THE INTERPLAY AMONG ELEMENTARY STUDENTS' IMPLICIT THEORIES OF ABILITY, EPISTEMOLOGICAL BELIEFS, MOTIVATIONAL BELIEFS, ACHIEVEMENT GOALS, LEARNING STRATEGIES, PROCRASTINATION AND SCIENCE ACHIEVEMENT

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

BY

FİLİZ BEZCİ

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

JANUARY 2016

Approval of the Graduate School of Social Sciences

Prof. Dr. Meliha ALTUNIŞIK
Director

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

Prof. Dr. Ceren ÖZTEKİN
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.

Prof. Dr. Semra SUNGUR
Supervisor

Examining Committee Members

Prof. Dr. Ayhan YILMAZ (Hacettepe Uni, SSME)

Prof. Dr. Semra SUNGUR (METU, ELE)

Prof. Dr. Jale ÇAKIROĞLU (METU, ELE)

Prof. Dr. Esin ATAV (Hacettepe Uni, SSME)

Prof. Dr. Özgür ERDUR-BAKER (METU, EDS)

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: Filiz BEZCİ

Signature:

ABSTRACT

THE INTERPLAY AMONG ELEMENTARY STUDENTS' IMPLICIT THEORIES OF ABILITY, EPISTEMOLOGICAL BELIEFS, MOTIVATIONAL BELIEFS, ACHIEVEMENT GOALS, LEARNING STRATEGIES, PROCRASTINATION AND SCIENCE ACHIEVEMENT

Bezci, Filiz

Ph.D., Department of Elementary Education

Supervisor: Prof.Dr. Semra SUNGUR

January 2016, 514 pages

The aim of this study was to examine the relationships among seventh grade students' implicit theories of ability (i.e., incremental theory of ability), epistemological beliefs (i.e., source of knowing, certainty of knowledge, development of knowledge and justification for knowing), motivational beliefs (i.e., self-efficacy and task value), achievement goals (i.e., mastery-approach goal, performance-approach goal, mastery-avoidance goal and performance-avoidance goal), learning strategies (i.e., cognitive learning strategies and metacognitive learning strategies), procrastination and science achievement. For the purpose of the study, a path model was proposed and tested. A total of 4510 seventh grade students participated in the study.

Although observed relations showed some variation across dimensions of the variables, path analysis results, in general, indicated that students' incremental theory of ability, epistemological beliefs and motivational beliefs are directly related with their achievement goals, learning strategies use, procrastination and science achievement. Results also revealed that students' achievement goals are directly linked to their learning strategy use and procrastination. Additionally, students' learning strategy use was found to be directly associated with their procrastination and science achievement.

Keywords: Implicit Theories of Ability, Epistemological Beliefs, Motivational Beliefs, Procrastination, Learning Strategies

ÖZ

İLKÖĞRETİM ÖĞRENCİLERİNİN YETENEĞE YÖNELİK ÖRTÜLÜ TEORİLERİ, EPİSTEMOLOJİK İNANÇLARI, GÜDÜSEL İNANÇLARI, HEDEF YÖNELİMLERİ, ÖĞRENME STRATEJİLERİ, ERTELEME DAVRANIŞLARI VE FEN BAŞARILARI ARASINDAKİ İLİŞKİ

Bezci, Filiz
Doktora, İlköğretim Bölümü
Tez Yöneticisi: Prof. Dr. Semra Sungur
Ocak 2016, 514 sayfa

Bu çalışmanın amacı yedinci sınıf öğrencilerinin fen dersi ile ilgili örtülü yetenek teorileri (artan yetenek teorisi türünden), epistemolojik inançları (bilginin kaynağı, bilginin kesinliği, bilginin gelişimi ve bilginin gerekçelendirilmesi), güdüsel inançları (öz-yeterlilik inançları, görev değer inançları), başarı hedef yönelimleri (öğrenme yaklaşma hedefleri, performans yaklaşma hedefleri, öğrenme kaçınma hedefleri ve performans kaçınma hedefleri), öğrenme stratejileri (bilişsel öğrenme stratejileri ve bilişötesi öğrenme stratejileri), erteleme davranışları ve fen başarıları arasındaki ilişkiyi incelemektir. Bu amaçla bir model tasarlanmış ve yol analizi ile test edilmiştir. Çalışmaya toplam 4510 yedinci sınıf öğrencisi katılmıştır.

İlişkiler değişkenlerin boyutları arasında farklılık gösterse de, genel olarak yol analizi sonuçları öğrencilerin artan yetenek teorilerinin, epistemolojik inançlarının ve güdüsel inançlarının doğrudan hedef yönelimleri, öğrenme stratejileri, erteleme davranışları ve fen başarıları ile ilişkili olduğunu göstermiştir. Ayrıca öğrencilerin hedef yönelimleri öğrenme stratejileri ve erteleme davranışları ile doğrudan ilişkili bulunmuştur. Buna ek olarak, sonuçlar öğrenme stratejilerinin erteleme davranışları ve fen başarıları ile doğrudan ilişkili olduğunu ortaya koymuştur.

Anahtar Kelimeler: Örtülü Yetenek Teorileri, Epistemolojik İnançlar, Güdüsel İnançlar, Erteleme Davranışı, Öğrenme Stratejileri

To my beautiful mother Muazzez BEZCİ

&

To the memory of my father Sakin BEZCİ

ACKNOWLEDGEMENT

I would like to express my deepest appreciation and gratitude to my supervisor Prof. Dr. Semra Sungur for her encouragement, guidance, patient, fast feedbacks, and greatest support throughout writing this doctoral dissertation. She is an extraordinary scholar and I will always be indebted for the opportunity to have been her student. Also I would like to thank the my committee members; Prof. Dr. Jale Çakiroğlu, Prof. Dr. Özgür Erdur-Baker, Prof. Dr. Ayhan Yılmaz and Prof. Dr. Esin Atav for their support, and valuable suggestions to my dissertation.

I also extend my gratitude to TUBITAK for providing financial support in this process by National Scholarship Programme for PhD Students.

I am grateful to Prof. Dr. Ceren Öztekin, Prof. Dr. Gaye Teksöz, Prof. Dr. Özgül Yılmaz-Tüzün and Assoc. Dr. Elvan Şahin for their encouragement and support during my education years in METU. In addition, I extend my appreciation to Prof. Dr. Meliha Altunışık and Assoc. Dr. Yaşar Kondakçı, working with them in the Graduate School of Social Sciences of METU provided me invaluable experience. Moreover, I want to express my deep thanks to Assoc. Dr. Arif Özer who taught me the analysis techniques used in my thesis. I am also grateful to Prof. Dr. Mehmet Beşirli for his support.

My warmest thanks go to my dear friends who I met during my doctoral education; Dr. Ayşe Yenilmez-Türkoğlu, Dr. Gülsüm Gök, Dr. Kader Bilican, Dr. Deniz Ateş, Dr. Büşra Tuncay-Yüksel, Dr. Burcu Şenler, Dr. Yasemin Taş, Dr. Sündüs Yerdelen, Dr. Nurcan Cansız, Dr, Mustafa Cansız, Dr. Yasemin Özdem, Dr. Umut Alper, Dr. Gülsüm Akyol, Dekant Kıran, Berna Sicim, Gamze Çetinkaya, Güliz Karaaslan, Şebnem Soylu, Simge Yılmaz, Betül Yeniterzi, Birgül Çakır, Zeynep Serap Tekten, Kübra Oğuz, Simge Sönmez, Zeynep Tuba Sungur, Yusuf İkbal Oldaç and Fethi Kurtiy Şahin.

Special heartfelt thanks to my beloved nuclear family members. First of all I want to express my deepest thank to my father Sakin Bezci who always encouraged me for the Ph.D. education, but unfortunately he could not see my graduation - Rest in peace my love, I miss you too much. And I am deeply thankful to my beautiful mother Muazzez Bezci who endlessly encouraged and supported me with love - I am grateful to you mum. Also, I would like to thank my dear sister Dr.Figen Bezci who always motivated me and I never understand how time is running out with her - You are my happiness Bidi. Finally, I would like to present my deep thanks to my husband Hasan Bircan for his love, patience, invaluable support and understanding - Life is easier with you my love. Additionally, I am grateful to my big family for their support and encouragement. Their endless love and good wishes were always with me - I love you all, and thank you very much.

TABLE OF CONTENTS

LIST OF TABLES

TABLES

LIST OF FIGURES

FIGURES

LIST OF ABBREVIATIONS

ITSAS : Implicit Theories of Science Ability Scale

EBQ : Epistemological Beliefs Questionnaire

AGQ : Achievement Goal Questionnaire

MSLQ : Motivated Strategies for Learning Questionnaire

TPS : Tuckman Procrastination Scale

SAT : Science Achievement Test

SEM : Structural Equation Modeling

χ^2 : Chi Square

RMSEA : Root Mean Square Error of Approximation

SRMR : Standardized Root Mean Square Residual

NFI : Normed Fit Index

CFI : Comparative Fit Index

GFI : Goodness-of-Fit Index

CHAPTER I

INTRODUCTION

Individuals develop beliefs and those beliefs have pivotal role in their life to organize their world and interpret the meaning of their experience (Dweck, 1999). Particularly, those beliefs shape individuals' psychological worlds and affect their thinking, feeling and behavior. In academic settings, learners' beliefs act as filter to help interpretation of learning process and its components (Thomas & Rohwer, 1987). Therefore many of the educational theories and models focused on individuals' beliefs and values (e.g., Bandura, 1986, 1997; Dweck, 2002, 2006; Dweck, Chiu & Hong, 1995; Dweck & Legget, 1988; Eccles, 1987, 1993, 2005; Eccles, Adler, Futterman, Goff, Kaczala, Meece & Midgley, 1983; Eccles & Wigfield, 1995; Hofer & Pintrich, 1997; Schommer, 1990; Wigfield, 1994a; Wigfield & Eccles, 1992, 2000, 2002). Giving emphasis on individuals' beliefs and values Dweck and her colleagues (Bandura & Dweck, 1985; Diener & Dweck, 1978, 1980; Dweck, 1975, 1999; Dweck et al., 1995; Dweck & Legget, 1988; Dweck & Reppucci, 1973; Elliott & Dweck, 1988; Leggett & Dweck, 1986) developed a social-cognitive model of achievement motivation. According to the model, beliefs and values create individual differences named as implicit theories in different domains such as intelligence, personality and morality (e.g., Bandura & Dweck, 1985; Dweck et al., 1995; Dweck & Legget, 1988). Implicit theories of intelligence are about individuals' beliefs about the intellectual ability (Dweck, 2002, 2006; Dweck et al., 1995; Dweck & Legget, 1988; Hong, Chiu, Dweck, Lin, & Wan, 1999). Two self-theories were identified according to individuals' beliefs about the nature of intelligence as entity (i.e., fixed) theory of intelligence and incremental (i.e., malleable) theory of intelligence (Dweck & Legget, 1988). In the entity theory, intelligence is considered as fixed and nonmalleable on the contrary intelligence is envisaged as malleable and changeable in incremental theory. Although the meaning of intelligence and ability is not same, the implied phenomenon is supposed to be the same for implicit theories of ability and implicit theories of intelligence. Accordingly, both terms have been interchangeably used in many studies (e.g., Chen & Pajares, 2010; Cury, Da Fonseca, Rufo & Sarrazin, 2002; Cury, Elliot, Da Fonseca & Moller, 2006; Dweck, 2002; Ommundsen, 2003). Similar to individuals' implicit theories of intelligence, learners' beliefs about implicit theories of ability is demonstrated to be domain specific (Chen & Pajares, 2010; Dweck, 2002). Therefore, it is essential to concentrate on specific academic domain such as science or math while assessing learners' implicit theories of ability which is found to be associated with learners' goal setting, strategies use, effort, persistence and performance on academic tasks (Dweck, 1999, 2002; Dweck, et al., 1995; Dweck & Legget, 1988; Elliott & Dweck, 1988; Hong et al., 1999; Leggett & Dweck, 1986). Accordingly, students' implicit theories of ability were examined in relation to their goals, learning strategies use, procrastination tendencies, and achievement in science in the current study.

