the latent dependent variables.

Table 4.15 Indirect Effects among Latent Dependent Variables

	MGO	PAPGO	PAVGO	ELA	ORG	MSR	ACH
MGO	-	-	-	-	-	-	-
PAPGO	-	0.92*	0.88*	-	-	-	-
PAVGO	-	0.46*	0.92*	-	-	-	-
ELA	0.19	-	-	-	-	-	-
ORG	-	-	-	-	-	-	-
MSR	0.29	-	-	-	0.71	-	-
ACH	0.23	-	-	-1.37*	1.76*	-	-

* Non-significant indirect effects

Similarly, Table 4.16 illustrates the total effects among the latent dependent variables.

Table 4.16 Total Effects among Latent Dependent Variables

	MGO	PAPGO	PAVGO	ELA	ORG	MSR	ACH
MGO	-	-	-	-	-	-	-
PAPGO	-	0.92^{*}	1.84	-	-	-	-
PAVGO	-	0.96^{*}	0.92^{*}	-	-	-	-
ELA	0.30	-	-	-	0.73	-	-
ORG	0.26	-	-	-	-	-	-
MSR	0.29	-	-	0.97	0.71	-	-
ACH	0.23	-	-	2.41	-0.08^{*}	-1.41^{*}	-

* Non-significant total effects

When the direct and indirect effects were taken into consideration together, results regarding classroom goal structure revealed that students' perception of classroom goal structure was directly linked to their adoption of achievement goals. In particular, when students perceived their mathematics classroom as mastery oriented, they adopted mastery goals for learning mathematics. Similarly, when they perceived their classroom as performance oriented, they adopted performance goals for learning mathematics. Next, among the achievement goals, only mastery goals were associated with students' use of learning strategies which, in turn, linked to their mathematics achievement. There was a reciprocal relationship between performance approach and performance avoidance goals, and none of these performance orientations were associated with students' use of learning strategies or mathematics achievement.

Besides, self-efficacy was both directly and indirectly related to students' adoption of achievement goals, use of learning strategies, and mathematics achievement. In particular, when the direct effect was considered, self-efficacy was not significantly related to mathematics achievement. However, when the direct and indirect effects were considered together, it was significantly related to mathematics achievement. Lastly, among the learning strategies, only elaboration was directly and significantly related to students' mathematics achievement. Organization was significantly linked to elaboration and metacognitive self-regulation, but not to mathematics achievement. Elaboration was significantly linked to metacognitive self-regulation. However, metacognitive self-regulation was not significantly related to any measured variable in the study.

4.2.2. Effect Size

Each statistical test has its own index of effect size. For regression analysis and linear models, Cohen (1988) suggested using a standardized measure of effect size, called f^2, which is equal to $R^2/(1 - R^2)$, where R^2 is the squared multiple correlation (p.410-414). For this index, an f^2 value of 0.02 is regarded as a small effect size, 0.15 is regarded as a medium effect size, and 0.35 or greater values are regarded as large effect sizes. If these values are converted into R^2 values, an R^2 value of 0.02 will be regarded as small effect size, 0.13 as medium effect size, and 0.26 as large effect size. Table 4.17 summarizes the effect size values for each structural equation in the model. According to this classification, all the structural equations had large effect sizes (f^2 larger than 0.35), except for the structural equation belonging to Mathematics Achievement (R^2= 0.19, f^2= 0.23) which had a medium effect size.

Table 4.17 Effect Size of Each Structural Equation

	R^2	f^2
MGO	0.80	4.00
PAPGO	0.98	49.00
PAVGO	0.92	11.50
ELA	0.94	15.66
ORG	0.62	1.63
MSR	0.94	15.66
ACH	0.19	0.23

4.2.3. Power

In SEM analysis, hypothesis testing consists of confirming that a theoretical specified model fits sample variance-covariance data, by testing the significance of structural coefficients or testing the equality of coefficients between groups (Schumacker & Lomax, 2004). The initial model represents the null hypothesis (H_o) and the final model represents the alternative hypothesis (H_a). Each model produces a chi-square goodness of fit value and the difference between these values is used for testing significance. Mathematically, this difference (denoted as $D^2 = \chi_o{}^2 - \chi_a{}^2$ with degrees of freedom $df_d = df_o - df_a$) is tested for significance at a specified alpha level where "H_o is rejected if D^2 exceeds the critical chi-square value with df_d degrees of freedom" (Schumacker & Lomax, p.113). In this study, the alpha level was taken to be 0.05.

The power of hypothesis testing, which is the probability of rejecting H_o when it is false, depends on "the true population model, significance level, degrees of freedom, and sample size" (Schumacker & Lomax, 2004, p.113). MacCallum, Brown and Sugawara (1996) suggested a sample size table in which they indicated minimum number of participants required for ensuring a power of 0.80, with certain levels of degrees of freedom, at the significance level of 0.05. According to this table, with 25 degrees of freedom, a minimum sample size of 363 is recommended for close fit, and a sample size of 411 is recommended for non close fit. Similarly, with 30 degrees of freedom, a minimum sample size of 314 is recommended for close fit, and a sample size of 366 is recommended for non close fit. In this study, hypothesis testing had 1590 degrees of freedom, and the sample consisted of 1019 participants, which was a highly satisfactory number for ensuring a power of 1.00.

CHAPTER V

5. DISSCUSSION, CONCLUSION, AND IMPLICATIONS

In this chapter, first, a summary of the major findings are presented. Then, discussions and conclusions are drawn from the results obtained. Lastly, assumptions and limitations of the study are indicated, and recommendations are made for educational theory and practice as well as future research in this field.

5.1. Major Findings

This study was conducted in an attempt to integrate a number of cognitive, motivational and behavioral factors in elementary mathematics education, and to develop a structural model that might explain the direct and indirect relationships among these concepts as well as their underlying dimensions. In particular, it was intended to examine the interrelationships among students' achievement goal orientations, perception of classroom goal structure, self-efficacy, use of self-regulatory strategies, and academic achievement in mathematics.

Results of goodness of fit statistics revealed that the structural model demonstrated a very good fit to the data, considering the complexity of the model and the number of variables. In particular, the model was able to explain 98% of the variance in students' adoption of performance approach goal orientation; 94% of the variance in students' use of metacognitive self-regulation strategies; 94 % of the variance in students' use of elaboration strategies; 92% of the variance in students' adoption of performance avoidance goal orientation; 80% of the variance in students' adoption of mastery goal orientation; 62% of the variance in students' use of organization strategies; and 19 % of the variance in students' mathematics achievement.

Results regarding both the direct and indirect effects revealed that students' perception of classroom goal structure were directly linked to their adoption of achievement goal orientations. Among these goal orientations, only mastery goal orientation was associated with students' use of learning strategies, which, in turn, related to their mathematics achievement. Besides, there was a reciprocal relationship between performance approach and performance avoidance goal orientations. Next, among the learning strategies, only elaboration was significantly related to mathematics achievement. Organization was linked to elaboration and metacognitive self-regulation, but not to mathematics achievement. Explicitly, metacognitive self-regulation was not related to any measured variable in the study. Lastly, self-efficacy was both directly and indirectly related to students' adoption of achievement goals, use of learning strategies, and mathematics achievement. However, it was significantly related to achievement only when the total effects were considered.

5.2. Discussions

In the beginning of the study, a number of relationships were hypothesized among the measured variables, based on the theoretical and empirical evidences gathered from the previous studies. It was proposed that students' self-efficacy and perception of classroom goal structure would be linked to their adoption of achievement goal orientations. Then, these goal orientations were expected to be associated with students' use of learning strategies, which, in turn, would be linked to their mathematics achievement. Also, it was expected that self-efficacy would both directly and indirectly contribute to students' use of learning strategies and mathematics achievement. The results of the data analyses provided support for most of the hypothesized relationships, although there were several unexpected results as well. However, in general, the findings were mostly in line with the predictions made.

Considering students' perceptions of classroom goal structure, the results of the present study revealed that students' perception of classroom goal structure as mastery oriented was significantly and positively related to students' adoption of mastery goals, which, in turn, related to their use of learning strategies and mathematics achievement. Next, students' perception of classroom goal structure as performance approach oriented was positively linked to students' adoption of performance approach goals, and their perception of classroom goal structure as performance avoidance oriented was positively linked to their adoption of performance avoidance goals. However, none of these performance orientations were associated with students' use of learning strategies or mathematics achievement.

Previous research on classroom goal structure has also indicated that the goal characteristic of the classroom environment plays an influential role in the type of goals students adopt (Patrick et al., 2001; Roeser, Midgley, & Urdan, 1996; Turner et al., 2002). Particularly, when students perceived their learning environment as emphasizing deep understanding of the material, encouraging process rather than competition, and focusing on the mastery of the learning tasks, they tended to develop mastery goal orientation for that subject matter (Bong, 2001; Roeser, Midgley, & Urdan, 1996). On the other hand, when students perceived their learning environment as promoting competition and rewarding better performance, they were more likely to pursue either performance approach or performance avoidance goals (Ryan, Gheen, & Midgley, 1998).

In this aspect, this study upheld the findings of previous studies, and added support to the fact that students develop achievement goals that are parallel to the goal structure of their classroom environment. This result might imply that classroom environments have an impact on mathematics achievement by shaping the type of achievement goals that students adopt. Specifically, the results suggest that learning environments that focus on mastery of learning tasks are more likely to be beneficial for students' mathematics achievement than performance oriented environments.

Considering students' achievement goal orientations, the results of the present study revealed that mastery goal orientation was the only type of goal orientation that was related to students' use of elaboration, organization, and metacognitive self-regulation strategies. Besides, although not directly linked, it was only the mastery goal orientation that was significantly related to students' mathematics achievement. At this point, previous research findings have also indicated that different kind of goal orientations are associated with different kind of behavioral, cognitive, and affective learning outcomes, mostly because they emphasize different ways of thinking about competence (Barron & Harackiewicz, 2001). In particular, it has been consistently reported that pursuing a mastery goal orientation is positively associated with adaptive patterns of achievement-related outcomes, such as demonstrating deeper use of learning strategies (Harackiewicz et al, 2002; Urdan & Midgley, 2003) and having high academic achievement (Urdan & Midgley, 2003).

Theoretically, finding a positive relationship between mastery goals and mathematics achievement can be anticipated, because students with mastery goals are interested in learning for its own sake, they choose challenging tasks, and focus on developing new skills and improving their competence. However, at this point, one may ask 'Then, why mastery goals were not directly related to students' mathematics achievement?' Actually, in the literature, a number of recent research studies have also pointed out no direct link between mastery goals and academic achievement (Barron & Harackiewicz, 2001; Elliot & McGregor, 2001; Pintrich, 2000; Wolters, 2004). Regarding this indirect relation, Barron and Harackiewicz (2001) suggested that optimal achievement outcomes may occur when students pursue both mastery and performance goals together, because when students have the option of pursuing both types of goals, "they can better negotiate their achievement experiences by focusing on the achievement goal that is most relevant at a particular time" (p.708). Taking it from a very different perspective, Wolters (2004) proposed that mastery goals may predict students' academic achievement "only when other motivational variables that are tied more directly to student achievement are not accounted for" (p.239). In other words, Wolters stated that mastery goals could be directly linked to students' mathematics achievement if other motivational factors, such as self-efficacy, were not included in the analysis. However, according to the results of this study, one possible explanation of this situation could be that simply pursuing mastery goals may be beneficial for learning mathematics, but it may not be sufficient for gathering favorable achievement outcomes. At this point, further research may be essential for providing additional explanations to clarify this issue.

In addition, although a number of previous studies have indicated a positive link between performance approach goals and academic achievement (Elliot & Church, 1997; Harackiewicz et al., 2002; Pintrich, 2000), no such relationship was found in this study. Actually, in the literature, performance approach goals are both linked to adaptive achievement-related outcomes, such as having low test anxiety (Middleton & Midgley, 1997) and having high persistence (Elliot & Church, 1997; Harackiewicz et al., 2002; Pintrich, 2000), and to maladaptive achievement-related outcomes, such as avoiding negative judgments (Linnenbrink & Pintrich, 2002) and avoiding challenge (Pintrich & Schunk, 2002). In this aspect, the results of this study support the view that performance approach goals do not promote adaptive achievement-related outcomes. However, it is also not possible to say that performance approach goals are only maladaptive. Indeed, performance approach goals may be beneficial for other aspects of student functioning, but according to the results of this study, they are not beneficial for using more learning strategies or enhancing mathematics achievement.

The results of this study also extend the previous research findings by suggesting a significant reciprocal relationship between performance approach and performance avoidance goals. A possible explanation of this finding might be that performance approach and performance avoidance goals are not independent of each other. In other words, elementary school students are likely to hold both types of performance goals together. When learning tasks become highly challenging, students with performance approach goals may switch to performance avoidance goals in order not to look incapable, or vice versa.

Considering students' self-efficacy, previous research findings have indicated that self-efficacy is related to a number of adaptive academic outcomes, such as adopting mastery goals, selecting challenging tasks (Elliot, 1999), using different self-regulation strategies (Pajares, 2001), and having high academic achievement (Schunk, 2000). Building on the earlier works, the results of this study also indicated that self-efficacy was positively related to students' adoption of achievement goals, use of learning strategies, and mathematics achievement. In particular, regarding students' achievement goals, self-efficacy was positively related to both mastery goals and performance approach goals. At this point, finding a positive relationship between self-efficacy and mastery goals was expected, because when students believe in their capability to do mathematics, they might be more concerned with extending their understanding and improving their skills. Besides, finding a positive relationship between self-efficacy and performance approach goals might be due to the approach characteristic of performance approach goals (Greene at al., 2004; Middleton, Kaplan, & Midgley, 2004; Wolters Yu, & Pintrich, 1996). That is, high judgment of capability may be more linked to "approach motivation" such as mastery and performance approach, while low judgment of capability may be more linked to "avoidance motivation" (Greene et al., 2004, p.466).

In addition, regarding the relation between self-efficacy and learning strategies, the hypothesis that self-efficacy would be significantly related to students' use of learning strategies was partially validated in this study. Statistically, self-efficacy was significantly related to students' use of elaboration, organization, and metacognitive self-regulation strategies. However, the link between self-efficacy and metacognitive self-regulation was not direct. Also, self-efficacy was significantly related to mathematics achievement, only when the total effects were considered. In the literature, numerous research studies have reported moderate to strong relationships between self-efficacy, self-regulation strategies, and mathematics achievement (Malpass, O'Neil, & Hocevar, 1999; Pajares & Graham, 1999; Skaalvik and Skaalvik, 2009). Among these studies, Malpass, O'Neil, and Hocevar (1999) indicated that self-efficacy was strongly related to mathematics achievement, and moderately related to self-regulation strategies. Similarly, in a path model, Garcia and Pintrich (1991) found that both intrinsic motivation and self-efficacy had moderate effects on students' use of self-regulation strategies. Furthermore, in a more recent study, through structural equation modeling analyses, Skaalvik and Skaalvik (2009) reported that self-efficacy was an important mediator of students' mathematics achievement. That is, having a high self-efficacy perception was an important prerequisite for students' mathematics learning and achievement.

Taking together, self-efficacy can provide important insights about students' academic functioning and performance in mathematics. Although self-efficacy literature suggests a strong relation between self-efficacy and academic achievement, in this study, no strong direct relation was found between self-efficacy and mathematics achievement. In particular, self-efficacy was related to mathematics achievement only when mediated by effective use of learning strategies. One possible explanation of this finding might be related with students' overestimation or underestimation of their actual capabilities. In particular, when students judge their capabilities unrealistically, they may adopt maladaptive learning behaviors (Pajares & Graham, 1999), which may result in unexpected learning outcomes. On the other hand, when students have an optimal level of self-efficacy, they may reflect this on their use of learning strategies and achieve better in mathematics. At this point, identifying and challenging unrealistic self-efficacy beliefs may be essential for successful functioning in learning mathematics (Usher & Pajares, 2008).

Considering students' use of learning strategies, three learning strategies were used in this study to examine students' self-regulation strategies. These learning strategies consisted of organization, elaboration, and metacognitive self-regulation. In the literature, organization and elaboration are categorized as cognitive strategies, whereas metacognitive self-regulation is categorized as metacognitive strategies. Basically, cognitive strategies are known as facilitating students to acquire new information, constructing connections with prior knowledge, and retrieving appropriate information when needed (Pintrich et al., 1991). Besides, metacognitive strategies are known as enhancing students' awareness, knowledge, and control of their cognition, and helping them to check and correct their behaviors as they proceed on a task (Pintrich et al., 1991).

The results of this study regarding the interrelationships among learning strategies indicated that students' use of organization strategies was significantly and positively related to their use of elaboration strategies, and then these elaboration strategies was significantly and positively linked to the use of metacognitive self-regulation strategies. From a conceptual aspect, finding a positive relationship between organization strategies and elaboration strategies was anticipated, because they are both categorized as cognitive strategies. In particular, elaboration strategies, such as paraphrasing, summarizing, and generative note taking, help students to store information into long-term memory by making internal connections among the recently learnt concepts and prior knowledge (Pintrich et al., 1991). Besides, organization strategies, such as clustering, outlining, and selecting the main idea, help students to choose the proper information and build connections among the information to be learned. Therefore, as both elaboration and organization strategies promote the comprehension and retention of knowledge, they were found to be strongly relating to each other. Besides, finding a strong link between cognitive strategies and metacognitive self-regulation was also not surprising, because metacognitive self-regulation refers to the control and regulation aspect of cognition (Pintrich et al., 1991).

What was surprising in this study was the nature of the relationships between learning strategies and mathematics achievement. Previous research has strongly suggested that students' use of different learning strategies serves as an important predictor of their academic performance (Pape & Wang, 2003; Pintrich & DeGroot, 1990; Zimmerman & Martinez-Pons, 1990). In this study, among the learning strategies, only elaboration was significantly and directly related to students' mathematics achievement. However, the link between organization and mathematics achievement, as well as the link between metacognitive self-regulation and mathematics achievement were not significant.

In the literature, there are a number of recent research studies which reported results similar to this study. Among these studies, Mousoulides and Philippou (2005) examined the relationships among motivational beliefs, self-regulation strategies and mathematics achievement for pre-service teachers in Cyprus. Similar to the present study, elaboration, organization and metacognitive self-regulation were used as the basis of self-regulation strategies, and MSLQ were used for assessing participants' use of learning strategies. Their results revealed that self-regulation strategies, especially metacognitive self-regulation strategies, had moderate negative relations with mathematics achievement. As a possible explanation, researchers suggested that the participants might have "held high beliefs regarding their self-regulation strategies regardless of their ability" (p.327). That is, the participants might have indicated that they were effectively using self-regulation strategies, indeed when they were not using them as high as indicated.

Similarly, Malpass, O'Neil, and Hocevar (1999) investigated the effects of gender, self-efficacy, learning goal orientation, self-regulation strategies, and worry on high school students' mathematics achievement. The researchers used the State Metacognitive Inventory, prepared by O'Neil and Abedi (1996), for assessing participants' use of learning strategies, including metacognitive self-regulation strategies and cognitive strategies. The path analysis results indicated a nonsignificant relationship between self-regulation strategies and mathematics achievement. Based on the results gathered, the researchers suggested that this might be due to the assessment issue of self-regulation strategies or the characteristic of the sample used in the study.

Furthermore, in a recent study, Al-Harty and Was (2010) examined the relationship among self-efficacy, task value, goal orientation, learning strategies, and academic achievement. The researchers used MSLQ for assessing prospective teachers' use of learning strategies. Results revealed that the sum of learning strategies subscales, including rehearsal, elaboration, organization and critical thinking, did not correlate with academic achievement at all. Also, there was no significant direct relationship between metacognitive self-regulation and academic achievement; instead, they found a moderate negative correlation. The researchers did not indicate any possible explanation for their findings.

Taking together, similar to the findings of these studies, in this study, no significant relationship was found between organization and mathematics achievement, as well as between metacognitive self-regulation and mathematics achievement. A possible explanation of these findings might be that assessing students' learning strategies through self-report instruments, such as MSLQ, was not a valid method for interpreting their actual implementation of these strategies. Alternatively, multiple data collection methods, such as observations or interviews, could be used to triangulate the data gathered from the self-report questionnaire. Besides, MSLQ was normally designed to assess college students' use of different learning strategies. In this study, the participants were 7^{th} grade elementary school students. Therefore, the findings might have been prevalent in this age group due to their developmental stages. Specially, as metacognitive self-regulation involves complex cognitive processes, metacognitive knowledge and skills might have not been properly developed at this age group. The last and may be the least probable reason is that metacognitive self-regulation really do not relate to students' mathematics achievement. At this point, further research may provide a richer understanding for this situation.

The present study is one of the few studies that simultaneously investigated the underlying dimensions of students' self-efficacy beliefs, achievement goal orientations (including mastery goal orientation, performance approach goal orientation, performance avoidance goal orientation), perceptions of classroom goal structure (including classroom mastery goal structure, classroom performance approach goal structure, classroom performance avoidance goal structure), use of self-regulation strategies (including elaboration, organization, metacognitive self-regulation), and academic achievement , in the domain of elementary mathematics education, specially in the Turkish context. In the literature, there are numerous research studies that integrated a number of cognitive, motivational, and behavioral aspects of students' mathematics learning. However, most of these studies differed with respect to the methodologies used, the dimensions and underlying dimensions of the concepts investigated, as well as the characteristic of the sample examined. In the following part, only the studies with structural equation modeling framework will be summarized, concentrating on the theoretical similarities and differences between the models.

Recently, Skaalvik and Skaalvik (2009) examined the effect of self-concept, self-efficacy, performance approach orientation, task orientation, and interest on elementary and high school students' mathematics achievement. Through structural equation modeling analyses, their results indicated that self-perception (self-efficacy and self-concept) was positively related to performance approach orientation, task orientation and to interest in working with mathematics, strongly predicting subsequent mathematics achievement. Like the findings of the present study, this study also highlighted the importance of self-efficacy as an important mediator of students' mathematics achievement. Although this study related a number of motivational variables with mathematics achievement, it did not examine students' perception of classroom goal structure or their use of learning strategies. Besides, although it included achievement goals, they were limited to only performance approach orientation and task orientation.

In another recent study, Meuschke (2006) examined the interrelationships among achievement goal orientations, self-efficacy, classroom goal structure, help seeking, and mathematics achievement. The participants were 396 college students enrolled in remedial mathematics courses at a community college. Through structural equation modeling analyses, the results of their study indicated that students' perceptions of classroom goal structure, as well as their achievement goal orientations and self-efficacy, were found to influence their help seeking behaviors, which strongly predicted mathematics achievement. Specially, 40% of the variance in adaptive help seeking was accounted by mastery goal orientation, classroom mastery goal structure, and self-efficacy. Like the findings of the present study, mastery goal orientation, classroom mastery goal structure, and self-efficacy were found to be important predictors of mathematics achievement. However, as the study only included help seeking behavior as the mediator variable, no comparison could be made between the models regarding the significance of self-regulation strategies.

In a similar vein, Mousoulides and Philippou (2005) examined the relationships between motivational beliefs (including self-efficacy, task value, goal orientation), self-regulation strategies (including elaboration, organization, metacognitive self-regulation), and mathematics achievement. The participants were 194 pre-service teachers in Cyprus. MSLQ and a mathematics achievement test were used as the data collection instruments. The results of the structural equation modeling analysis revealed that self-efficacy was a strong predictor of mathematics achievement, whereas the use of self-regulation strategies had a negative effect on mathematics achievement. Besides, mastery goal orientation was found to be a strong predictor of self-efficacy, and therefore had an indirect effect on mathematics achievement through self-efficacy. Mousoulides and Philippou' study was one of the most similar model studies to the current study, considering the theoretical aspects of the present study. However, it was conducted with pre-service teachers. Besides, it did not examine the role of classroom goal structure in relation with students' goal orientations, self-efficacy beliefs, and self-regulation strategies.

In summary, regarding the results of these model studies, even though the criterion variables and sample characteristics were differing from each other, most of the results were comparable, especially on providing empirical evidence for the importance of considering motivational factors and self-regulated learning strategies for examining students' mathematics achievement.

5.3. Conclusion

In this study, the interrelationships among students' achievement goal orientations, perception of classroom goal structure, self-efficacy, use of self-regulation strategies, and mathematics achievement were examined. An initial model was proposed including possible relationships among the measured constructs. While some of these relationships have been previously tested, the aim of the present study was to extend the literature by offering a comprehensive model which may explain how the interplay among a number of motivational factors relate to self-regulation strategies and to the quality of mathematics learning. In general, the findings supported many of the hypothesized relationships, and offered additional clarification for the prior work. However, there were also some expected direct relationships which were not obtained in the final model, including the relationship between self-efficacy and mathematics achievement as well as the relationship between metacognitive self-regulation and mathematics achievement. Several possible reasons were discussed regarding both the expected and unexpected outcomes.

Briefly, there were four main factors that significantly related to students' mathematics achievement. These factors were classroom mastery goal structure, personal mastery goal orientation, self-efficacy, and use of elaboration strategies. In particular, among the classroom goal structures, only classroom mastery goal structure was significantly related to mathematics achievement. Next, among the personal goal orientations, only mastery goal orientation was significantly related to mathematics achievement. Besides, among the learning strategies, only use of elaboration strategies was significantly related to mathematics achievement. In addition, among all the main factors, only elaboration was both significantly and directly related to mathematics achievement. The other factors were related to mathematics achievement through their links on the use of elaboration strategies. Actually, this last point may be the most important and foundational aspect of this study. It implies that motivational factors are not alone enough for fostering students' mathematics achievement. Indeed, it is the use of learning strategies which mediate the link between motivational factors and mathematics achievement.

The findings are highly important for both theory and practice. At a broad level, this study demonstrates a clear link between motivational variables, use of self-regulation strategies and mathematics achievement. Next, the present findings advance the goal theory by providing further support for the strong relation between students' personal achievement goal orientations and their perceptions of classroom goal structure. Also, the findings add support to the goal theory by fortifying the adaptiveness of mastery goals both at classroom level and individual level, for fostering more self-regulation and mathematics achievement. Lastly, this study suggests that motivational aspects of learning do not directly relate to academic achievement in mathematics. Rather, motivation is related to mathematics achievement only via the mediating role of self-regulation strategies, which highlights the importance of self-regulation for successful mathematics learning.

5.4. Implications for Theory and Practice

Motivation has long been considered as an important predictor of student learning. Especially, students' goal orientations have been consistently associated with different patterns of achievement related outcomes. However, it is generally acknowledged that students' adoption of achievement goals is a dynamic process that involves not only the learner but also the contextual characteristics of the learning environment. In this study, one of the major findings was that students' perceptions of classroom goal structure were directly linked to their adoption of achievement goals, and among these goals, only mastery goals were associated with their mathematics achievement. In view of these findings, if educators would like to improve achievement levels of their students, they may need to screen and inspire the type of achievement goals that students pursue. Specially, understanding how students adopt achievement goals and improving their goal orientations would have significant theoretical and practical implications for administrative, curricular, and instructional decision making.

In particular, development of mastery goals should be a major goal of education. In this aspect, classroom discourse might be a significant tool to create and maintain learning contexts that support mastery goal orientation. In order to establish effective discourse patterns, mathematics teachers may need to establish classroom norms that build an encouraging classroom climate in which students' ideas, ways of thinking and their mathematical dispositions are respected and valued. Besides, teachers can stress the importance of understanding the concepts, relate them to students' daily lives, and pose meaningful problems. In the literature, a number of strategies have been suggested to teachers for fostering the adoption of mastery goals in their classroom. Some of these strategies include making special effort to recognize students' individual progress, providing several different activities that have novel and interesting features, showing how the learnt concepts have meaning in the real world, and offering tasks at a range of capability levels so that all students can be challenged (Maehr & Midgley, 1991; Midgley et al, 2000).

Another major finding in this study was that students' self-efficacy beliefs for learning mathematics was directly related to their mastery goal orientations and strategy use, which, in turn, related to their mathematics achievement. In view of this finding, if mathematics educators would like to enhance students' self-efficacy beliefs, they may need to use a number of strategies, such as preparing moderately difficult mathematics tasks which are slightly above students' ability levels, using scaffolding when students need and only for as long as they need, and not comparing students' performance against each other. Besides, allowing students to take some control of their own learning process, such as setting some rules, having assignment options, and having self-determined due dates, may help them to feel capable and confident while learning mathematics.

In this study, the most leading factor that directly related to students' mathematics achievement was their use of learning strategies. Especially, elaboration strategies, such as paraphrasing, summarizing, and generative note taking, were found to be highly related to students' mathematics achievement. In order to enhance students' use of learning strategies, teachers need to pay attention to how students learn mathematics, how they make connections among the learnt concepts, organize their ideas, and systematize the material. Applying as many strategies as possible may help students to acquire new strategies. However, they should also learn when and where to use it.

Students may experience different kinds of learning strategies while working together. In order to encourage collaborative learning among students, teachers may give group projects, pose ill-defined problems, or implement inquiry based activities. In the literature, a number of instructional strategies have been suggested to teachers for improving their students' learning strategies, such as using mathematical problem solving, constructing mental models, and using technology to support learning (Schraw, Crippen, & Hartley, 2006). All these practices may encourage students to use more self-regulation strategies, as well as fostering their commitment and intellectual growth in learning mathematics.

Lastly, the results of this study revealed that students' motivational beliefs were linked to their mathematics achievement only through their links on the use of learning strategies. So, if mathematics educators would like to enhance students' mathematics achievement, they may need to consider motivational factors together with learning strategies instead of considering each factor isolated from each other.

5.5. Recommendations for Future Research

Students' achievement is a complex process affected by numerous variables. Efforts to clarify this issue will provide valuable knowledge to researchers and practitioners. In particular, future research on the factors that explain variations in students' motivation and their direct or indirect effect on academic achievement would have significant theoretical and practical implications. Specially, future research on the relationship among students' achievement goal orientations, perceptions of teacher's goals, and perceptions of parents and neighborhood would make significant contributions to educational efforts for improving students' motivation to learn mathematics. Recently, achievement goal theorists propose a multiple goal perspective, suggesting that students pursue more than one achievement goal at a time. Yet, there is no consensus regarding the conceptualization of these multiple goals. For example, should multiple goals be understood as students having three to four separate learning goals at the same time or as students holding achievement goals connected in some manner? To date, the nature of multiple goals and their relation to educational outcomes remains as an important question, and there is a lack of a theoretical framework as well as methodological practices guiding the understanding of multiple goals.