Besides, students' beliefs in science ability, their epistemological beliefs emerge as another important construct influencing achievement related processes and outcomes (Ryan, 1984; Schommer, 1993). Students' beliefs about knowledge and knowing constitute their personal epistemology (i.e., epistemological beliefs). Early researches on individuals' epistemological beliefs were more or less unidimensional but later Schommer (1990) proposed that personal epistemology is independent multidimensional beliefs system. This assertion has initiated a movement of the research on the field from developmental approach to a broader approach which relates personal epistemology with cognition and performance. Schommer (1990) conceptualized the epistemological beliefs about simplicity, certainty and source of knowledge, and also control and speed of knowledge acquisition. First three dimensions have been commonly mentioned in personal epistemology literature, specifically certainty and simplicity dimensions are under nature of knowledge, and source dimension is under nature of knowing. But the last two dimensions, control (i.e., fixed or improvable feature of intelligence) and speed (i.e., quick or gradual acquisition of knowledge) of acquisition were derived from Dweck and her colleagues' social-cognitive model based on the researches about individuals' implicit theories of intelligence (Schommer, 1990). But, Schommer's model was criticized in terms of dimensions since it was not gave similar factor structure in different studies (e.g., Qian & Alvermann, 1995). Also, other researches (e.g., Hofer & Pintrich, 1997) studying in the field indicated that control and speed dimensions of Schommer's model are not focused on whether nature of knowledge or knowing, they argue that personal epistemology should be in purest form and it should be limited by beliefs about the nature of knowledge and knowing. Therefore, Hofer and Pintrich (1997) proposed a theoretical structure for personal epistemology considering the criticism on Schommer's model. Accordingly, they suggested four epistemological belief dimensions, namely; certainty of knowledge and simplicity of knowledge dimensions representing the nature of knowledge; source of knowledge and justifications of knowledge representing the nature of knowing. In addition, Conley, Pintrich, Vekiri and Harrison (2004) proposed a structure for elementary grade students' epistemological beliefs in science specifying four dimensions, namely; source of knowing (i.e., beliefs about origin of scientific knowledge depends on authority or individuals' own observation and reasoning), certainty of knowledge (i.e., beliefs about scientific questions have single right answer or more than one right answers), development of knowledge (i.e., beliefs about scientific knowledge is stable or has an evolving nature) and justification for knowing (i.e., beliefs about scientific experiments have role on justification of scientific laws or solutions of arguments and developing new ideas). In the current study, the structure proposed by Conley et al., (2004) was used considering the fact that the study was to be conducted with elementary students in science classes. When the research on students' epistemological beliefs was examined, it was realized that epistemological beliefs in academic settings was generally studied with college and high school students. However, according to research findings, epistemological beliefs start to develop at early ages of children (Wellman, 1992) and have continuity (Chandler, Hallett, & Sokol, 2002). Also, it was commonly reported in the literature that students' have more sophisticated beliefs in higher grades than lower grades (Schommer, Calvert, Gariglietti, & Bajaj, 1997; Schommer, Mau, Brookhart, & Hutter, 2000; Kurt, 2009). Thus, there is a need for investigating students' epistemological beliefs in early grade levels. Examining students' epistemological beliefs is essential, because epistemological beliefs of students play pivotal role in students learning (Buehl, 2003; Schommer, 1990; Schommer, Crouse & Rhodes, 1992). In addition, a sizeable body of research demonstrated the relations of epistemological beliefs with achievement goals (Chen & Pajares, 2010; DeBacker & Crowson; 2006; Hofer & Pintrich, 1997; Kızılgüneş, Tekkaya & Sungur, 2009; Muis & Franco, 2009; Pamuk, 2014; Paulsen & Feldman, 1999; Phan, 2009; Yılmaz & Şen, 2012), learning strategies (Alpaslan,Yalvac, Loving & Willson, 2015; Bråten & Strømsø, 2005; Dahl, Bals & Turi, 2005; Kardash & Howell, 2000; Özkan, 2008; Pamuk, 2014; Paulsen & Feldman, 2007; Ryan, 1984), academic problems such as procrastination (Boffeli, 2007) and achievement (Conley et al., 2004; Hofer, 2000; Kızılgüneş, 2007; Özkan, 2008; Pamuk, 2014; Ryan, 1984; Schommer, 1993; Schommer-Aikins & Easter, 2006; Yeşilyurt, 2013). These relations were also examined in the current study specifically in science domain.

Apart from students' beliefs concerning science ability and their epistemological beliefs, their motivational beliefs appear to play important role in their learning and performance (Bandura, 1977, 1982, 1986; Bandura & Schunk, 1981; Eccles, 1987; 1993, 2005; Eccles et al., 1983; Linnenbrink & Pintrich, 2002, 2003; Multon, Brown & Lent, 1991; Wigfield & Eccles, 1992, 2000, 2002). In the related literature, students' motivational beliefs which appear to be the most influential in their learning include self-efficacy beliefs and task value beliefs. Self-efficacy concerns individual judgments of their capabilities for a task (Bandura, 1986, 1997). Self-efficacy beliefs of individuals may affect their choice of activities, effort, persistence, interest and achievement (Bandura, 1977, 1997; Pajares, 1996, 1997; Schunk, 1981, 1995). Therefore, high self-efficacy ensures higher levels of achievement and greater self-regulation for students (Schunk & Pajares, 2009). In addition, task value involves students' beliefs regarding the qualities of tasks in terms of being important, interesting and useful (Eccles, 2005; Eccles et al., 1983; Wigfield & Eccles, 1992; Wigfield, Tonks & Klauda, 2009). If individuals believe the importance and/or enjoyment and/or utility and/or low costs of a task, they will more prone to engage in it (Eccles et al., 1983). And task value of individuals is directly related with achievement performance, persistence, and choice of learners in academic setting (Eccles, 1987, 1993, 2005; Eccles et al., 1983; Eccles & Wigfield, 1995; Meece, Wigfield, & Eccles, 1990; Wigfield, 1994a; Wigfield & Eccles, 1992, 2000, 2002). In general, students with adaptive motivational beliefs appear to use learning strategies at higher levels (Ames &

Archer, 1988; Bråten & Olaussen, 1998; Kıran, 2010; Pintrich & De Groot, 1990; Sungur, 2007; Taş & Çakir, 2014; Yumuşak, Sungur & Çakıroğlu, 2007), demonstrate lower levels of academic problems such as procrastination (Akbay, 2009; Corkin, 2012; Haycock, McCarthy & Skay, 1998; Hensley, 2013; Klassen, Krawchuk & Rajani, 2008; Özer & Altun, 2011; Taura, Abdullah, Roslan & Omar, 2015; Tuckman, 1991; Uzun Özer, 2010; Wolters, 2003, 2004), and have higher levels of achievement (Chen & Pajares, 2010; Hıdıroğlu, 2014; Senler & Sungur, 2014; Sungur & Güngören, 2009; Yerdelen, 2013; Yumuşak et al., 2007). Additionally, adaptive motivational beliefs were found to be associated with students' desire to learn and understand the topics meaningfully (Bandura, 1986, 1997; Dweck & Leggett, 1988; Elliott & Dweck, 1988; Schunk & Pajares, 2009). These reported relations in the relevant literature were tested in the current study with elementary students specifically in science domain. Conducting the studies in specific domains is important because, students' motivational beliefs may change from domain to domain (Bandura, 1997; Bong, 2001; Eccles & Wigfield, 1995; Eccles, Wigfield, Harold & Blumenfeld, 1993).

According to related literature, besides motivational beliefs, achievement goals emerge as an important motivational construct in academic settings. Achievement goals refer to students' purpose or meanings of academic activities (Kaplan & Maehr, 2007; Maehr & Nicholls, 1980; Midgley, Kaplan & Middleton, 2001). Although, achievement goals were evaluated in different frameworks such as dichotomous (Ames & Archer, 1987, 1988; Dweck & Elliott, 1983; Nicholls, 1980, 1989) and trichotomous (Elliot, 1997; Elliot & Church, 1997; Elliot & Harackiewicz, 1996; Middleton & Midgley, 1997), a 2x2 achievement goal framework (Elliot, 1999; Elliot & McGregor, 2001; Pintrich, 2000) were asserted recently which include mastery-approach, performance-approach, mastery-avoidance and performance avoidance achievement goals. Accordingly, individuals setting mastery-approach goals "focus on mastering task, learning, understanding", performance-approach goals "focus on being superior, besting others, being the smartest, best at task in comparison to others", mastery-avoidance goals "focus on avoiding misunderstanding, avoiding not learning or not mastering task" and performance-avoidance "focus on avoiding inferiority, not looking stupid or dumb in comparison to others" (Pintrich, 2000, p.477). Also, 2x2 framework for achievement goals were taken into account in the current study. In addition, the related literature indicated the effect of learners' achievement goals on their learning strategies (Alpaslan et al., 2015; Ames, 1984; Ames & Archer, 1988; Bandura & Dweck, 1985; Dupeyrat & Mariné, 2005; Dweck & Leggett, 1988; Elliot & McGregor, 2001; Elliot, McGregor, & Gable, 1999; Harackiewicz, Barron, Tauer, Carter & Elliot, 2000; Kadıoglu & Uzuntiryaki-Kondakci, 2014; Kahraman & Sungur, 2011; Kıngır, Tas, Gok & Sungur-Vural, 2013; Kıran, 2010; Leggett & Dweck, 1986; Muis & Franco, 2009; Rastegar, Jahromi, Haghighi & Akbari, 2010; Somoncuoğlu & Yıldırım, 1999; Tas & Cakir, 2014; Wolters, 2004), tendency to intentionally postpone academic activities (Cao, 2012; Ferrari, 1991a, 1991b, 1991c; Ganesan, Mamat, Mellor, Rizzuto & Kolar, 2014; Howell & Buro, 2009; Howell & Watson, 2007; Kandemir, 2010; McGregor & Elliot, 2002, Study 2; Özer & Altun, 2011; Scher & Ferrrari, 2000; Scher & Osterman, 2002; Wolters, 2003, 2004). The present study also aimed to investigate the relations in the science domain studying with elementary students.

As indicated in the previous paragraphs, students' epistemological beliefs, motivational beliefs and achievement goals are found to be significantly linked to their use of learning strategies. Learning strategies are learners' intentionally processed mental activities while engaging in learning activities (Brandt, 1988). Importance of learning strategies use has been emphasized in some social cognitive models (e.g., Diener & Dweck, 1978, 1980; Dweck, 1986; Dweck et al., 1995; Dweck & Leggett, 1988, Elliott & Dweck, 1988) and self-regulated models (e.g., Muis, 2007; Pintrich, 2000; Winne & Hadwin, 1998; Zimmerman, 1989, 1990, 1998). Learning strategies were classified and categorized in different ways in the related literature. For instance in Dweck and her colleagues' social cognitive model, learning strategies were categorized according to way of their use as; effective or ineffective strategies. Also, in some source learning strategies were classified as deep vs. surface learning strategies (Biggs, 1987; Meece, Blumenfeld, & Hoyle, 1988; Miller, Greene, Montalvo, Ravindran, & Nichols, 1996). But the most commonly used categorization of learning strategies was done by Pintrich, Smith, Garcia and

McKeachie (1991) on two broad domains, namely; cognitive strategies (i.e., cognitive learning strategies) and metacognitive strategies (i.e., metacognitive learning strategies), also this categorization was used in the current study. Accordingly cognitive learning strategies are learners' skills which are used to control their participation, learning, remembering, and thinking (Gagné, 1985) to choose, get and combine the new knowledge with existing knowledge (Dowson & McInerney, 1998) and it is composed of rehearsal, elaboration, organization and critical thinking for information (Pintrich et al., 1991). Besides, metacognitive learning strategies are about regulation of learners' own knowledge about their cognitive process, products and everything related with them for learning process (Brown, 1978, 1987; Flavell, 1976, 1979) and they are comprised of planning, monitoring and regulating (Pintrich et al., 1991). In the meantime, metacognitive learning strategies draw on cognitive process (Flavell 1979; Nelson, 1999) while cognitive activities are execution of the task needed process, metacognitive activities are function as executive of the process (Veenman, 2012). So learners' metacognitive learning strategies are related with their cognitive learning strategies (Heikkilä & Lonka, 2006; Kasımi, 2012; Phakiti, 2006; Saçkes, 2010). Besides learners using learning strategies less are more prone to intentionally postpone academic activities (Cao, 2012; Howell & Watson, 2007; Klingsieck, Fries, Horz & Hofer, 2012; Motie, Heidari & Sadeghi, 2012; Wolters, 2003) but more use of those strategies mediates learners to higher academic achievement (Butler & Winne, 1995; Pintrich, 2000; Pintrich & De Groot, 1990; Zimmerman, 2000;

Zimmerman & Martinez-Pons, 1986). In the current study, the role of students' learning strategies use in their procrastination tendencies and achievement in science were also examined.

Learners' tendencies to intentionally postpone such academic tasks such as reading assignments, homework and studying for examinations despite of its negative outcomes are named as academic procrastination (Howell & Watson, 2007; Senécal, Koestner, & Vallerand, 1995; Steel, 2007). Although the most common definition for procrastination is "the act of needlessly delaying tasks to the point of subjective discomfort" (Solomon & Rothblum, 1984, p. 503), it has many definition because it was studied from various perspectives as being trait, state, self-protection method, reinforced behavior, suspicious about own ability, self-regulation failure, maladaptive behavior and so forth in the related literature. Also, procrastination is an explanation of being low achiever of educational psychology (Scher & Osterman, 2002; van Eerde, 2003; Wolters, 2004).

In addition, the related literature indicates the direct role of learners' implicit theories of ability (Chen & Pajares, 2010; Cury, et al., 2006; Good, Aronson & Inzlich, 2003; Robins & Pals, 2002; Blackwell, Trzesniewski & Dweck, 2007), epistemological beliefs (Hofer, 2000; Kızılgüneş, 2007; Özkan, 2008; Pamuk, 2014; Pintrich et al., 2004; Schommer-Aikins & Easter, 2006; Schommer, 1993; Schommer, Brookhart, Hutter & Mau, 2000; Yeşilyurt, 2013), motivational beliefs (Bandura, 1977, 1982, 1986; Bandura & Schunk, 1981; Chen & Pajares, 2010; Eccles, 1987; 1993, 2005; Eccles et al., 1983; Hensley, 2013; Hıdıroğlu, 2014; Kıngır et al., 2013; Linnenbrink & Pintrich, 2002, 2003; Mohammadi, Rouhi & Davaribina, 2012; Multon et al., 1991; Pamuk, 2014; Senler & Sungur, 2014; Sungur & Güngören, 2009; Wigfield & Eccles, 1992, 2000, 2002; Yerdelen, 2013; Yumuşak et al., 2007), learning strategies (Akyol, Sungur & Tekkaya, 2010; Butler & Winne, 1995; Dupeyrat & Mariné, 2005; Kaya & Kablan, 2013; Kıngır et al., 2013; Muis & Franco, 2009; Özkan, 2008; Pintrich, 2000; Pintrich & De Groot, 1990; Rastegar et al., 2010; Yerdelen, 2013; Yumuşak et al., 2007; Zimmerman, 2000; Zimmerman & Martinez-Pons; 1986, 1988) and procrastination (Bezci & Sungur, 2013; Çakıcı, 2003; Howell & Watson, 2007; Klassen et al., 2008; Klingsieck et al., 2012; McGregor & Elliot, 2002, Study 2; Mendelson, 2007; Scher & Osterman, 2002; Steel, 2007; van Eerde, 2003; Wolters, 2004) on their academic achievement. Since all mentioned variables have domain specific nature, the current study focused on science domain and explored those variables influence the science achievement of the students.

1.1 Purpose of the Study

The current study proposed (see Figure 1.1) and tested a model of the interplay among elementary students' implicit theories of ability, epistemological beliefs, motivational beliefs, achievement goals, learning strategies, procrastination and achievement for science course using path analysis.

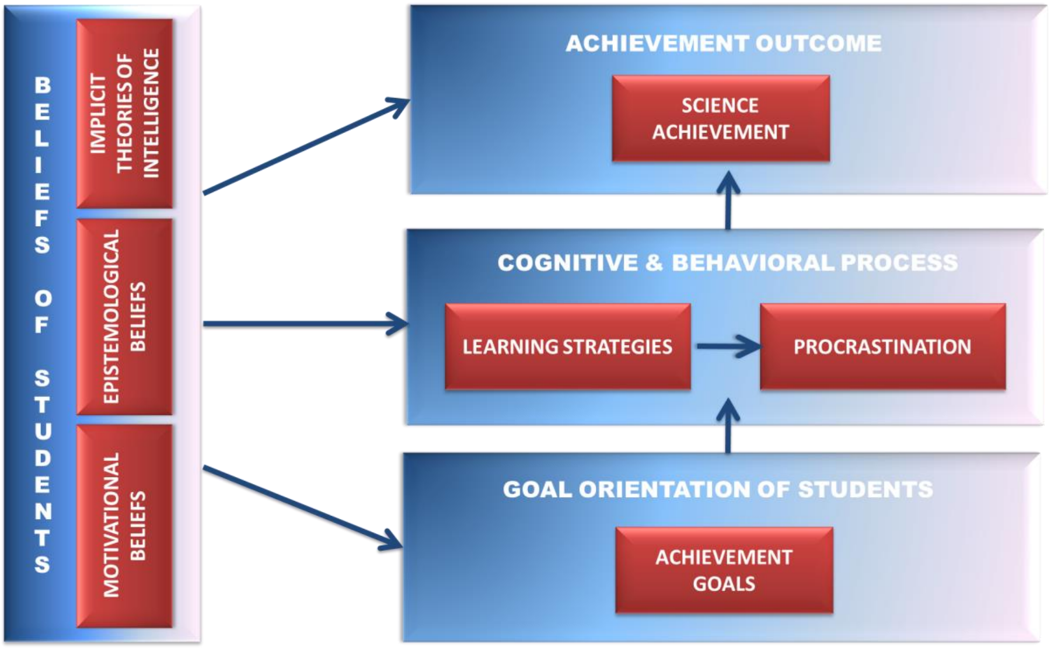


Figure 1.1 The Proposed Basic Model

1.2 Proposed Model

The related literature indicated that learners' implicit theories of ability is related with their achievement goals (Bandura & Dweck, 1985; Blackwell, Trzesniewski & Dweck, 2007; Chen & Pajares, 2010; Cury, et al., 2006; Dweck, 1999; 2006; Dweck & Leggett, 1988; Elliott & Dweck, 1988; Elliot & McGregor, 2001, Study 3; Hong et al., 1999; Leondari & Gialamas, 2002; Ommundsen, 2001a; 2001b; Robins & Pals, 2002; Stipek & Gralinski, 1996), learning strategies (Abdullah, 2008; Bråten & Olaussen, 1998; Diener & Dweck, 1978, 1980; Doron, Stephan, Boiché & Scanff, 2009; Dweck, 1986; Dweck et al., 1995; Dweck & Leggett, 1988; Elliott & Dweck, 1988; Ommundsen, 2003; Ommundsen, Haugen & Lund, 2005; Stipek & Gralinski, 1996), procrastination (Howell & Buro, 2009) and academic achievement (Chen & Pajares, 2010; Cury, et al., 2006; Good et al., 2003; Robins & Pals, 2002; Blackwell, Trzesniewski & Dweck, 2007). In the current study, students' implicit theories of ability for science domain were investigated as incremental theory of ability. Accordingly, present study proposed that elementary students' incremental theory of ability is associated with their achievement goals, learning strategies, procrastination and academic achievement for science course.

Besides, the related literature pointed that learners' epistemological beliefs are related with their achievement goals (Chen & Pajares, 2010; DeBacker & Crowson; 2006; Hofer & Pintrich, 1997; Kızılgüneş et al., 2009; Muis & Franco, 2009; Pamuk, 2014; Paulsen & Feldman, 1999; Phan, 2009; Yılmaz & Şen, 2012), learning strategies (Alpaslan et al., 2015; Bråten & Strømsø, 2005; Dahl, Bals & Turi, 2005; Kardash & Howell, 2000; Özkan, 2008; Pamuk, 2014; Paulsen & Feldman, 2007; Ryan, 1984), procrastination (Boffeli, 2007) and academic achievement (Conley etal., 2004; Hofer, 2000; Kızılgüneş, 2007; Özkan, 2008; Pamuk, 2014; Ryan, 1984; Schommer, 1993; Schommer-Aikins & Easter, 2006; Yeşilyurt, 2013). For epistemological beliefs, Hofer and Pintrich's (1997) framework was taken as a guide by Conley et al. (2004) and researchers considered epistemological beliefs' dimensions as source of knowing, certainty of knowledge, development of knowledge and justification for knowing for examining elementary school students' epistemological beliefs about science. Therefore, in the current study it was proposed that elementary students' beliefs about source of knowing, certainty of knowledge, development of knowledge and justification for knowing dimensions are associated with their achievement goals, learning strategies, procrastination and science achievement.

In addition, the related literature showed that students' motivational beliefs (i.e., self-efficacy and task value beliefs) are related with their achievement goals (Bandura, 1986; Bandura & Schunk, 1981; Cury, et al., 2006; Dweck & Elliott, 1983; Dweck & Leggett, 1988; Elliot & Church, 1997; Elliott & Dweck, 1988; Kahraman & Sungur, 2013; Kıngır et al., 2013; Kıran, 2010; Liem, Lau & Nie, 2008; Schunk & Pajares, 2009; Senler & Sungur, 2014; Sungur, 2007; Wigfield, 1994b; Wolters, Yu & Pintrich, 1996; Zimmerman, 2000; Zimmerman & Bandura, 1994), learning strategies (Ames & Archer, 1988; Bråten & Olaussen, 1998; Dweck & Leggett, 1988; Elliott & Dweck, 1988; Kıngır et al., 2013; Kıran, 2010; Pintrich & De Groot, 1990; Pintrich, 1999; Sungur, 2007; Taş & Çakir, 2014; Wigfield & Eccles, 2000; Yumuşak et al., 2007; Zimmerman & Martinez-Pons, 1990), procrastination (Ackerman & Gross, 2005; Akbay, 2009; Aydoğan, 2008; Cao, 2012; Corkin, 2012; Haycock et al., 1998; Hensley, 2013; Kandemir, 2010; Klassen et al., 2008; Özer & Altun, 2011; Pychyl, Lee, Thibodeau, & Blunt, 2000; Solomon & Rothblum, 1984; Steel, 2007; Taura et al., 2015; Tuckman, 1991; Uzun Özer, 2010; Wolters, 2003, 2004) and academic achievement (Bandura, 1977, 1982, 1986;

Bandura & Schunk, 1981; Chen & Pajares, 2010; Eccles, 1987; 1993, 2005; Eccles et al., 1983; Hensley, 2013; Hıdıroğlu, 2014; Kıngır et al., 2013; Linnenbrink & Pintrich, 2002, 2003; Mohammadi et al., 2012; Multon et al., 1991; Pamuk, 2014; Senler & Sungur, 2014; Sungur & Güngören, 2009; Wigfield & Eccles, 1992, 2000, 2002; Yerdelen, 2013; Yumuşak et al., 2007). Therefore, in the current study it was proposed that seventh grade elementary students' self-efficacy and task value are associated with their achievement goals, learning strategies, procrastination and science achievement.

Moreover, as related literature indicated learners' achievement goals are related with their learning strategies (Alpaslan et al., 2015; Ames & Archer, 1988; Ames, 1984; Bandura & Dweck, 1985; Dupeyrat & Mariné, 2005; Dweck & Leggett, 1988; Elliot & McGregor, 2001; Elliot et al., 1999; Harackiewicz et al., 2000; Kadıoglu & Uzuntiryaki-Kondakci, 2014; Kahraman & Sungur, 2011; Kıngır et al., 2013; Kıran, 2010; Leggett & Dweck, 1986; Muis & Franco, 2009; Rastegar et al., 2010; Somoncuoğlu & Yıldırım, 1999; Tas & Cakir, 2014; Wolters, 2004) and procrastination (Cao, 2012; Ferrari, 1991a, 1991b, 1991c; Ganesan et al., 2014; Howell & Buro, 2009; Howell & Watson, 2007; Kandemir, 2010; McGregor & Elliot, 2002, Study 2; Özer & Altun, 2011; Scher & Ferrrari, 2000; Scher & Osterman, 2002; Wolters, 2003, 2004). Achievement goals of the learners' were assessed in 2x2 framework (Elliot, 1999; Elliot & McGregor, 2001; Pintrich, 2000) which contains mastery-approach, performance-approach, mastery-avoidance and performance-avoidance goals in the current study. Therefore, in the current study it was proposed that seventh grade elementary students' mastery-approach, performance-approach, mastery-avoidance and performance-avoidance goals are associated with their learning strategies and procrastination in science course.

Furthermore, the related literature pointed that learners' learning strategies use is related with their procrastination (Cao, 2012; Howell & Watson, 2007; Klingsieck et al., 2012; Motie et al., 2012; Wolters, 2003) and academic achievement (Akyol et al., 2010; Butler & Winne, 1995; Dupeyrat & Mariné, 2005; Kaya & Kablan, 2013; Kıngır et al., 2013; Muis & Franco, 2009; Özkan, 2008; Pintrich, 2000; Pintrich & De Groot, 1990; Rastegar et al., 2010; Yerdelen, 2013; Yumuşak et al., 2007; Zimmerman, 2000; Zimmerman & Martinez-Pons; 1986, 1988). Learning strategies of the learners' was examined into two broad domains, namely; cognitive learning strategies and metacognitive learning strategies in the current study. And a link between cognitive and metacognitive learning strategies use is showed by some studies (Heikkilä & Lonka, 2006; Kasımi, 2012; Phakiti, 2006; Saçkes, 2010). Therefore, in the current study, it was proposed that seventh grade elementary students' cognitive learning strategies and metacognitive learning strategies are associated with their procrastination and science achievement, also their cognitive learning strategies use is related with their metacognitive learning strategies use in science course.

Since the related literature showed that learners' procrastination is related with their academic achievement (Bezci & Sungur-Vural, 2013; Çakıcı, 2003; Howell & Watson, 2007; Klassen et al., 2008; Klingsieck et al., 2012; McGregor & Elliot, 2002, Study 2; Mendelson, 2007; Scher & Osterman, 2002; Steel, 2007; van Eerde, 2003; Wolters, 2004), it was proposed that seventh grade elementary students' procrastination is associated with their science achievement in the current study. Therefore, the proposed model was become as in Figure 1.2.