In addition to motivational factors, research should also focus on students' use of different learning strategies while learning mathematics. In this study, only students' use of elaboration, organization and metacognitive self-regulation strategies were examined. Future research should also emphasize other learning strategies such as rehearsal, critical thinking, effort regulation, peer learning, help seeking and time management strategies. Which strategies students use more while learning mathematics? Which strategies specially contribute to their mathematics achievement? How do these strategies relate to other factors that affect students' learning? Specially, literature can be examined about learning strategies which are peculiar to mathematics learning and instruments can be developed for measuring these learning strategies in the context of mathematics learning. Above all, more research is needed in Turkish context, especially in elementary school settings, in order to have better understanding about how these concepts develop and affect students' mathematics learning.

The purpose of this study was to offer a comprehensive model in the field of self-regulation, which may enrich the previous models by clarifying the interplay among motivational factors, self-regulation strategies, and the quality of mathematics learning. With the development of this model, it was expected to give direction to future studies that will be conducted in this field. In this view, in order to obtain a more holistic of picture of students' mathematics learning, future model studies can emphasize other cognitive, behavioral and contextual factors that may have impact on the factors examined in this study. Besides, future research may emphasize the cyclical aspect of the self-regulation processes. For researchers who would like to examine achievement facor in their model studies, it is highly recommended to include learning strategies factor regarding the results of this study.

When conducting research in this field, it is highly important to take some points into consideration. For example, the majority of studies conducted in this field are cross sectional. Although cross sectional studies help researchers to reach a big number of participants and enhance the generalizability of the research findings, it provides no strong evidence about how these concepts change by time and environment. A clearer understanding of the complex relationships among the indicated factors can be gained from a longitudinal perspective.

Lastly, multiple data collection methods can be useful while collecting data in this field. For instance, qualitative approaches, such as classroom observations and interviews, can give deeper understanding of the phenomenon from both students' and teachers' perspectives. Qualitative data can also be used for validating the information gathered from the self-report questionnaires. In this aspect, using both qualitative and quantitative approaches may provide a more realistic picture to the phenomena, and offer a more sophisticated understanding of students' mathematics learning and achievement.

REFERENCES

Alcı, B., Altun, S. (2007). Lise öğrencilerinin matematik dersine yönelik öz düzenleme ve bilişüstü becerileri, cinsiyete, sınıfa ve alanlara göre farklılaşmakta mıdır? Çukurova Üniversitesi Sosyal Bilimler Enstitüsü Dergisi, 16(1), 33-44.

Akyol, G., Sungur, S., & Tekkaya, C. (2010). The contribution of cognitive and metacognitive strategy use to students' science achievement. Educational Research and Evaluation, 16(1), 1-21.

Al-Harty, I.S., & Was, C.A. (2010). Goals, efficacy and metacognitive self-regulation: A path analysis. International Journal of Education, 2(1), 1-20.

Ames, C. (1984). Achievement attributions and self-instructions under competitive and individualistic goal structures. Journal of Educational Psychology, 76(3), 478-487.

Ames, C. (1992). Classrooms: Goals, structures, and student motivation. Journal of Educational Psychology, 84(3), 261-271.

Ames, C., & Archer, J. (1988). Achievement goals in the classroom: Students' learning strategies and motivation processes. Journal of Educational Psychology, 80, 260-267.

Anderman, E. M., & Maher, M. L. (1994) Motivation and schooling in the middle grades. Review of Educational Research, 64, 287-309.

Anderman, E. M., Maehr, M. L., & Midgley, C. (1999). Declining motivation after the transition to middle school: Schools can make a difference. Journal of Research and Development in Education, 32, 131-147.

Anderman, E. M., & Midgley, C. (1997). Changes in achievement goal orientations, perceived academic competence, and grades across the transition to middle-level schools. Contemporary Educational Psychology, 22, 269-298.

Ball, D. L., Lubienski, S. T., & Mewborn, D. S. (2001). Research on teaching mathematics: The unsolved problem of teachers' mathematical knowledge. In V. Richardson (Ed.), Handbook of research on teaching (4th ed). New York: Macmillan. Banks, J. H. (1964). Learning and teaching arithmetic. Boston, MA: Allyn & Bacon.

Bandura, A. (1982). Self-efficacy mechanism in human agency. American Psychologist, 37,122-147.

Bandura, A. (1986). Social foundations of thought and action: A social cognitive theory. Englewood Cliffs, NJ: Prentice-Hall.

Bandura, A. (1993). Perceived self-efficacy in cognitive development and functioning. Educational Psychologist, 28, 117-148.

Bandura, A. (1997). Self-efficacy: The exercise of control. New York: W. H. Freeman and Company.

Barker, K., Dowson, M., & McInerney, D. M. (2002). Performance approach, performance avoidance and depth of information processing: A fresh look at relations between students' academic motivation and cognition. Educational Psychology, 22, 571-589.

Barron, K. E., & Harackiewicz, J. M. (2001). Achievement goals and optimal motivation: Testing multiple goal models. Journal of Personality and Social Psychology, 80(5), 706-722.

Bell, B.S., & Kozlowski, W.J. (2002). Goal orientation and ability: Interactive effects on self-efficacy, performance, and knowledge. Journal of Applied Psychology, 87(3), 497-505.

Bentler, P. M. (2002). EQS Structural Equations Program Manual. Encino, CA: Mulitvariate Software.

Blumenfeld, P. C. (1992). Classroom learning and motivation: Clarifying and expanding goal theory. Journal of Educational Psychology, 84, 272-281.

Boekaerts, M. (1997). Self-regulated learning: A new concept embraced by researchers, policy makers, educators, teachers, and students. Learning and Instruction, 7, 161-186.

Boekaerts, M. (1999). Self-regulated learning: Where we are today. International Journal of Educational Research, 31(6), 445-551.

Boggiano, A. K., & Barrett, M. (1985). Performance and motivational deficits of helplessness: The role of motivational orientations. Journal of Personality and Social Psychology, 49, 1753-1761.

Bollen, K. A., & Long, J. S., (Eds.). (1993). Testing structural equation models. Newbury Park, CA: Sage.

Bong, M. (2001). Between and within domain relations of academic motivation among middle and high school students: Self-efficacy, task value, and achievement goals. Journal of Educational Psychology, 93, 23-34.

Bouffard, T., Boisvert, J., Vezeau, C, & Larouche, C. (1995). The impact of goal orientation on self-regulation and performance among college students. British Journal of Educational Psychology, 65, 317-329.

Brdar, I., Rijavec, M. & Loncaric, D. (2006). Goal orientation, coping with school failure and school achievement. European Journal of Psychology of Education, 21(1), 53-70.

Briggs, S.R. & Cheek, J. M. (1986). The role of factor analysis in the development and evaluation of personality scales. Journal of Personality, 54, 106-148.

Britner, S. L., & Pajares, F. (2001). Self-efficacy beliefs, motivation, race, and gender in middle school science. Journal of Women and Minorities in Science and Engineering, 7, 271-285.

Brophy, J. (1987). Synthesis of research on strategies for motivating students to learn. Educational Leadership, 45(2), 40-48.

Brophy, J. (1999). Research on motivation in education: past, present and future. In T. Urdan. M. Maehr, & P.R. Pintrich, (Eds.), Advances in motivation and achievement, Volume 11 (pp. 1-44), Connecticut: JAI Press.

Brown, C. A., & Smith, M. S. (1997). Supporting the development of mathematical pedagogy. The Mathematics Teacher, 90(2), 138-143.

Brown, N.M. (2003). A study of elementary teachers' abilities, attitudes, and beliefs about problem solving. Dissertation Abstracts International, 64(10), 3620. (UMI No. 3108818).

Butler, D. L. (1998). The strategic content learning approach to promoting self-regulated learning: A report of three studies. Journal of Educational Psychology, 90, 682-697.

Butler, R. (1987). Task-involving and ego-involving properties of evaluation: Effects of different feedback conditions on motivational perceptions, interest, and performance. Journal of Educational Psychology, 79(4), 474-482.

Butler, R. (2006). Are mastery and ability goals both adaptive? Evaluation, initial goal construction and the quality of task engagement. The British Psychological Society, 76, 595-611.

Byrne, B.M. (2006). Structural equation modeling with EQS: Basic concepts, application, and programming (2nd ed.). Mahwah, NJ: Lawrence Erlbaum

Carr, M., Steiner, H. H., Kyser, B., & Biddlecomb, B. (2008). A comparison of predictors of early emerging gender differences in mathematics competency. Learning and Individual Differences, 18(1), 61-75.

Chen, P. & Zimmerman, B. (2007). A cross-national comparison study on the accuracy of self-efficacy beliefs of middle-school mathematics students. Journal of Experimental Education, 75(3), 221-244.

Chin, W. W. (1998). Issues and opinion on structural equation modeling. Management Information Systems Quarterly, 22(1), 7-16.

Cleary, T. J., & Zimmerman, B. J. (2004). Self-regulation empowerment program: A school-based program to enhance self-regulated and self-motivated cycles of student learning. Psychology in the Schools, 41(5), 537-550.

Cohen, J. (1988). Statistical Power Analysis for the Behavioral Sciences (2nd Ed.). hillsdale, NJ: Lawrence Earlbaum Associates.

Covington, M.V. (1985). Strategic thinking and fear of failure. In J. Segal, S. Chipman, & R. Glaser (Eds.). Thinking and Seaming skills: Relating instruction to research (p.389-416). Hillsdale, NJ: Erlbaum.

Covington, M.V. (2000). Goal theory, motivation, and school achievement: an integrative review. Annual Review of Psychology, 51, 171-200.

Curran, P. J., West, S. G., & Finch, J. F. (1996). The robustness of test statistics to nonnormality and specification error in confirmatory factor analysis. Psychological Methods, 1, 16-29.

Daniel, G. E. (2003). Effects of cognitive strategy instruction on the mathematical problem solving of middle school students with learning disabilities. Dissertation Abstracts International, 64(6), 1968. (UMI No. 3093640).

Deci, E. L., Vallerand, R. J., Pelletier, L. G. & Ryan, R. M. (1991). Motivation and Education: The self-determination perspective. Educational Psychologist, 26, 325-346.

Dede, Y. (2008). Matematik öğretmenlerinin öğretimlerine yönelik öz-yeterlilik inaçları. Türk Eğitim Bilimleri Dergisi, 6(4), 741-757.

DeShon, R. P., & Gillespie, J. Z. (2005). A motivated action theory account of goal orientation. Journal of Applied Psychology, 90, 1096-1127.

Diener, C. I., & Dweck, C. S. (1980). An analysis of learned helplessness: The processing of success. Journal of Personality and Social Psychology, 39, 940-952.

Dilworth, R. P. (1966).The role of problems in mathematical education. In The role of axioms and problem solving in mathematics (pp. 91-97). Washington, DC: The Conference Board of the Mathematics Sciences.

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

Dweck, C. S., & Elliott, E. S. (1983). Achievement motivation. In E. M. Heatherington Ed.), Handbook of Child Psychology: Vol. 4, Socialization, personality, and social development (pp. 643-691). New York: Wiley.

Du Toit, M. & Du Toit, S.H.C. (2001). Interactive LISREL: User's guide. Lincolnwood, IL: Scientific Software International.

Dweck, C., & Leggett, E. (1988). A social cognitive approach to motivation and personality. Psychological Review, 95, 256-273.

Elliot, A. J. (1999). Approach and avoidance motivation and achievement goals. Educational Psychologist, 34, 169-189.

Elliot, A. J., & Church, M. A. (1997). A hierarchical model of approach and avoidance achievement motivation. Journal of Personality and Social Psychology, 72(1), 218-232.

Elliot, E. S., & Dweck, C.S. (1988). Goals: An approach to motivation and achievement. Journal of Personality and Social Psychology, 54, 5-12.

Elliot, A. J. & Harackiewicz, J.M. (1996). Approach and avoidance goals and intrinsic motivation: a mediational analysis. Journal of Personality and Social Psychology, 70, 461-475.

Elliot, A. J., & McGregor, H. A. (2001). A 2 x 2 achievement goal framework. Journal of Personality and Social Psychology, 80(3), 501-519.

Elliot, A. J., & Thrash, T. M. (2001). Achievement goals and the hierarchical model of achievement motivation. Educational Psychology Review, 13,139-156.

Epstein, J. (1988). Effective schools or effective students: Dealing with diversity. In Policies for America's public schools: Teachers, equity, indicators, ed. R. Haskins and D. MacRae, 89- 126. Norwood, NJ: Ablex.

Friedel, J. M., Cortina, K. S., Turner, J. C., & Midgley, C. (2007). Achievement goals, efficacy beliefs and coping strategies in mathematics: The roles of perceived parent and teacher goal emphases. Contemporary Educational Psychology, 32(3), 434-458.

Garcia, T., & Pintrich, P. R. (1991, April). Student motivation and self-regulated learning: A LISREL model. Paper presented at the annual meeting of the American Educational Research Association, Washington, DC.

Garcia, T., & Pintrich, P. R. (1994). Regulating motivation and cognition in the classroom: The role of self-schemas and self-regulatory strategies. In D. H. Schunk & B. J. Zimmerman (Eds.), Self-regulation of learning and performance: Issues and educational applications (pp. 127-153). Hillsdale, NJ: Lawrence Erlbaum.

Garver, M. S., & Mentzer, J.T. (1999). Logistics research methods: Employing structural equation modeling to test for construct validity. Journal of Business Logistics, 20(1), 33-57.

Gaskill, P. J., & Woolfolk Hoy, A. (2002). Self-efficacy and self-regulated learning: The dynamic duo in school performance. In J. Aronson & D. Cordova (Eds.), Improving education: Classic and contemporary lessons from psychology (pp. 183-206). New York: Academic Press.

Gehlbach, H. (2006). How changes in students' goal orientations relate to outcomes in social studies. The Journal of Educational Research, 99 (6), 358-370.

George, D., & Mallery, P. (2003). SPSS for windows step by step: A simple guide and reference. Boston: Pearson Education.

Gravetter, F. & Wallnau, L. B. (2007). Statistics for the Behavioral Sciences (7th ed.). Belmont, CA: Thomson Wadsworth.

Greene, B. A., & Miller, R. B. (1993, April). Influences on course performance: Goals, perceived ability, and self-regulation. Paper presented at the annual meeting of the American Educational Research Association, Atlanta, GA.

Greene, B. A., & Miller, R. B. (1996). Influences on achievement: Goals, perceived ability, and cognitive engagement. Contemporary Educational Psychology, 21, 181-192.

Greene, B. A., Miller, R. B., Crowson, H. M., Duke, B. L., & Akey, K. L. (2004). Predicting high school students' cognitive engagement and achievement: Contributions of classroom perceptions and motivation. Contemporary Educational Psychology, 29, 462-482.

Guay, F., Vallerand, R. J., & Blanchard, C. (2000). On the assessment of situational intrinsic and extrinsic motivation: The situational motivation scale (SIMS). Motivation and Emotion, 24,175-213.

Haladyna. T. M. (1999). Developing and validating multiple-choice exam items, 2nd ed. Mahwah, NJ: Lawrence Erlbaum Associates.

Harackiewicz, J. M, Barron, K. E., & Elliot, A. J. (1998). Rethinking achievement goals: When are they adaptive for college students and why? Educational Psychologist, 33, 1-21.

Harackiewicz, J.M., Barron, K.E., Pintrich, P.R., Elliot, A.J., & Thrash, T.M. (2002). Revision of achievement goal theory: necessary and illuminating. Journal of Educational Psychology, 92, 638-645.

Harter, S., & Jackson, B. K. (1992). Trait vs. nontrait conceptualizations of intrinsic/extrinsic motivational orientation. Motivation and Emotion, 16, 209-230.

Heaton, R. M. (2000). Teaching mathematics to the new standards: Relearning the dance. New York: Teachers College Press.

Heo, H. (1999). The effect of self-regulated learning strategies on learner achievement and perceptions on personal learning responsibility. Dissertation Abstracts International, 59(10), 3794.

Hoe, S. L. (2008). Issues and procedures in adopting structural equation modeling technique. Journal of Applied Quantitative Methods, 3(1), 76-83.

Hoelter, D. R. (1983). The analysis of covariance structures: Goodness-of-fit indices. Sociological Methods and Research, 11, 325-344.

Holladay, C.L., & Quinones, M.A. (2003). Practice variability and transfer of training: The role of self-efficacy generality. Journal of Applied Psychology, 88(6), 1094-1103.

Howard, B. C., McGee, S., Shia, R., & Hong, N. S. (2001, April). The influence of metacognitive selfregulation and ability levels on problem solving. Paper presented at the annual meeting of the American Educational Research Association, Seattle, WA.

Hoyle, R. H. (1995). Structural equation modeling: Concepts, issues, and applications. Thousand Oaks, CA: Sage.

Işıksal, M. & Aşkar, P. (2005). The effect of spreadsheet and dynamic geometry software on the achievement and self-efficacy of 7th-grade students. Educational Research, 47(3), 333-350.

Jöreskog, K.G., & Sörbom, D. (1993). LISREL 8: Structural equation modeling with the SIMPLIS command language. Chicago: Scientific Software International.

Kaplan, A., Gheen, M., & Midgley, C. (2002). The classroom goal structure and student disruptive behavior. British Journal of Educational Psychology, 72, 191-211.

Kaplan, A., & Maehr, M. L. (2002). Adolescents' achievement goals: Situating motivation in sociocultural contexts. In F. Pajares & T. Urdan (Eds.), Academic motivation of adolescents (pp. 125-167). Greenwich, CT: Information Age Publishing.

Kaplan, A., Middleton, M. J., Urdan, T., & Midgley, C. (2002). Achievement goals and goal structures. In C. Midgley (Ed.), Goals, goal structures, and patterns of adaptive learning (pp. 21 - 53). Mahwah, NJ: Lawrence Erlbaum.

Karabenick, S.A. (2004). Perceived achievement goal structure and college student help seeking. Journal of Educational Psychology, 96(3), 569-581.

Karadeniz, Ş., Büyüköztürk, Ş., Akgün, Ö.E., Çakmak, E.K., & Demirel, F. (2008). The Turkish adaptation study of the Motivated Strategies for Learning Questionnaire (MSLQ) for 12-18 year old children: Results of confirmatory factor analysis. The Turkish Online Journal of Educational Technology, 7(4).

Kelloway, E.K. (1998). Using LISREL for structural equation modeling: A researcher's guide. Thousand Oaks: Sage Publications.

Kilpatrick, J., Swafford, J., & Findell, B. (Eds.). (2001). Adding it up: Helping children learn mathematics. Washington, DC: National Academies Press.

King, A. (1992). Comparison of self-questioning, summarizing, and notetaking review as strategies for learning from lectures. American Educational Research Journal, 29, 303-323.

Kirby, J. R. & Williams, N. H. (1991). Learning problems: A cognitive approach. Toronto, Ontario: Kagan and Woo.

Kline, R.B. (1998). Principles and practice of structural equation modeling. New York: The Guilford Press.

Kline, R.B. (2011). Principles and practice of structural equation modeling (3rd ed.). New York: The Guilford Press.

Konrad, M., Heif, S., & Itoi, M. (2007). More bang for the book: Using children's literature to promote self-determination and literacy skills. Teaching Exceptional Children, 40(1), 64-71.

Kunnan, A. J. (1998). An introduction to structural equation modeling for language assessment research. Language Testing, 15(3), 295-332.

Lau, K. & Lee, J. (2008). Examining Hong Kong students' achievement goals and their relations with students' perceived classroom environment and strategy use. Educational Psychology, 28(4), 357-372.

Lester, F. K. (1994). Musings about mathematical problem solving research: 1970-1994. Journal for Research in Mathematics Education, 25(6), 660-675.

Linnenbrink, E. A. (2005). The dilemma of performance-approach goals: The use of multiple goal contexts to promote students' motivation and learning. Journal of Educational Psychology, 97(2), 197-213.

Linnenbrink, E. A., & Pintrich, P. R. (2002). Achievement goal theory and affect: an asymmetrical bidirectional model. Educational Psychologist, 37(2), 69-78.

Linnenbrink, E. A., & Pintrich, P. R. (2003). The role of self-efficacy beliefs in student engagement and learning in the classroom. Reading & Writing Quarterly, 19, 119-137.

Lyke, J. & Young, A. (2006). Cognition in context: students' perceptions of classroom goal structures and reported cognitive strategy use in the college classroom. Research in Higher Education, 47(4), 477-490.

MacCallum, R.C., Browne, M.W., & Sugawara, H.M. (1996). Power analysis and determination of sample size for covariance structure modeling. Psychological Methods, 1(2), 130-149.

Maehr, M. L. (1989). Thoughts about motivation. In C. Ames & R. Ames (Eds.), Research on motivation in education: Goals and cognition (Vol. 3, pp. 299 - 315). San Diego, CA: Academic Press.

Maehr, M. L., & Anderman, E. (1993). Reinventing schools for early adolescents: Emphasizing task goals. Elementary School Journal, 93, 593-610.

Maehr, M.L., & Midgley, C. (1991). Enhancing student motivation: A school wide approach. Educational Psychologist, 26, 399-427.

Malpass, J. R., O'Neil, H. F., & Hocevar, D. (1999). Self-regulation, goal orientation, self-efficacy, worry, and high-stakes math achievement for mathematically gifted high school students. Roeper Review, 21(4), 281-288.

Marcou, A., & Philippou, G. (2005). Motivational beliefs, self-regulated learning and mathematical problem solving. Proceedings of the Conference of the International Group for the Psychology of Mathematics Education, Australia, 3, 297-304.

Martin, A. J., Marsh, H.W., Debus, R.L., & Malmberg, L. (2007). Performance and mastery orientation of high school and college students. Educational and Psychological Measurement, 20, 1-24.

Maruyama, G. (1998). Basics of structural equation modeling. Thousand Oaks, CA: Sage Publications.

McQuitty, S. (2004). Statistical power and structural equation models in business research. Journal of Business Research, 57(2), 175-183.

McWhaw, K. A. (1997). The interaction of goal orientation and interest on students' use of self-regulated learning strategies (Doctoral Dissertation, Concordia University, Canada) (UMI No. AAT MQ44890)

MEB (Millî Eğitim Bakanlığı Talim ve Terbiye Kurulu Başkanlığı)(2005). İlköğretim Matematik Dersi 6-8. Sınıflar Öğretim Programı. M.E.B.: Ankara.

MEB (Millî Eğitim Bakanlığı) (2008). Yıllara göre il istatistikleri. Retrieved December 29, 2008, from http://ankara.meb.gov.tr/veb/istatistik/istatistik.xsl

MEB (Millî Eğitim Bakanlığı Talim ve Terbiye Kurulu Başkanlığı)(2008). İlköğretim Matematik Dersi 6-8. Sınıflar Öğretim Programı ve Kılavuzu. M.E.B.: Ankara.

Meece, J. L. (1991). The classroom context and student motivational goals. In M. L. Maehr & P. R. Pintrich (Eds.) Advances In Motivation And Achievement. (Vol. 7, pp. 261-285) Greenwich. CT: JAI Press.

Meece, J. L., Anderman, E. M., & Anderman, L. H. (2006). Classroom goal structure, student motivation, and academic achievement. Annual Review of Psychology, 57, 487-503.

Meece, J. L., Blumenfeld, P. C, & Hoyle, R. H. (1988). Students' goal orientations and cognitive engagement I classroom activities. Journal of Educational Psychology, 80(4), 514-523.

Meece, J. L., Glienke, B. B., & Burg, S. (2006). Gender and motivation. Journal of School Psychology, 44(5), 351-373.

Meece, J. L., Herman, P., & McCombs, B. L. (2003). Relations of learner-centered teaching practices to adolescents' achievement goals. International Journal of Educational Research, 39, 457-475.

Meece, J. L., & Holt, K. (1993). A pattern analysis of students' achievement goals. Journal of Educational Psychology, 85(4), 582-590.

Meece, J. L. & Miller S. D. (1999). Changes in elementary school children's achievement goals for reading and writing: Results of a longitudinal and an intervention study. Scientific Studies of Reading, 3(3), 207-229.

Mels, G. (2003). A workshop on structural equation modelling: An Introduction. New York: Longmans Green and Co.

Meuschke, D.M. (2006). The relationship between goal-orientation, help-seeking, math self-efficacy, and mathematics achievement in a community college. Unpublished Doctoral Thesis, University of Southern California, DAI-A 67/05. (UMI 3220135)

Meyer, D. K., & Turner, J. C. (2002). Using instructional discourse analysis to study the scaffolding of student self-regulation. Educational Psychologist, 37(1), 17-25.

Middleton, M., Kaplan, A., & Midgley, C. (2004). The change in middle school students' achievement goals in mathematics over time. Social Psychology of Education, 7, 289-311.

Middleton, M. J., & Midgley, C. (1997). Avoiding the demonstration of lack of ability: An underexplored aspect of goal theory. Journal of Educational Psychology, 89(4), 710-718.

Midgley, C, Arunkumar, R., & Urdan, T. C. (1996). "If I don't do well tomorrow, there's a reason": Predictors of adolescents' use of academic self-handicapping strategies. Journal of Educational Psychology, 88(3), 423-434.

Midgley, C., Kaplan, A., Middleton, M., Maher, M. L., Urdan, T., Hicks Anderman, L., Anderman, E., & Roeser, R. (1998). The development and validation of scales assessing students' achievement goal orientations. Contemporary Educational Psychology, 23, 113-131.

Midgley, C., Kaplan, A., & Middleton, M.J. (2001). Performance-approach goals: good for what, for whom, under what circumstances, and at what cost? Journal of Educational Psychology, 93, 77-86.

Midgley, C., Maehr, M. L., Hruda, L. Z., Anderman, E., Anderman, L., Freeman, K. E., Gheen, M., Kaplan, A., Kumar, R., Middleton, M. J., Nelson, J., Roeser, R., & Urdan, T., (2000). Manual for the Patterns of Adaptive Learning Scales (PALS). Ann Arbor, MI: University of Michigan.

Mohr, D. S. (2005). The impact of logo on pre-service elementary teachers' beliefs, knowledge of geometry, and self-regulation of learning. Dissertation Abstracts International, 67(1), 123. (UMI No. 3202899).

Mousoulides, N.,& Philippou, G. (2005). Students' motivational beliefs, self-regulation strategies and mathematics achievement. In Chick, H. L. & Vincent, J. L. (Eds.), Proceedings of the 29th Conference of the International Group for the Psychology of Mathematics Education, 3, 321-328, Melbourne: PME.

NCTM (National Council of Teachers of Mathematics) (2000). Principles and standards for school mathematics. Reston, VA.

Ng, C. (1999, November). Adolescent students' multiple goals in learning mathematics. Paper presented at the AARE-NAZRE Joint Conference, Melbourne, Australia.

Nicholls, J. G. (1984). Achievement motivation: Conceptions of ability, subjective experience, task choice, and performance. Psychological Review, 91, 328-346.

Nicholls, J. G. (1989). The competitive ethos and democratic education. Cambridge, MA: Harvard University Press.

Nicholls, J. G., Cobb, P., Wood, T., Yackel E., & Patashnick, M. (1990). Assessing students' theories of success in mathematics: Individual and classroom differences. Journal for Research in Mathematics Education, 21(2), 109-122.

O'Neil, H. F., & Abedi, J. (1996). Reliability and validity of a state metacognitive inventory: Potential for alternative assessment. Journal of Educational Research, 89, 234-245.

Orhan, F. (2008). Self-regulation strategies used in a practicum course: a study of motivation and teaching self-efficacy. Hacettepe Üniversitesi Eğitim Fakültesi Dergisi, 35, 251-262.

Öztürk, B., Bulut, S & Koç, Y. (2007). Motivation and self-regulation in mathematics. Academic Exchange Quarterly, 11(1), 149-154.

Pajares, F. (2001). Toward a positive psychology of academic motivation. The Journal of Educational Research, 95(1), 27-35.

Pajares, F. (2002). Gender and perceived self-efficacy in self-regulated learning. Theory into Practice, 41(2), 116-125.

Pajares, F., Britner, S. L., & Valiante, G. (2000). Relation between achievement goals and self-beliefs of middles school students in writing and science. Contemporary Educational Psychology, 25, 406-422.

Pajares, F., & Graham, L. (1999). Self-efficacy, motivation constructs, and mathematics performance of entering middle school students. Contemporary Educational Psychology, 24,124-139.

Pallant, J. (2007). SPSS Survival Manual: A step by step guide to data analysis using SPSS (Version 15). Open University Press.

Pape, S. J., Bell, C.V., & Yetkin, I. E. (2003). Developing mathematical thinking and self-regulated learning: A teaching experiment in a seventh-grade mathematics classroom. Educational Studies in Mathematics, 53, 179-202.

Pape, S. J., & Smith, C. (2002). Self-regulating mathematics skills. Theory into Practice, 41(2), 93-101.

Pape, S. J., & Wang, C. (2003). Middle school children's strategic behavior: Classification and relation to academic achievement and mathematical problem solving. Instructional Science, 31, 419-449.

Patrick, H., Anderman, L. H., Ryan, A. M., Edelin, K. C, & Midgley, C. (2001). Teachers' communication of goal orientations in four fifth-grade classrooms. The Elementary School Journal, 102(1), 35-58.

Patrick, H., & Middleton, M.J. (2002). Turning the kaleidoscope: What we see when self-regulated learning is viewed with qualitative lens. Educational Psychologist, 37, 27-39.

Pedhazur, E. J. & Pedhazur-Schmelkin, L.P. (1991). Measurement, design, and analysis: An integrated approach. Hillsdale, NJ: Lawrence Earlbawm Associate.

Pekrun, R. (1992). The impact of emotions on learning and achievement: Towards a theory of cognitive/motivational mediators. Applied Psychology: An International Review, 41(4), 359-376.

Perry, N. E. (1998). Young children's self-regulated learning and contexts that support it. Journal of Educational Psychology, 90, 715-729.

Perry, N.E., VandeKamp, K.O., Mercewr, L.K., & Nordby, C.J. (2002). Investigating teacher-student interactions that foster self-regulated learning. Educational Psychologist, 37(1), 5-15.

Pintrich, P. R. (1989). The dynamic interplay of student motivation and cognition in the college classroom. In C. Ames & M. L. Maehr (Eds.), Advances in motivation and achievement: Motivation enhancing environments (pp. 117-160). Greenwich, CT: JAI Press.