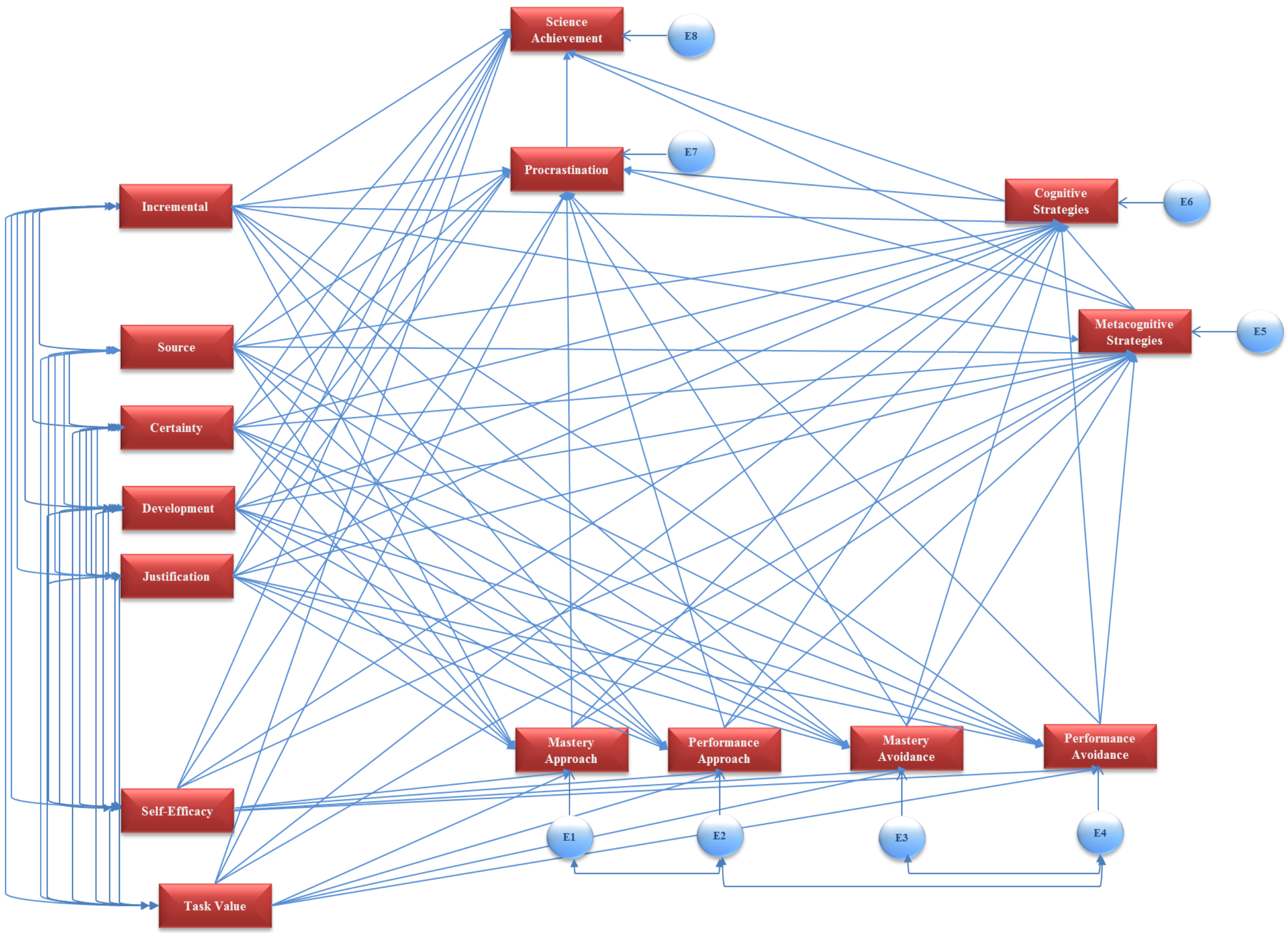


Figure 1.2 The Proposed Path Model

Specifically the current study addressed the following research questions;

1. Specifically regarding science course, what is the interplay among Turkish seventh grade elementary school students' implicit theories of ability, epistemological beliefs, motivational beliefs, achievement goals, learning strategies, procrastination and science achievement?
   1.1. Specifically regarding science course, is there a relationship between Turkish seventh grade elementary school students' achievement goals (i.e., mastery-approach goal, performance-approach goal, mastery-avoidance goal and performance-avoidance goal) and their implicit theories of ability (i.e., incremental theory of ability)?
   1.2. Specifically regarding science course, is there a relationship between Turkish seventh grade elementary school students' achievement goals (i.e., mastery-approach goal, performance-approach goal, mastery-avoidance goal and performance-avoidance goal) and epistemological beliefs (i.e., source of knowing, certainty of knowledge, development of knowledge and justification for knowing)?
   1.3. Specifically regarding science course, is there a relationship between Turkish seventh grade elementary school students' achievement goals (i.e., mastery-approach goal, performance-approach goal, mastery-avoidance goal and performance-avoidance goal) and motivational beliefs (i.e., self-efficacy and task value)?

1.4. Specifically regarding science course, is there a relationship between Turkish seventh grade elementary school students' learning strategies (i.e., cognitive learning strategies and metacognitive learning strategies) and their implicit theories of ability (i.e., incremental theory of ability)?

1.5. Specifically regarding science course, is there a relationship between Turkish seventh grade elementary school students' learning strategies (i.e., cognitive learning strategies and metacognitive learning strategies) and their epistemological beliefs (i.e., source of knowing, certainty of knowledge, development of knowledge and justification for knowing)?

1.6. Specifically regarding science course, is there a relationship between Turkish seventh grade elementary school students' learning strategies (i.e., cognitive learning strategies and metacognitive learning strategies) and their motivational beliefs (i.e., self-efficacy and task value)?

1.7. Specifically regarding science course, is there a relationship between Turkish seventh grade elementary school students' learning strategies (i.e., cognitive learning strategies and metacognitive learning strategies) and their achievement goals (i.e., mastery-approach goal, performance-approach goal, mastery-avoidance goal and performance-avoidance goal)?

1.8. Specifically regarding science course, is there a relationship between Turkish seventh grade elementary school students' cognitive learning strategies and metacognitive learning strategies?

1.9. Specifically regarding science course, is there a relationship between Turkish seventh grade elementary school students' procrastination and their implicit theories of ability (i.e., incremental theory of ability)?

1.10. Specifically regarding science course, is there a relationship between Turkish seventh grade elementary school students' procrastination and their epistemological beliefs (i.e., source of knowing, certainty of knowledge, development of knowledge and justification for knowing)?

1.11. Specifically regarding science course, is there a relationship between Turkish seventh grade elementary school students' procrastination and their motivational beliefs (i.e., self-efficacy and task value)?

1.12. Specifically regarding science course, is there a relationship between Turkish seventh grade elementary school students' procrastination and their achievement goals (i.e., mastery-approach goal, performance-approach goal, mastery-avoidance goal and performance-avoidance goal)?

1.13. Specifically regarding science course, is there a relationship between Turkish seventh grade elementary school students' procrastination and their learning strategies (i.e., cognitive learning strategies and metacognitive learning strategies)?

1.14. Specifically regarding science course, is there a relationship between Turkish seventh grade elementary school students' science achievement and their implicit theories of ability (i.e., incremental theory of ability)?

1.15. Specifically regarding science course, is there a relationship between Turkish seventh grade elementary school students' science achievement and their epistemological beliefs (i.e., source of knowing, certainty of knowledge, development of knowledge and justification for knowing)?

1.16. Specifically regarding science course, is there a relationship between Turkish seventh grade elementary school students' science achievement and their motivational beliefs (i.e., self-efficacy and task value)?

1.17. Specifically regarding science course, is there a relationship between Turkish seventh grade elementary school students' science achievement and their learning strategies (i.e., cognitive learning strategies and metacognitive learning strategies)?

1.18. Specifically regarding science course, is there a relationship between Turkish seventh grade elementary school students' science achievement and their procrastination?

1.3 Significance of the Study

The main vision of national elementary science education curriculum defined by Ministry of National Education of Turkey (MONE; 2005, 2013) is that regardless of the individual differences of students, they are educated to become scientifically literate. Scientific literacy necessitates deeper understanding of science topic and concepts and scientifically literate individuals have positive attitudes toward science, equipped with science process skills and also they use those skills in everyday life. Thus, acquisition of scientific knowledge is an essential part of scientific literacy and science achievement emerges as an important indicator of the students' knowledge acquisition. However, examinations of the Turkish students' rank in international exams such as Trends in International Mathematics and Science Study (TIMSS; Turkey participated TIMSS in 1999, 2007, 2011) and The Programme for International Student Assessment (PISA; Turkey participated in PISA in 2003, 2006, 2009, 2012) indicated that among the participant countries, our students commonly below the average of the participants concerning science achievement. To improve the academic outcome, MONE has attempted to make some fundamental changes in science curriculum and revised it for 1-8 grades in 2005 and recently it was decided in 2013 that students start to take science courses as from 3rd grade. Although there are such attempts to improve students' science achievement in Turkey, it is imperative to examine the factors which contribute to students' science achievement to be able to propose better solutions to enhance students' achievement in science.

Because if the factors associated with science achievement are identified, more specific suggestions can be made for curriculum developers, science teachers, and educators. Accordingly, the current study aimed to determine the factors (i.e., implicit theories of ability, epistemological beliefs, motivational beliefs, achievement goals, learning strategies, and procrastination) related to the elementary students' science achievement by proposing and testing a path model. Path models have the advantage of allowing the examination of the relationships among several variables simultaneously. Thus, the present study have potential to make a contribution to the relevant literature by investigating relationships among various variables suggested to be associated with science achievement through a single path model.

Among these variables, implicit theories of ability have great importance on learner' achievement motivation, since beliefs about nature of ability create the whole motivational framework (Dweck & Master, 2009). Learners' implicit theories of ability is started to differentiate at early ages (Dweck, 2002) and tend to be stable and objective (Dweck, 2002; Robins & Pals, 2002). So it is important to detect learners' those beliefs about the nature of the ability at early ages because those theories have pivotal role on learners' achievement motivation, they foster learners to different response pattern, helpless (i.e., maladaptive) pattern and mastery-oriented (i.e., adaptive) pattern through affecting learners' way of interpretation and responding learning opportunities, struggling with challenging tasks, effort and persistence (Diener & Dweck, 1978; Dweck, 1999, 2002; Dweck, et al., 1995; Dweck & Elliott, 1983; Dweck & Legget, 1988; Elliott & Dweck, 1988; Hong et al., 1999; Leggett & Dweck, 1986). In addition, implicit theories of ability could be intervened to desired target beliefs since it was indicated in the related literature that carefully designed interventions created meaningful impact on learners' those beliefs (e.g., Blackwell et al., 2007; Good et al., 2003). Thus understanding learners' implicit theories of ability's in associations with other factors may provide how it could be intervened to support learners through positive outcomes. Also, implicit theories of ability could vary according to the domain in academic settings (Chen & Pajares, 2010; Dweck & Master, 2009; Stipek & Gralinski, 1996) but there is restricted source about the learners' beliefs about malleability or nonmalleability of ability in science domain. Moreover, the number of national studies conducted on students' implicit theories of ability is limited so there is need for understanding Turkish students' beliefs about science ability to be able to provide some clues regarding the generalizability of the findings from different countries.

In addition, students' epistemological beliefs alter their learning, cognition and motivation (Hofer & Pintrich, 1997; Perry, 1981). Even young students have beliefs about nature of knowledge and knowing (Conley et al., 2004; Schommer-Aikins, Duell, & Hutter, 2005). Schommer (1993) offered that both direct and indirect link between epistemological beliefs and academic achievement should be examined and confirmed. Schommer (1998) and Hofer and Pintrich (1997) indicated that epistemological beliefs of students may affect achievement through mediating effect of their cognition which involve use of various learning strategies. In addition, students' epistemological beliefs involve their choice of comprehension standards (Ryan, 1984) such as achievement goals (Schutz, Pintrich & Young, 1993). Epistemological beliefs are demonstrated to be domain specific (Hofer, 2000; 2006; Jehng, Johnson & Anderson, 1993; Kurt, 2009; Muis, Bendixen, & Haerle, 2006; Paulsen & Wells, 1998) and context-depended (Hammer & Elby, 2002; Hammer, 1994; Hofer, 2001; Pamuk, 2014) so studies about epistemological beliefs may lead to different results depending on context of the studies. Thus, current study aims to focus on science domain studying with elementary students in Turkey. Domain specific studies considering contextual factors have potential to provide a better understanding of these beliefs and their relation to various achievement related processes and outcomes. Although context is not a variable specifically examined in the current study, considering characteristics of educational context in Turkey while interpreting the results may provide valuable information. Despite the fact that there some national studies which examined epistemological beliefs of elementary students (e.g., Kızılgüneş, 2007; Özkan, 2008; Pamuk, 2014), current study differs from these studies in terms of the variables investigated in relation to epistemological beliefs. In addition, there is a difference between the present study and some of the previous research concerning the theoretical approaches utilized to assess epistemological beliefs. Accordingly, the present study aimed to explore how elementary students' epistemological beliefs are related with various factors including achievement goals, learning strategies use, procrastination, and achievement in the context of Turkish educational system for science course. There are no studies in the national and international literature specifically examining these variables within the science domain. However, as it was elaborated in the literature section, it is reasonable to investigate these relations based on related theoretical approaches and empirical findings emerged in the related literature. If the proposed relations are supported in the current study, it may have valuable implications for science education.

Similar to implicit theories of ability and epistemological beliefs, it was commonly indicated literature that students' achievement goals, motivational beliefs such as self-efficacy and task value are domain specific (Ames & Archer, 1988; Bandura, 1997; Bong, 2001; Elliot & McGregor, 2001; Eccles & Wigfield, 1995; Eccles et al., 1993; Pajares, 1997; Wigfield & Eccles, 2000) and influenced by educational context (Ames, 1992; Ames & Archer, 1988; Ames, Schunk, & Meece, 1992; Bandura, 1986, 1997; Eccles & Midgley, 1989; Maehr & Midgley, 1996; Schunk & Pajares, 2009; Turner, Meyer, Midgley & Patric, 2003; Wigfield, Eccles, & Rodriguez, 1998). Accordingly, although, the current study did not focus on context, investigations of achievement goals, self-efficacy and task value beliefs in Turkey and their associations within the proposed model may have potential to enrich the related literature. In addition, because Turkish elementary science curriculum

(MONE, 2005, 2013) aimed to increase students' motivation for science course, there is a need for determining students' achievement goals and motivational beliefs in science and their relations with other variables of interest.