Pintrich, P. R. (1994). Continuities and discontinuities: future directions for research in educational psychology. Educational Psychologist, 29, 137-148.

Pintrich, P. R. (2000). Multiple goals, multiple pathways: The role of goal orientation in learning and achievement. Journal of Educational Psychology, 92, 544-555.

Pintrich, P. R. (2005). The role of goal orientation in self-regulated learning. In M. Boekaerts, P. R. Pintrich & M. Zeidner (Eds.), Handbook of Self-Regulation (pp. 451-502). Burlington, MA: Elseiver Academic Press.

Pintrich, P. R., & De Groot, E. V. (1990). Motivational and self-regulated learning components of classroom academic performance. Journal of Educational Psychology, 82(1), 33-40.

Pintrich, P. R., & Garcia, T. (1991). Student goal orientation and self-regulation in the college classroom. In M. Maehr & P. R. Pintrich (Eds.). Advances in Motivation and Achievement: Goals and Self-Regulatory Processes (pp. 371-403). Greenwhich, CT: JAI.

Pintrich, P. R., & Schrauben, B. (1992). Students' motivational beliefs and their cognitive engagement in classroom academic tasks. In D. H. Schunk & J. L. Meece(Eds.) Student Perceptions In The Classroom. Hillsdale, NJ: Lawrence Erlbaum Associates.

Pintrich, P. R., & Schunk, D. (1996). Motivation in education: Theory, research, and applications. Engelwood Cliffs, NJ: Prentice Hall.

Pintrich, P. R., & Schunk, D. H. (2002). Motivation in education: Theory, research, and applications (2nd ed.). Upper Saddle River, NJ: Merrill.

Pintrich, P. R., Smith, D. A. F., Garcia, T., & McKeachie, W. J. (1991). A manual for the use of the Motivated Strategies for Learning Questionnaire (MSLQ).

Polat, Z. S., & Bulut, S. (2009, September). The effects of problem solving methos on student's problem solving performance and achievement. Paper presented at European Conference on Educational Research, Vienna, Austria.

Ann Arbor, MI: National Center for Research to Improve Postsecondary Teaching and Learning.

Raykov, T., & Marcoulides, G.A. (2006). A first course in structural equation modeling (2nd Edition). Lawrence Erlbaum Associates, Inc. Publishers.

Reisinger, Y., & Turner, L.W. (2003). Cross-cultural behaviour in tourism: concepts and analysis. Elsevier Butterworth: Heinemann.

Roeser, R., Midgley, C., & Urdan, T. (1996). Perceptions of the school psychological environment and early adolescents' psychological and behavioral functioning in school: The mediating role of goals and belonging. Journal of Educational Psychology, 88, 408-422.

Ryan, R. M., & Connell, J. P. (1989). Perceived locus of causality and internalization: Examining reasons for acting in two domains. Journal of Personality and Social Psychology, 57, 749-761.

Ryan, R. M., Connell, J. P., & Deci, E. L. (1985). A motivational analysis of self-determination and self-regulation in education. In C. Ames & R. E. Ames (Eds.), Research on motivation in Education: The classroom milieu (pp. 13-51). New York: Academic Press.

Ryan, A. M., Gheen, M. H., & Midgley, C. (1998). Why do some students avoid asking for help? An examination of the interplay among students' academic efficacy, teachers' social-emotional role, and the classroom goal structure. Journal of Educational Psychology, 90(3), 528-535.

Ryan, R.M., & Grolnik, W.S. (1986). Origins and pawns in the classroom: Self-report and projective assessments of individual differences in children's perceptions. Journal of Personality and Social Psychology, 50, 550-558.

Ryan, R, M, Kuhl, J., & Deci, E. L. (1997). Nature and autonomy: An organizational view of social neurobiological aspects of self-regulation in behavior and development. Development and Psychopathology, 9, 701-728.

Ryan, A. M., & Patrick, H. (2001). The classroom social environment and changes in adolescents' motivation and engagement during middle school. American Educational Research Journal, 38, 437-460.

Sansone, C, & Harackiewicz, J. M. (2000). Controversies and new directions - is it déjà vu all over again? In C. Sansone & J. M. Harachiewicz (Eds.), Intrinsic and extrinsic motivation: the search for optimal motivation and performance. San Diego: Academic Press.

Schiefele, U. (1991). Interest, learning, and motivation. Educational Psychologist, 26, 299-323.

Schoenfeld, A. H. (1992). Learning to think mathematically: Problem solving, metacognition and sense making in mathematics. In D. Grouws (Ed.), Handbook for research on mathematics teaching and learning (pp. 334-370). New York, NY: MacMillan.

Schraw, G., Horn, C, Thorndike-Christ, T., & Bruning, R. (1995). Academic goal orientations and student classroom achievement. Contemporary Educational Psychology, 20, 359-368.

Schraw, G. Crippen, K. J., & Hartley, K. (2006). Promoting self-regulation in science education: Metacognition as pasrt of a broader perspective on learning. Research in Science Education, 36, 111-139.

Schreiber, J. B., Nora, A., Stage, F. K., Barlow, E. A. & King, J. (2006). Reporting Structural Equation Modeling and Confirmatory Factor Analysis Results: A Review. The Journal of Educational Research, 6, 323-337.

Schumacker, R.E., & Lomax, R.G. (2004). A beginner's guide to structural equation modeling. Mahwah, NJ: Lawrence Erlbaum.

Schunk, D. H. (1991). Self-efficacy and academic motivation. Educational Psychologist, 26, 207-231.

Schunk, D. H. (1996). Goal and self-evaluative influences during children's cognitive skill learning. American Educational Research Journal, 33, 359-382.

Schunk, D. H. (2000). Coming to terms with motivational constructs. Contemporary Educational Psychology, 25, 116-119.

Schunk, D. H. (2001). Social cognitive theory and self-regulated learning. In B. J. Zimmerman and D. H. Schunk (Eds.), Self-regulated learning and academic achievement: Theoretical perspectives (2nd ed, pp. 153-189). Hillsdale, NJ: Erlbaum.

Schunk, D. H., & Hanson, A. R. (1985). Peer models: Influences on children s self-efficacy and achievement. Journal of Educational Psychology, 77, 313-322.

Schunk, D. H., & Zimmerman, B., J. (1996). Modeling and self-efficacy influences on children's development of self-regulation. In J. Juvonen & K. Wentzel, (Eds.) Social motivation: Understanding children's school adjustment (pp. 154-190). Cambridge, England: Cambridge University Press.

Schwartz, N. H., Andersen, C. A., Howard, B. C., Hong, N., & McGee, S. (1998, April). The influence of configurational knowledge on children's problem-solving performance in a hypermedia environment. Paper presented at the annual meeting of the American Educational Research Association, San Diego, CA.

Schweinle, A., Meyer, D. K., & Turner, J..C. (2006). Striking the right balance: Students' motivation and affect in upper elementary mathematics classes. Journal of Educational Research, 99(5), 271-293.

Senko, C., & Harackiewicz, J.M. (2005). Regulation of achievement goals: The role of competence feedback. Journal of Educational Psychology, 97(3), 320-336.

Seifert, T. L. (1995). Academic goals and emotions: A test of two models. The Journal of Psychology, 129(5), 543-552.

Shuell, T. J. (1990). Teaching and learning as problem solving. Theory into Practice, 29(2), 102-108.

Shin, M. (1998). The effects of self-regulated learning environments on achievement and motivation in problem solving. Dissertation Abstracts International, 58(11), 4193. (UMI No. 9816190).

Skaalvik, E.M., & Skaalvik, S. (2009). Self-concept and self-efficacy in mathematics: Relation with mathematics motivation and achievement. Journal of Education Research, 3(3), 255-278.

Skinner, E. A., & Belmont, M. J. (1993). Motivation in the classroom: Reciprocal effects of teacher behavior and student engagement across the school year. Journal of Educational Psychology, 85, 571-581.

Sivo, S. A., Fan, X. T., Witta, E .L., & Willse, J. T. (2006). The search for 'optimal' cutoff properties: Fit index criteria in structural equation modeling. The Journal of Experimental Education, 74(3), 267-289.

Snow, R. E., & Jackson, D. N. (1994). Individual differences in conation: Selected constructs and measures. In H. F. C. Neil & M. Drillings (Motivation: Theory and Research (pp. 71-100). Hillsdale, New Jersey: Lawrence Erlbaum.

Somuncuoglu, Y. & Yildirim, A. (1999). Relationship between achievement goal orientations and use of learning strategies. The Journal of Educational Research, 92(5), 267-277.

Sonay Polat, Z., & Bulut, S. (2009, September). The effects of problem solving methos on student's problem solving performance and achievement. Paper presented at European Conference on Educational Research, Vienna, Austria.

Song, H. & Grabowski, B.L., (2006). Stimulating intrinsic motivation for problem solving using goal-oriented contexts and peer group composition. Educational Technology, Research and Development, 54(5), 445-467.

Steele, D. F., & Widman, T. F. (1997). Practitioner's research: A study in changing pre-service teachers' conceptions about mathematics. School Science and Mathematics, 97(4), 184-192.

Stevens, J. (2002). Applied multivariate statistics for the social sciences. Mahwah, NJ: Lawrence Erlbaum.

Stipek, D. (2002). Motivation to learn: Integrating theory and practice (4th ed.). Boston: Allyn and Bacon.

Stipek, D.J., & Kowalski, P.S. (1989). Learned helplessness in task oriented versus performance orienting testing conditions. Journal of Educational Psychology, 81, 384-391.

Stipek, D. J., Salmon, J. M., Givvin, K. B., Kazemi, E., Saxe, G., & MacGyvers, V. L. (1998). The value (and convergence) of practices suggested by motivation research and promoted by mathematics education reformers. Journal for Research in Mathematics Education, 29(4), 465-488.

Sungur, S. (2004). An implementation of problem based learning in high school biology courses. Unpublished Doctoral Thesis, Middle East Technical University, Ankara.

Sungur, S. (2007). Modeling the relationships among students' motivational beliefs, metacognitive strategy use, and effort regulation. Scandinavian Journal of Educational Research, 51(3), 315-326.

Sungur, S., & Tekkaya, C. (2006). Effects of problem-based learning and traditional instruction on self-regulated learning. The Journal of Educational Research, 99, 307-317.

Tabachnick, B. G, & Fidell, L. S. (1989). Using multivariate statistics. New York: Harpers Collins.

Tabachnick, B. G., & Fidell, L. S. (2007). Using multivariate statistics (5^{th} ed.) Boston: Allyn and Bacon.

Taş, Y. & Tekkaya, C. (July, 2008). Students' adoption of personal goal orientations and their perceptions of science classroom goal structures. Paper presented at the Junior Researchers of EARLI, Leuven, Belgium.

Torrano Montalvo F., & Gonzales Torres M.C. (2004). Self-regulated learning: Current and future directions. Electronic Journal of Research in Educational Psychology, 2(1), 1-34.

Turner, J. C, Meyer, D. K., Cox, K. E., Logan, C, DiCintio, M., & Thomas, C. T. (1998). Creating contexts for involvement in mathematics. Journal of Educational Psychology, 90(4), 730-745.

Turner, J. C, Midgley, C, Meyer, D.K., Gheen, M., Anderman, E. M., Kang, Y., et al. (2002). The classroom environment and students' reports of avoidance strategies in mathematics: a multi-method study. Journal of Educational Psychology, 94, 88-106.

Turner, J. C, & Patrick, H. (2004). Motivational influences on student participation in classroom learning activities. Teachers College Record, 106(9), 1759-1785.

Urdan, T. (1997). Achievement goal theory: past results, future directions. In M.L. Maehr & P.R. Pintrich (Eds.), Advances in motivation and achievement, (Vol. 10). Greenwich, CT: JAI Press; pp. 99–141.

Urdan, T.C., & Maehr, M.L. (1995). Beyond a two-goal theory of motivation and achievement: A case for social goals. Review of Educational Research, 65(3), 213-243.

Urdan, T. C. & Midgley, C. (2003). Changes in the perceived classroom goal structure and pattern of adaptive learning during early adolescence. Contemporary Educational Psychology, 28, 524-551.

Urdan, T. C., Midgley, C., & Anderman, E. M. (1998). The role of classroom goal structure in students' use of self-handicapping. American Educational Research Journal, 35, 101-122.

Usher, E. L. & Pajares, F. (2008). Self-efficacy for self-regulated learning: A validation study. Educational and Psychological Measurement, 68(3), 443-463.

Üredi, I. & Üredi, L. (2005). İlköğretim 8. sınıf öğrencilerinin öz-düzenleme stratejileri ve motivasyonel inançlarının matematik başarısını yordama gücü. Mersin Üniversitesi Eğitim Fakültesi Dergisi, 1(2), 250-261.

Verschaffel, L., De Corte, E., Lasure, S., Van Vaerenbergh, G., Bogaerts, H., & Ratinckx, E. (1999). Learning to solve mathematical application problems: A design experiment with fifth graders. Mathematical Thinking and Learning, 1, 195-229.

Wang, X. & Cheng, L. (2003). Chinese EFL students' perceptions of classroom assessment environment and their goal orientations. Language Testing Update, 33, 43-47.

Webb, N. L. (1999). Alignment of Science and Mathematics Standards and Assessments in Four States. Washington, DC: Council of Chief State School Officers.

Wehmeyer, M., Palmer, S., Agran, M., Mithaug, D., & Martin, J. (2000). Promoting casual agency: the self-determined learning model of instruction. Exceptional Children, 66(4), 439-453.

Weiner, B. (1990). History of motivational research in education. Journal of Educational Psychology, 82, 616-622.

Weinstein, C. E., & Mayer, R. E. (1986). The teaching of learning strategies. In M. Wittrock (Ed.), Handbook of research on teaching (pp. 315-327). New York: Macmillan.

Wentzel, K.R. (1993). Motivation and achievement in early adolescence: The role of multiple classroom goals. Journal of Early Adolescence, 13, 4-20.

Wentzel, K. (1996). Social and academic motivation in middle school: Concurrent and long-term relations to academic effort. Journal of Early Adolescence, l6(4), 390-406.

Winne, P. H. (2001). Self-regulated learning viewed from models of information processing. In B. J. Zimmerman and D. H. Schunk (Eds.), Self-regulated learning and academic achievement: Theoretical perspectives (2^{nd} ed, pp. 153-189). Hillsdale, NJ: Erlbaum.

Wood, T., & Sellers, P. (1997). Deepening the analysis: longitudinal assessment of a problem-centered mathematics program. Journal for Research in Mathematics Education, 28, 163-186.

Wolters, C. A. (2004). Advancing achievement goal theory: Using goal structures and goal orientations to predict students' motivation, cognition, and achievement. Journal of Educational Psychology, 96(2), 236-250.

Wolters, C. A. & Pintrich, P. R. (1998). Contextual differences in student motivation and self-regulated learning in mathematics, English, and social studies classrooms. Instructional Science, 26, 27-47.

Wolters, C. A., Yu, S. L, & Pintrich, P. R. (1996). The relation between goal orientations and students' motivational beliefs a self-regulated learning. Learning and Individual differences, 8(3), 211-238.

Yumusak, N., Sungur, S., & Cakiroglu, J. (2007). Turkish high school students' biology achievement in relation to academic self-regulation. Educational Research and Evaluation, 13(1), 53-69.

Zimmerman, B. J. (1989). Models of self-regulated learning and academic achievement. In B. J. Zimmerman & D. H. Schunk (Eds.), Self-regulated learning and academic achievement: Theory, research, and practice (pp. 1-25). New York: Springer-Verlag.

Zimmerman, B. J. (1990). Self-regulated learning and academic achievement: An overview. Educational Psychologist, 21, 3-18.

Zimmerman, B. J. (1994). Dimensions of academic self-regulation. In D. H. Schunk & B. J. Zimmerman (Eds.), Self-regulation of learning and performance (pp. 3-21). Hillsdale, NJ: Erlbaum.

Zimmerman, B. J. (2000). Attaining self-regulation: A social cognitive perspective. In M. Boekaerts, P. Pintrich, & M. Ziedner (Eds.), Handbook of self-regulation (pp. 13-39). Orlando, FL: Academic Press.

Zimmerman, B. J. (2001). Achieving self-regulation: The trial and triumph of adolescence. In F. Pajares & T. Urdan (Eds.), Adolescence and Education (Vol. 2, pp. 1-27). Greenwich, CT: Information Age.

Zimmerman, B. J. (2002). Becoming a self-regulated learner. Theory into Practice, 41, 64-70.

Zimmerman, B. J. (2005). Attaining self regulation: A social cognitive perspective. In M. Boekaerts, P. R. Pintrich & M. Zeidner (Eds.), Handbook of self-regulation (pp. 13-39). Burlington, MA: Elseiver Academic Press.

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

Zimmerman, B. J., & Kitsantas, A. (1997). Development phases in self-regulation: Shifting from process goals to outcome goals. Journal of Educational Psychology, 89, 29-36.

Zimmerman, B. J., & Martinez-Pons, M. (1986). Development of a structured interview for assessing student use of self-regulated learning strategies. American Educational Research Journal, 23(4), 614-628.

Zimmerman, B. J., & Martinez-Pons, M., (1990). Student differences in self-regulated learning: Relating grade, sex, and giftedness to self-efficacy and strategy use. Journal of Educational Psychology, 82, 51-59.

Zimmerman, B. J., & Schunk, D. H. (2001). Self-regulated learning and academic achievement: Theoretical perspectives (2nd ed). Mahawah, NJ: Erlbaum.

APPENDICES

A. THE INSTRUMENT (TURKISH)

Sevgili Öğrenciler,

Bu anket sizin Matematik dersine yönelik tutum ve hedeflerinizi ölçmeyi amaçlamaktadır. Ankete vereceğiniz cevaplar, bilimsel bir araştırmanın yürütülmesi amacıyla kullanılacak, kişisel bilgi ve görüşleriniz kesinlikle gizli tutulacaktır.

Lütfen soruları cevaplamadan önce dikkatle okuyunuz. Soruların doğru yada yanlış cevabı yoktur; her soruda size en yakın olan seçeneği işaretleyiniz. Bu anketin sağlayacağı yarar, soruları cevaplamakta göstereceğiniz içtenlik ve dikkate bağlıdır.

Fatma Kayan
Eğitim Fakültesi
İlköğretim Bölümü
ODTÜ-Ankara

A. KİŞİSEL BİLGİLER

1. Cinsiyetiniz

○ Kız ○ Erkek

2. Okulunuz ____

3. Sınıfınız _____________

4. Okul numaranız _______________________

5. Geçen yıla ait SBS Sınav Puanınız ___________

6. Geçen yıla ait SBS Matematik sonuçlarınız:

Doğru	Yanlış	Boş
__________	__________	__________

B. İLKÖĞRETİM ÖĞRENCİLERİNİN MATEMATİK DERSİ HAKKINDAKİ GÖRÜŞLERİ

Lütfen aşağıda verilen tüm soruları dikkatle okuyarak cevabınızı, ifadenin karşısındaki seçeneklerden sizin için en uygun olanı işaretleyerek belirtiniz.

1..........2.........3..........4..........5

Kesinlikle Katılmıyorum — Biraz Katılıyorum — Kesinlikle Katılıyorum

Soru No	Matematikteki hedefleriniz	Kesinlikle Katılmıyorum ⇦				Kesinlikle Katılıyorum ⇨
1.	Bu yılki matematik dersinde birçok yeni kavram öğrenmek benim için önemlidir.	1	2	3	4	5
2.	Matematik dersindeki hedeflerimden biri, arkadaşlarıma bu derste iyi olduğumu göstermektir.	1	2	3	4	5
3.	Matematik dersindeki amacım, diğer öğrencilerin zeki olmadığımı düşünmelerini önlemektir.	1	2	3	4	5
4.	Bu dersteki amaçlarımdan biri, mümkün olduğunca çok öğrenmektir.	1	2	3	4	5
5.	Matematik dersindeki amaçlarımdan biri arkadaşlarıma bu dersin benim için kolay olduğunu göstermektir.	1	2	3	4	5
6.	Matematik dersindeki bir amacım, bu derste zorlanıyormuş gibi görünmemektir.	1	2	3	4	5
7.	Bu yıl matematik dersindeki hedeflerimden biri, birçok yeni beceri kazanmaktır.	1	2	3	4	5
8.	Sınıftaki diğer öğrencilerle karsılaştırıldığımda zeki görünmek matematik dersindeki amaçlarımdan biridir.	1	2	3	4	5
9.	Matematik dersini anlamıyormuş gibi görünmek istemem.	1	2	3	4	5
10.	Matematik dersinde işlediğimiz konuları eksiksiz anlamak benim için önemlidir.	1	2	3	4	5
11.	Sınıftaki diğer öğrencilerin, matematik dersinde iyi olduğumu düşünmeleri benim için önemlidir.	1	2	3	4	5

Soru No	Matematikteki hedefleriniz					
12.	Matematik öğretmenimin, sınıf arkadaşlarımdan daha az bilgili olduğumu düşünmemesi benim için önemlidir.	1	2	3	4	5
13.	Bu yıl matematik dersiyle ilgili becerilerimi geliştirmek benim için önemlidir.	1	2	3	4	5
14.	Sınıftaki diğer öğrencilere göre zeki görünmek benim için önemlidir.	1	2	3	4	5

Soru No	Matematik dersine yönelik düşünceleriniz	Kesinlikle <u>Katılmıyorum</u> ⇦				Kesinlikle <u>Katılıyorum</u> ⇨
15.	Matematik dersimizde asıl amaç, derste işlenen konuları hakkıyla anlamaktır.	1	2	3	4	5
16.	Matematik dersimizde asıl hedef, iyi not almaktır.	1	2	3	4	5
17.	Matematik dersimizde sınıf arkadaşlarından daha başarısız <u>olmamak</u> önemlidir.	1	2	3	4	5
18.	Matematik dersimizde bir şeyler öğrendiğimiz sürece yanlış yapmamız problem değildir.	1	2	3	4	5
19.	Matematik dersimizde soruları doğru cevaplamak çok önemlidir.	1	2	3	4	5
20.	Matematik dersimizde arkadaşlarının önünde hata <u>yapmamak</u> önemlidir.	1	2	3	4	5
21.	Matematik dersimizde ne kadar ilerleme kaydettiğin gerçekten önemlidir.	1	2	3	4	5
22.	Matematik dersimizde sınavlardan yüksek not almak önemlidir.	1	2	3	4	5
23.	Matematik dersimizde arkadaşlarına derste başarısız <u>olmadığını</u> göstermek gerçekten önemlidir.	1	2	3	4	5
24.	Matematik dersimizde sadece ezberlemek değil gerçekten anlamak önemlidir.	1	2	3	4	5
25.	Matematik dersimizde aptalmış gibi <u>görünmemek</u> çok önemlidir.	1	2	3	4	5

Soru No	Matematik dersine yönelik düşünceleriniz	Kesinlikle Katılmıyorum ⇦				Kesinlikle Katılıyorum ⇨
26.	Matematik dersimizde yeni fikir ve kavramları öğrenmek çok önemlidir.	1	2	3	4	5
27.	Matematik dersimizde gayretli olmak çok önemlidir.	1	2	3	4	5
28.	Matematik dersimizde başarısız gibi görünmemek çok önemlidir.	1	2	3	4	5

Lütfen aşağıda verilen tüm soruları dikkatle okuyarak cevabınızı, ifadenin karşısındaki numaralardan sizin için en uygun olanı yuvarlak içine alarak belirtiniz.

1......2......3......4......5......6......7

Beni hiç yansıtmıyor — Beni tam olarak yansıtıyor

Soru No	Matematikte kendinize güveniniz	Beni hiç yansıtmıyor ⇦						Beni tam olarak yansıtıyor ⇨
29.	Matematik dersinden yüksek bir not alacağıma inanıyorum.	1	2	3	4	5	6	7
30.	Matematik dersinin en zor konuları bile öğrenebileceğimden eminim.	1	2	3	4	5	6	7
31.	Matematik dersinin temel kavramlarını öğrenebileceğimden eminim.	1	2	3	4	5	6	7
32.	Matematik dersinde öğretmenin anlatacağı en karmaşık konuları bile anlayabileceğimden eminim.	1	2	3	4	5	6	7
33.	Matematik dersinin ödevlerinde ve sınavlarında başarılı olacağıma eminim.	1	2	3	4	5	6	7
34.	Matematik dersinde başarılı olacağımı düşünüyorum.	1	2	3	4	5	6	7
35.	Matematik dersinde öğretilen becerilerde kendimi çok iyi geliştirebileceğimden eminim.	1	2	3	4	5	6	7
36.	Matematik dersinin öğretmenini ve gereken becerilerin zorluğunu dikkate aldığımda, başarılı olacağımı düşünüyorum.	1	2	3	4	5	6	7

Soru No	Matematik öğrenme stratejileriniz	Beni hiç yansıtmıyor ⇦						Beni tam olarak yansıtıyor ⇨
37.	Matematik dersine çalışırken, ders notları, kitaplar ve sınıfta konuşulanlar gibi farklı kaynaklardan edindiğim bilgileri bir araya getiririm.	1	2	3	4	5	6	7
38.	Matematik dersinde verilen kaynaklara çalışırken, düşüncelerimi düzenlemeye yardımcı olması için konuların başlıklarını ve alt başlıklarını çıkarırım.	1	2	3	4	5	6	7
39.	Matematik çalışırken, kendime konuya odaklanmama yardımcı olacak sorular sorarım.	1	2	3	4	5	6	7
40.	Matematik dersinde öğrendiğim konular ile diğer derslerdeki konular arasında olabildiğince bağlantı kurmaya çalışırım.	1	2	3	4	5	6	7
41.	Matematik dersine çalışırken, okuduğum bilgilerin ve derste tuttuğum notların üzerinden geçip en önemli noktaları bulmaya çalışırım.	1	2	3	4	5	6	7
42.	Matematik dersi sırasında başka şeyler düşündüğüm için önemli noktaları sık sık kaçırırım.	1	2	3	4	5	6	7
43.	Çalıştığım matematik konularının, önceden bildiğim konularla bağlantısını kurmaya çalışırım.	1	2	3	4	5	6	7
44.	Matematik dersinin konularını düzenlememe yardımcı olması için basit şemalar, tablolar ya da şekiller çizerim.	1	2	3	4	5	6	7
45.	Matematik çalışırken kafam karıştığında, başa dönerek anlamaya çalışırım.	1	2	3	4	5	6	7
46.	Matematik dersine çalışırken, derste tuttuğum notların ve çalıştığım kaynaklardaki önemli konuların özetini çıkarırım.	1	2	3	4	5	6	7
47.	Matematik dersine çalışırken sınıfta tuttuğum notları gözden geçirir ve önemli konuların başlık ve alt başlıklarını çıkarırım.	1	2	3	4	5	6	7

Soru No	Matematik öğrenme stratejileriniz	Beni hiç yansıtmıyor ⇦						Beni tam olarak yansıtıyor ⇨
48.	Matematik çalışırken anlamakta zorlandığımda, çalışma yöntemimi değiştiririm.	1	2	3	4	5	6	7
49.	Çalıştığım kitaplarla, matematik dersinde öğrendiğim kavramlar arasında bağlantı kurarak dersin konularını anlamaya çalışırım.	1	2	3	4	5	6	7
50.	Yeni bir konuyu ayrıntılı çalışmaya başlamadan önce genellikle konuların nasıl düzenlendiğini gözden geçiririm.	1	2	3	4	5	6	7
51.	Matematik kitaplarından edindiğim bilgileri, ders sırasında kullanmaya çalışırım.	1	2	3	4	5	6	7
52.	Çalıştığım konuyu anlayıp anlamadığımdan emin olmak için kendime sorular sorarım.	1	2	3	4	5	6	7
53.	Dersin gereklerine ve öğretmenin öğretme şekline göre ders çalışma yöntemimi değiştirmeye çalışırım.	1	2	3	4	5	6	7
54.	Matematik dersine çalışmama rağmen hiçbir şey anlamadığım zamanlar çok olur.	1	2	3	4	5	6	7
55.	Matematik dersine çalışırken konuları yalnızca okuyup geçmek yerine, düşünerek neyi öğrenmem gerektiğine karar vermeye çalışırım.	1	2	3	4	5	6	7
56.	Matematik dersine çalışırken anlamakta zorlandığım kavramları belirlemeye çalışırım.	1	2	3	4	5	6	7
57.	Matematik dersine çalışırken, her yeni konuya geçtiğimizde yapacaklarımı belirlemek için kendime hedefler koyarım.	1	2	3	4	5	6	7
58.	Derste not tutarken kafam karışırsa, sonrasında bu karışıklığı mutlaka düzeltirim.	1	2	3	4	5	6	7

C. MATEMATİK TESTİ

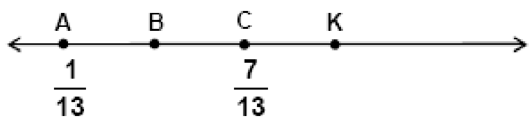
1) Verilen çarpma tablosuna göre,
a+b+c = ?

X	2	-3	1
a	-2	3	-1
4	8	-12	**c**
b	-10	15	-5

A) -2 **B)** -10

C) 2 **D)** 10

2)



Şekildeki sayı doğrusunda **A** ve **K** noktaları arası **B** ve **C** noktaları ile üç eş parçaya ayrılmıştır. **A** ve **C** noktalarının gösterdiği rasyonel sayılar $\frac{1}{13}$ ve $\frac{7}{13}$ olduğuna göre, <u>**K noktası**</u> hangi rasyonel sayıyı gösterir?

A) $\frac{8}{13}$ **B)** $\frac{10}{13}$

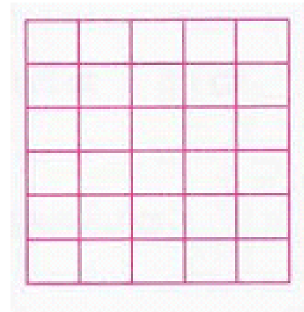
C) $\frac{11}{13}$ **D)** 1

3) $\dfrac{1+\frac{3}{7}}{1-\frac{1}{2}}$ işleminin sonucu nedir?

A) $\frac{8}{7}$ **B)** $\frac{20}{21}$

C) $\frac{10}{14}$ **D)** $\frac{20}{7}$

4) Yandaki otuzluk kartın **önce** $\frac{1}{6}$'sını, sonra **kalan kısmın** $\frac{2}{5}$'ini boyayan bir öğrenci, **kaç kutu daha boyarsa** otuzluk kartın $\frac{5}{6}$'sını boyanmış olur?



A) 5 **B)** 10

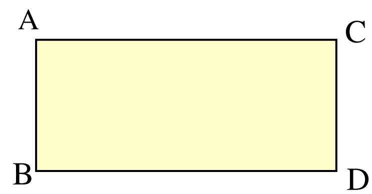
C) 15 **D)** 20

5) $2(x-1) + 3(x^2+4x+1)$ cebirsel ifadesinin **en sade** eş değeri aşağıdakilerden hangisidir?

A) x^2+8x-1 **B)** $3x^2+6x-1$

C) $-3x^2+10x-5$ **D)** $3x^2+14x+1$

6) Kısa kenarının uzunluğu **a** olan bir dikdörtgenin boyu, kısa kenarının **6 katı** ise, bu dikdörtgenin **çevresi** aşağıdaki cebirsel ifadelerden hangisi ile gösterilir?



A) a+6a **B)** 2a+6a

C) a+12a **D)** 2a+12a

7) Bir sayının 2 **katının** 4 **fazlası**, aynı sayının 3 **katından** 26 **eksik** ise bu sayı kaçtır?

A) 6 **B)** 22

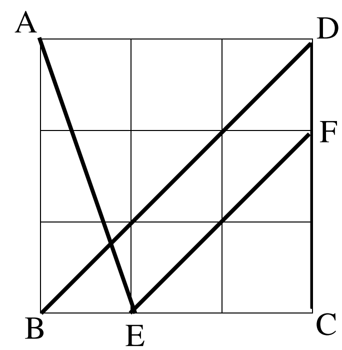
C) 30 **D)** 36

8) Bir miktar para **5 kişiye** eşit olarak paylaştırılıyor. Bu para **8 kişiye** eşit olarak paylaştırılsaydı her biri **6 TL** <u>daha az</u> para alacaktı. Buna göre, paylaştırılan para kaç TL'dir?

A) 40 TL **B)** 80 TL

C) 120 TL **D)** 160 TL

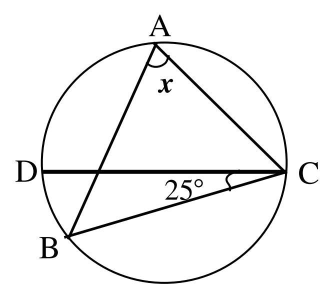
9) Yandaki şekle göre, aşağıdakilerden hangisi doğrudur?



A) [AE] ⊥ [EF] **B)** [AE] ⊥ [BD]

C) [BD] // [EF] **D)** [DC] // [AE]

10) Şekilde [CD] çaptır. s(BCD) = 25° ise **x açısının** değeri nedir?



A) 65° **B)** 90°

C) 130° **D)** 155°

APPENDIX B

B. THE INSTRUMENT (ENGLISH)

Dear Students,

This survey is prepared to better understand your perceptions about elementary mathematics lessons. There is no penalty if you decide not to participate or to later withdraw from the study. Please be assured that your response will be kept absolutely confidential. The study will be most useful if you respond to every item in the survey, however you may choose not to answer one or more of them, without penalty.

Thank you in advance for your assistance in studying this survey.

Fatma Kayan
Education Faculty
Elementary Education
METU-Ankara

A. DEMOGRAPHIC INFORMATION

1. Gender

○ Female ○ Male

2. School Name ____

3. Class ____________

4. School Number ______________________

5. Level of Determination Examination Result for last year ___________

6. Level of Determination Examination Mathematics Results for last year:

Number Correct	Number Incorrect	Number Blank
___________	___________	___________

B. ELEMENTARY SCHOOL STUDENTS' PERCEPTIONS OF MATHEMATICS LESSONS

Please, provide your opinion for each item using the following scale by placing a tick on the response that best fits you.

1..........2.........3..........4..........5

Not all true Somewhat True Very True

Item No	Personal Achievement Goal Orientation	Not all True ⇦				Very True ⇨
1.	It's important to me that I learn a lot of new concepts this year. (MGO)	1	2	3	4	5
2.	One of my goals is to show others that I'm good at my class work. (PAPGO)	1	2	3	4	5
3.	One of my goals is to keep others from thinking I'm not smart in class. (PAVGO)	1	2	3	4	5
4.	One of my goals in class is to learn as much as I can. (MGO)	1	2	3	4	5
5.	One of my goals is to show others that class work is easy for me. (PAPGO)	1	2	3	4	5
6.	One of my goals in class is to avoid looking like I have trouble doing the work. (PAVGO)	1	2	3	4	5
7.	One of my goals is to master a lot of new skills this year. (MGO)	1	2	3	4	5
8.	One of my goals is to look smart in comparison to the other students in my class. (PAPGO)	1	2	3	4	5
9.	It's important to me that I don't look stupid in class. (PAVGO)	1	2	3	4	5
10.	It's important to me that I thoroughly understand my class work. (MGO)	1	2	3	4	5
11.	It's important to me that other students in my class think I am good at my class work. (PAPGO)	1	2	3	4	5
12.	It's important to me that my teacher doesn't think that I know less than others in class. (PAVGO)	1	2	3	4	5

Item No	Personal Achievement Goal Orientation					
13.	It's important to me that I improve my skills this year. (MGO)	1	2	3	4	5
14.	It's important to me that I look smart compared to others in my class. (PAPGO)	1	2	3	4	5

(MGO=Mastery Goal Orientation; PAPGO=Performance-Approach Goal Orientation; PAVGO=Performance-Avoid Goal Orientation)

Item No	Classroom Goal Structure	Not all True ⇦				Very True ⇨
15.	In our class, really understanding the material is the main goal. (CMGS)	1	2	3	4	5
16.	In our class, getting good grades is the main goal. (CPAPGS)	1	2	3	4	5
17.	In our class, it's important not to do worse than other students. (CPAVGS)	1	2	3	4	5
18.	In our class, it's OK to make mistakes as long as you are learning. (CMGS)	1	2	3	4	5
19.	In our class, getting right answers is very important. (CPAPGS)	1	2	3	4	5
20.	In our class, it's important that you don't make mistakes in front of everyone. (CPAVGS)	1	2	3	4	5
21.	In our class, how much you improve is really important. (CMGS)	1	2	3	4	5
22.	In our class, it's important to get high scores on tests. (CPAPGS)	1	2	3	4	5
23.	In our class, showing others that you are not bad at class work is really important. (CPAVGS)	1	2	3	4	5
24.	In our class, it's important to understand the work, not just memorize it. (CMGS)	1	2	3	4	5
25.	In our class, it's very important not to look dumb. (CPAVGS)	1	2	3	4	5
26.	In our class, learning new ideas and concepts is very important. (CMGS)	1	2	3	4	5

Item No	Classroom Goal Structure					
27.	In our class, trying hard is very important. (CMGS)	1	2	3	4	5
28.	In our class, one of the main goals is to avoid looking like you can't do the work. (CPAVGS)	1	2	3	4	5

(CMGS=Classroom Mastery Goal Structure; CPAPGS=Classroom Performance-Approach Goal Structure; CPAVGS=Classroom Performance-Avoid Goal Structure)

Please, provide your opinion for each item using the following scale by placing a tick on the response that best fits you.

1.........2.........3.........4.........5.........6.........7

Not All True of Me — Very True of Me

Item No	Self-Efficacy	Not all True of Me ⇦						Very True of Me ⇨
29.	I believe I will receive an excellent grade in this class.	1	2	3	4	5	6	7
30.	I'm certain I can understand the most difficult material presented in the readings for this course.	1	2	3	4	5	6	7
31.	I'm confident I can understand the basic concepts taught in this course.	1	2	3	4	5	6	7
32.	I'm confident I can understand the most complex material presented by the instructor in this course.	1	2	3	4	5	6	7
33.	I'm confident I can do an excellent job on the assignments and tests in this course.	1	2	3	4	5	6	7
34.	I expect to do well in this class.	1	2	3	4	5	6	7
35.	I'm certain I can master the skills being taught in this class.	1	2	3	4	5	6	7
36.	Considering the difficulty of this course, the teacher, and my skills, I think I will do well in this class.	1	2	3	4	5	6	7

Item No	Learning Strategies	Not all True of Me ⇦						Very True of Me ⇨
		1	2	3	4	5	6	7
37.	When I study for this class, I pull together information from different sources, such as lectures, readings, and discussions. (ELA)	1	2	3	4	5	6	7
38.	When I study the readings for this course, I outline the material to help me organize my thoughts. (ORG)	1	2	3	4	5	6	7
39.	When reading for this course, I make up questions to help focus my reading. (MSR)	1	2	3	4	5	6	7
40.	I try to relate ideas in this subject to those in other courses whenever possible. (ELA)	1	2	3	4	5	6	7
41.	When I study for this course, I go through the readings and my class notes and try to find the most important ideas. (ORG)	1	2	3	4	5	6	7
42.	During class time I often miss important points because I'm thinking of other things. (MSR)	1	2	3	4	5	6	7
43.	When reading for this class, I try to relate the material to what I already know. (ELA)	1	2	3	4	5	6	7
44.	I make simple charts, diagrams, or tables to help me organize course material. (ORG)	1	2	3	4	5	6	7
45.	When I become confused about something I'm reading for this class, I go back and try to figure it out. (MSR)	1	2	3	4	5	6	7
46.	When I study for this course, I write brief summaries of the main ideas from the readings and the concepts from the lectures. (ELA)	1	2	3	4	5	6	7
47.	When I study for this course, I go over my class notes and make an outline of important concepts. (ORG)	1	2	3	4	5	6	7
48.	If course materials are difficult to understand, I change the way I read the material. (MSR)	1	2	3	4	5	6	7

Item No	Learning Strategies	Not all True of Me ⇦						Very True of Me ⇨
49.	I try to understand the material in this class by making connections between the readings and the concepts from the lectures. (ELA)	1	2	3	4	5	6	7
50.	Before I study new course material thoroughly, I often skim it to see how it is organized. (MSR)	1	2	3	4	5	6	7
51.	I try to apply ideas from course readings in other class activities such as lecture and discussion. (ELA)	1	2	3	4	5	6	7
52.	I ask myself questions to make sure I understand the material I have been studying in this class. (MSR)	1	2	3	4	5	6	7
53.	I try to change the way I study in order to fit the course requirements and instructor's teaching style. (MSR)	1	2	3	4	5	6	7
54.	I often find that I have been reading for class but don't know what it was all about. (MSR)	1	2	3	4	5	6	7
55.	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. (MSR)	1	2	3	4	5	6	7
56.	When studying for this course I try to determine which concepts I don't understand well. (MSR)	1	2	3	4	5	6	7
57.	When I study for this class, I set goals for myself in order to direct my activities in each study period. (MSR)	1	2	3	4	5	6	7
58.	If I get confused taking notes in class, I make sure I sort it out afterwards. (MSR)	1	2	3	4	5	6	7

(ELA=Elaboration; ORG=Organization; MSR=Metacognitive Self-Regulation)

C. MATHEMATICS ACHIEVEMENT TEST

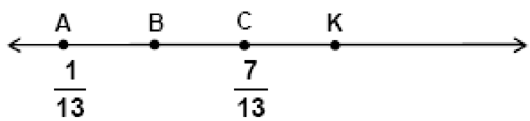
1) According to the multiplication table given, what is the result of the following operation:
a+b+c = ?

X	2	-3	1
a	-2	3	-1
4	8	-12	**c**
b	-10	15	-5

A) -2 **B)** -10

C) 2 **D)** 10

2)



On the number line, the distance between point **A** and point **K** are divided into three equal pieces with points **B** and **C**. If point **A** represents $\frac{1}{13}$ and point **C** represents $\frac{7}{13}$, what does point **K** represent?

A) $\frac{8}{13}$ **B)** $\frac{10}{13}$

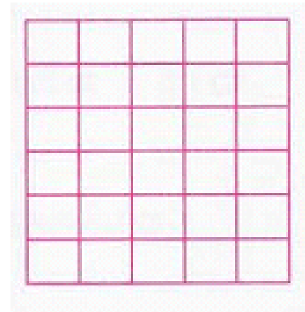
C) $\frac{11}{13}$ **D)** 1

3) Find the result of the following operation: $\dfrac{1+\frac{3}{7}}{1-\frac{1}{2}}$

A) $\frac{8}{7}$ **B)** $\frac{20}{21}$

C) $\frac{10}{14}$ **D)** $\frac{20}{7}$

4) A student divides a square tile into 30 equal pieces. First, he paints $\frac{1}{6}$ of the pieces. Then, he paints $\frac{2}{5}$ of the rest of the pieces. How many more pieces should he paint, if he wants to paint $\frac{5}{6}$ of all the pieces?



A) 5 **B)** 10

C) 15 **D)** 20

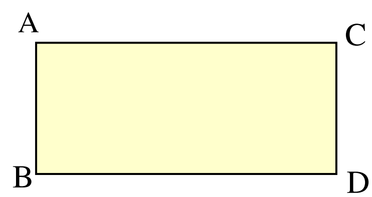
5) What is the simplest form of the following algebraic expressions:

$2(x\text{-}1) + 3(x^2+4x+1) = ?$

A) x^2+8x-1 **B)** $3x^2+6x-1$

C) $-3x^2+10x-5$ **D)** $3x^2+14x+1$

6) In the figure, the width of the rectangle equals to **a**, and the lenght equals to **6 times** of the witdth. Then, which algebraic expression represents the perimeter of the rectangle?



A) a+6a **B)** 2a+6a

C) a+12a **D)** 2a+12a

7) If the sum of **twice** a number and **4** equals to **26** less than **3 times** of the number, what is this number?

A) 6 **B)** 22

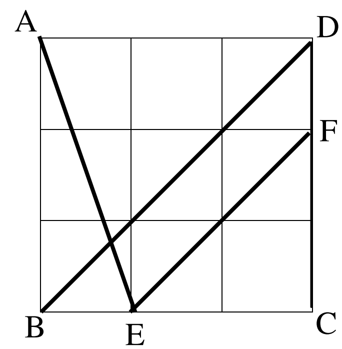
C) 30 **D)** 36

8) An amount of money is divided equally among **5** people. If the money was divided among **8** people, each person would take **6 TL** less than the previous distribution. Then, what is the amount of the total money?

A) 40 TL　　**B)** 80 TL

C) 120 TL　　**D)** 160 TL

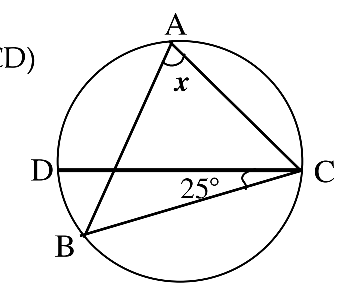
9) According to the figure, which one of the following notation is true?



A) [AE] ⊥ [EF]　　**B)** [AE] ⊥ [BD]

C) [BD] // [EF]　　**D)** [DC] // [AE]

10) In the figure, [CD] is the **diameter**. If m(BCD) equals to 25°, find the angle **x** ?



A) 65°　　**B)** 90°

C) 130°　　**D)** 155°

APPENDIX C

C. EXPLORATORY FACTOR ANALYSIS BASED ON THE PILOT STUDY

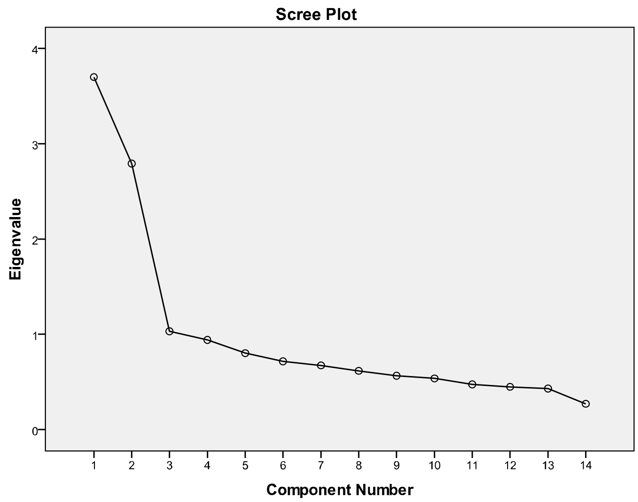
1. Achievement Goal Orientation Scale

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.822
Bartlett's Test of Sphericity	Approx. Chi-Square	977.348
	df	91
	Sig.	0.000

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	3.699	26.422	26.422	3.699	26.422	26.422	3.312
2	2.792	19.943	46.365	2.792	19.943	46.365	3.169
3	1.031	7.366	53.731	1.031	7.366	53.731	1.504
4	0.941	6.724	60.455				
5	0.802	5.731	66.187				
6	0.716	5.112	71.299				
7	0.674	4.814	76.113				
8	0.617	4.407	80.519				
9	0.565	4.034	84.553				
10	0.537	3.837	88.390				
11	0.476	3.398	91.787				
12	0.449	3.206	94.994				
13	0.430	3.070	98.064				
14	0.271	1.936	100.000				



Pattern Matrix

	Component		
	1	2	3
Q14	0.784		
Q8	0.759		
Q11	0.697		
Q2	0.679		
Q3	0.582		
Q5	0.533		
Q12	0.385		0.336
Q13		0.818	
Q1		0.807	
Q10		0.787	
Q4		0.750	
Q7		0.693	
Q9			0.840
Q6	0.426		0.477

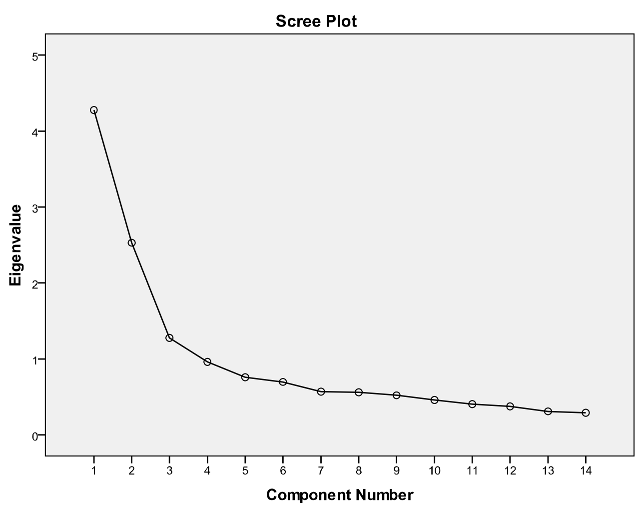
2. Classroom Goal Structure Scale

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.840
Bartlett's Test of Sphericity	Approx. Chi-Square	1191.491
	df	91
	Sig.	0.000

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	4.278	30.554	30.554	4.278	30.554	30.554	3.754
2	2.530	18.074	48.628	2.530	18.074	48.628	3.033
3	1.276	9.118	57.746	1.276	9.118	57.746	2.018
4	0.961	6.866	64.612				
5	0.759	5.418	70.030				
6	0.697	4.982	75.012				
7	0.570	4.068	79.080				
8	0.561	4.004	83.084				
9	0.522	3.725	86.809				
10	0.460	3.287	90.096				
11	0.406	2.902	92.998				
12	0.377	2.690	95.688				
13	0.311	2.219	97.907				
14	0.293	2.093	100.000				



Pattern Matrix

	Component		
	1	2	3
Q26	0.858		
Q24	0.829		
Q27	0.812		
Q15	0.778		
Q21	0.735		
Q25		0.806	
Q28		0.776	
Q23		0.759	
Q20		0.684	
Q17		0.624	
Q16			-0.775
Q22	0.357		-0.700
Q19			-0.593
Q18			0.414

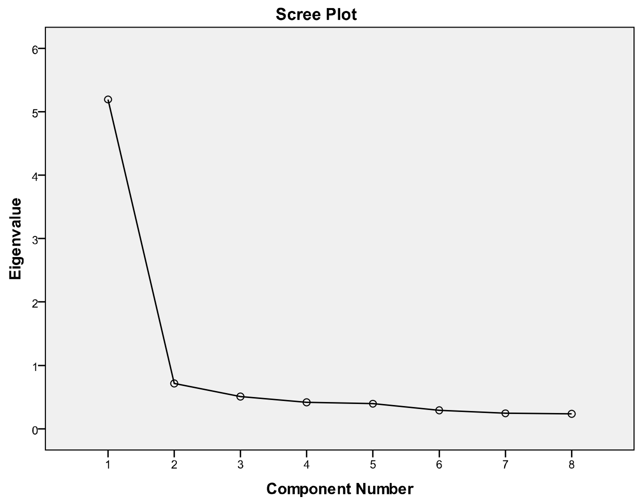
3. Self-Efficacy Scale

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.920
Bartlett's Test of Sphericity	Approx. Chi-Square	1290.397
	df	28
	Sig.	0.000

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.193	64.917	64.917	5.193	64.917	64.917
2	0.715	8.933	73.850			
3	0.508	6.353	80.203			
4	0.418	5.219	85.422			
5	0.396	4.945	90.367			
6	0.291	3.631	93.998			
7	0.245	3.056	97.054			
8	0.236	2.946	100.000			



Component Matrix

	Component
	1
Q30	0.843
Q33	0.834
Q35	0.832
Q29	0.828
Q32	0.827
Q34	0.826
Q31	0.795
Q36	0.640

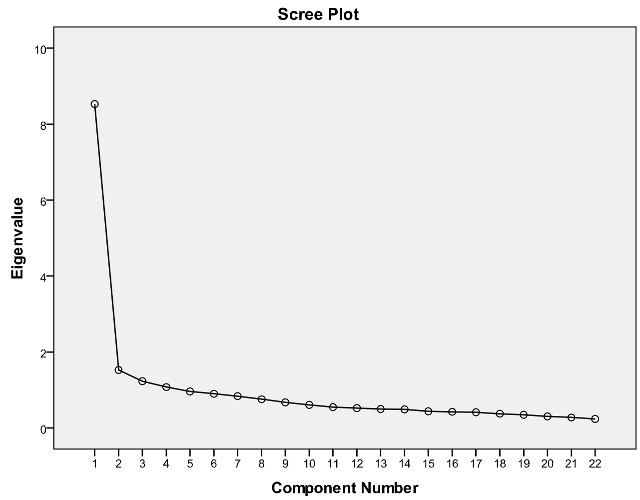
4. Learning Strategies Scale

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.926
Bartlett's Test of Sphericity	Approx. Chi-Square	2352.191
	df	231
	Sig.	0.000

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	8.526	38.753	38.753	8.526	38.753	38.753	7.916
2	1.527	6.939	45.692	1.527	6.939	45.692	1.525
3	1.231	5.597	51.289	1.231	5.597	51.289	5.440
4	1.077	4.898	56.186				
5	0.964	4.383	60.570				
6	0.901	4.095	64.665				
7	0.839	3.815	68.479				
8	0.758	3.444	71.924				
9	0.677	3.078	75.002				
10	0.607	2.761	77.763				
11	0.551	2.503	80.266				
12	0.527	2.395	82.661				
13	0.498	2.262	84.923				
14	0.490	2.225	87.148				
15	0.439	1.994	89.143				
16	0.426	1.937	91.080				
17	0.416	1.889	92.969				
18	0.376	1.709	94.678				
19	0.350	1.589	96.268				
20	0.304	1.382	97.650				
21	0.277	1.258	98.907				
22	0.240	1.093	100.000				



Pattern Matrix

	Component		
	1	2	3
Q45	0.766		
Q40	0.759		
Q49	0.748		
Q56	0.729		
Q43	0.724		
Q55	0.709		
Q51	0.626		
Q52	0.614		
Q48	0.578	-0.318	
Q50	0.569		
Q58	0.538		
Q57	0.520		
Q39	0.461		
Q44	0.389		
Q54_REVERSED		0.757	
Q_42_REVERSED		0.751	
Q53		-0.470	
Q38			-0.796
Q47			-0.780
Q46			-0.726
Q41	0.358		-0.449
Q37	0.394		-0.415

APPENDIX D

D. CFA FOR ACHIEVEMENT GOAL ORIENTATION SCALE

The SIMPLIS Syntax of CFA for AGO

Real Data Set
Observed Variables
mgo1 mgo2 mgo3 mgo4 mgo5 papgo1 papgo2 papgo3 papgo4 papgo5 pavgo1 pavgo2 pavgo3 pavgo4

Covariance matrix from File: ago.cov
Asymptotic covariance matrix from file: ago.acp
Sample Size = 1019

Latent Variables
Mgo Papgo Pavgo

Relationships
mgo1 mgo2 mgo3 mgo4 mgo5= Mgo
papgo1 papgo2 papgo3 papgo4 papgo5= Papgo
pavgo1 pavgo2 pavgo3 pavgo4= Pavgo

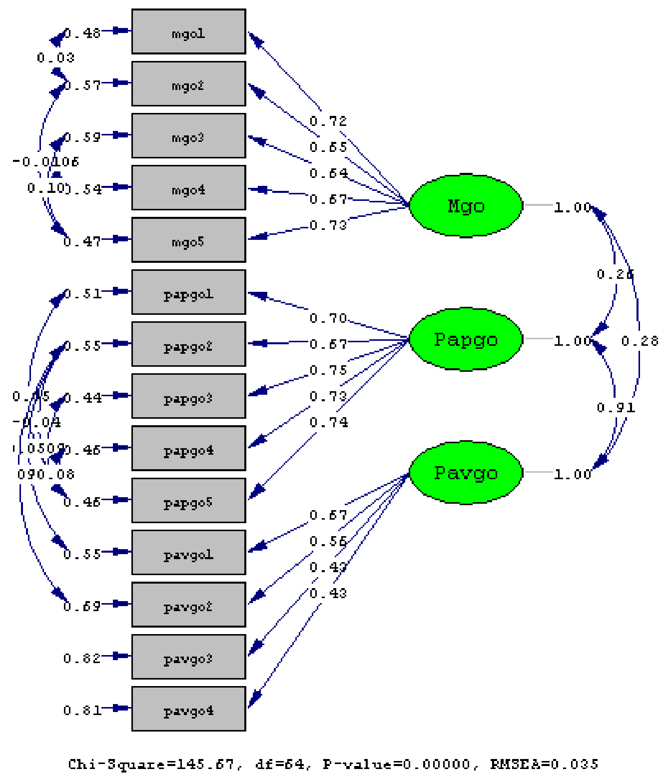
Set Error Covariance between papgo5 and papgo4 free
Set Error Covariance between papgo5 and papgo1 free
Set Error Covariance between papgo5 and papgo3 free
Set Error Covariance between papgo5 and papgo2 free
Set Error Covariance between papgo2 and pavgo1 free
Set Error Covariance between pavgo2 and papgo2 free
Set Error Covariance between mgo2 and mgo1 free
Set Error Covariance between mgo4 and mgo3 free
Set Error Covariance between mgo5 and mgo2 free
Set Error Covariance between mgo5 and mgo3 free

Path Diagram
End of problem

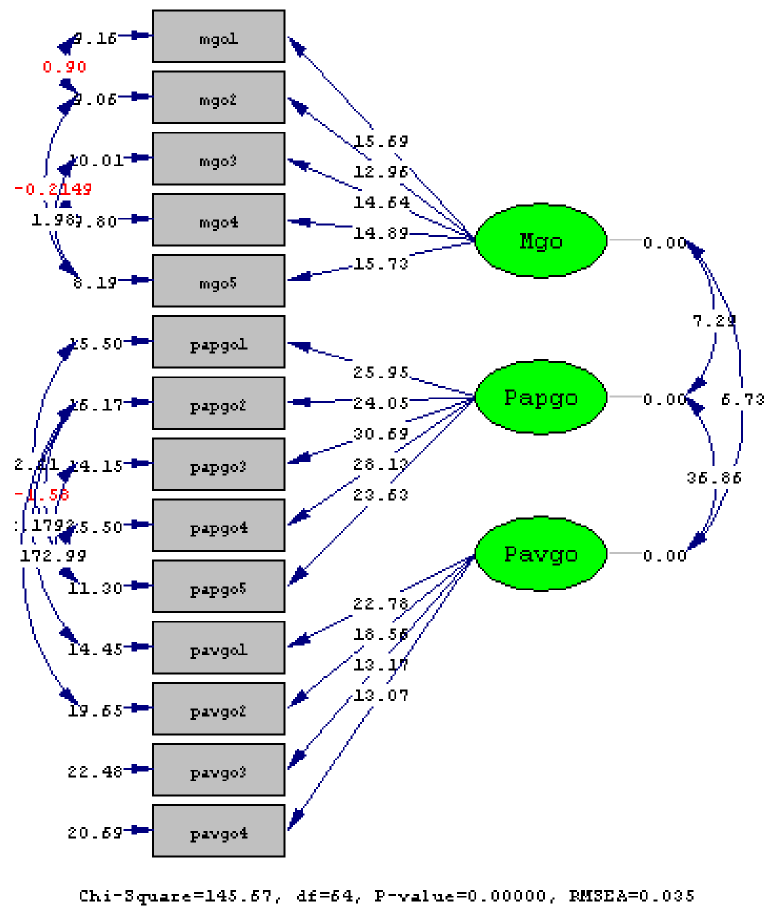
LISREL Estimates of Parameters for Achievement Goal Orientation Scale

(Coefficients in Standardized Value and t-Values)

Coefficients in Standardized Value



Coefficients in t-Values



Goodness of Fit Statistics for AGO

Degrees of Freedom = 64
Minimum Fit Function Chi-Square = 176.16 (P = 0.00)
Normal Theory Weighted Least Squares Chi-Square = 181.56 (P = 0.00)
Satorra-Bentler Scaled Chi-Square = 145.67 (P = 0.00)
Chi-Square Corrected for Non-Normality = 153.16 (P = 0.00)
Estimated Non-centrality Parameter (NCP) = 81.67
90 Percent Confidence Interval for NCP = (50.39; 120.67)

Minimum Fit Function Value = 0.17
Population Discrepancy Function Value (F0) = 0.080
90 Percent Confidence Interval for F0 = (0.049; 0.12)
Root Mean Square Error of Approximation (RMSEA) = 0.035
90 Percent Confidence Interval for RMSEA = (0.028; 0.043)
P-Value for Test of Close Fit (RMSEA < 0.05) = 1.00

Expected Cross-Validation Index (ECVI) = 0.22
90 Percent Confidence Interval for ECVI = (0.19; 0.26)
ECVI for Saturated Model = 0.21
ECVI for Independence Model = 8.87