Not only acquisition of structured knowledge but also the way of reaching and enhancing the knowledge is important for information age. Adept learners use cognitive learning strategies to operate cognitive process and metacognitive learning strategies to monitor the progress (Flavell, 1979). And also, those strategies enhance the learning (Brown, Bransford, Ferrara & Campione, 1983; Pressley, Goodchild, Fleet, Zajchowski, & Evans, 1989) and performance (Butler & Winne, 1995; Pintrich, 2000; Pintrich & De Groot, 1990; Zimmerman, 2000; Zimmerman & Martinez-Pons, 1986) of learners. Since learners are introduced with much new information at early grades as in elementary level, it is important for learners actively use learning strategies. However, it is commonly emphasized that learning strategies use may vary according to domains and context (Alexander & Judy, 1988; Bransford & Heldmeyar, 1983; Pintrich, 2004; Somoncuoğlu & Yıldırım, 1999). For example, with the need for keeping up with the change in science and technology area, the curriculum used in elementary science education in Turkey has been changed greatly in 2004 (MONE, 2005). Although some other revisions were done later (MONE, 2013), the general frame has been protected and according to this frame, student centered approach has been adopted and students' active constructive role through gathering knowledge have been emphasized. Accordingly, students are expected to use various learning strategies allowing deeper processing of information. Therefore, investigating the elementary students' learning strategies use and its potential antecedents such as epistemological beliefs, motivational beliefs, and achievement goals and its consequence in terms of procrastination and achievement in a path model for science courses may enhance understanding of domain specific nature of these strategies and may contribute to the both national and international literature.

The current study also has potential to make contribution to the literature on procrastination because a sizeable amount of the procrastination studies were sampled in psychology or psychology related courses. However, results may vary for different domains related with task characteristics and situation (e.g., Ferrari & Tice, 2000; Senécal, Lavoie & Koestner, 1997; Solomon & Rothblum, 1984; Steel, 2007). Moreover, it is commonly mentioned that individuals procrastinate more at lower ages and it becomes less when they get older and learn more (Beswick, Rothblum, & Mann, 1988; Stead, Shanahan, & Neufeld, 2010; Steel, 2007). But procrastination is rarely studied at lower levels; great amount of the studies was conducted on college and undergraduate students which is also valid for national studies. Studying procrastination at lower level may provide an opportunity forestall it before it become a study habit, and curriculum, courses and assignments may be arranged accordingly. In addition, in order to prevent detrimental effect of procrastination, there is a need for deep understanding of the procrastination's internal roots such as beliefs of procrastinators, their purpose in educational settings and their engagement with academic activities. Accordingly, in the current study, procrastination was examined in relation to implicit theories of ability, epistemological beliefs, motivational beliefs, achievement goals, and learning strategies use. Additionally, its relation with science achievement will be investigated.

Overall, current findings have potential to have important implication for science teachers, science textbook authors, curriculum developers and educational policy makers. Depending on the results, some suggestions can be made for curriculum developers and teachers to create learning environments conducive to students' science learning.

1.4 Definition of the Important Terms

Implicit Theories of Ability: It refers to individuals' beliefs about the intellectual ability (Dweck, 2002, 2006). In the current study, it was assessed with the Implicit Theories of Intelligence Scale for Children-Self Form (Dweck, 1999) and the items were adapted to measure elementary students' beliefs about their abilities in science rather than just in general intellectual abilities.

Entity Theory of Ability: It refers to individuals' beliefs about ability as fixed and nonmalleable, and those individuals with entity theory of ability attribute their failure as lack of ability and consider ability as stable and unchanging (Dweck & Legget, 1988). In the current study, entity theory of intelligence items of the Implicit Theories of Intelligence Scale for Children-Self Form (Dweck, 1999) was used with adapting them to assess elementary students' entity theory of science ability as Implicit Theories of Science Ability Scale (ITSAS).

Incremental Theory of Ability: It refers to individuals' beliefs about ability as malleable and changeable, and those individuals with incremental theory of ability believe that the association between effort and intellectual ability is positive (Dweck & Legget, 1988). In the current study, the scores obtained from the ITSAS were reverse coded so that higher scores indicate higher levels of the belief that science ability can change and be improved with time and experience.

Epistemological Beliefs: They refer to learners' beliefs about the nature of knowledge and knowing (Hofer & Pintrich, 1997). In the current study, epistemological beliefs of elementary students' assessed with the Epistemological Beliefs Questionnaire (Conley et al., 2004) in science course, higher scores representing sophisticated beliefs of students for all dimensions and lower scores resenting naïve beliefs for the belonged dimensions, namely;

source of knowing, certainty of knowledge, development of knowledge and justification for knowing.

Source of Knowing: It refers to learners' beliefs about whether the knowledge constructed by oneself or resides in external authorities (Conley et al., 2004). In the current study, while sophisticated beliefs of elementary students represent that "scientific knowledge can be socially constructed by oneself", naïve beliefs reflect that "scientific knowledge can only come from an external authority like a professional scientist or a teacher" Chen (2010, p.20).

Certainty of Knowledge: It refers to learners' beliefs about whether scientific questions have only one right answer or it could have multiple answers (Conley et al., 2004). In the current study, while sophisticated beliefs of elementary students represent that "scientific questions can have multiple answers", naïve beliefs reflect that "questions in science can only have one correct answer" Chen (2010, p.20).

Development of Knowledge: It refers to learners' beliefs about science whether scientific knowledge is an evolving and changing body of knowledge or a fixed body of knowledge (Conley et al., 2004). In the current study, while sophisticated beliefs of elementary students represent that "science is a constantly evolving body of knowledge", naïve beliefs reflect that "science is a fixed body of knowledge" Chen (2010, p.20).

Justification for Knowing: It refers to learners' beliefs about the role of experiment and how learners justify knowledge, it reflects students' beliefs about whether the experiments have role on the solutions of arguments and developing new ideas or they only act on justification of scientific laws (Conley et al., 2004). In the current study, while sophisticated beliefs of elementary students represent that "experiments in science are used to support arguments and develop new ideas", naïve beliefs reflect that "experiments are simply class projects and that they just prove that a scientific law is true" Chen (2010, p.20).

Motivational Beliefs: In the current study, motivational beliefs of elementary students were considered as their self-efficacy and task value for science course.

Self-Efficacy: It refers to learners' "judgments of their capabilities to organize and execute courses of action required to attain designated types of performances'' (Bandura, 1986, p. 391). In the current study, elementary students' beliefs about their capabilities to be successful in science class were assessed with the Motivated Strategies for Learning Questionnaire (MSLQ; Pintrich et al., 1991).

Task Value: It refers to the qualities of tasks and their effect on learners' desire to do them (Eccles, 2005; Eccles et al., 1983; Wigfield & Eccles, 1992;

Wigfield et al., 2009). In the current study, elementary students' beliefs about the science course materials in terms of being interesting, important and useful were assessed with the MSLQ (Pintrinch et al., 1991).

Achievement Goals: They refer to learners' purposes or meanings of academic activities are named as their achievement goals (Kaplan & Maehr, 2007; Maehr & Nicholls, 1980; Midgley et al., 2001). In the current study, elementary students' purposes to succeed in science class were assessed with the Achievement Goal Questionnaire (AGQ; Elliot & Church, 2001) which includes four dimensions, namely; mastery-approach goal, performance-approach goal, mastery-avoidance goal and performance-avoidance goal.

Mastery-Approach Goal: It refers to learners' "focus on mastering task, learning, understanding" and use of "standards of self-improvement, progress, deep understanding of task" (Pintrich, 2000, p.477). In the current study, mastery-approach goal indicates the purpose of elementary students to succeed in science course via focusing on science course's task to master, learn and understand in science class.

Performance-Approach Goal: It refers to learners' "focus on being superior, besting others, being the smartest, best at task in comparison to others" and use of "normative standards such as getting best or highest grades, being top or best performer in class" (Pintrich, 2000, p.477). In the current study, performance-approach goal indicates the purpose of elementary students to succeed in science course via focusing on their performance to be the best with respect to others in science class.

Mastery-Avoidance Goal: It refers to learners' "focus on avoiding misunderstanding, avoiding not learning or not mastering task" and use of "standards of not being wrong, not doing it incorrectly relative to task" (Pintrich, 2000, p.477). In the current study, mastery-avoidance goal indicates the purpose of elementary students to succeed in science course via avoiding misunderstanding, not learning or not mastering science course's task in science class.

Performance-Avoidance Goal: It refers to learners' "focus on avoiding inferiority, not looking stupid or dumb in comparison to others" and use of "normative standards of not getting the worst grades, being lowest performer in class" (Pintrich, 2000, p.477). In the current study, performance-avoidance goal indicates the purpose of elementary students to succeed in science course via focusing on their performance to avoid being the worst with respect to others in science class.

Learning Strategies: They refer to learners' use of ''mental processes that learners can deliberately recruit to help themselves learn and understand something new'' (Brandt, 1988, p. 14). In the current study, elementary students' intentionally processed cognitive and metacognitive activities while engaging in learning activities about science course was assessed with MSLQ (Pintrinch et al., 1991) via cognitive and metacognitive strategies sub-scale.

Cognitive Learning Strategies: They refer to learners' skills which are used to control their participation, learning, remembering, and thinking (Gagné, 1985) to choose, get and combine the new knowledge with existing knowledge (Dowson & McInerney, 1998) and it is composed of rehearsal, elaboration, organization and critical thinking (Pintrich et al., 1991). In the current study, elementary students' cognitive learning strategies use represents their control for their cognitive activities to choose, get and combine the new knowledge with existing knowledge about science course and it was assessed with MSLQ (Pintrich et al., 1991) via using items for rehearsal, elaboration, organization and critical thinking.

Metacognitive Learning Strategies: They refer to learners' regulation of their own knowledge about their cognitive process, products and everything related with learning process (Flavell, 1976, 1979; Brown, 1978, 1987) and they are comprised of planning, monitoring and regulating (Pintrich et al., 1991). In the current study, elementary students' metacognitive learning strategies use represents their regulation of knowledge about their cognitive process, products and everything related with learning process and it was assessed with MSLQ (Pintrinch et al., 1991) via using items for metacognitive self-regulation.

Procrastination: It refers to learners' "the act of needlessly delaying tasks to the point of subjective discomfort" (Solomon & Rothblum, 1984, p. 503). In the current study, it represents elementary students' intentional delay of science course tasks and it was assesed with The Tuckman Procrastination Scale (Tuckman, 1991).

Science Achievement: In the current study, elementary students' science achievement was assessed with their performance on the 14-item multiple choice science test including the first three units of seventh grade curriculum; 1) Body system, 2) Force and Motion, and 3) Electricity.

CHAPTER II

LITERATURE REVIEW

In this chapter, the previous studies providing theoretical and empirical background for the current study were presented: Firstly, variables of the study (i.e., implicit theories of ability, epistemological beliefs, motivational beliefs, achievement goal orientations, learning strategies, procrastination, and science achievement) with their definitions and theoretical roots were presented in detail. Secondly, the review of the literature on the relationships between these variables leading to the proposed model in the current study was displayed.

Ministry of National Education of Turkey (MONE; 2005, 2013) explained the main vision of national elementary science education curriculum as regardless of the individual differences of students, they are educated to become scientifically literate. Scientific literacy requires a deep understanding of science topic and concepts as well as developing positive attitudes toward science, possessing science process skills and using these skills in everyday life. Accordingly, acquiring basic scientific knowledge, which can be reflected by level of students' achievement in science, is an essential component of scientific literacy. However, examinations of the Turk students' rank in international exams such as Trends in International Mathematics and Science Study (TIMSS) and The Programme for International Student Assessment

(PISA) indicated that among the participant countries' our students commonly below the average of the participants concerning science achievement. To improve the academic outcome, MONE has attempted to make some fundamental changes in science curriculum and revised it. As part of improving students' science achievement, it is also imperative to examine the factors which contribute to students' science achievement. Accordingly the current study aimed to determine the factors related to the elementary students' science achievement. Previous studies pointed out that, students' beliefs on ability, nature of knowledge and knowing, ability level to do a given task and the value attributed to tasks are associated with their achievement for a specific academic domain. In addition, related literature indicates that students' achievement goals, learning strategies use and procrastination are affected from the abovementioned beliefs and also the association among them have pivotal role on students' achievement. Based on the aforementioned reasons, subsequent sections include the theoretical and empirical background for these factors (i.e., implicit theories of ability, epistemological beliefs, motivational beliefs, achievement goals, learning strategies, procrastination) and their bivariate relationships.

2.1 Implicit Theories of Ability

Dweck and her colleagues (e.g., Bandura & Dweck, 1985; Diener & Dweck, 1978, 1980; Dweck, 1975; Dweck, Chiu & Hong, 1995; Dweck & Legget, 1988; Dweck & Reppucci, 1973; Elliott & Dweck, 1988; Leggett & Dweck,

1986) developed a social-cognitive model of achievement motivation considering the idea that individuals have different beliefs which shape their psychological worlds and affect their thinking, feeling and behaving (Hong, Chiu, Dweck, Lin, & Wan, 1999). According to the model, beliefs and values creating the individual differences are called implicit theories (e.g., Bandura & Dweck, 1985; Dweck et al., 1995; Dweck & Legget, 1988). Main assumption of implicit theories is that the theory affects individuals' inferences, judgement and reactions (Dweck, 1996; Dweck et al., 1995).