Chi-Square for Independence Model with 91 Degrees of Freedom = 8997.47
Independence AIC = 9025.47
Model AIC = 227.67
Saturated AIC = 210.00
Independence CAIC = 9108.44
Model CAIC = 470.65
Saturated CAIC = 832.29

Normed Fit Index (NFI) = 0.98
Non-Normed Fit Index (NNFI) = 0.99
Parsimony Normed Fit Index (PNFI) = 0.69
Comparative Fit Index (CFI) = 0.99
Incremental Fit Index (IFI) = 0.99
Relative Fit Index (RFI) = 0.98

Critical N (CN) = 652.47

Root Mean Square Residual (RMR) = 0.059
Standardized RMR = 0.043
Goodness of Fit Index (GFI) = 0.98
Adjusted Goodness of Fit Index (AGFI) = 0.96
Parsimony Goodness of Fit Index (PGFI) = 0.59

APPENDIX E

E. CFA FOR CLASSROOM GOAL STRUCTURE SCALE

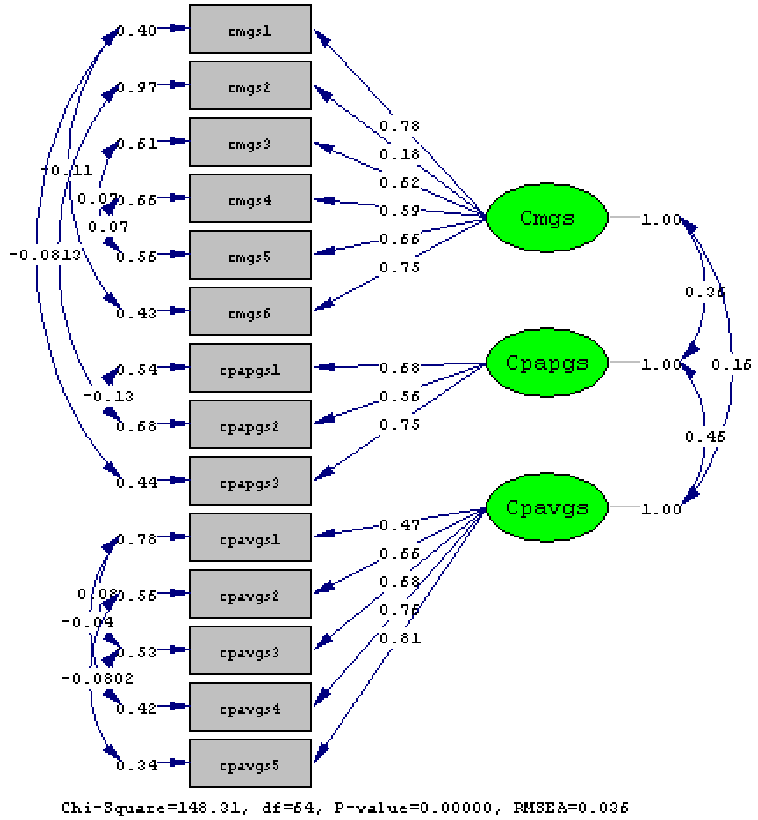
The SIMPLIS Syntax of CFA for CGS

```
Real Data Set
Observed Variables
cmgs1 cmgs2 cmgs3 cmgs4 cmgs5 cmgs6 cpapgs1 cpapgs2 cpapgs3 cpavgs1
cpavgs2 cpavgs3 cpavgs4 cpavgs5

Covariance matrix from File: cgs.cov
Asymptotic covariance matrix from file: cgs.acp
Sample Size = 1019

Latent Variables
Cmgs Cpapgs Cpavgs

Relationships
cmgs1 cmgs2 cmgs3 cmgs4 cmgs5 cmgs6= Cmgs
cpapgs1 cpapgs2 cpapgs3= Cpapgs
cpavgs1 cpavgs2 cpavgs3 cpavgs4 cpavgs5= Cpavgs

Set Error Covariance between cmgs6 and cmgs1 free
Set Error Covariance between cpapgs2 and cmgs2 free
Set Error Covariance between cpapgs2 and cpapgs1 free
Set Error Covariance between cpapgs3 and cmgs1 free
Set Error Covariance between cpavgs3 and cpavgs1 free
Set Error Covariance between cpavgs4 and cpavgs1 free
Set Error Covariance between cpavgs4 and cpavgs3 free
Set Error Covariance between cpavgs5 and cpavgs2 free
Set Error Covariance between cmgs5 and cmgs3 free
Set Error Covariance between cmgs5 and cmgs4 free

Path Diagram
End of problem
```

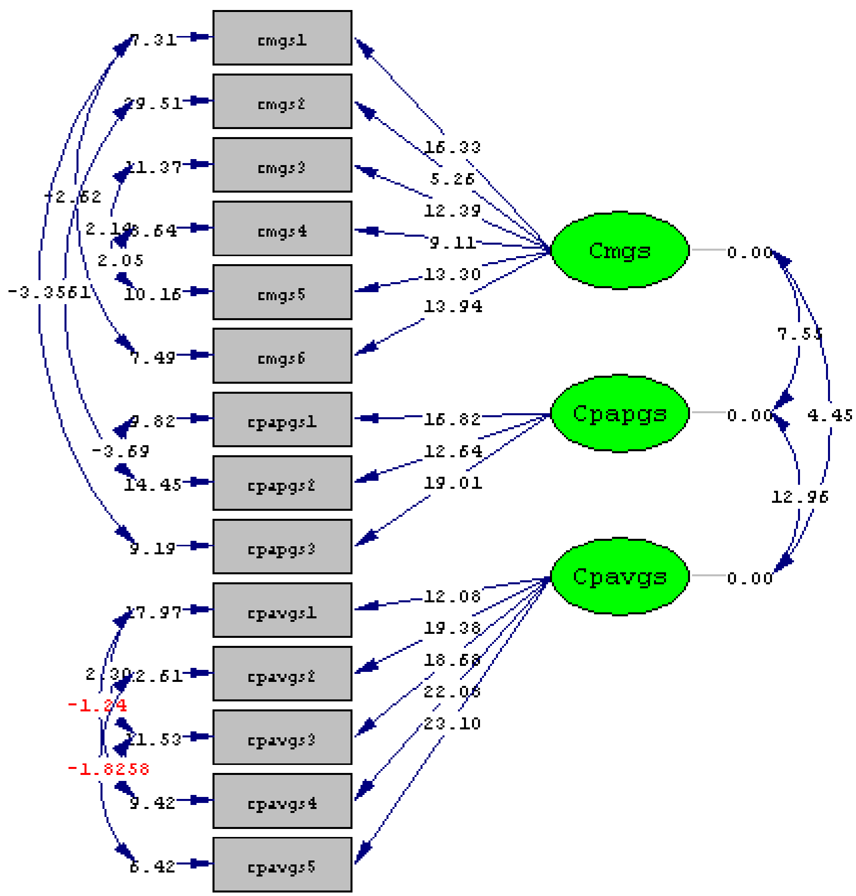
LISREL Estimates of Parameters for Classroom Goal Structure Scale

(Coefficients in Standardized Value and t-Values)

Coefficients in Standardized Value



Coefficients in t-Values



Goodness of Fit Statistics for CGS

Degrees of Freedom = 64

Minimum Fit Function Chi-Square = 191.45 (P = 0.00)
Normal Theory Weighted Least Squares Chi-Square = 192.45 (P = 0.00)
Satorra-Bentler Scaled Chi-Square = 148.31 (P = 0.00)
Chi-Square Corrected for Non-Normality = 150.59 (P = 0.00)
Estimated Non-centrality Parameter (NCP) = 84.31
90 Percent Confidence Interval for NCP = (52.63; 123.71)

Minimum Fit Function Value = 0.19
Population Discrepancy Function Value (F0) = 0.083
90 Percent Confidence Interval for F0 = (0.052; 0.12)
Root Mean Square Error of Approximation (RMSEA) = 0.036
90 Percent Confidence Interval for RMSEA = (0.028; 0.044)
P-Value for Test of Close Fit (RMSEA < 0.05) = 1.00

Expected Cross-Validation Index (ECVI) = 0.23
90 Percent Confidence Interval for ECVI = (0.20; 0.26)
ECVI for Saturated Model = 0.21
ECVI for Independence Model = 6.39

Chi-Square for Independence Model with 91 Degrees of Freedom = 6477.89
Independence AIC = 6505.89
Model AIC = 230.31
Saturated AIC = 210.00
Independence CAIC = 6588.86
Model CAIC = 473.30
Saturated CAIC = 832.29

Normed Fit Index (NFI) = 0.98
Non-Normed Fit Index (NNFI) = 0.98
Parsimony Normed Fit Index (PNFI) = 0.69
Comparative Fit Index (CFI) = 0.99
Incremental Fit Index (IFI) = 0.99
Relative Fit Index (RFI) = 0.97
Critical N (CN) = 640.85

Root Mean Square Residual (RMR) = 0.060
Standardized RMR = 0.047
Goodness of Fit Index (GFI) = 0.97
Adjusted Goodness of Fit Index (AGFI) = 0.96
Parsimony Goodness of Fit Index (PGFI) = 0.59

APPENDIX F

F. CFA FOR SELF-EFFICACY SCALE

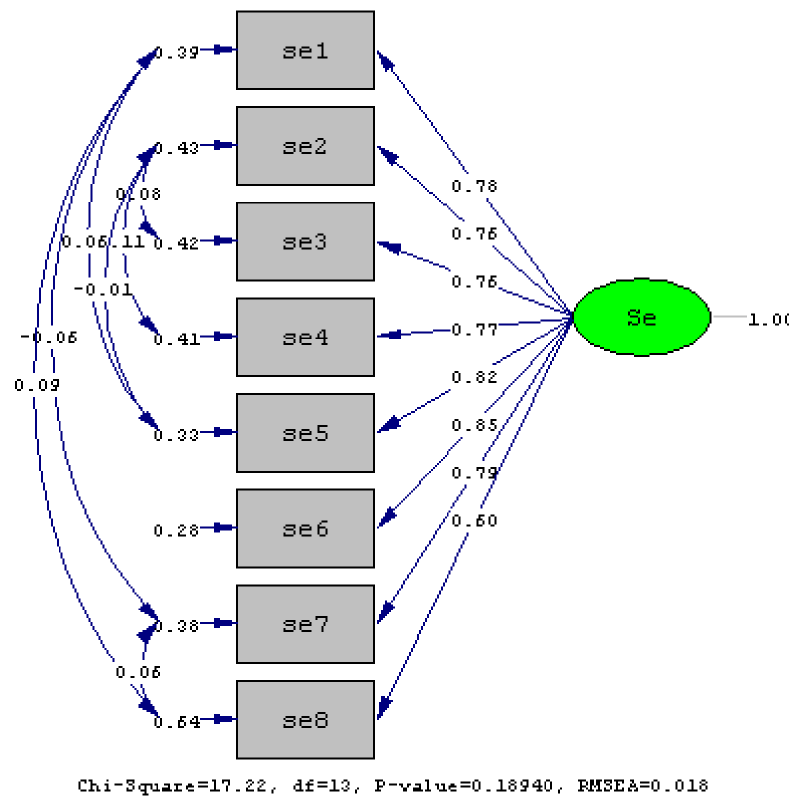
The SIMPLIS Syntax of CFA for Self-Efficacy

```
Real Data Set
Observed Variables
se1 se2 se3 se4 se5 se6 se7 se8

Covariance matrix from File: self.cov
Asymptotic covariance matrix from file: self.acp
Sample Size = 1019

Latent Variables
Se

Relationships
se1 se2 se3 se4 se5 se6 se7 se8= Se

Set Error Covariance between se5 and se1 free
Set Error Covariance between se4 and se2 free
Set Error Covariance between se8 and se7 free
Set Error Covariance between se7 and se1 free
Set Error Covariance between se8 and se1 free
Set Error Covariance between se3 and se2 free
Set Error Covariance between se5 and se2 free

Path Diagram
End of problem
```

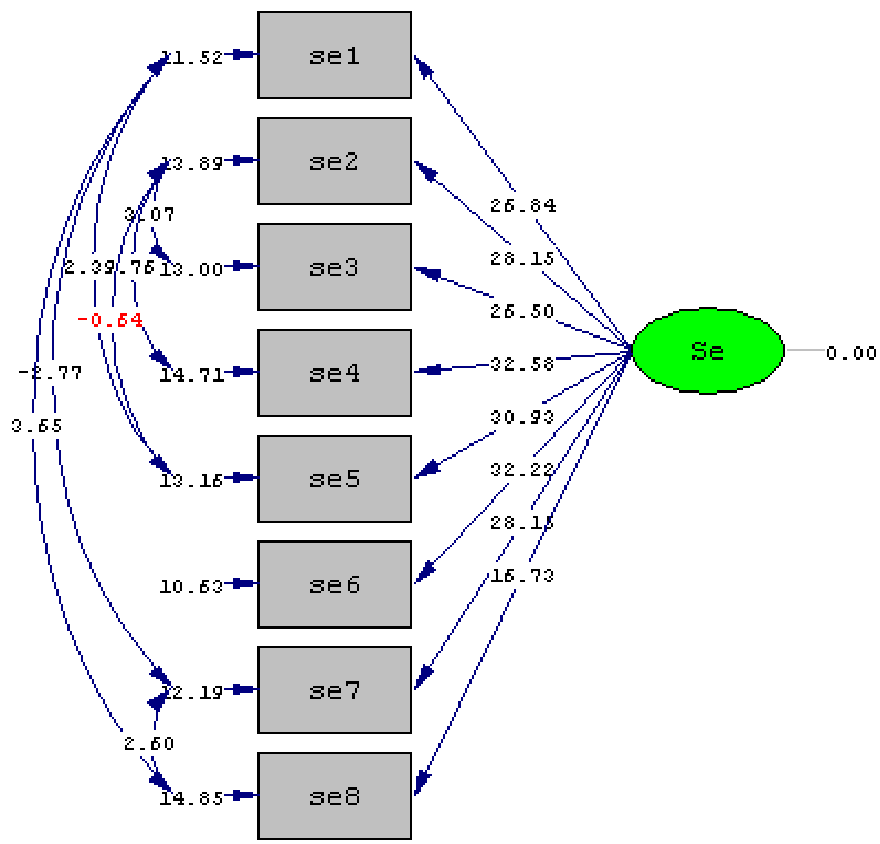
LISREL Estimates of Parameters for Self-Efficacy Scale

(Coefficients in Standardized Value and t-Values)

Coefficients in Standardized Value



Coefficients in t-Values



Chi-Square=17.22, df=13, P-value=0.18940, RMSEA=0.018

Goodness of Fit Statistics for Self-efficacy

Degrees of Freedom = 13
Minimum Fit Function Chi-Square = 37.77 (P = 0.00031)
Normal Theory Weighted Least Squares Chi-Square = 36.00 (P = 0.00059)
Satorra-Bentler Scaled Chi-Square = 17.22 (P = 0.19)
Chi-Square Corrected for Non-Normality = 26.73 (P = 0.014)
Estimated Non-centrality Parameter (NCP) = 4.22
90 Percent Confidence Interval for NCP = (0.0; 19.18)

Minimum Fit Function Value = 0.037
Population Discrepancy Function Value (F0) = 0.0041
90 Percent Confidence Interval for F0 = (0.0; 0.019)
Root Mean Square Error of Approximation (RMSEA) = 0.018
90 Percent Confidence Interval for RMSEA = (0.0; 0.038)
P-Value for Test of Close Fit (RMSEA < 0.05) = 1.00

Expected Cross-Validation Index (ECVI) = 0.062
90 Percent Confidence Interval for ECVI = (0.058; 0.077)
ECVI for Saturated Model = 0.071
ECVI for Independence Model = 9.96

Chi-Square for Independence Model with 28 Degrees of Freedom = 10120.10
Independence AIC = 10136.10
Model AIC = 63.22
Saturated AIC = 72.00
Independence CAIC = 10183.51
Model CAIC = 199.53
Saturated CAIC = 285.36

Normed Fit Index (NFI) = 1.00
Non-Normed Fit Index (NNFI) = 1.00
Parsimony Normed Fit Index (PNFI) = 0.46
Comparative Fit Index (CFI) = 1.00
Incremental Fit Index (IFI) = 1.00
Relative Fit Index (RFI) = 1.00

Critical N (CN) = 1637.81

Root Mean Square Residual (RMR) = 0.037
Standardized RMR = 0.013
Goodness of Fit Index (GFI) = 0.99
Adjusted Goodness of Fit Index (AGFI) = 0.98
Parsimony Goodness of Fit Index (PGFI) = 0.36

APPENDIX G

G. CFA FOR LEARNING STRATEGIES SCALE

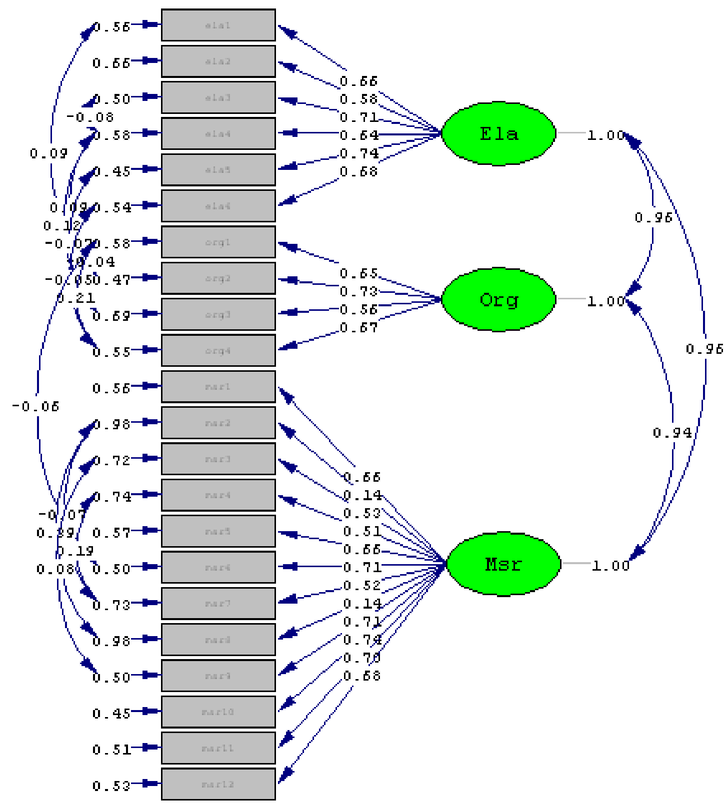
The SIMPLIS Syntax of CFA for Learning Strategies

```
Real Data Set
Observed Variables
ela1 ela2 ela3 ela4 ela5 ela6 org1 org2 org3 org4 msr1 msr2 msr3 msr4 msr5 msr6
msr7 msr8 msr9 msr10 msr11 msr12

Covariance matrix from File: learn.cov
Asymptotic covariance matrix from file: learn.acp
Sample Size = 1019

Latent Variables
Ela Org Msr

Relationships
ela1 ela2 ela3 ela4 ela5 ela6= Ela
org1 org2 org3 org4= Org
msr1 msr2 msr3 msr4 msr5 msr6 msr7 msr8 msr9 msr10 msr11 msr12= Msr

Set Error Covariance between ela4 and ela3 free
Set Error Covariance between org2 and ela1 free
Set Error Covariance between org2 and org1 free
Set Error Covariance between org3 and ela4 free
Set Error Covariance between org3 and ela5 free
Set Error Covariance between org4 and ela6 free
Set Error Covariance between org4 and org1 free
Set Error Covariance between msr6 and org1 free
Set Error Covariance between msr7 and msr2 free
Set Error Covariance between msr7 and msr4 free
Set Error Covariance between msr8 and msr2 free
Set Error Covariance between msr9 and msr3 free
Set Error Covariance between org2 and ela4 free

Path Diagram
End of problem
```

LISREL Estimates of Parameters for Learning Strategies Scale

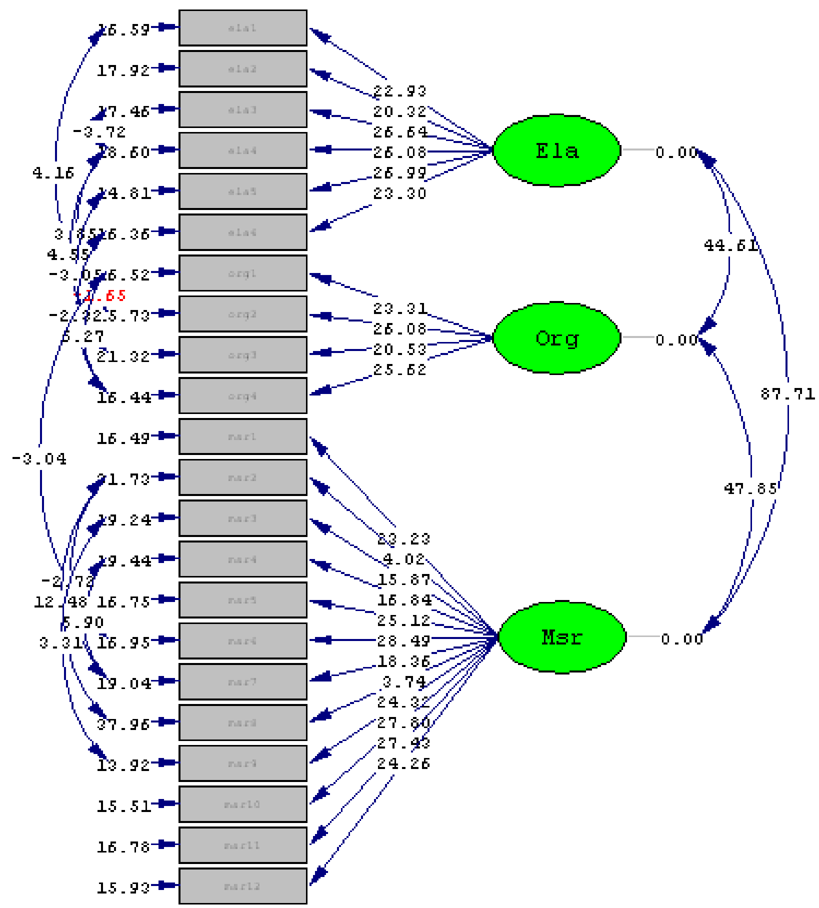
(Coefficients in Standardized Value and t-Values)

Coefficients in Standardized Value



Chi-Square=355.11, df=193, P-value=0.00000, RMSEA=0.029

Coefficients in t-Values



Chi-Square=355.11, df=193, P-value=0.00000, RMSEA=0.029

Goodness of Fit Statistics for Learning Strategies

Degrees of Freedom = 193
Minimum Fit Function Chi-Square = 505.30 (P = 0.0)
Normal Theory Weighted Least Squares Chi-Square = 522.29 (P = 0.0)
Satorra-Bentler Scaled Chi-Square = 355.11 (P = 0.00)
Chi-Square Corrected for Non-Normality = 464.69 (P = 0.0)
Estimated Non-centrality Parameter (NCP) = 162.11
90 Percent Confidence Interval for NCP = (113.08; 218.97)

Minimum Fit Function Value = 0.50
Population Discrepancy Function Value (F0) = 0.16
90 Percent Confidence Interval for F0 = (0.11; 0.22)
Root Mean Square Error of Approximation (RMSEA) = 0.029
90 Percent Confidence Interval for RMSEA = (0.024; 0.033)
P-Value for Test of Close Fit (RMSEA < 0.05) = 1.00

Expected Cross-Validation Index (ECVI) = 0.47
90 Percent Confidence Interval for ECVI = (0.42; 0.52)
ECVI for Saturated Model = 0.50
ECVI for Independence Model = 34.25

Chi-Square for Independence Model with 231 Degrees of Freedom = 34827.39
Independence AIC = 34871.39
Model AIC = 475.11
Saturated AIC = 506.00
Independence CAIC = 35001.77
Model CAIC = 830.71
Saturated CAIC = 2005.42

Normed Fit Index (NFI) = 0.99
Non-Normed Fit Index (NNFI) = 0.99
Parsimony Normed Fit Index (PNFI) = 0.83
Comparative Fit Index (CFI) = 1.00
Incremental Fit Index (IFI) = 1.00
Relative Fit Index (RFI) = 0.99

Critical N (CN) = 693.66

Root Mean Square Residual (RMR) = 0.12
Standardized RMR = 0.031
Goodness of Fit Index (GFI) = 0.96
Adjusted Goodness of Fit Index (AGFI) = 0.94
Parsimony Goodness of Fit Index (PGFI) = 0.73

APPENDIX H

H. APPROVAL OF THE ETHICS COMMITTEE

1956

Orta Doğu Teknik Üniversitesi
Middle East Technical University

Sosyal Bilimler Enstitüsü
Grad. Sch. of Social Sciences

06531 Ankara, Türkiye
Phone: +90 (312) 2102094
Fax: +90 (312) 2103705
www.sbe.metu.edu.tr

Sayı : B.30.2.ODT.0.41.72.00/2010/400- 426 ~~387~~
Konu : Fatma Kayan Fadlelmula hk.

18/01/2010

REKTÖRLÜK MAKAMI'NA,

İlköğretim Anabilim Dalı Doktora Programı öğrencisi **Fatma Kayan Fadlelmula'nın**, 2009-2010 eğitim-öğretim yılı II. döneminde "İlköğretim Öğrencilerinin Güdüsel İnanışları, Öz-Düzenleme Stratejileri ve Matematik Başarılarına İlişkin Bir Yapısal Model" başlıklı çalışmasına ilişkin olarak Ankara ilinde bulunan Milli Eğitim Bakanlığı'na bağlı ekte listesi verilen okullarda öğrenim gören yaklaşık 1000 ilköğretim 7. Sınıf öğrencisine uygulama yapması için görevlendirme başvurusu incelenmiş; ilgili Anabilim Dalı Başkanlığı'nın görüşüne dayanarak adı geçen öğrencinin isteği doğrultusunda görevlendirilmesi, Etik Komite onayı koşulu ile uygun görülmüştür.

Gereği için bilgilerinize saygılarımla sunarım.

Prof. Dr. Sencer AYATA
Sosyal Bilimler Enstitüsü Müdürü

Ekler: YKK
EABD görüşü
Öğrenciye ait ilgili evraklar

Etik Komite Onayı

Uygundur

19/01/2010

Prof. Dr. Canan ÖZGEN
Uygulamalı Etik Araştırma Merkezi
(UEAM) Başkanı
ODTÜ 06531 ANKARA

APPENDIX I

I. PERMISSION OF MINISTRY OF NATIONAL EDUCATION

EĞİTİM
FAKÜLTESİ DEKANLIĞI
Ev. Arş. Md. Saat :

T.C.
ANKARA VALİLİĞİ
Milli Eğitim Müdürlüğü

BÖLÜM : İstatistik Bölümü
SAYI : B.B.08.4.MEM.4.06.00.06-312/ 12227_198 11/02/2010
KONU : Araştırma İzni
Fatma KAYAN FADLELMULA

ORTA DOĞU TEKNİK ÜNİVERSİTESİNE
(Eğitim Fakültesi)

İlgi : a) MEB Bağlı Okul ve Kurumlarda Yapılacak Araştırma ve Araştırma Desteğine Yönelik İzin ve Uygulama Yönergesi.
b) Üniversiteniz Eğitim Fakültesinin 25/01/2010 tarih ve 1153 sayılı yazısı.

Üniversiteniz İlköğretim Anabilim Dalı Doktora öğrencisi Fatma KAYAN FADLELMULA' nın **"İlköğretim öğrencilerinin güdüsel inanışları, öz-düzenleme stratejileri ve matematik başarılarına ilişkin bir yapısal model"** konulu tez ile ilgili çalışma yapma isteği Müdürlüğümüzce uygun görülmüş ve araştırmanın yapılacağı İlçe Milli Eğitim Müdürlüğüne bilgi verilmiştir.

Mühürlü anketler (7 sayfadan oluşan) ekte gönderilmiş olup, uygulama yapılacak sayıda çoğaltılması ve çalışmanın bitiminde iki örneğinin (CD/disket) Müdürlüğümüz İstatistik Bölümüne gönderilmesini rica ederim.

Gülçin UYSAL
Müdür a.
Müdür Yardımcısı

EKLER :
Anket (7 sayfa)

18.02.10 003647

18/02 İÖB'ne

İl Milli Eğitim Müdürlüğü-Beşevler
Strateji Geliştirme Bölümü
Bilgi İçin: Kamil COŞGUN

Tel : 215 15 43- 413 36 66- 212 66 40/110
Fax: 215 15 43
strateji06@meb.gov.tr

APPENDIX J

J. STRUCTURAL EQUATION MODEL

The SIMPLIS Syntax of SEM

```
Real Data Set
Observed Variables
Ach mgo1 mgo2 mgo3 mgo4 mgo5 papgo1 papgo2 papgo3 papgo4 papgo5 pavgo1
pavgo2 pavgo3 pavgo4 cmgs1 cmgs2 cmgs3 cmgs4 cmgs5 cmgs6 cpapgs1 cpapgs2
cpapgs3 cpavgs1 cpavgs2 cpavgs3 cpavgs4 cpavgs5 se1 se2 se3 se4 se5 se6 se7 se8
ela1 ela2 ela3 ela4 ela5 ela6 org1 org2 org3 org4 msr1 msr2 msr3 msr4 msr5 msr6
msr7 msr8 msr9 msr10 msr11 msr12

Covariance matrix from File: model.cov
Asymptotic covariance matrix from file: model.acp
Sample Size = 1019

Latent Variables
Mach Mgo Papgo Pavgo Cmgs Cpapgs Cpavgs Se Ela Org Msr

Relationships
Ach = 1*Mach
mgo1 mgo2 mgo3 mgo4 mgo5= Mgo
papgo1 papgo2 papgo3 papgo4 papgo5= Papgo
pavgo1 pavgo2 pavgo3 pavgo4= Pavgo
cmgs1 cmgs2 cmgs3 cmgs4 cmgs5 cmgs6= Cmgs
cpapgs1 cpapgs2 cpapgs3= Cpapgs
cpavgs1 cpavgs2 cpavgs3 cpavgs4 cpavgs5= Cpavgs
se1 se2 se3 se4 se5 se6 se7 se8= Se
ela1 ela2 ela3 ela4 ela5 ela6= Ela
org1 org2 org3 org4= Org
msr1 msr2 msr3 msr4 msr5 msr6 msr7 msr8 msr9 msr10 msr11 msr12= Msr

Mgo= Cmgs Se
Papgo= Pavgo Cpapgs Se
Pavgo= Papgo Cpavgs
Ela= Mgo Se Org
Org= Mgo Se
Msr= Ela
Mach = Se Ela Org Msr

Set Error Variance of Ach to 0
Set Error Covariance between mgo5 and mgo3 free
```

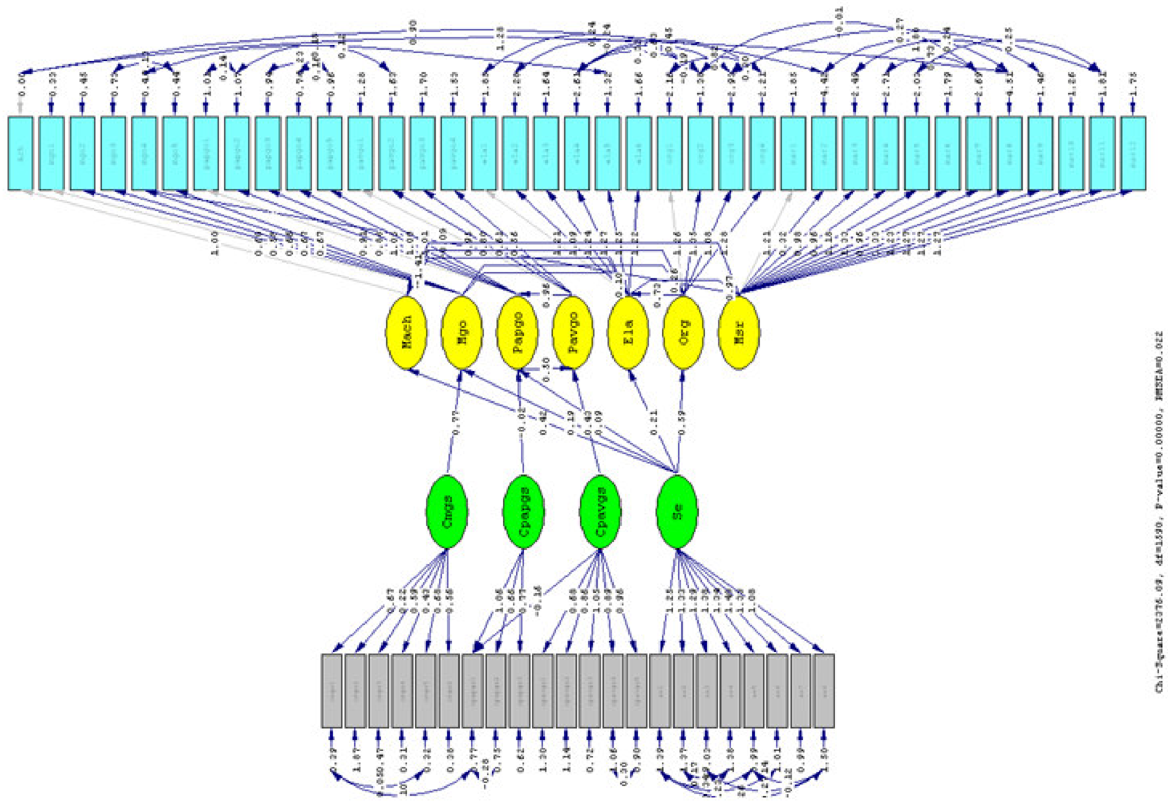
Set Error Covariance between papgo5 and papgo3 free
Set Error Covariance between cpapgs2 and cpapgs1 free
Set Error Covariance between cpavgs1 and pavgo4 free
Set Error Covariance between cpavgs5 and cpavgs4 free
Set Error Covariance between se4 and se2 free
Set Error Covariance between se5 and se1 free
Set Error Covariance between se8 and se1 free
Set Error Covariance between org2 and org1 free
Set Error Covariance between org3 and ela4 free
Set Error Covariance between org4 and org1 free
Set Error Covariance between msr7 and msr4 free
Set Error Covariance between msr8 and Ach free
Set Error Covariance between msr7 and org2 free
Set Error Covariance between msr8 and msr2 free
Set Error Covariance between papgo5 and papgo4 free
Set Error Covariance between papgo2 and papgo1 free
Set Error Covariance between pavgo2 and papgo2 free
Set Error Covariance between org2 and ela2 free
Set Error Covariance between org2 and ela4 free
Set Error Covariance between msr2 and Ach free
Set Error Covariance between org4 and ela4 free
Set Error Covariance between se8 and se3 free
Set Error Covariance between se6 and se1 free
Set Error Covariance between se3 and se2 free
Set Error Covariance between cpapgs1 and cmgs1 free
Set Error Covariance between ela5 and mgo4 free
Set Error Covariance between org2 and ela1 free
Set Error Covariance between org4 and org3 free
Set Error Covariance between msr9 and msr3 free
Set Error Covariance between msr11 and org3 free
Set Error Covariance between msr11 and msr5 free
Set Error Covariance between cmgs1 and mgo4 free
Set Error Covariance between cmgs5 and cmgs1 free
Set Error Covariance between cpavgs3 and pavgo2 free
Set Error Covariance between cpavgs4 and pavgo3 free
Set Error Covariance between se6 and se5 free
Set Error Covariance between se8 and se5 free

Path Diagram
Admissibility Check = OFF
End of problem

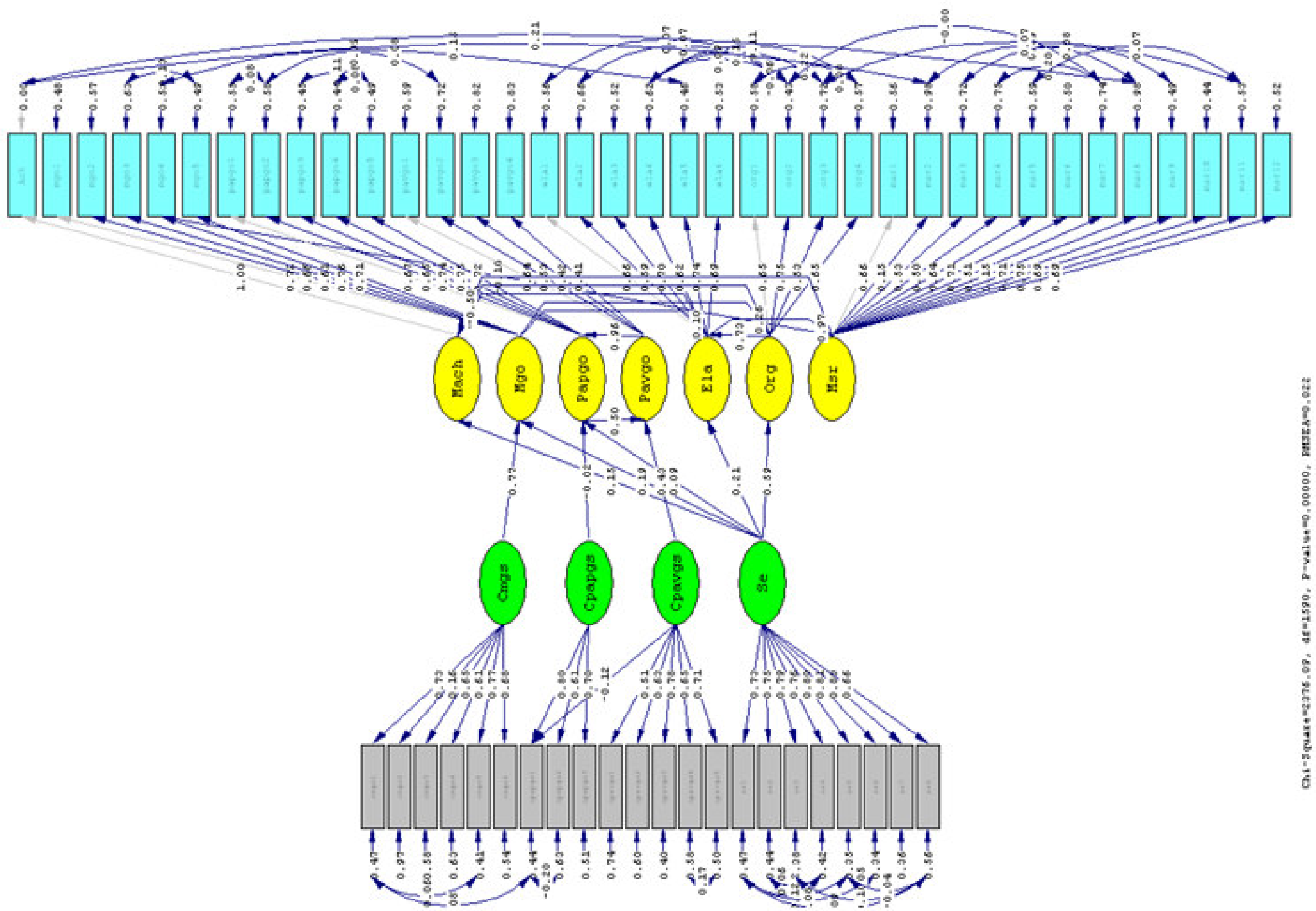
LISREL Estimates of Parameters

(Basic Model with Estimates, Standardized Solution and t-Values)

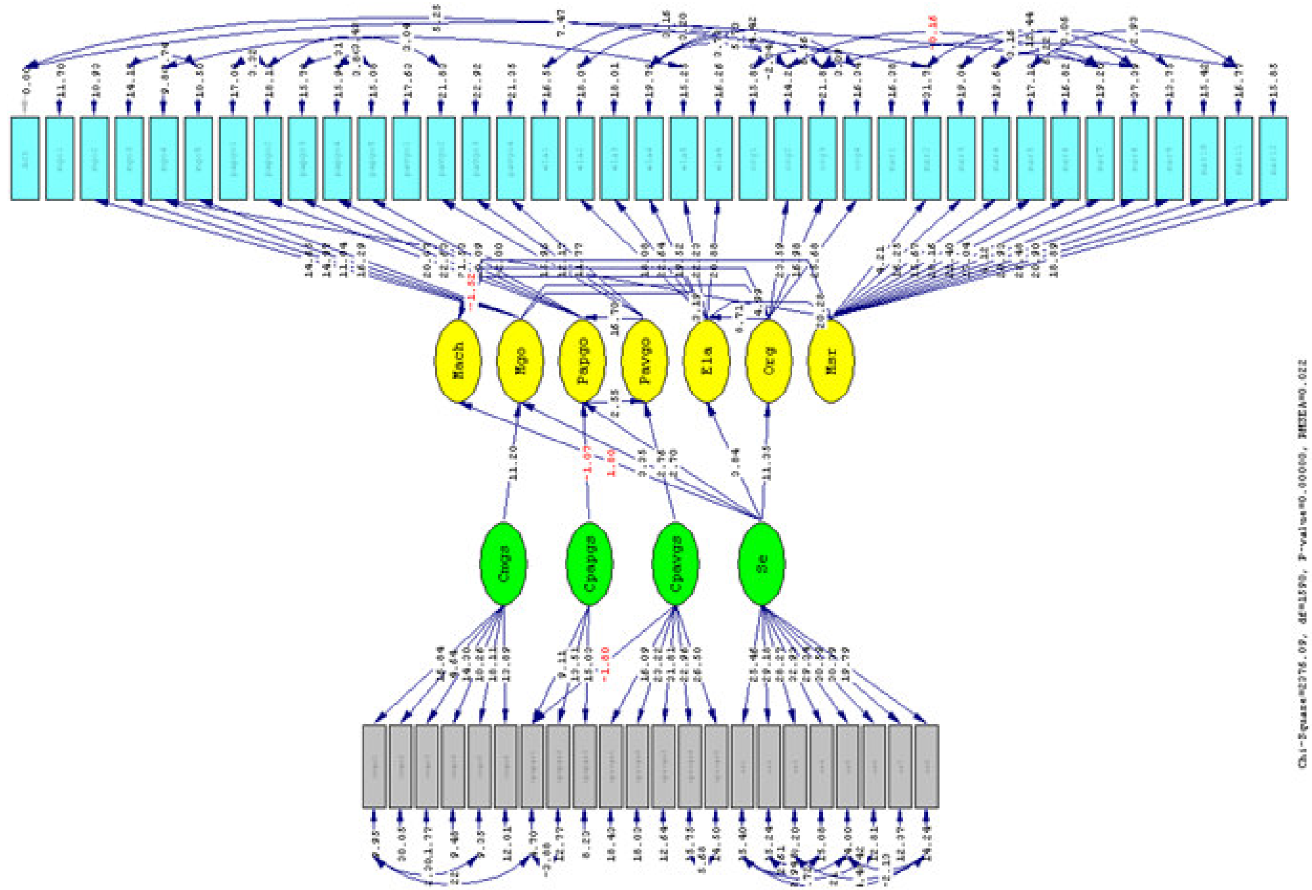
Basic Model with Estimates



Basic Model with Standardized Solution



Basic Model with t-Values



Goodness of Fit Statistics for SEM

Degrees of Freedom = 1590
Minimum Fit Function Chi-Square = 3005.18 (P = 0.0)
Normal Theory Weighted Least Squares Chi-Square = 3111.99 (P = 0.0)
Satorra-Bentler Scaled Chi-Square = 2376.09 (P = 0.0)
Estimated Non-centrality Parameter (NCP) = 786.09
90 Percent Confidence Interval for NCP = (659.22; 920.90)

Minimum Fit Function Value = 2.95
Population Discrepancy Function Value (F0) = 0.77
90 Percent Confidence Interval for F0 = (0.65; 0.90)
Root Mean Square Error of Approximation (RMSEA) = 0.022
90 Percent Confidence Interval for RMSEA = (0.020; 0.024)
P-Value for Test of Close Fit (RMSEA < 0.05) = 1.00

Expected Cross-Validation Index (ECVI) = 2.69
90 Percent Confidence Interval for ECVI = (2.56; 2.82)
ECVI for Saturated Model = 3.48
ECVI for Independence Model = 130.31

Chi-Square for Independence Model with 1711 Degrees of Freedom = 132532.57
Independence AIC = 132650.57
Model AIC = 2736.09
Saturated AIC = 3540.00
Independence CAIC = 133000.23
Model CAIC = 3802.87
Saturated CAIC = 14030.04

Normed Fit Index (NFI) = 0.98
Non-Normed Fit Index (NNFI) = 0.99
Parsimony Normed Fit Index (PNFI) = 0.91
Comparative Fit Index (CFI) = 0.99
Incremental Fit Index (IFI) = 0.99
Relative Fit Index (RFI) = 0.98

Critical N (CN) = 739.67

Root Mean Square Residual (RMR) = 0.11
Standardized RMR = 0.043
Goodness of Fit Index (GFI) = 0.91
Adjusted Goodness of Fit Index (AGFI) = 0.90
Parsimony Goodness of Fit Index (PGFI) = 0.81

APPENDIX K

K. TURKISH SUMMARY

Giriş

Günümüzde bilginin hızlı bir şekilde artması, bireylerin hem okul hem de iş yaşamında yeni bilgi ve becerilere sahip olması ihtiyacını gündeme getirmiştir (Heo, 1999). Özellikle, bilginin temel yapısındaki değişiklikler, eğitim programlarının yeniden gözden geçirilmesine neden olmuş, bilgi yüklemeye yönelik geleneksel eğitim anlayışı yerine öğrenciyi merkeze alan yaklaşımların ön plana çıkmasını gerektirmiştir (Schoenfeld, 1992). Bu bağlamda öğrenme süreci üzerinde aktif rol alabilen, sorumluluk üstlenebilen, hedefler belirleyebilen, neyi, ne zaman, nasıl yapacağına karar verebilen ve kararlarını gerçekleştirebilen bireylerin yetiştirilmesi önem kazanmıştır (Boekaerts, 1999).

Eğitim alanında yapılan araştırmalarda öğrencilerin öğrenme süreci üzerinde aktif rol alması konusu "öz-düzenleme" kavramını gündeme getirmiştir. Genel anlamada, öz-düzenleme zihinsel bir yetenek veya akademik çalışma becerisi olmaktan ziyade öğrencinin öğrenmeye yönelik amaçlar oluşturduğu, bu amaçları gerçekleştirmeye yönelik stratejiler belirlediği ve stratejilerin sonuçlarını izleyip değerlendirdiği döngüsel bir süreç olarak tanımlanmaktadır (Pintrich, 2005). Bu süreç içerisinde öğrenciler öğrenmeyi kendilerine sağlanan bir aktivite olarak değil de, kendi kendilerine yaptıkları bir aktivite olarak görmekte (Zimmerman ve Martinez-Pons, 1990), bilişlerini, güdülerini ve davranışlarını düzenleyerek öğrenme sürecinde aktif ve yapıcı bir rol oynamaktadır (Zimmerman, 2005).

Bilişsel açıdan, öğrenciler herhangi bir akademik görevle karşılaşınca işin gereklerini yerine getirebilmek için kendi bilgi ve becerilerini gözden geçirirler (Winne, 2001), plan yaparlar, kendi kendilerini izler ve öz-değerlendirmeler yaparlar (Zimmerman ve Martinez-Pons, 1992). Davranışsal açıdan, öğrenciler en iyi öğrenebilecekleri öğrenme ortamlarını hazırlar (Linnenbrink ve Pintrich, 2002), zamanı etkili bir şekilde kullanırlar (Lester, 1994). Güdüsel açıdan ise öğrenciler kendi hedeflerini belirler (Pintrich, 2000), yüksek düzeyde öz-yeterlik inancına sahiptirler (Bandura, 1997) ve gerçekleştereceklери göreve oldukça değer verirler (Bong, 2001).

Öz-düzenlemeye dayalı öğrenme üzerinde çalışan kuramcılar, söz konusu becerinin geliştirilip ölçülmesine yönelik çeşitli modeller ortaya koymuşlardır (örneğin; Boekaerts (1997), Pintrich ve De Groot (1990), Winne (2001) ve Zimmerman (1989)). Her ne kadar bu modeller kendi aralarında bir çok farklılıklar gösterse ve farklı değişkenler üzerinde durulsa da, genel olarak birçoğu iki temel boyut üzerinde durmaktadır. Bu boyutlar, 'öz-düzenleme stratejileri've 'güdüsel inançlar'dır.

Genel olarak, öz-düzenleme stratejileri öğrencilerin materyalleri anlamak, hatırlamak ve öğrenmek için kullandıkları tekrarlama, ayrıntılandırma ve örgütleme gibi bilişsel stratejilerin yanı sıra bilişlerini planlamak, izlemek ve düzenlemek için kullandıkları bilişüstü stratejileri kapsamaktadır (Pintrinch ve De Groot, 1990).Yapılan araştırmalar sadece öz-düzenleme stratejileri kullanmanın öğrencilerin başarılarını arttırmak için yeterli olmadığını, bunların yanında öğrencilerin bu stratejileri kullanmak için güdülenmeleri gerektiğini göstermektedir (Anderman ve Maher, 1994; Elliot ve Harackietwicz, 1996; Greene ve Miller, 1996; Pintrich, 1989).

Öz-düzenleme sürecinde öğrencilerin güdülenmesine yardımcı olan en önemli öğelerden biri güdüsel inançlarıdır. Güdüsel inançlar, öğrencilerin olgulara, olaylara ve konu alanına ilişkin sahip oldukları fikirler ve değer yargılarını içerir (Boekaerts, 1999). Güdüsel inançlar başlıca hedef yönelimi, amaca odaklanma, görev değeri ve öz-yeterlik gibi öğrencinin kendisiyle ilgili inanışlarının yanı sıra (Pintrich ve De Groot, 1990) derse yönelik hedeflerin algılanması gibi sınıf içerisindeki algılarını da içermektedir (Midgley ve diğerleri, 2000). Yapılan araştırmalar, özellikle hedef yönelimi ve öz-yeterlik ile öz-düzenleme strateji kullanımı arasında yüksek bir korelasyon olduğunu ortaya koymuştur (Pintrich ve De Groot, 1990).

Öz-yeterlik bireyin bir işi gerçekleştirebilme ve başarabilme yeteneği konusundaki yargılarını ifade etmektedir (Pajares, 2002). Öğrencilerin öz-yeterlik inancı, onların öğrenme işlevini başarılı bir şekilde yerine getirebilmek için gerekli davranışları gösterecekleri konusundaki inanışları olarak tanımlanmaktadır (Bandura, 1997). Bu konuda yapılan çalışmalar, öz-düzenleme becerilerine sahip olan öğrencilerin yüksek derecede öz-yeterlik inancına sahip olduklarını göstermektedir (Linnenbrink ve Pintrich, 2002; Zimmerman ve Martinez-Pons,1990; Garcia ve Pintrich, 1991).

Hedef yönelimi ise öğrencilerin öğrenmeye yönelik tutumu ya da amaçları olarak tanımlanabilir (Dweck ve Elliot, 1988). Bu konuda yapılan ilk çalışmalar öğrenme yönelimi ve performans yönelimi olmak üzere iki tip hedef yönelimi üzerine yoğunlaşmıştır. İlkinde temel amaç derste sunulan konuları tam olarak öğrenmek ve bu konularda uzmanlaşmak iken ikincisinde temel amaç sınıfta diğer öğrencilere ve öğretmene performanslarını göstermek ve ne kadar başarılı olduğunu kanıtlamaktır (Harackiewicz ve diğerleri, 2002). Yapılan araştırmalar öğrenme yönelimine sahip öğrencilerin hata yapmaktan çekinmediklerini, aksine bunu öğrenmenin bir parçası olarak gördüklerini (Diener ve Dweck, 1980), yüksek öğrenme güdüsüne sahip olduklarını ve öğrenirken değişik stratejiler kullandıklarını (Pintrich, 2000) göstermiştir. Bunun yanında, performan yönelimine sahip öğrenciler üzerinde yapılan araştırmalar ise akademik başarı yönünden kimi zaman olumlu (Ames ve Archer, 1988; Ames, 1992; Elliot ve Church, 1997; Linnenbrink ve Pintrich, 2002; Pintrich ve Schunk, 2002) kimi zaman olumsuz (Elliot ve Church, 1997; Harackiewicz ve diğerleri, 2002; Pintrich, 2000) sonuçlar vermiştir.

Günümüzde performans yönelimi, performans yaklaşma ve performans kaçınma olmak üzere iki alt boyutta incelenmektedir. Genel olarak, performans yaklaşma yönelimi olan öğrenciler sınıfta en yüksek notu alma ve en iyi olma çabası gösterirken performans kaçınma yönelimi olan öğrenciler sınıfta aptal durumuna düşmeme ve anlamadıklarını saklama gayreti içinde bulunmuşlardır (Elliot ve Church, 1997; Pajares, 2001). Alan yazınında genellikle olumsuz akademik davranışlarla ilişkilendirilen performans kaçınma yönelimi, öz-yeterlik ile negatif, sınav kaygısı ve düşük not ile pozitif yönde ilişkili bulunmuştur (Elliot ve McGregor, 2001; Elliot ve Church, 1997; Kaplan et al, 2002). Bunun yanında bazı çalışmalarda başarı gibi olumlu akademik sonuçlarla ilişkilendirilen performans yaklaşma yönelimi (Linnenbrink, 2005), bazı çalışmalarda kolay ödevleri tercih etme, zor durumlarda kolayca pes etme, yardım istemekten kaçınma ve ezber kullanma gibi olumsuz akademik davranışlarla ilişkilendiriliştir (Elliott ve Harackiewicz, 1996; Kaplan ve diğerleri, 2002; Wolters, 2004). Son yıllarda yapılan araştırmalarda öğrenme yönelimi için de yaklaşma ve kaçınma ayrımı yapılması gerektiği savunulsa da (Elliot, 1999; Pintrich, 2000; Pintrich ve Schunk, 2002) bu ayrışmanın öğrenme üzerine etkisi tam olarak anlaşılmamıştır.

Araştırmanın Amacı

Bu çalışmanın genel amacı ilköğretim matematik eğitimi ile ilgili bazı bilişsel, davranışsal ve güdüsel kavramları bir araya getirip bu kavramlar arasındaki doğrudan ve dolaylı ilişkileri açıklayan bir yapısal eşitlik modeli oluşturmaktır. Bu bağlamda, öğrencilerin matematik eğitimi ile ilgili hedef yönelimleri, derse yönelik hedef algıları, öz-yeterlik inanışları, öz-düzenleme strateji kullanımları ile akademik başarıları arasındaki ilişki incelenmiştir.

Araştırmanın Önemi

Son yıllarda akademik başarı ile ilgili yapılan çalışmaların odak noktasını öğrencilerin kendi öğrenme süreci üzerinde etkin rol oynadığı öz-düzenleme kavramı oluşturmuştur. Ancak, çeşitli öğretim kademelerinde yapılan ulusal ve uluslararası çalışmalar, öğrencilerin en çok korku duyduğu ve başarısızlık gösterdiği derslerden birinin matematik olduğunu vurgulamaktadır (Ryan ve Patrick, 2001; Turner ve diğerleri, 1998; Üredi ve Üredi, 2005). Bu durumda, öğrencilerin matematik dersindeki başarısızlık durumunu önlemek için öğrenme süreci ve akademik başarı ile ilgili değişkenlerin ortaya konulması gerekmektedir. Bu anlamda, elde edilen bulguların ilköğretim öğrencilerinin matematik başarısını arttırmaya yönelik yapılacak çalışmalara ışık tutacağı düşünülmektedir. Özellikle, öğrencilerin matematik öğrenme motivasyonlarını artırmada ve öz-düzenleyici öğrenmelerini desteklemede hem teorik hem de pratik bilgiler sunacaktır.

Ayrıca, çalışma kapsamında ilköğretim matematik eğitimi ile ilgili çeşitli bilişsel, davranışsal ve güdüsel kavramları bir araya getiren bir ölçek hazırlanmıştır. Bu amaçla, alan yazınında sıkça kullanılmakta olan Uyumsal Öğrenme Örüntüleri Ölçeği (PALS) ile Güdülenme ve Öğrenme Stratejileri Ölçeği'ne (MSLQ) ait bazı alt boyutlar Türkçe'ye uyarlanmıştır. Geliştirilen bu ölçeğin ilköğretim öğrencilerinin matematik başarısını arttırmaya yönelik yapılacak çalışmalarda geçerli ve güvenilir bir kaynak olacağı düşünülmektedir.

Yöntem

Katılımcılar

Araştırmanın evreni, Ankara'daki tüm 7. sınıf ilköğretim öğrencileridir. Araştırmanın örneklemi ise Ankara'nın farklı merkezî ve kırsal ilçelerinde devlet okullarına devam eden 1019 yedinci sınıf öğrencisinden oluşmaktadır. Bu ilçeler başlıca Çankaya, Etimesgut, Keçiören ve Yenimahalle'dir. Katılımcılara ait demografik bilgiler Tablo 1'de özetlenmiştir.

Tablo 1 Katılımcılara Ait Demografik Bilgiler

İlçeler	Okullar	Sınıflar	Cinsiyet		Sınıfta Toplam Katılımcı	Okulda Toplam Katılımcı	İlçede Toplam Katılımcı
			Erkek	Kız			
Çankaya	A Okulu	A Sınıfı	7	6	13	29	360
		B Sınıfı	10	6	16		
	B Okulu	A Sınıfı	9	12	21	21	
		A Sınıfı	21	18	39	113	
	C Okulu	B Sınıfı	19	15	34		
		C Sınıfı	33	7	40		
	D Okulu	A Sınıfı	12	10	22	71	
		B Sınıfı	9	10	19		
		C Sınıfı	18	12	30		
	E Okulu	A Sınıfı	10	5	15	15	
	F Okulu	A Sınıfı	14	13	27	111	
		B Sınıfı	16	12	28		
		C Sınıfı	13	15	28		
		D Sınıfı	14	14	28		
Etimesgut	G Okulu	A Sınıfı	21	18	39	84	203
		B Sınıfı	23	22	45		
	H Okulu	A Sınıfı	14	16	30	119	
		B Sınıfı	16	15	31		
		C Sınıfı	13	14	27		
		D Sınıfı	15	16	31		
Keçiören	I Okulu	A Sınıfı	15	10	25	151	283
		B Sınıfı	15	16	31		
		C Sınıfı	15	16	31		
		D Sınıfı	10	23	33		
		E Sınıfı	16	15	31		
	J Okulu	A Sınıfı	22	18	40	132	
		B Sınıfı	18	13	31		
		C Sınıfı	18	14	32		
		D Sınıfı	17	12	29		
Yenimahalle	K Okulu	A Sınıfı	15	17	32	173	173
		B Sınıfı	17	19	36		
		C Sınıfı	18	18	36		
		D Sınıfı	20	14	34		
		E Sınıfı	15	20	35		
Toplam	11 okul	34 sınıf	538	481	1019	1019	1019

Çalışmada Çankaya ilçesindeki 6 okuldan (360 öğrenci; %35,5), Etimesgut ilçesindeki 2 okuldan (208 öğrenci; %20), Keçiören ilçesindeki 2 okuldan (283 öğrenci; %27,7) ve Yenimahalle ilçesindeki 1 okuldan (173 öğrenci; %17) olmak üzere toplam 11 devlet okulundan veri toplanmıştır. Veriler toplam 34 sınıfta öğrencilerin normal ders saatleri sırasında toplanmıştır. Sınıfların mevcutları 13 ile 45 arasında değişmektedir. Öğrencilerin 481'i kız (%47,2), 538'i (%52,8) erkektir.

Veri Toplama Aracı

Veri toplama aracı olarak bir ölçek ve bir matematik başarı testi uygulanmıştır. Ölçek katılımcıların matematik dersi ile ilgili hedef yönelimlerini, ders ortamına yönelik hedef algılarını, öz-yeterlik inanışlarını, öğrenme stratejilerini kullanımlarını ve bazı kişisel bilgilerini ölçmektedir. Toplam 58 maddeden oluşan ölçek hazırlanırken ilgili alanda daha önceden geliştirilmiş Uyumsal Öğrenme Örüntüleri Ölçeği (PALS; Patterns of Adaptive Learning Survey) ile Güdülenme ve Öğrenme Stratejileri Ölçeği'nden (MSLQ; Motivated Strategies for Learning Questionnaire) yararlanılmıştır.