Although Dweck's model adapted on different domains such as intelligence, personality and morality, implicit theories about intelligence were taken into consideration according to the aim of the current study. Implicit theories of intelligence refer to individuals' beliefs about the intellectual ability (Dweck, 2002, 2006). Although the meaning of intelligence and ability is not same, the implied phenomenon is same for *implicit theory of ability* and *implicit theory of intelligence.* Also, they are used as interchangeably in some sources (e.g., Chen & Pajares, 2010; Cury, Da Fonseca, Rufo & Sarrazin, 2002; Cury, Elliot, Da Fonseca & Moller, 2006; Dweck, 2002; Ommundsen, 2003) and rest of the current study.

Dweck and Legget (1988) identified two self-theories according to individuals' beliefs about the nature of intelligence as *entity (fixed) theory of intelligence* and *incremental (malleable) theory of intelligence*. In the entity theory, intelligence is considered as fixed and nonmalleable. Individuals affiliating the theory On the other hand, intelligence is envisaged as malleable and changeable. Also individuals holding incremental theory of intelligence believed the plasticity of intelligence since they believe that the relationship between effort and intellectual ability is positive. The differences between two theories eventuated in the difference of individuals' emotion, motivation and achievement.

Domain specificity of the implicit theories was done based on intelligence, personality and morality by Dweck and Legget (1988). Particularly, the domain specify of implicit theories of intelligence were not considered according to academic domains by the pioneers initially. Although, Stipek and Gralinski (1996) did not found any difference between third-sixth grade students' implicit theories of intelligence in mathematics and social studies, they proposed that students' beliefs about implicit theories of intelligence may become more differentiated when they enter adolescent and face with challenging subjects. In addition, Dweck (2002) noted that students' beliefs about implicit theories of intelligence start to differentiate at age seven-eight and tend to be stable and objective, also children's ability could be different in different domains for example about intellectual, athletic or musical ability. Moreover, Chen and Pajares (2010) take into account the Stipek and Gralinski (1996)'s suggestion and adapted Implicit Theories of Intelligence Scale for Children-Self Form (Dweck, 1999) as Implicit Theories of Science Ability

Scale to assessed sixth grade students' students beliefs about implicit theories of intelligence for science course specifically. Also, the same scale with the same modification was used in the current study. But only students' entity theory of ability was assessed since using the items for both entity and incremental theory of ability make incremental items more attractive and those items are likely to persuade students (Dweck et al., 1995).

Researches regarding the students' implicit theory of intelligence reveal that the concept has a key role in students' academic motivation and achievement. Specifically, individuals developed different achievement goals, strategies they use on academic tasks, persistence and performance on challenging tasks and academic achievement (Dweck, 2002; Dweck et al., 1995; Dweck & Legget, 1988; Hong et al., 1999).

2.2 Epistemological Beliefs

Epistemology is a branch of philosophy and it is concerned with "the origin, nature, limits, methods, and justification of human knowledge" (Hofer, 2002, p. 4). Philosophical discussions about nature of knowledge and knowing have been continuing for many years starting from ancient Greeks (Buehl & Alexander, 2001). But, later epistemology also attracted the attention of psychologists (Hofer, 2001) and psychological research on epistemological beliefs started in the mid-1950s (Özkan, 2008). Although, individuals do not hold those beliefs consciously, they influence their interpretation of the surroundings and research on psychology and education investigate how the individuals' beliefs about knowledge and knowing conceptualized and how individuals use them during their interpretation of the surroundings (Chen, 2010).

Although pioneering works on knowledge and knowing were conducted based on qualitatively approach, Marlene Schommer and her colleagues proposed the multidimensional epistemological belief model based on paper-and-pencil measure of the beliefs which was different from unidimensional models developed up to that time. Schommer (1994) claims that unidimensional models could not help to understand complexity of personal epistemology and their associations with learning, also individuals' epistemological beliefs operate independently from each other, they range from naïve beliefs to sophisticated beliefs and a person could have sophisticated beliefs in some dimensions and s/he could have naïve beliefs in other dimensions. Schommer's (1990) model includes five dimensions, namely; *structure of knowledge* (i.e., isolation or integration of knowledge), *certainty of knowledge* (i.e., tentativeness or stability of knowledge), *source of knowledge* (i.e., origin of knowledge whether authority or own observation and reasoning), *control of knowledge acquisition* (i.e., fixed or improvable feature of intelligence) and *speed of knowledge acquisition* (i.e., quick or gradual acquisition of knowledge). In addition, Schommer (1990) developed 63-items Epistemological Belief Questionnaire (EBQ) to assess epistemological beliefs of participants and the data collected from college students indicated four factor structure; innate ability, quick learning, simple knowledge, and certain knowledge. Later, Schommer-Aikins, (2002) reported her 30-items form of the scale with four factor structures as ability to learn, speed of learning, stability of knowledge, and structure of knowledge.

Although the factor structure of Schommer's (1990) model was gave similar results in some studies (e.g., Dunkle, Schraw & Bendixen 1993; Jehng, Johnson & Anderson 1993), it was reported as problematic in some others (e.g., Qian & Alvermann, 1995). Also, it was pointed that control and speed of knowledge acquisition dimensions of Schommer's model do not focus on nature of knowledge or knowing so they are not epistemological belief dimensions (Hofer & Pintrich, 1997). Hofer and Pintrich (1997) propose a theoretical structure for personal epistemology with considering the criticism on Schommer's model. Accordingly, Hofer and Pintrich (1997) clustered four epistemological belief dimensions under two general areas; beliefs about *the nature of knowledge* and *the nature or process of knowing*. *Certainty of knowledge* and *simplicity of knowledge* dimensions represent the nature of knowledge; *source of knowing* and *justification for knowing* represent the nature of knowing (Hofer & Pintrich, 1997). Certainty of knowledge dimension; at lower levels individuals believe that absolute truth exists, at higher levels they believe that knowledge is tentative and evolving (Hofer & Pintrich, 1997). Simplicity of knowledge dimension at lower levels knowledge is viewed as discrete, concrete, knowable facts and at higher level individuals believe that knowledge is relative and contextual (Hofer & Pintrich, 1997). Source of knowing dimension; at lower levels individuals believe that knowledge stems out of external sources and authority rather than self, at higher levels individuals see themselves with ability to build up knowledge by themselves (Hofer & Pintrich, 1997). Justification for knowing dimension is about how individuals evaluate knowledge assertions regarding "use of evidence, the use they make of authority and expertise, and their evaluation of experts" individuals at higher level "move through a continuum of dualistic beliefs to the multiplistic acceptance of opinions to reasoned justification for beliefs" (Hofer & Pintrich, 1997, p. 120).

On the other hand, domain-specificity of epistemological beliefs was not considered in the initial models and it was assumed that beliefs about nature of knowledge and knowing are domain general (e.g., Schommer, 1990). Jehng et al. (1993) conducted a study with university students in the soft fields (viz., social science and arts/ humanities) and in the hard fields (viz., engineering and business) and results of the study displayed that student from soft fields more likely to believe the uncertainty of knowledge, their independent reasoning ability and disorderly process of learning. A similar study conducted by Paulsen and Wells (1998), researchers examined the differences of students from soft (viz., humanities, fine arts, social sciences, education, business), hard (viz., natural sciences, engineering), applied (viz., education, business, engineering) and pure (viz., natural sciences, social sciences, humanities) field in epistemological beliefs and they reported differences in three dimensions, simple knowledge, quick learning, and certain knowledge, over four. Also, Hofer (2000) compared the domain-general and discipline-focused epistemological beliefs of college students. Results of the study indicated that students had different epistemological beliefs on psychology and science disciplines. Specifically, students indicated more sophisticated beliefs on justification for knowing, source of knowing and certainty of knowledge dimensions on psychology discipline than science discipline. Besides, Kurt (2009) detected differences in students' epistemological beliefs who attending mathematics-science field and literature-social science field as a national source. Moreover, contemporary studies pointed out that although there is domain generality within the fields, there is also domain-specificity (Hofer, 2006; Muis, Bendixen, & Haerle, 2006). Elementary students' epistemological beliefs on the nature of knowledge and knowing regarding science course were within the scope of the current study and domain-specify was considered in data collection procedure.

Within the science domain, Conley, Pintrich, Vekiri and Harrison (2004) explored the epistemological beliefs of fifth grade elementary students. And researchers developed a self-report questionnaire to assess those students' epistemological beliefs. Although the definitions of the general areas parallel to previously mentioned model suggested by Hofer and Pintrich (1997), beliefs about the nature of knowing and beliefs about the nature of knowledge, the questionnaire was adapted from the Elder’s (2002) study for young students’ epistemological beliefs about nature of knowledge and knowing. The questionnaire includes 26 items in four dimensions, namely; source of knowing, certainty of knowledge, development of knowledge and justification for knowing. Accordingly source of knowing and justification for knowing dimensions represent beliefs about the nature of knowing; certainty of knowledge and development of knowledge dimensions reflects beliefs about the nature of knowledge. Source of knowing dimension is about students’ beliefs about whether the knowledge constructed by oneself or resides in external authorities. Justification for knowing dimension regards students’ beliefs about the role of experiment and how learners justify knowledge, it reflects students’ beliefs about whether the experiments have role on the solutions of arguments and developing new ideas or they only act on justification of scientific laws. Certainty of knowledge dimension consists of beliefs about the nature of knowledge, it deals with students beliefs about whether scientific questions have only one right answer or it could have multiple answers. Development of knowledge dimension is concerned with students’ beliefs about science whether scientific knowledge is an evolving and changing body of knowledge or a fixed body of knowledge. In addition, the mentioned questionnaire, Epistemological Beliefs Questionnaire (Conley et al., 2004), was also used in the current study to assessed the epistemological beliefs of elementary students regarding science course. Moreover, higher scores in each dimension indicate more sophisticated beliefs in science. And Chen (2010, p. 19) defined sophisticated epistemological beliefs (in an order with source of knowing, certainty of knowledge, development of knowledge and justification for knowing) for the same questionnaire as;

> (1) scientific knowledge can be socially constructed by oneself; that (2) scientific questions can have multiple answers; that (3) science is a constantly evolving body of knowledge; and that (4) experiments in science are used to support arguments and develop new ideas.

Also, Chen (2010, p. 20) identified naïve epistemological beliefs (in an order with source of knowing, certainty of knowledge, development of knowledge and justification for knowing) as;

> (1) scientific knowledge can only come from an external authority like a professional scientist or a teacher; that (2) questions in science can only have one correct answer; that (3) science is a fixed body of knowledge; and that (4) experiments are simply class projects and that they just prove that a scientific law is true.

Those clarifications for the terms sophisticated and naïve epistemological beliefs of students about science were also valid for the current study.

2.3 Motivational Beliefs

Motivational beliefs were taken into consideration as learners' self-efficacy and task value in the current study. And theoretical backgrounds of self-efficacy and task value were presented separately.

2.3.1 Self-efficacy

Albert Bandura (1986, 1997) proposed a social cognitive theory based on the idea that every individual has a self-system to control their thoughts, feelings, and actions. So individuals proactively take part in their own development and most probably affect the outcomes of their actions. The function of individuals in the system was named as *human agency* and human being has some certain capabilities that are symbolizing, learning vicariously, planning alternative strategies, being self-regulated and being self-reflective. Therefore, Bandura stated that individuals behaves under the influence of three factors, namely; personal (i.e., cognitive, affective and biological events), behavioral, and environmental. Personal, behavioral and environmental factors reciprocally affect each other and it is known as *triadic reciprocal determinism*.

Particularly, human's capability for self-reflection is a prominent feature of Bandura's social cognitive theory (Schunk & Pajares, 2009). Because, self-reflection provides self-referent thoughts about their experiences, cognitions, beliefs and behaviors for individuals; afterwards individuals make self-evaluation and alter their thoughts and behaviors (Pajares, 1995; Schunk & Pajares, 2009). On account of this, individuals' perception of *self-efficacy* is a part of their self-evaluation and also self-reflection. Self-efficacy beliefs of individuals are defined as ''people's judgments of their capabilities to organize and execute courses of action required to attain designated types of performances'' (Bandura, 1986, p. 391). It was also hypothesized that self-efficacy affect individuals behaviors and environments and also affected by them (Bandura, 1986, 1997). In academic settings, individuals with high self-efficacy beliefs are more prone to engage in self-regulation and generate more effective environment; also affected from outcomes of behaviors and input of environment (Schunk & Pajares, 2009).