Uyumsal Öğrenme Örüntüleri Ölçeği, Midgley ve arkadaşları tarafından 2000 yılında geliştirilmiş ve eğitim alanında ilköğretimden yükseköğretime kadar birçok seviyede kullanılmıştır. Ölçek genel olarak öğrenme ortamının doğası ile öğrencilerin güdüleri, inanışları ve davranışları arasındaki ilişkileri ölçmek için geliştirilmiştir. Ölçek, öğrenci ölçeği ve öğretmen ölçeği olmak üzere iki ana boyuttan oluşmaktadır. Öğrenci ölçeği başlıca öğrencilerin kişisel hedef yönelimlerini, derse yönelik hedef algılarını, öğretmenlere yönelik hedef algılarını, akademik algılarını ve aile ile çevrelerine yönelik algıları ölçmektedir. Benzer şekilde, öğretmen ölçeği ise öğretmenlerin okula yönelik hedef algılarını, derse yönelik hedeflerini ve kişisel öğretim etkinliklerini ölçmektedir.

Güdülenme ve Öğrenme Stratejileri Ölçeği ise Pintrich ve arkadaşları tarafından 1991 yılında geliştirilmiş ve genellikle yükseköğretim seviyesinde kullanılmıştır. Ölçek, güdüsel inançlar ve öğrenme stratejileri olmak üzere iki ana boyuttan oluşmaktadır. Güdüsel inançlar boyutu başlıca hedef yönelimi, amaca odaklanma, görev değeri ve öğrenme inanışlarının kontrolü gibi konuları ölçmektedir. Öğrenme stratejileri boyutu ise tekrarlama, ayrıntılandırma, örgütleme, kritik düşünme gibi bilişsel stratejilerin yanı sıra bilişüstü öz-düzenleme stratejileri ile zaman ve çalışma çevresi yönetimi gibi stratejileri ölçmektedir.

Tablo 2'de ölçekte ölçülen boyutlara ait bilgiler özetlenmiştir. Öğrencilerin matematik dersi ile ilgili hedef yönelimleri, matematik öğrenmeye yönelik tutumları ya da amaçları olarak da tanımlanmaktadır. Bu çalışmada, öğrencileri hedef yönelimleri Uyumsal Öğrenme Örüntüleri Ölçeği'nden yararlanılarak ölçülmüştür. 'Kesinlikle katılıyorum', 'katılıyorum', 'biraz katılıyorum', 'katılmıyorum', ve 'kesinlikle katılmıyorum' şeklinde 5'li Likert tipinde derecelendirilen 14 madde üç alt boyutta incelenmiştir. Alt boyutlar başılca şunlardır: (1) Öğrenme yönelimi (örn: Bu yılki matematik dersinde birçok yeni kavram öğrenmek benim için önemlidir; Matematik dersinde işlediğimiz konuları eksiksiz anlamak benim için önemlidir), (2) Performans yaklaşma yönelimi (örn: Matematik dersindeki hedeflerimden biri, arkadaşlarıma bu derste iyi olduğumu göstermektir; Sınıftaki diğer öğrencilere göre zeki görünmek benim için önemlidir), (3) Performans kaçınma yönelimi (örn: Matematik dersini anlamıyormuş gibi görünmek istemem; Matematik dersindeki bir amacım, bu derste zorlanıyormuş gibi görünmemektir). Orjinal çalışmada yapılan iç tutarlılık testleri sonucu Cronbach alpha katsayıları sırasıyla 0.85, 0.89, 0.74 olarak hesaplanmıştır. Bu çalışmada ise alpha güvenirlik katsayıları sırasıyla 0.82, 0.86, 0.61 olarak hesaplanmıştır.

Benzer şekilde, öğrencilerin matematik dersinin hedeflerini nasıl algıladıkları da Uyumsal Öğrenme Örüntüleri Ölçeği'nden yararlanılarak ölçülmüştür. 5'li Likert tipinde derecelendirilen 14 madde üç alt boyutta incelenmiştir. Alt boyutlar başılca şunlardır: (1) Öğrenme yönelimli ders ortamı (örn: Matematik dersimizde asıl amaç, derste işlenen konuları hakkıyla anlamaktır; Matematik dersimizde bir şeyler öğrendiğimiz sürece yanlış yapmamız problem değildir), (2) Performans yaklaşma yönelimli ders ortamı (örn: Matematik dersimizde asıl hedef, iyi not almaktır;

Matematik dersimizde soruları doğru cevaplamak çok önemlidir), (3) Performans kaçınma yönelimli ders ortamı (örn: Matematik dersimizde başarısız gibi görünmemek çok önemlidir; Matematik dersimizde arkadaşlarının önünde hata yapmamak önemlidir). Orjinal çalışmada sırasıyla 0.76, 0.70, 0.83 olarak hesaplanan alpha katsayıları, bu çalışmada 0.71, 0.67, 0.80 olarak hesaplanmıştır.

Öğrencilerin, matematiği öğrenmeye yönelik öz-yeterlik inanışları ise Güdülenme ve Öğrenme Stratejileri Ölçeği'nden yararlanılarak ölçülmüştür. Öz-yeterlik kavramı genel olarak öğrencilerin öğrenme işlevini başarılı bir şekilde yerine getirebilme konusundaki yargılarını ifade etmektedir. Bu kavramı ölçmek üzere 'beni tam olarak yansıtıyor', 'beni biraz yansıtıyor', 'beni hiç yansıtmıyor' şeklinde 7'li Likert tipinde derecelendirilen 8 madde kullanılmıştır (örn: Matematik dersinin en zor konuları bile öğrenebileceğimden eminim; Matematik dersinde başarılı olacağımı düşünüyorum). Orjinal çalışmada 0.93 olarak hesaplanan alpha güvenirlik katsayısı, bu çalışmada 0.92 olarak hesaplanmıştır.

Öğrencilerin matematik öğrenimleri sırasında kullandıkları öz-düzenleme stratejileri de Güdülenme ve Öğrenme Stratejileri Ölçeği'nden yararlanılarak ölçülmüştür. 7'li Likert tipinde derecelendirilen 22 madde üç alt boyutta incelenmiştir. Alt boyutlar başılca şunlardır: (1) Ayrıntılandırma (örn: Matematik dersine çalışırken, ders notları, kitaplar ve sınıfta konuşulanlar gibi farklı kaynaklardan edindiğim bilgileri bir araya getiririm; Çalıştığım matematik konularının, önceden bildiğim konularla bağlantısını kurmaya çalışırım), (2) Örgütleme (örn: Matematik dersinde verilen kaynaklara çalışırken, düşüncelerimi düzenlemeye yardımcı olması için konuların başlıklarını ve alt başlıklarını çıkarırım; Matematik dersine çalışırken, okuduğum bilgilerin ve derste tuttuğum notların üzerinden geçip en önemli noktaları bulmaya çalışırım, (3) Bilişüstü öz-düzenleme (örn: Matematik çalışırken, kendime konuya odaklanmama yardımcı olacak sorular sorarım; Matematik çalışırken anlamakta zorlandığımda, çalışma yöntemimi değiştiririm). Orjinal çalışmada sırasıyla 0.76, 0.64, 0.79 olarak hesaplanan alpha güvenirlik katsayıları, bu çalışmada 0.83, 0.78, 0.84 olarak hesaplanmıştır.

Dolayısıyla, öğrenme strateji kullanımı ile ilgili alt boyutlar için elde edilen katsayı değerleri orjinal ölçekte elde edilenlerden daha yüksektir.

Tablo 2 Ölçekte Ölçülen Boyutlara Ait Özet Bilgiler

Boyutlar	Alt Boyutlar	Madde Sayısı	Güvenilirlik (Cronbach Alpha)	
			Orjinal	Bulgu
Hedef Yönelimi	Öğrenme Yönelimi (Mastery Goal Orientation: MGO)	5	0,85	0,81
	Performans YaklaşmaYönelimi (Performance Approach Goal Orientation: PAPGO)	5	0,89	0,85
	Performans Kaçınma Yönelimi (Performance Avoidance Goal Orientation: PAVGO)	4	0,74	0,61
Derse Yönelik Hedef Algılama	Öğrenme Yönelimli Ortam (Classroom Mastery Goal Structure: CMGS)	6	0,76	0,71
	Performans Yaklaşma Yönelimli Ortam (Classroom Performance Approach Goal Structure: CPAPGS)	3	0,70	0,66
	Performans Kaçınma Yönelimli Ortam (Classroom Performance Avoidance Goal Structure: CPAVGS)	5	0,83	0,80
Öz-Yeterlik	Öz-Yeterlik (SE)	8	0,93	0,92
Öğrenme Stratejileri	Ayrıntılandırma (Elaboration: ELA)	6	0,76	0,82
	Örgütleme (Organization: ORG)	4	0,64	0,78
	Bilişüstü Öz-düzenleme (Metacognitive Self-Regulation: MSR)	12	0,79	0,84

Çalışma kapsamında seçilen alt boyutlar Türkçe'ye çevrilirken daha önce yapılan bazı çevirlerden faydalanılmıştır. Uyumsal Öğrenme Örüntüleri Ölçeği için Taş ve Tekkaya'nın fen bilgisi eğitimi için 2008 yılında hazırladığı çeviriden faydalanılmıştır. Güdülenme ve Öğrenme Stratejileri Ölçeği için ise Büyüköztürk ve arkadaşlarının çeşitli kademeler ve dersler için 2004 yılında hazırladığı çevirinin yanı sıra Sungur'un biyoloji eğitimi için 2004 yılında hazırladığı çeviriden faydalanılmıştır. Çeviriler yapılırken özellikle Türk okul kültürüne, ilköğretim seviyesine ve matematik eğitimine uygunluğu göz önünde bulundurulmuştur. Hazırlanan ölçek öncelikle İngiliz dili uzmanları tarafından incelenerek çevirinin uygunluğu, maddelerin anlaşılırlığı ve akıcılığı açısından değerlendirilmiştir. Sonrasında konu alan eğitim uzmanları tarafından incelenerek maddelerin matematik eğitimine ve ilköğretim seviyesine uygunluğu değerlendirilmiştir.

Tablo 3 Başarı Testi Sorularının İçerik Analizi

Alt Öğrenme Alanları	Konular	2008 SBS	2009 SBS	Başarı Testi
Sayılar	Tam Sayılarla İşlemler (3 kazanım)	1	1	1
	Rasyonel Sayılar (3 kazanım)	1		1
	Rasyonel Sayılarla İşlemler (4 kazanım)	1	1	2
Cebir	Cebirsel İfadeler (2 kazanım)	1		2
	1. Dereceden Denklemler (5 kazanım)		1	2
Geometri	Doğrular ve Açılar (6 kazanım)	2	1	1
	Çember ve Daire (5 kazanım)		1	1
Toplam		6	5	10

Başarı testi ise katılımcıların matematik başarılarını ölçmek için hazırlanmıştır. Öğrencilerin matematik başarıları testine verdikleri doğru cevap sayısı kullanılarak ölçülmüştür. 10 adet çoktan seçmeli sorudan oluşan testin soru yapısı ve konu kapsamı 2008 ve 2009 yıllarında uygulanmış olan 7. sınıf Seviye Belirleme Sınav (SBS) soruları incelenerek hazırlanmıştır. Bunun yanında, sorular hazırlanırken 7. sınıf matematik ders kitabında yer alan sorulardan da faydalanılmıştır. Bu hususta, testin kapsam geçerliğini ölçmek için uzman görüşleri alınmıştır.

Ana çalışma bahar dönemi başlangıcında uygulandığı için başarı testinin konu kapsamı güz dönemi konuları ile sınırlandırılmıştır. Ayrıca, veri toplama aracının güvenirlik ve geçerliğini kontrol etmek için yapılan pilot çalışma sırasında 'Oran ve Orantı', 'Çokgenler', 'Eşitlik ve Benzerlik' gibi konuların yer aldığı 3. ünite henüz işlenmemiş olduğu için hazırlanan sorular güz döneminde işlenen ilk iki üniteyi kapsamaktadır. Tablo 3'te güz dönemine ait alt öğrenme alanları, konular, kazanım sayıları, 2008 SBS ve 2009 SBS sorularının konu dağılımları ve başarı testi sorularının konu dağılımları özetlenmiştir. Ayrıca, Tablo 4'te başarı testi sorularının güçlük dereceleri 'Basit', 'Orta' ve 'Güç' olmak üzere üç kategoride özetlenmiştir.

Tablo 4 Başarı Testi Sorularının Güçlük Dereceleri

Alt Öğrenme Alanları	Konular	Güçlük Dereceleri			Toplam
		Basit	Orta	Zor	
Sayılar	Tam Sayılarla İşlemler		1. soru		1
	Rasyonel Sayılar		2. soru		1
	Rasyonel Sayılarla İşlemler	3. soru		4. soru	2
Cebir	Cebirsel İfadeler		5. soru		2
			6. soru		
	1. Dereceden Denklemler		7. soru	8. soru	2
Geometri	Doğrular ve Açılar	9. soru			1
	Çember ve Daire		10. Soru		1
Toplam		2	6	2	10

Pilot çalışma

Ana çalışma için veri toplama sürecine başlamadan önce Çankaya ilçesinin farklı mahallelerindeki üç devlet okulunda, 250 yedinci sınıf öğrencisine ile bir pilot çalışma uygulanmıştır. Pilot çalışmaya katılan öğrencilere ait demografik bilgiler Tablo 5'te özetlenmiştir. Kısaca, pilot çalışma toplam 9 sınıfta öğrencilerin normal ders saatleri sırasında uygulanmıştır. Sınıfların mevcutları 8 ile 19 arasında değişmektedir. Öğrencilerin 122'si kız (%48,8), 128'i (%51,2) erkektir.

Tablo 5 Pilot Çalışmadaki Katılımcılara Ait Demografik Bilgiler

Okullar	İlçeler	Sınıflar	Cinsiyet		Toplam
			Erkek	Kız	
A Okulu	Çankaya-Çukurambar	A Sınıfı	15	15	79
		B Sınıfı	9	17	
		C Sınıfı	8	15	
B Okulu	Çankaya-Çiğdem	A Sınıfı	19	9	80
		B Sınıfı	17	12	
		C Sınıfı	10	13	
C Okulu	Çankaya-Balgat	A Sınıfı	18	9	91
		B Sınıfı	14	15	
		C Sınıfı	18	17	
Toplam			128	122	250

Pilot çalışmadan elde edilen veriler, öncelikle ölçek maddelerinin faktör yapılarını incelemek ve amacına uymayan maddeleri belirlemek üzere açımlayıcı faktör analizi (exploratory factor analysis) yapmak için kullanılmıştır. Her boyut için yapılan ayrı açımlayıcı analizlerde maddelerin faktör yükleri incelenmiş, KMO örneklem uygunluk katsayıları hesaplanmış ve Barlett Sphericity testleri yapılmıştır. Genel olarak, verilerin doğrulayıcı faktör analizine uygunluğu için KMO örneklem uygunluk katsayısının 0,60 ve üzeri olması, Barlett Sphericity testinin ise anlamlı çıkması beklenmektedir.

Bu çalışmada, hedef yönelimi boyutuna ait KMO örneklem uygunluk katsayısı 0,82 ve Barlett Sphericity testi analamlı (χ^2= 977.34, p= 0.00) bulunmuştur.

Maddelerin faktör yükleri 0,33 ile 0,84 arasında değişmektedir. Temel bileşenler tekniği (principle components analysis) kullanılarak yapılan faktör çözümlemesi sonuçlarına göre özdeğeri (eigenvalue) 1'in üzerinde olan 3 alt boyut bulunmakta ve bu alt boyutlar toplam varyansın %53,7'sini açıklamaktadır. Benzer şekilde, derse yönelik hedef algılama boyutu için KMO örneklem uygunluk katsayısı 0,84, Barlett Sphericity testi ise analamlı (χ^2= 1191.49, p= 0.00) bulunmuştur. Maddelerin faktör yükleri 0,35 ile 0,85 arasında değişmektedir. Özdeğeri 1'in üzerinde olan 3 alt boyut bulunmakta ve bu alt boyutlar toplam varyansın %57,7'sini açıklamaktadır.

Öz-yeterlik boyutu için KMO örneklem uygunluk katsayısının 0,92 ve Barlett Sphericity testi analamlı (χ^2= 1290.39, p= 0.00) bulunmuştur. Maddelerin faktör yükleri 0,64 ile 0,84 arasında değişmektedir. Özdeğeri 1'in üzerinde olan sadece 1 alt boyut bulunmakta ve bu alt boyut toplam varyansın %64,9'unu açıklamaktadır. Son olarak, öğrenme stratejileri boyutu için KMO örneklem uygunluk katsayısının 0,92 ve Barlett Sphericity testi analamlı (χ^2=2352.19.39, p=0.00) bulunmuştur. Maddelerin faktör yükleri 0,31 ile 0,79 arasında değişmektedir. Özdeğeri 1'in üzerinde olan 3 alt boyut bulunmakta ve bu alt boyutlar toplam varyansın %51,3'ünü açıklamaktadır. Sonuç olarak, yapılan analizlere göre daha geçerli ve güvenilir sonuçlar elde etmek için ölçekteki hiçbir boyuttan herhangi bir madde silinmemiştir.

Pilot çalışmadan elde edilen veriler ayrıca matematik başarı testinin analizi için kullanılmıştır. Öncelikle, öğrencilerin matematik başarı testine verdikleri doğru cevap sayıları ile 6. sınıf SBS matematik testine verdikleri doğru cevap sayıları karşılaştırılmış, test başarısı ile SBS başarısı arasında pozitif yüksek korelasyon (r=0,598, N= 242, p<0.01) olduğu saptanmıştır. Sonra, elde edilen korrelasyon değeri kullanılarak belirleme katsayısı (coefficient of determination) hesaplanmış, bulunan 35,76 değeri matematik başarı testi ile 6. sınıf SBS matematik testi arasında %36'lık ortak varyans olduğunu göstermiştir. Son olarak, teste verilen doğru cevap sayıları kullanılarak soruların güçlük dereceleri kontrol edilmiştir.

Verilerin Toplanması ve Çözümlenmesi

Veriler, 2009-2010 akademik yılı bahar döneminde, Ankara'daki devlet okullarına devam eden 1019 yedinci sınıf öğrencisinden toplanmıştır. Veri toplama aracı optik form olarak hazırlanmış ve katılımcıların normal ders saatleri sırasında uygulanmıştır. Her uygulama yaklaşık bir ders saati sürmüştür. Veriler optik okuyucu ile girilmiş, analizlere başlamadan önce girilen verilerin doğruluğunu test etmek üzere veri giriş hatalarının kontrolu, kayıp verilerin belirlenmesi ve aykırı değerlerin tespiti gibi çeşitli veri eleme yöntemleri kullanılmıştır. Verilerin çözümlenmesinde, açımlayıcı faktör analizi, güvenilirlik testi ve çeşitli betimsel analizler için PASW Statistics 18.0 programı kullanılmıştır. Doğrulayıcı faktör analizi ve yapısal eşitlik modeli çalışmalarında ise LISREL 8.80 for Windows programı kullanılmıştır.

Bulgu ve Yorumlar

Ana çalışmada veri analizi ve hipotez testi için yapısal eşitlik modellemesi (structural equation modeling) tekniği kullanılmıştır. Esas veri analizinden önce verilerin doğruluğunu test etmek üzere veri giriş hatalarını kontrol etmek, kayıp verileri belirlemek ve aykırı değerleri tespit etmek gibi çeşitli veri eleme yöntemleri kullanılmıştır. Ardından çalışmadaki birtakım değişkenleri tanımlamak ve özetlemek için çeşitli betimsel analizler yapılmıştır. Esas veri analizi için ölçekte yer alan her boyuta yönelik bir doğrulayıcı faktör analizi (confirmatory factor analysis) yapılmış, ayrıca tüm örnekleme yönelik yapısal eşitlik modellemesi çalışılmıştır.

Doğrulayıcı Faktör Analizleri

Doğrulayıcı faktör analizi, genellikle ölçeklerin faktöryel (yapı) geçerliğini test etmek için kullanılır ve genel olarak belirli değişkenlerin bir kuram temelinde önceden belirlenmiş faktörler üzerinde yer alıp almadığının sınanmasına dayanır. Bu çalışmada, her boyuta ait gizil değişkenlerin ve gösterge değişkenlerin faktör yapıları doğrulayıcı faktör analizleri ile sınanmıştır. İlk olarak hiçbir bağlantı eklemeden her modelin uyum istatistikleri ve modifikasyon indeksleri sonuçları incelenmiştir. Sonra, sınanan faktör yapılarının verilerle daha yüksek uyum sağlaması için modifikasyon indeksleri değerlendirilmiş ve bazı maddelerin hataları arasında korelasyon düzeyleri dikkate alınarak revizyonlar yapılmıştır.

Her alt boyut için ayrı yapılan analiz sonuçlarına göre hedef yönelimi alt boyutunda 3 faktör (χ^2= 145.67, df= 64, χ^2/df= 2.27, GFI= 0.98 ve AGFI= 0.96), derse yönelik hedef algılama alt boyutunda 3 faktör (χ^2= 148.31, df= 64, χ^2/df= 2.31, GFI= 0.97 ve AGFI= 0.96), öz-yeterlik alt boyutunda 1 faktör (χ^2= 17.22, df= 13, χ^2/df= 1.30, GFI= 0.99 ve AGFI= 0.98) ve öğrenme stratejileri alt boyutunda 3 faktör (χ^2= 355.11, df= 193, χ^2/df= 1.83, GFI= 0.96 ve AGFI= 0.94) olmak üzere toplam 10 faktörden oluşan bir yapı elde edilmiştir. Sırasyıla Tablo 6'da hedef yönelimi boyutunun model uyum değerleri, Tablo 7'de derse yönelik hedef algılama boyutunun model uyum değerleri, Tablo 8'de öz-yeterlik boyutunun model uyum değerleri ve Tablo 9'da öğrenme stratejileri boyutunun model uyum değerleri özetlenmiştir. Sonuç olarak, doğrulayıcı faktör analizleri ölçeğin faktör yapısına ilişkin önerilen ölçme modelinin geçerli olduğunu göstermektedir. Diğer bir deyişle, Türkçe'ye uyarlanan her alt boyutun orjinal ölçeklerde önerilen faktör yapılarına bire bir uyduğunu göstermektedir.

Tablo 6 Hedef Yönelimi Boyutunun Model Uyum Değerleri

Uyum Ölçütleri	Kabul Edilebilir Uyum	Çalışmada Elde Edilenler
Ki-Kare (Chi-Squared: χ^2)	Anlamsız	145,67 **(p = 0,00)**
Normlaştırılmış Ki-Kare (Normed Chi-Squared: NC)	NC<5	2,27
Uyum İyiliği İndeksi (Goodness of Fit Index: GFI)	GFI>0,90	0,98
Düzeltilmiş Uyum İyiliği İndeksi (Adjusted Goodness of Fit Index: AGFI)	AGFI>0,90	0,96
Yaklaşık Hataların Ortalama Karekökü (Root Mean Square Error of Approximation: RMSEA)	0,05<RMSEA<0,10 (orta derecede uyum) RMSEA<0,05 (çok iyi uyum)	0,03 (çok iyi uyum)
Ortalama Hataların Karekökü (Root Mean Square Residual: RMR)	RMR<0,05	0,05
Standart Ortalama Hataların Karekökü (Standardized Root Mean Square Residual: S-RMR)	S-RMR<0,05	0,04
Sıkılık Uyum İyiliği İndeksi (Parsimony Goodness of Fit Index: PGFI)	Olabildiğince Yüksek	0,59
Sıkılık Normlaştırılmış Uyum İndeksi (Parsimony Normed Fit Index: PNFI)	Olabildiğince Yüksek	0,69
Normlaştırılmış Uyum İndeksi (Normed Fit Index: NFI)	NFI>0,90	0,98
Normlaştırılmamış Uyum İndeksi (Non-Normed Fit Index: NNFI)	NNFI>0,90	0,99
Karşılaştırıcı Uyum İndeksi (Comparative Fit Index: CFI)	CFI>0,90	0,99
Fazlalık Uyum İndeksi (Incremental Fit Index: IFI)	IFI>0,90	0,99
Göreli Uyum İndeksi (Relative Fit Index: RFI)	RFI>0,90	0,98

Tablo 7 Derse Yönelik Hedef Algılama Boyutunun Model Uyum Değerleri

Uyum Ölçütleri	Kabul Edilebilir Uyum	Bulgu
Ki-Kare (Chi-Squared: χ^2)	Anlamsız	148,31 **(p = 0,00)**
Normlaştırılmış Ki-Kare (Normed Chi-Squared: NC)	NC<5	2,31
Uyum İyiliği İndeksi (Goodness of Fit Index: GFI)	GFI>0,90	0,97
Düzeltilmiş Uyum İyiliği İndeksi (Adjusted Goodness of Fit Index: AGFI)	AGFI>0,90	0,96
Yaklaşık Hataların Ortalama Karekökü (Root Mean Square Error of Approximation: RMSEA)	0,05<RMSEA<0,10 (orta derecede uyum) RMSEA<0,05 (çok iyi uyum)	0,03 (çok iyi uyum)
Ortalama Hataların Karekökü (Root Mean Square Residual: RMR)	RMR<0,05	**0,06**
Standart Ortalama Hataların Karekökü (Standardized Root Mean Square Residual: S-RMR)	S-RMR<0,05	0,04
Sıkılık Uyum İyiliği İndeksi (Parsimony Goodness of Fit Index: PGFI)	Olabildiğince Yüksek	0,59
Sıkılık Normlaştırılmış Uyum İndeksi (Parsimony Normed Fit Index: PNFI)	Olabildiğince Yüksek	0,69
Normlaştırılmış Uyum İndeksi (Normed Fit Index: NFI)	NFI>0,90	0,98
Normlaştırılmamış Uyum İndeksi (Non-Normed Fit Index: NNFI)	NNFI>0,90	0,98
Karşılaştırıcı Uyum İndeksi (Comparative Fit Index: CFI)	CFI>0,90	0,99
Fazlalık Uyum İndeksi (Incremental Fit Index: IFI)	IFI>0,90	0,99
Göreli Uyum İndeksi (Relative Fit Index: RFI)	RFI>0,90	0,97

Tablo 8 Öz-Yeterlik Boyutunun Model Uyum Değerleri

Uyum Ölçütleri	Kabul Edilebilir Uyum	Bulgu
Ki-Kare (Chi-Squared: χ^2)	Anlamsız	17,22 **(p = 0,00)**
Normlaştırılmış Ki-Kare (Normed Chi-Squared: NC)	NC<5	1,30
Uyum İyiliği İndeksi (Goodness of Fit Index: GFI)	GFI>0,90	0,99
Düzeltilmiş Uyum İyiliği İndeksi (Adjusted Goodness of Fit Index: AGFI)	AGFI>0,90	0,98
Yaklaşık Hataların Ortalama Karekökü (Root Mean Square Error of Approximation: RMSEA)	0,05<RMSEA<0,10 (orta derecede uyum) RMSEA<0,05 (çok iyi uyum)	0,01 (çok iyi uyum)
Ortalama Hataların Karekökü (Root Mean Square Residual: RMR)	RMR<0,05	0,03
Standart Ortalama Hataların Karekökü (Standardized Root Mean Square Residual: S-RMR)	S-RMR<0,05	0,01
Sıkılık Uyum İyiliği İndeksi (Parsimony Goodness of Fit Index: PGFI)	Olabildiğince Yüksek	0,36
Sıkılık Normlaştırılmış Uyum İndeksi (Parsimony Normed Fit Index: PNFI)	Olabildiğince Yüksek	0,46
Normlaştırılmış Uyum İndeksi (Normed Fit Index: NFI)	NFI>0,90	1,00
Normlaştırılmamış Uyum İndeksi (Non-Normed Fit Index: NNFI)	NNFI>0,90	1,00
Karşılaştırıcı Uyum İndeksi (Comparative Fit Index: CFI)	CFI>0,90	1,00
Fazlalık Uyum İndeksi (Incremental Fit Index: IFI)	IFI>0,90	1,00
Göreli Uyum İndeksi (Relative Fit Index: RFI)	RFI>0,90	1,00

Tablo 9 Öğrenme Stratejileri Boyutunun Model Uyum Değerleri

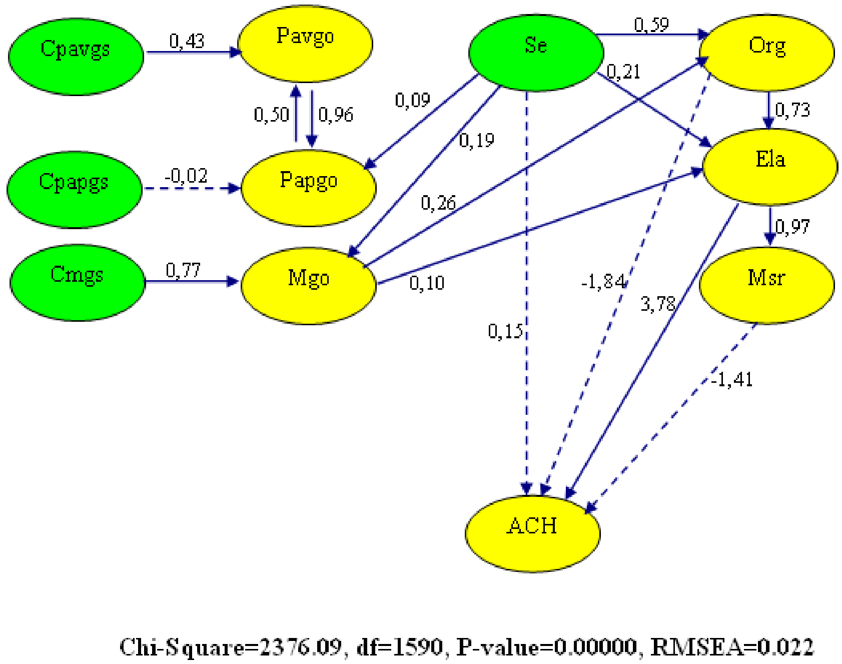
Uyum Ölçütleri	Kabul Edilebilir Uyum	Bulgu
Ki-Kare (Chi-Squared: χ^2)	Anlamsız	355,11 **(p=0,00)**
Normlaştırılmış Ki-Kare (Normed Chi-Squared: NC)	NC<5	1,83
Uyum İyiliği İndeksi (Goodness of Fit Index: GFI)	GFI>0,90	0,96
Düzeltilmiş Uyum İyiliği İndeksi (Adjusted Goodness of Fit Index: AGFI)	AGFI>0,90	0,94
Yaklaşık Hataların Ortalama Karekökü (Root Mean Square Error of Approximation: RMSEA)	0,05<RMSEA<0,10 (orta derecede uyum) RMSEA<0,05 (çok iyi uyum)	0,02 (çok iyi uyum)
Ortalama Hataların Karekökü (Root Mean Square Residual: RMR)	RMR<0,05	**0,12**
Standart Ortalama Hataların Karekökü (Standardized Root Mean Square Residual: S-RMR)	S-RMR<0,05	0,03
Sıkılık Uyum İyiliği İndeksi (Parsimony Goodness of Fit Index: PGFI)	Olabildiğince Yüksek	0,73
Sıkılık Normlaştırılmış Uyum İndeksi (Parsimony Normed Fit Index: PNFI)	Olabildiğince Yüksek	0,83
Normlaştırılmış Uyum İndeksi (Normed Fit Index: NFI)	NFI>0,90	0,99
Normlaştırılmamış Uyum İndeksi (Non-Normed Fit Index: NNFI)	NNFI>0,90	0,99
Karşılaştırıcı Uyum İndeksi (Comparative Fit Index: CFI)	CFI>0,90	1,00
Fazlalık Uyum İndeksi (Incremental Fit Index: IFI)	IFI>0,90	1,00
Göreli Uyum İndeksi (Relative Fit Index: RFI)	RFI>0,90	0,99

Yapısal Eşitlik Modeli

Açımlayıcı ve doğrulayıcı faktör analizleri sonuçlarına göre hedef yönelimi boyutunda 3 gizil değişken, derse yönelik hedef algılama boyutunda 3 gizil değişken, öz-yeterlik boyutunda 1 gizil değişken ve öğrenme stratejileri boyutunda 3 gizil değişken olmak üzere toplam 10 gizil değişken ve 58 gösterge değişkenden oluşan bir yapı elde edilmiştir. Yapısal eşitlik modellemesinde bunlara ilaveten matematik başarısı gizil değişkeni eklenmiştir.