In expectancy-value theory, expectancies for success were defined as learners' beliefs about "how well they will do on an upcoming task, either in the immediate or longer term future" (Eccles & Wigfield, 2002, p. 119). Also, Eccles, Adler, Futterman, Goff, Kaczala, Meece and Midgley (1983) defined expectancies for success as focused on future ability and this point is distinct from ability beliefs since they are focused on present ability (Wigfield & Eccles, 2000) but empirical studies indicated that these constructs are closely related with each other (Eccles & Wigfield, 1995; Eccles, Wigfield, Harold & Blumenfeld 1993). However, Bandura (1997) asserted expectancy-value theories focus on outcome expectations. The difference arises from the point that "individuals can believe that a certain behavior will produce a certain outcome (outcome expectation), but may not believe they themselves can do that behavior (efficacy expectation)" (Wigfield & Eccles, 1992, p. 8). Also, Bandura (1997) pointed that outcome expectations are weaker to predict individuals' performance and choice than efficacy expectations. But Eccles and her colleagues claimed that the focus in expectancy-value model is more personal and similar to efficacy expectations (Eccles & Wigfield, 2002;

Wigfield & Eccles, 2000). In addition, Bandura (1997) stated that self-efficacy should be measured at the task-specific level which will provide more powerful predication from individuals' beliefs to their behavior because association between the task and self-efficacy would weaken when self-efficacy measure and performance domain do not correspond. Wigfield and Eccles (2000) pointed that their measures of ability beliefs and expectancies in expectancy-value theory is also specific but it is not as much as what Bandura mentioned, they were defined as domain specific rather than activity specific.

In addition, self-efficacy is individuals' beliefs about their capability on a specific tasks but it is not same with knowing what to do so there is no definite relation between individuals' self-efficacy and their abilities or skills (Schunk & Pajares, 2004). Although, individuals' skills positively affect their self-efficacy and their attainment of the subsequent skills, self-efficacy and skills are not synonymous (Bandura, 1997). Also, self-efficacy is different from the term self-concept which is individuals' overall view of the self namely collective self-perceptions (Shavelson & Bolus, 1982) and heavily depends on how individuals evaluate themselves relative to others (Schunk & Pajares, 2005). Moreover, self-esteem is differentiating from self-efficacy since it is heavily on individuals' affective judgements on self-worth (Schunk & Pajares, 2005).

Bandura (1997) indicated that individuals get information from four sources to gauge their self-efficacy. The first one is individuals' *actual performance* which is the most reliable one. The second source of the self-efficacy beliefs is consistent of information gathered through *vicarious experiences* which means acquiring information about individuals own capabilities from how others perform through observing similar others. The third one includes the information obtained as a result of *social or verbal persuasions* for which trustworthiness of the persuader is important. And the forth one is *physiological and emotional states* of individuals such as anxiety and stress. On the other hand, it was hypothesized that self-efficacy beliefs of individuals influence their motivation (i.e., task choice, effort and persistence), learning, self-regulation and academic achievement (Bandura, 1986, 1997). Also, self-efficacy beliefs mediate the association between knowledge and action (Pajares, 1995). In addition, learners' belief about themselves to perform the task and accomplish their goals is referred in different terms such as "self-efficacy, perceived competence, perceived ability, personal agency beliefs, and confidence in the motivational literature" (Bråten & Olaussen, 1998, p. 183).

2.3.2 Task Value

Atkinson (1957) stated that expectancies of success and incentive values are two main component of individual achievement motivation, which is evaluated as relatively stable dispositions, in his *expectancy-value theory*. According to Atkinson incentive values are attractiveness of a task to succeed but he did not accounted incentive values in his equation for achievement motivation since he and his colleagues asserted that incentive values are the inverse of probability of success and it influence individuals' choice of academic tasks according to his and his colleagues extensive laboratory-based research (Wigfield, 1994a, Wigfield, Tonks & Klauda, 2009). After Atkinson, there have been two different approaches to values of individuals; one group of researchers have concentrated on more broad values which might affect behavioral choices of individuals and the other approach, based on expectancy-value model, have dealt with the nature of *achievement task values* (Wigfield & Eccles, 1992). As an example of the first approach's researcher, Rokeach (1979) defined human values in a more general concept as;

> core conceptions of the desirable within every individual and society. They serve as standards or criteria to guide not only action but also judgement, choice, attitude, evaluation, argument, exhortation, rationalization, and one might add, attribution of causality. (p. 2)

Accordingly, the researcher emphasized that the values are at the top of the hierarchy that encompass attitudes and behaviors, and values only differ across cultures and he differentiated values into two, namely; terminal values which represent general desired life goals and instrumental values which are desirable behaviors to reach the terminal values. Researchers belonging the second approach researches, studied on achievement related task value, have defined individuals value in narrower frame but they added different aspects of it such as importance of task and attainment; pointed the associations among learners' task value and their performance and persistence; reported the positive association between expectancies for success and attainment value in contrast to Atkinson, who claimed the inverse relation; indicated the reciprocal link between learners' goals and their broad values (Wigfield & Eccles, 1992).

After above mentioned literature, Eccles, Wigfield and their colleagues developed the modern expectancy-value model in real-world achievement situations (e.g., Eccles, 1987, 1993, 2005; Eccles et al., 1983; Eccles & Wigfield, 1995; Meece, Wigfield, & Eccles, 1990; Wigfield, 1994a; Wigfield & Eccles, 1992, 2000, 2002). They defined expectancy and value components in a richer way with linking them psychological, social, and cultural determinants and researchers proposed that expectancy and value components directly related with achievement performance, persistence, and choice of learners (see Figure 2.1). In addition, it was hypothesized that expectancies and values are affected by task-specific beliefs like perceptions of competence and task difficulty; learners' goals, self-schema and affective memories. Also, learners' perceptions and interpretations are impacted by social and cultural factors.

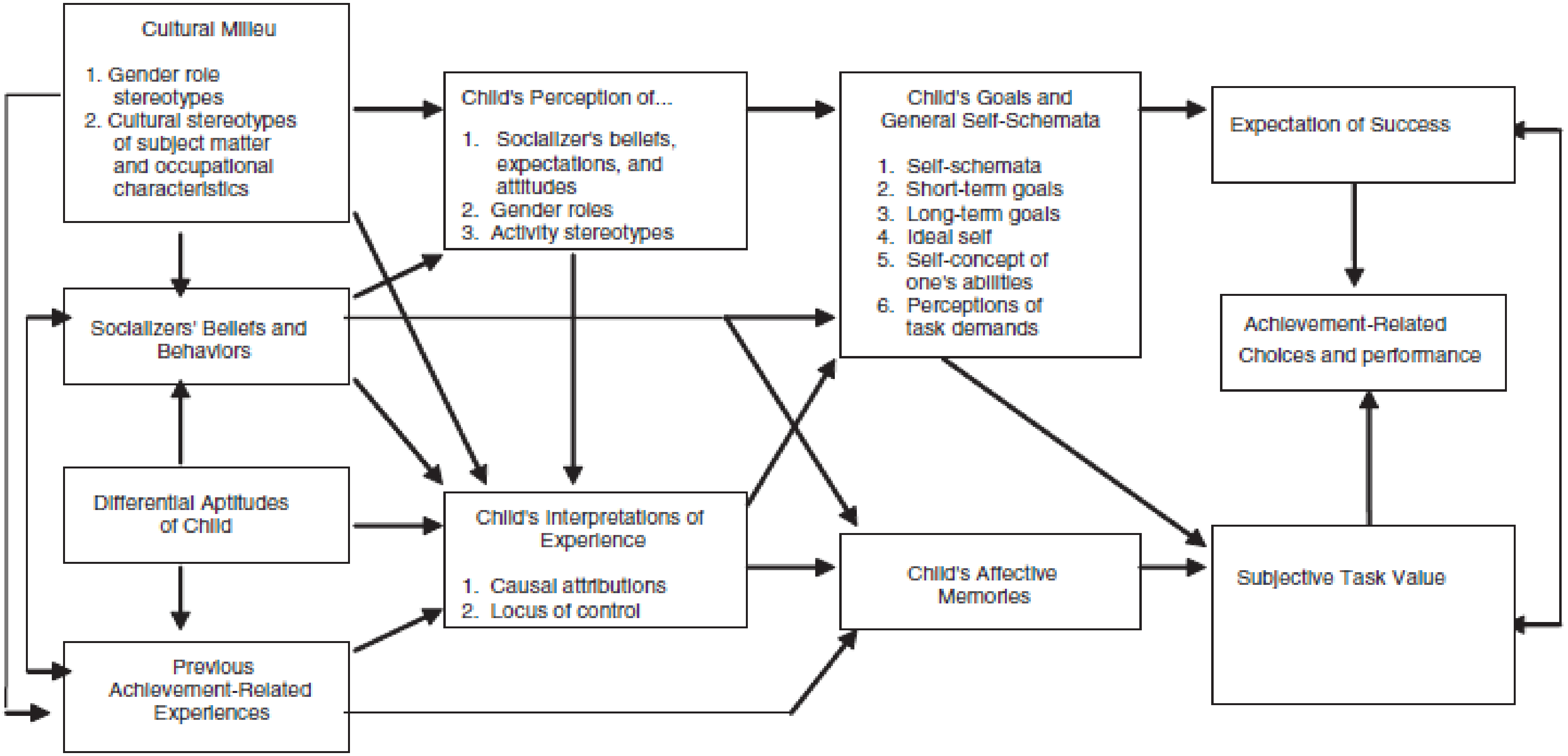


Figure 2.1 Eccles, Wigfield and Colleagues' Modern Expectancy-Value Model. From Expectancy-value theory (p.57), by A. Wigfield, S. Tonks and S. L. Klauda, 2009, in *Handbook of motivation in school* (pp. 55–76) by K. R. Wentzel & A. Wigfield (Eds.), New York, NY: Routledge. Copyright (2009) by Taylor and Francis. Reprinted with permission.

While defining value component of their model, Eccles and her colleagues considered the qualities of tasks and their effect on individuals’ desire to do them, so value component was termed as task value; also the assigned value of a task varies from person to person which reflects that task value is related with individuals’ motivation and implies that it is subjective (Eccles, 2005; Eccles et al., 1983; Wigfield & Eccles, 1992; Wigfield et al., 2009). In addition to be subjective, task value of individuals could be identified within a given domain if children in fifth grade and beyond and (Eccles & Wigfield, 1995; Eccles et al., 1983)

Also, Eccles et al. (1983) proposed that learners’ achievement values are formed by four major components, namely; *attainment value*, *intrinsic value*, *utility valu*e and *cost*. Accordingly, attainment value is “the importance of doing well on a given task”; intrinsic value refers to “the enjoyment one gains from doing the task”; utility value is about “how a task fits into an individual’s future plans”; and cost indicates to “how the decision to engage in one activity (e.g., doing schoolwork) limits access to other activities (e.g., calling friends)” (Wigfield & Eccles, 2000, p. 72).

2.4 Achievement Goals

The foundation of the achievement goals concept laid in 1980s; the pioneering studies were conducted by Carol Dweck and John Nicholls (Moller & Elliot, 2006). Dweck and her colleagues’ studies (e.g., Bandura & Dweck, 1985;

Diener & Dweck, 1978, 1980; Dweck, 1975; Dweck et al., 1995; Dweck & Legget, 1988; Dweck & Reppucci, 1973; Elliott & Dweck, 1988; Leggett & Dweck, 1986) investigated the difference in learners' behavior pattern when they faced with a challenge and the researchers proposed a social-cognitive model of achievement motivation which built around goals and goal-oriented behavior. Dweck and Elliott (1983) conceptualize goals concept and they identified two types of goals; *performance goal*, which are about individuals' concern to gain favorable judgments of their competence and avoid to present inadequacy of their ability, and *learning goal*, which are about individuals' concerns to increase their competence. In addition, learners' performance goal is associated with their beliefs about ability that is fixed which is called as entity theory of ability, and learning goal is related with their beliefs that ability is changeable and it could be increased which is named as incremental theory of ability (Bandura & Dweck, 1985; Leggett, 1985). Also, those different goals foster learners to different response pattern, helpless pattern and mastery-oriented pattern, learners with performance goal more prone to follow helpless pattern whereas learning goal favors learners to mastery-oriented pattern in the same situation (Elliott & Dweck, 1988; Leggett & Dweck, 1986). Specifically, helpless (i.e., maladaptive) pattern is "an avoidance of challenge and a deterioration of performance in the face of obstacles" and mastery-oriented (i.e., adaptive) pattern "involves the seeking of challenging tasks and the maintenance of effective striving under failure" (Dweck & Leggett, 1988, p. 256). Also, in more general conceptualizing learners' behavior pattern is related with their implicit theory of ability, particularly learners behaving in helpless pattern more focus on ability and inadequacy of it on the other hand learners following mastery-oriented pattern more focus on effort (Diener & Dweck, 1978).

On the other hand, Nicholls (1980, 1989) labeled individuals' goals as *task-involvement* and *ego-involvement*. Task-involvement realizes under neutral conditions and related with enhancing performance, persistence and positive affect. On the other side, ego-involvement exists under competitive conditions arising public self-consciousness and associated with poor performance, withdrawing and negative affect. Thus, according to both Dweck and Nicholls, there is a dichotomy in individuals' goals. Those goals can be integrated and labeled as learning and performance goals (Ames & Archer, 1987, 1988). According to dichotomous framework "performance goals are presumed to activate the self and self-related issues (e.g., self-presentation), while mastery goals are thought to better facilitate a task-based focus (or task involvement)." (McGregor & Elliot, 2002, p. 381).