Modelin oluşturulması ilk olarak alan yazınında yapılan araştırmalar doğrultusunda bir hipotez model öne sürülerek başlamıştır. Parametreler hesaplanırken ham veriler kullanılmış, verilerin çözümünde temel çıkarım tekniği olarak robust maksimum olasılık (Robust Maximum Likelihood) kullanılmıştır. Modelin eldeki veri ile uyumunun sınanması için ki kare testi (chi square goodness of fit test) uygulanmıştır. Genel olarak model ile veri arasında iyi uyum elde edilmiştir.

Modelin geliştirilmesi için modifikasyon indekslerinin önerdiği bazı bağlantılar modele eklenmiştir. Bu amaç doğrultusunda performans kaçınma yöneliminden (PAVGO) performans yaklaşma yönelimine (PAPGO) bir path eklenmiştir (ki karedeki azalma 10,4). Benzer şekilde, performans yaklaşma yöneliminden (PAPGO) de performans kaçınma yönelimine (PAVGO) bir path eklenmiştir (ki karedeki azalma 158,7). Ayrıca, bazı maddeler arasındaki korelasyonlar serbest bırakılmıştır. Bunların bir kısmı doğrulayıcı factor analizleri sırasında LISREL programının önerdiği bağlantılardan oluşmaktadır.



Şekil 1 Standart Katsayılı Yapısal Eşitlik Modeli

Sonuç olarak elde edilen model Şekil 1'de gösterilmiştir. Modelde, derse yönelik hedef algılama boyutuna ait 3 gizil değişken (Cmgs, Cpapgs, Cpavgs) ile öz-yeterlik (Se) değişkeni gizil içsel değişken olarak, diğer değişkenler ise gizil dışsal değişken olarak tanımlanmıştır. Genel olarak, modelin karmaşık ve çok değişkenli olduğu gözönüne alındığında uyum indekslerinin (χ^2= 2376.09, df= 1590, RMSEA=0.022) çok iyi uyum gösterdiği görülmektedir.

Tablo 10'da modeldeki yapısal eşitlikler için elde edilen LISREL kestirimleri, standart hatalar, t değerleri ve belirleme katsayıları verilmektedir. LISREL kestirimlerinden beta (β), bağımlı bir gizil değişkenin başka bir bağımlı gizil değişken üzerindeki regrasyonunu gösteren bağlantı katsayısıdır. Gama (γ) ise bağımsız bir gizil değişkenin bağımlı bir gizil değişken üzerindeki regrasyonunu gösteren bağlantı katsayısıdır. Modeldeki bağlantı katsayıları ve t değerleri incelendiğinde performans yaklaşma yönelimi (Papgo) ile performans yaklaşma yönelimli ortam (Cpapgs) arasındaki bağlantının (t= -1,07), başarı ile örgütleme (Org) arasındaki bağlantının (t= -1,84), başarı ile bilişüstü öz-düzenleme (Msr) arasındaki bağlantının (t= -1,52) ve başarı ile öz-yeterlik (Se) arasındaki bağlantının (1,80) anlamlı olmadığı bulunmuştur. Modeldeki diğer bağlantıların ise anlamlı ve pozitif olduğu görülmektedir.

Tablo 10 Modeldeki Yapısal Eşitlik İlişkileri

Nereye	Nereden	LISREL Kestirimleri	SH	t	R^2
Mgo	Cmgs	0,77 (γ)	0,06	11,20	0,80
	Se	0,19 (γ)	0,05	3,35	
Papgo	Pavgo	0,96 (β)	0,05	16,70	0,98
	Cpapgs	-0,02 (γ)	0,02	-1,07*	
	Se	0,09 (γ)	0,03	2,70	
Pavgo	Papgo	0,50 (β)	0,20	2,55	0,92
	Cpavgs	0,43 (γ)	0,16	2,76	
Ela	Mgo	0,10 (β)	0,03	3,19	0,94
	Org	0,73 (β)	0,08	8,71	
	Se	0,21 (γ)	0,05	3,84	
Org	Mgo	0,26 (β)	0,05	5,00	0,62
	Se	0,59 (γ)	0,05	13,35	
Msr	Ela	0,97 (β)	0,04	20,28	0,94
Başarı	Ela	3,78 (β)	1,54	2,45	0,19
	Org	-1,84 (β)	1,00	-1,84*	
	Msr	-1,41 (β)	0,93	-1,52*	
	Se	0,42 (γ)	0,23	1,80*	

*Anlamlı olmayan yollar

Tablo 10'da ayrıca modeldeki her bir yapısal eşitlik için elde edilen belirleme katsayıları (R^2) verilmektedir. Açıklanan varyans olarak tanımlanan belirleme katsayısı, yapısal eşitlikte yer alan değişkenlerin gözlenen değişmelerin ne kadarını açıkladıklarını ifade eder. Bu anlamda, belirleme katsayısı yapısal eşitliğin tahmin gücünü, diğer bir deyişle başarısını yansıtmaktadır. Elde edilen yapısal eşitliklerdeki doğrudan etkiler incelendiğinde, hedef yönelimine ait alt boyutlar için öğrenme yönelimli ortam (Cmgs; $\gamma = 0{,}77$, t= 11,20) ile öz-yeterliğin (Se; $\gamma = 0{,}19$, t= 3,35) öğrencilerin öğrenme yöneliminin %80'nini açıkladığı görülmektedir. Performans kaçınma yönelimi (Pavgo; $\beta = 0{,}96$, t= 16,70), performans yaklaşma yönelimli ortam (Cpapgs; $\gamma = -0{,}02$, t= -1,07) ve öz-yeterlik (Se: $\gamma = 0{,}09$, t= 2,70) ise öğrencilerin performans yaklaşma yöneliminin %98'ini açıklamaktadır. Bunun yanında, performans yaklaşma yönelimi (Papgo; $\beta = 0{,}50$, t= 2,55) ve performans kaçınma yönelimli ortam (Cpavgs; $\gamma = 0{,}43$, t= 2,76) ise öğrencilerin performans kaçınma yöneliminin %92'sini açıklamaktadır.

Öğrenme stratejilerine ait alt boyutlar incelendiğinde, öğrenme yönelimi (Mgo; $\beta = 0{,}10$, t= 3,19), örgütleme (Org; $\beta = 0{,}73$, t= 8,71) ve öz-yeterliğin (Se; $\gamma =0{,}21$, t= 3,84) öğrencilerin ayrıntılandırma strateji kullanımının %94'ünü açıkladığı görülmektedir. Benzer şekilde, öğrenme yönelimi (Mgo; $\beta = 0{,}26$, t= 5,00) ve öz-yeterlik (Se; $\gamma = 0{,}59$, t= 13,35) öğrencilerin örgütleme strateji kullanımının %62'sini açıklamaktadır. Bunun yanında, ayrıntılandırma (Ela; $\beta = 0{,}97$, t= 20,28) tek başına bilişüstü öz-düzenleme strateji kullanımın %94'ünü açıklamaktadır. Son olarak, ayrıntılandırma (Ela; $\beta = 3{,}78$, t= 2,45), örgütleme (Org; $\beta = -1{,}84$, t= -1,84), bilişüstü öz-düzenleme (Msr; $\beta = -1{,}41$, t= -1,52) ve öz-yeterlik (Se; $\gamma = 0{,}42$, t=1,80) öğrencilerin matematik başarısının %19'unu açıklamaktadır. Bu değişkenlerin arasında sadece ayrıntılandırma stratejisi kullanımı öğrencilerin matematik başarısı ile anlamlı olarak ilişkilidir.

Bunlara ek olarak, gizil değişkenler arasındaki doğrudan ve dolaylı etkilerin birbirlerine eklenmesi ile elde edilen toplam etkiler de hesaplanmıştır. Tablo 11'de bağımsız gizil değişkenler ile bağımlı gizil değişkenler arasındaki toplam etkiler özetlenmiştir. Tablo 12'de ise bağımlı gizil değişkenler arasındaki toplam etkiler özetlenmiştir.

Tablo 11 Bağımlı ve Bağımsız Gizil Değişkenler Arasındaki Toplam Etkiler

Bağımlı Değişkenler	Bağımsız Değişkenler			
	Cmgs	Cpapgs	Cpavgs	Se
Mgo	0,77	-	-	0,19
Papgo	-	-0,04*	0,79	0,18
Pavgo	-	-0,02*	0,83	0,09
Ela	0,23	-	-	0,69
Org	0,20	-	-	0,64
Msr	0,22	-	-	0,67
Başarı	0,18	-	-	0,91

* Anlamı olmayan toplam etkiler

Tablo 12 Bağımlı Gizil Değişkenler Arasındaki Toplam Etkiler

	Mgo	Papgo	Pavgo	Ela	Org	Msr	Başarı
Mgo	-	-	-	-	-	-	-
Papgo	-	0,92*	1,84	-	-	-	-
Pavgo	-	0,96*	0,92*	-	-	-	-
Ela	0,30	-	-	-	0,73	-	-
Org	0,26	-	-	-	-	-	-
Msr	0,29	-	-	0,97	0,71	-	-
Başarı	0,23	-	-	2,41	-0,08*	-1,41*	-

* Anlamı olmayan toplam etkiler

Tablo 11 ve Tablo 12’de değişkenler arasındaki toplam etkiler değerlendirildiğinde, derse yönelik hedef algılama ile ilgili sonuçlar genel anlamda öğrencilerin derse yönelik hedef algıları ile kişisel hedef yönelimleri arasında doğrudan ilişki olduğunu göstermektedir. Özellikle matematik dersini öğrenme yönelimli algılayan öğrencilerin matematik öğrenmek için de öğrenme yönelimi gösterdiği bulunmuştur. Benzer şekilde matematik dersini performans yaklaşma yönelimli algılayan öğrencilerin matematik öğrenmek için performans yaklaşma yönelimi gösterdiği ve matematik dersini performans kaçınma yönelimli algılayan öğrencilerin matematik öğrenmek için performans kaçınma yönelimi gösterdiği tespit edilmiştir. Bunların yanında hedef yönelimleri arasında sadece öğrenme yöneliminin öğrencilerin öğrenme stratejileri ve matematik başarıları ile ilişkili olduğu bulunmuştur. Diğer taraftan performans yaklaşma yönelimi ile performans kaçınma yönelimi arasında karşılıklı ilişki olduğu, ancak her iki performans yöneliminin de öğrencilerin öğrenme stratejileri ve matematik başarıları ile anlamlı derecede ilişkili olmadığı tespit edilmiştir.

Ayrıca, öz-yeterliğin hem doğrudan hem de dolaylı olarak öğrencilerin hedef yönelimleri, öğrenme strateji kullanımları ve matematik başarıları ile ilişkili olduğu bulunmuştur. Öz-yeterlik her ne kadar matematik başarısı ile doğrudan anlamlı derecede ilişkili değilse de toplam etkiler gözönünde bulundurulduğunda matematik başarısı ile anlamlı derecede ilişkili bulunmuştur. Son olarak öğrenme stratejileri arasında sadece ayrıntılandırma stratejileri ile matematik başarısı arasında doğrudan ve anlamlı derecede ilişkili görülmüştür. Bunun yanında örgütleme stratejileri ile ayrıntılandırma stratejileri ve bilişüstü öz-düzenleme stratejileri arasında anlamlı ilişki olsa da, ne örgütleme stratejileri ne de bilişüstü öz-düzenleme stratejileri matematik başarısı ile ilişkili bulunmuştur. Özellikle bilişüstü öz-düzenleme stratejileri çalışmada ölçülen hiçbir değişkenle ilişkili bulunmamıştır.

Tablo 13’de yapısal eşitliklerin belirleme katsayılarına (R^2) bağlı olarak etki büyüklükleri (f^2) gösterilmiştir. Eşitliklerin etki büyüklükleri, $R^2/(1 - R^2)$ formülü ile hesaplanmıştır. Cohen’nin (1988) sınıflandırmasına göre f^2 değerinin 0,02 olması küçük etkiyi, 0,15 olması orta etkiyi, 0,35 ve üzeri olması ise büyük etkiyi göstermektedir. Bu sınıflandırmaya göre matematik başarısı haricindeki tüm değişkenlere ait yapısal eşitlikler büyük derecede (0,35 ve üzeri) etki büyüklüğüne sahiptir. Matematik başarısına ait yapısal eşitlik ise orta derecede ($f^2 = 0,23$) etki büyüklüğüne sahiptir.

Tablo 13 Yapısal Eşitliklerin Etki Büyüklükleri

	R^2	f^2
MGO	0,80	4,00
PAPGO	0,98	49,00
PAVGO	0,92	11,50
ELA	0,94	15,66
ORG	0,62	1,63
MSR	0,94	15,66
Başarı	0,19	0,23

Tablo14'de yapısal eşitlik modeline ait uyum değerleri özetlenmiştir. Çalışmada, ki kare değeri (χ^2) , Uyum İyiliği İndeksi (GFI), Düzeltilmiş Uyum İyiliği İndeksi (AGFI), Yaklaşık Hataların Ortalama Karekökü (RMSEA), Standartize Edilmiş Hataların Ortalama Karelerinin Karekökü (S-RMR), Karşılaştırmalı Uyum İndeksi (CFI), Normlaştırılmamış Uyum İndeksi (NNFI) gibi uyum iyiliği kriterleri kullanılmıştır. Genel olarak elde edilen değerler (χ^2= 2376.09, df= 1590, χ^2/df= 1.49, GFI= 0.91 ve AGFI= 0.90), önerilen modelin tüm veri ile çok iyi uyumlu olduğunu göstermektedir.

Tablo 14 Yapısal Eşitlik Modeline Ait Uyum Değerleri

Uyum Ölçütleri	Kabul Edilebilir Uyum	Bulgu
Ki-Kare (Chi-Squared: χ^2)	Anlamsız	2376,09 **(p= 0,00)**
Normlaştırılmış Ki-Kare (Normed Chi-Squared: NC)	NC<5	1,49
Uyum İyiliği İndeksi (Goodness of Fit Index: GFI)	GFI>0,90	0,91
Düzeltilmiş Uyum İyiliği İndeksi (Adjusted Goodness of Fit Index: AGFI)	AGFI>0,90	0,90
Yaklaşık Hataların Ortalama Karekökü (Root Mean Square Error of Approximation: RMSEA)	0,05<RMSEA<0,10 (orta derecede uyum) RMSEA<0,05 (çok iyi uyum)	0,02 (çok iyi uyum)
Ortalama Hataların Karekökü (Root Mean Square Residual: RMR)	RMR<0,05	**0,11**
Standart Ortalama Hataların Karekökü (Standardized Root Mean Square Residual: S-RMR)	S-RMR<0,05	0,04
Sıkılık Uyum İyiliği İndeksi (Parsimony Goodness of Fit Index: PGFI)	Olabildiğince Yüksek	0,81
Sıkılık Normlaştırılmış Uyum İndeksi (Parsimony Normed Fit Index: PNFI)	Olabildiğince Yüksek	0,91
Normlaştırılmış Uyum İndeksi (Normed Fit Index: NFI)	NFI>0,90	0,98
Normlaştırılmamış Uyum İndeksi (Non-Normed Fit Index: NNFI)	NNFI>0,90	0,99
Karşılaştırıcı Uyum İndeksi (Comparative Fit Index: CFI)	CFI>0,90	0,99
Fazlalık Uyum İndeksi (Incremental Fit Index: IFI)	IFI>0,90	0,99
Göreli Uyum İndeksi (Relative Fit Index: RFI)	RFI>0,90	0,98

Tartışma

Bu çalışma ilköğretim matematik eğitimi ile ilgili bazı bilişsel, davranışsal ve güdüsel kavramları bir araya getirip bu kavramlar arasındaki doğrudan ve dolaylı ilişkileri açıklamak üzere gerçekleştirilmiştir. Özellikle ilköğretim öğrencilerinin matematik eğitimi ile ilgili hedef yönelimleri, derse yönelik hedef algıları, öz-yeterlik inanışları, öz-düzenleme strateji kullanımları ve akademik başarıları arasındaki ilişki incelenmiştir. Genel olarak, yapısal eşitlik modeline ait değerler incelendiğinde uyum değerleri ile veri arasında çok iyi uyum olduğu tespit edilmiştir. Elde edilen eşitlikler öğrencilerin performans yaklaşma yöneliminin %98'ini, bilişüstü öz-düzenleme strateji kullanımlarının %94'ünü, ayrıntılandırma strateji kullanımlarının %94'ünü, performans kaçınma yöneliminin %92'sini, öğrenme yöneliminin %80'ini, örgütleme strateji kullanımlarının %62'sini ve matematik başarısının %19'unu açıklamaktadır.

Değişkenler arasındaki toplam etkiler değerlendirildiğinde, öğrencilerin derse yönelik hedef algıları ile kişisel hedef yönelimleri arasında anlamlı derecede ilişki olduğu tespit edilmiştir. Bu anlamda eldeki bulgular önceki çalışmalarda elde edilen bulguları (Patrick ve diğerleri, 2001; Roeser, Midgley ve Urdan, 1996; Turner ve diğerleri, 2002) desteklemekte ve öğrencilerin hedef yönelimlerinin derse yönelik hedef algıları ile parelellik gösterdiğini tasdik etmektedir. Bu sonuç, ders ortamının öğrencilerin hedef yönelimlerini şekillendirdiğini, bu şekilde öğrencilerin matematik başarısı üzerine etki ettiğini ifade etmektedir. Özellikle matematik başarısı üzerine öğrenme yönelimli ortamların performans yönelimli ortamlardan daha etkili olduğu ortaya çıkmıştır.

Hedef yönelimleri konusunda sadece öğrenme yöneliminin öğrencilerin öğrenme stratejileri ve matematik başarıları ile ilişkili olduğu bulunmuştur. Bu sonuç alan yazınındaki birçok çalışma ile paralellik göstermektektedir (Harackiewicz ve diğerleri, 2002; Urdan ve Midgley, 2003). Teorik olarak öğrenme yönelimine sahip olan öğrencilerin dersi öğrenmedeki temel amacının derste sunulan konuları tam olarak öğrenmek ve bu konularda uzmanlaşmak olduğu düşünüldüğünde elde edilen bulgunun beklenen muhtemel bir bulgu olduğu söylenebilir. Bunun yanında, performans yaklaşma yönelimi ile performans kaçınma yönelimi arasında elde edilen karşılıklı ilişki de teorik olarak bu yönelimlerin performans odaklı olmasından kaynaklanmış olabilir. Bu bağlamda performans yaklaşma yönelimi ile performans kaçınma yöneliminin birbirinden bağımsız olmadığı, diğer bir deyişle öğrencilerin her iki yönelime birden sahip olduğu söylenebilir. Örneğin, performans yaklaşma yönelimli bir öğrenci zorlu görevlerle karşılaştığında yetersiz görünmemek için performans kaçınma yönelimine geçebilir, ya da tam tersi olabilir.

Öz-yeterlik konusunda elde edilen bulgular öz-yeterliğin hem doğrudan hem de dolaylı olarak öğrencilerin hedef yönelimleri, öğrenme strateji kullanımları ve matematik başarıları ile ilişkili olduğunu göstermiştir. Ancak, öz-yeterlik matematik başarısı ile sadece toplam etkiler gözönünde bulundurulduğunda anlamlı derecede ilişkili bulunmuştur. Bu konuda alan yazınında genellikle öz-yeterlik ile akademik başarı arasında orta ya da yüksek derecede ilişki olduğu ifade edilmiştir (Malpass, O'Neil ve Hocevar, 1999; Pajares ve Graham, 1999; Skaalvik ve Skaalvik, 2009). Elde edilen bu bulgu öğrencilerin öz-yeterliklerini abartmasından ya da azımsamasından kaynaklanmış olabilir. Bu durumda gerçek dışı değerlendirilen öz-yeterlik algıları öğrencilerin maladaptif davranış geliştirmesine (Pajares ve Graham, 1999) ve beklenmeyen neticeler elde etmesine neden olmuş olabilir. Bu anlamda öğrencilerin gerçek dışı öz-yeterlik algılarını farketmek ve bunları düzeltmek öğrencilerin matematik öğrenimlerini daha başarılı kılacaktır (Usher ve Pajares, 2008).

Son olarak, öğrenme stratejileri konusunda sadece ayrıntılandırma stratejileri ile matematik başarısı arasında anlamlı derecede ilişki olduğu, diğer taraftan ne örgütleme stratejilerinin ne de bilişüstü öz-düzenleme stratejilerinin matematik başarısı ile anlamlı derecede ilişkili olduğu görülmüştür. Bu konuda alan yazınında her ne kadar eldeki bulguları desteklemeyen araştırmalar olsa da, son yıllarda matematik eğitimi alanında yapılan bazı araştırmaların eldeki bulguları desteklediği görülmüştür (Mousoulides ve Philippou, 2005; Malpass, O'Neil ve Hocevar, 1999;

Al-Harty ve Was, 2010). Ancak, bu araştırmalar dikkatlice incelendiğinde veri toplama aracı olarak Güdülenme ve Öğrenme Stratejileri Ölçeği'nden faydalanıldığı farkedilmiştir. Bu nedenle, elde edilen bulguların ölçme aracından kaynaklı olabileceği düşünülmektedir. Bu husuta, öğrenme stratejileri konusunda yapılacak çalışmalarda anket kullanımına ek olarak sınıf gözlemi, röportaj gibi alternatif veri toplama tekniklerinin de kullanılması önerilmektedir. Ayrıca, Güdülenme ve Öğrenme Stratejileri Ölçeği'nin orjinalde yükseköğrenim aşamasındaki öğrenciler için geliştirildiği gözönünde bulundurulursa elde edilen bulguların ilköğretim seviyesindeki öğrenciler için muhtemel olduğu söylenebilir. Özellikle bu konuda yapılacak çalışmalar elde edilen bu durumun daha iyi açıklanabilmesi için katkı sağlayacaktır.

Sonuç

Sonuç olarak eldeki bulgular öğrencilerin matematik başarısını etkileyen dört temel kavram olduğunu göstermektedir. Bu kavramlar başlıca öğrenme yönelimli ortam, kişisel öğrenme yönelimi, öz-yeterlik ve ayrıntılandırma stratejileri kullanımıdır. Derse yönelik hedef algılama konusunda sadece öğrenme yönelimli ortam, hedef yönelimi konusunda sadece öğrenme yönelimi, öğrenme stratejileri konusunda sadece ayrıntılandırma stratejileri matematik başarısı ile anlamlı derecede ilişkili bulunmuştur. Ayrıca, bu dört temel kavram arasında sadece ayrıntılandırma stratejileri kullanımı matematik başarısı ile doğrudan ilişkili bulunmuştur. Diğer kavramların ayrıntılandırma stratejileri kullanımı aracılığıyla matematik başarısı ile ilişkili olduğu görülmüştür. Bu nokta aslında bu çalışmanın en önemli ve temel yönünü oluşturmakta, güdüsel unsurların öğrencilerin matematik başarısını etkilemede tek başına yeterli olmadığını ortaya koymaktadır. Bu hususta güdüsel unsurların ancak öğrenme stratejileri kullanımı üzerinden matematik başarısına etki ettiği sonucu ortaya çıkmaktadır.

VITA

Personal Information

Surname, Name: Kayan Fadlelmula, Fatma
Nationality: Turkish
Date of Birth: 26 June 1981
Place of Birth: Malatya, Turkey
Marital Status: Married
e-mail: kayan@metu.edu.tr / fatmakayan@yahoo.com

Education

Degree	Year	Institution	G.P.A.
Ph.D.	2011	METU Elementary Education	4.00 / 4.00
M.S.	2007	METU Elementary Science and Mathematics Education	4.00 / 4.00
B.S.	2004	METU Elementary Mathematics Education	3.25 / 4.00 (Honor Student)

Work Experience

Date	Place	Enrollment
Oct/2007 Mar/2009	METU Research Coordination Office	Research Assistant
Mar/2005 Dec/2006	RtB Educational Solutions Co., METU Teknokent	Multimedia Content Designer

Skills, Qualifications, and Awards

Languages	Turkish (Native), English (Fluent), Arabic (Basic)
Computer	Basic computer skills (Windows Office programs) Statistical programs (PASW Statistics 18.0; LISREL 8.80)
Awards	Scientific and Technological Research Council of Turkey, National Doctoral Research Scholarship

PUBLICATIONS

Journal Papers

1. Kayan Fadlelmula (2011). Assessing power of structural equation modeling studies: A meta-analysis. Education Research Journal, 1(3), 14-23.

2. Kayan Fadlelmula, F. & Cakiroglu, E. (2011). Pre-service teachers' perceptions about mathematical problems and the nature of problem solving. Education Research Journal, 1(3), 24-30.

3. Kayan Fadlelmula, F. (2011). The effect of gender on elementary students' goal orientations, use of learning strategies, and mathematics achievement. The International Journal of Learning, 18(1), 337-345.

4. Kayan Fadlelmula, F. & Ozgeldi, M. (2010). How a learner self-regulates reading comprehension: A case study for graduate level reading. Journal of US-China Education Review, 7(10), 22-28.

5. Kayan Fadlelmula, F. (2010). Mathematical problem solving and self-regulated learning. The International Journal of Learning, 17(3), 363-372.

6. Kayan Fadlelmula, F. (2009). Students' peer interactions in different group compositions. The International Journal of Learning, 16(2), 77-84.

7. Kayan, F., & Cakiroglu, E. (2008). Pre-service elementary mathematics teachers' mathematical problem solving beliefs. Hacettepe University Journal of Education, 35, 218-226. (Indexed by SSCI)

Books

1. Kayan Fadlelmula, F. (2009). Preservice Teachers' Beliefs about Mathematical Problem Solving: Beliefs about Mathematics Problems and the Nature of Problem Solving. Lambert Academic Publishing, Germany.

Conference Papers

1. Kayan Fadlelmula, F., Çakıroğlu, E., & Sungur, S. (2011, October). A structural equation modeling study on motivational beliefs, use of self-regulation strategies, and mathematics achievement. First International Congress on Curriculum and Instruction, Eskişehir, Turkey.

2. Kayan Fadlelmula, F., Çakıroğlu, E., & Sungur, S. (2011, October). Turkish version of the Patterns of Adaptive Learning Survey and Motivated Strategies for Learning Questionnaire for elementary mathematics education. First International Congress on Curriculum and Instruction, Eskişehir, Turkey.

3. Kayan Fadlelmula, F. (2011, September). A meta-analysis on power of structural equation modeling studies. European Conference on Educational Research, Berlin, Germany.

4. Kayan Fadlelmula, F., Çakıroğlu, E., & Sungur, S. (2011, September). Elementary students' motivational beliefs, use of self-regulation strategies, and mathematics achievement. European Conference on Educational Research, Berlin, Germany.

5. Kayan Fadlelmula, F. (2011, July). Effect of gender on elementary students' goal orientations, use of learning strategies, and mathematics achievement. 18th International Conference on Learning, Mauritius.

6. Kayan Fadlelmula, F. (2010, July). Interrelation between problem solving and self-regulation in mathematics education. Paper presented at the 17th International Conference on Learning, Hong Kong, Hong Kong.

7. Kayan Fadlelmula, F. (2010, February). Educational motivation and students' achievement goal orientations. Paper presented at the annual meeting of the World Conference on Educational Sciences, Istanbul, Turkey.

8. Kayan Fadlelmula, F., & Cakiroglu, E. (2009, October). Öğretmen adaylarının problem çözmenin doğasına yönelik inanışları. Paper presented at the annual meeting of the 18. Ulusal Eğitim Bilimleri Kurultayı, İzmir, Turkey.

9. Ozgeldi, M. & Fadlelmula Kayan, F. (2009, September). A case study: How a learner self-regulates reading comprehension. Paper presented at the annual meeting of the European Conference on Educational Research, Vienna, Austria.

10. Kayan Fadlelmula, F. (2009, July). Students' peer interactions in different group compositions. Paper presented at the 16th International Conference on Learning, Barcelona, Spain.

11. Kayan, F., & Cakiroglu, E. (2008, September). Pre-service teachers' beliefs about mathematical problem solving. Paper presented at the annual meeting of the European Conference on Educational Research, Göteborg, Sweden.

Review of Works

1. Kayan, F. (2008). What's worth fighting for in education? International Electronic Journal of Mathematics Education, 3(1), 74-75.

2. Kayan, F. (2007). An imaginative approach to teaching. Eurasia Journal of Mathematics, Science, & Technology, 3(3), 247-248.

3. Kayan, F. (2007). Öğretmen eğitimi ve öğretimde yaklaşımlar. Elementary Education Online, 6(3), k:2.