Most of the dichotomous framework differentiates achievement goals based on approach unitary division but motivational theories profound that activities in achievement settings could be orient towards approaching success or avoiding from failure (Elliot, 1997). As an extension of the dichotomous model Elliot and his colleagues (Elliot, 1997; Elliot & Church, 1997; Elliot & Harackiewicz,

1996) have developed a trichotomous model of achievement goals. They argue that performance goal does not represent unitary nature as in the dichotomous model since *performance-approach* and *performance–avoidance* goals have different antecedents and consequences (see Elliot, 1997; McGregor & Elliot, 2002). Also, the independence of goals in trichotomous model was supported by empirical researches (e.g., Elliot & Church, 1997; Middleton & Midgley, 1997). In the model performance goals are evaluated separately according to approach and avoidance dimensions but mastery goal hold as it is. Accordingly (McGregor & Elliot, 2002, p. 381);

> (1) performance-approach goals, which focus on the attainment of competence relative to others; (2) performance-avoidance goals, which focus on the avoidance of incompetence relative to others; and (3) mastery goals, which focus on the development of competence through task mastery.

Approach and avoidance valence were then reflected on the mastery and performance dimensions, in that way 2x2 achievement goal framework was constructed and studies about conceptual and empirical utility of the framework indicated independence of mastery-performance and approach-avoidance dimensions (Elliot, 1999; Elliot & McGregor, 2001; Pintrich, 2000). As distinctly from the trichotomous model mastery-avoidance goal represented the intrapersonal standards against incompetence on a given task (Elliot & McGregor, 2001; Moller & Elliot, 2006). The characteristics of *mastery-approach*, *mastery-avoidance*, *performance-approach* and *performance-avoidance* goals were presented in the Table 2.1. Also the independence of each dimensions of 2x2 achievement goal framework was examined in the related literature (Conroy, Elliot & Hofer, 2003; Elliot & McGregor, 2001; Moller & Elliot, 2006).

Table 2.1 The 2x2 Achievement Goal Framework

	Approach focus	Avoidance focus
Mastery orientation	Focus on mastering task, learning, understanding Use of standards of self-improvement, progress, deep understanding of task (Learning goal, task goal, task-involved goal)	Focus on avoiding misunderstanding, avoiding not learning or not mastering task Use of standards of not being wrong, not doing it incorrectly relative to task
Performance orientation	Focus on being superior, besting others, being the smartest, best at task in comparison to others Use of normative standards such as getting best or highest grades, being top or best performer in class (Performance goal, ego involved goal self-enhancing ego orientation, relative ability goal)	Focus on avoiding inferiority, not looking stupid or dumb in comparison to others Use of normative standards of not getting the worst grades, being lowest performer in class (Performance goal, ego-involved goal, self-defeating ego orientation)

From The role of goal orientation in self-regulated learning (p.477), by P.R. Pintrich, 2000, in *Handbook of self-regulation* (pp. 451–502) by M. Boekaerts, P. R. Pintrich, & M. Zeidner (Eds.), San Diego, CA: Academic Press. Copyright (2000, 2005) by Elsevier Inc. Reprinted with permission.

Thus, achievement goals were used to explain why students engage in learning activities throughout different approaches in the related literature (Elliot, 1999). A comprehensive meta-analysis conducted by Linnenbrink-Garcia, Tyson, and Patall (2008) with examining over 90 peer-reviewed journal articles based on the relationships between achievement goals and achievement indicated that nearly more than half studies indicated significant relations and 70% of experimental studies revealed nonsignificant results concerning effect of achievement goals on achievement. Nevertheless achievement goals are one of the locomotives in students' motivation; they are posited to have relationships with cognitive, affective and behavioral measures (Elliot & Dweck, 1988; Maehr & Zusho, 2009).

In the subsequent sections, the literature concerning achievement goals in relation to implicit theories of ability, epistemological beliefs and motivational beliefs were examined in detail.

2.4.1 Achievement Goals in Relation to Implicit Theories of Ability

The connection between implicit theories of ability and achievement goals was mentioned in the pioneer studies. The occurrence of the relationship evidenced by Dweck and her colleagues at different grade levels (see Bandura & Dweck, 1985; Dweck & Leggett, 1988; Elliott & Dweck, 1988; Hong et al., 1999). General tendency in the initial studies was to consider the achievement goals as two dimensional; learning and performance goals. Individuals having learning goal are defined as individuals who "seek to increase their competence, to understand or master something new" and individuals who have performance goals "seek to gain favorable judgments of their competence or avoid negative judgments of their competence" (Dweck, 1986, p. 1040).

Causality of implicit theories of intelligence on achievement goals were proved with experimental studies in which researchers manipulated the students' implicit theories of intelligence with two different passages to direct students incremental or entity theory and results indicated that the passages influenced students' beliefs about ability and direct them to choose performance or learning goals (Dweck et al., 1982; Elliott & Dweck, 1988). Accordingly, students who believe that a given task is an opportunity to affirm their ability or avoid displaying their inadequate ability tend to prefer performance goal; on the other hand, students who believe a given task as an occasion to increase their ability choose learning goal (Dweck, 1999, 2006). At this point it is important to note that, the terms used for the types of goals varies in the literature; *ability goal*, *ego-involved goal* or *normative goal* are used as equivalent to performance goals and *mastery goal*, *task goal* are considered as synonyms with learning goal (Dweck, 1999).

As a result of former studies, direct connection between entity theory and performance goal and, incremental theory and learning goal were hypothesized and tested distinctly from each other in recent studies and gave consistent results (e.g., Blackwell, Trzesniewski & Dweck, 2007; Chen & Pajares, 2010; Ommundsen, 2001a). But students could have both types of goals at the same time for a task although, learning goal is more challenging and performance goal is safer (Dweck, 1999). Also, Stipek and Gralinski (1996) obtained significant association between third and fourth grade students effort-related beliefs (assed as incremental theory of intelligence) and math performance goal orientation (r = .20, p < .01, first term; r = .30, p < .001, second term), social studies performance goal orientation (r = .26 for first term, r = .38 for second term, ps < .001). Also, in another study examining achievement goal as dichotomous, Ommundsen (2001b) reach the result after regression analysis that incremental theory of ability positively (β = .30, p < .001), associated with task goal orientation whereas beliefs that ability as stable was negatively (β = -.13, p < .05) associated with task goal orientation. Also the opinions that ability was a gift and stables both had positive relation (β = .22, p < .001, and β =.13, p < .05) with ego goal orientation as incremental theory of ability (β =.11, p < .05).

Moreover, Robins and Pals (2002) stated that rather than laboratory condition, learning and performance goals could not be considered as two distinct ends in real world context because they are mutually exclusive and inspire different psychological outcomes. Therefore, researchers evidence their hypothesis with a path analysis in which entity theory directly and positively predicted by performance goals (γ = .30, p < .05) negatively by learning goals (γ = -.25, p < .05).

In another study, Leondari and Gialamas (2002) tested the impact of implicit theories of intelligence on the trichotomous model of achievement goals, namely; mastery (i.e., task) goal, performance-approach goal and performance-avoidance goal of elementary and junior high school students. As implicit theories, only incremental theory dimension was used because of using both entity and incremental theory items create tendency to choose incremental theory of intelligence items on students. As researchers predicted incremental theory positively and significantly related with task (r = .16) and performance-approach goals (r = .12). But the expected negative relationship between belief that ability is modifiable and performance-avoidance goal did not detected.

In a similar study, Elliot and McGregor (2001, Study 3) examined the relationship between 2x2 achievement goal framework and implicit theories. The aim of the researchers was investigating antecedents and consequences of achievement goals. Domain general implicit theories were hypothesized as an antecedent of 2x2 achievement goal framework of students. Specifically, it was hypothesized that entity theory would be the positive predictor of both performance-approach and performance-avoidance goals, and incremental theory would positively anticipated mastery-approach goal. The zero-order correlation results indicate that entity theory of intelligence was positively correlated with mastery-approach goal (r = .11, p > .05), mastery-avoidance goal (r = .19, p < .05), performance-approach goal (r = .07, p > .05) and performance-avoidance goal (r = .13, p > .05). On the other hand incremental theory was negatively correlated with mastery-approach goal (r =-.05, p >.05), mastery-avoidance goal (r = -.16, p <.05), performance-approach goal (r = -.07, p >.05) and performance-avoidance goal (r = -.09, p >.05). Regression analysis of the results revealed that implicit theory was only significant predictor for mastery-avoidance goal and performance-avoidance goal. While entity theory was a positive predictor (β = .19), incremental theory was a negative predictor (β= -.16) of mastery-avoidance goal. Moreover, entity theory was significantly and positively anticipated performance-avoidance goal (β = .16) but incremental theory was not significantly predict the goal.

Later, Cury et al. (2006) modified the Dweck's social-cognitive achievement motivation based on 2x2 achievement goal framework in two studies. In the first study, a correlational study, the aim of the researchers was to examine direct effect of implicit theory of ability and perceived competence on achievement goals of participants whose age vary between 12 and 14. Inter-correlation results of the study indicated that entity theory of ability positively correlated with performance-approach (r = .23, p < .01) and performance-avoidance (r = .24, p < .01) goals. Incremental theory of ability positively related with mastery-approach (r = .27, p < .01) and mastery-avoidance (r = .24, p < .01) goals, on the other hand it was negatively associated with performance-avoidance goal (r = -.10, p < .05). Also, separate regression analysis were conducted to examine role of the implicit theories of ability and perceived competence on each achievement goal and results revealed that; incremental theory of ability significantly and positively predicted mastery-approach goal (β = .15) and mastery-avoidance goal (β = .25). On the other hand, performance-approach goal (β = .26) and performance-avoidance goal (β = .24) significantly and positively anticipated by entity theory of ability.

Moreover, in the second study which is an experimental laboratory study and it was conducting on 13-15 age group participants and intrinsic motivation was added to the study (Cury et al., 2006). The regression analysis was conducted to check the effect of implicit theories of ability and perceived competence, and it indicated that; the manipulated implicit theories of ability significantly affected each achievement goal dimension ($\beta = -.32$ for mastery-approach goal, $\beta = .35$ for performance-approach goal, $\beta = -.27$ for mastery-avoidance goal, $\beta = .38$ for performance-avoidance goal, $p < .01$). Students in the entity theory condition evidenced less mastery-approach ($\beta = -.32$) and mastery-avoidance ($\beta = -.31$), and greater performance-approach ($\beta = .35$) and performance-avoidance ($\beta = .38$) goals adoption than did those in the incremental theory condition.

As seen in above aforementioned studies, there is not consistency in the results. Some of the studies indicated that mastery goals are positively associated with learners' incremental theory of ability (e.g., Cury et al., 2006; Dweck, 1986; Robins & Pals, 2002; Ommundsen, 2001b) and negatively linked with their entity theory of ability (Cury et al., 2006; Robins & Pals, 2002; Ommundsen, 2001b). On the other hand, Elliot and McGregor (2001) reported that mastery-avoidance goal was negatively predicted by incremental theory of ability and positively predicted by entity theory of ability. In addition, there are some studies showing positive relationships between learners' performance goals and incremental theory of ability (e.g., Stipek & Gralinski, 1996; Robins & Pals;

2002; Ommundsen, 2001b) and between performance goals and entity theory of ability (e.g., Cury et al., 2006; Dweck, 1986; Elliot & McGregor, 2001; Robins & Pals; 2002; Ommundsen, 2001b). However, Cury et al. (2006) showed that learners' incremental theory of ability is negatively correlated with their performance-avoidance goal.

Since learners' implicit theories of ability is domain specific (Chen & Pajares, 2010; Dweck, 2002; Stipek & Gralinski, 1996) and, to the best of our knowledge, there is no national or international studies specifically investigating the association between elementary students' achievement goals in 2x2 framework and their implicit theory of ability in science course, the current study proposed the relationships between variables according to basic model proposed by Dweck and her colleagues. According to the model, learners' avoidance from both negative judgements and doing mistakes as well as their desire to be judged positively named as performance goal (Dweck et al., 1995). This definition of performance goal includes performance-approach goal and avoidance goals examined in the current study. Additionally, in the model, learning goal corresponds to the mastery-approach goal examined in the present study. Results of the studies conducted by Dweck and her colleagues demonstrated that there is positive association between entity theory of ability and performance goal and incremental theory of ability and mastery-approach goals (e.g., Bandura & Dweck, 1985; Dweck, 1996, 2002; Dweck et al., 1995; Dweck & Legget, 1988). At this point it is important to note that, in the current study, only the items assessing students' entity theory of ability was included because as suggested by Dweck et al. (1995) incremental items are more attractive and those items are likely to persuade students threatening the validity. However, the scores obtained from the entity items were reverse coded so that higher scores indicate higher levels of the belief that science ability can change and be improved with time and experience (i.e., incremental theory of ability). Accordingly, it was proposed that there is a positive association between elementary students' mastery-approach goal and their incremental theory of ability, and negative relationships exist between students' performance-approach goal, mastery-avoidance goal, and performance-avoidance goal and incremental theory of ability in the current study. A positive link was expected between mastery-approach goal and incremental theory of ability based on the studies of Dweck and her colleagues was also supported by several other studies in the literature (e.g., Cury et al., 2006; Robins & Pals; 2002; Ommundsen, 2001b). Similarly, there are studies in the literature supporting the proposed negative link between avoidance goals and incremental theory of ability (Cury et al., 2006; Elliot & McGregor, 2001).

2.4.2 Achievement Goals in Relation to Epistemological Beliefs

Achievement goals could be function of beliefs depending on subject matter (Stodolsky, Salk & Glaessner, 1991) and epistemological beliefs are linked to such goals which orient students' self-regulated learning (Hofer & Pintrich, 1997). As one of the initial study, Schutz, Pintrich and Young (1993) investigate absolutist or multiplist-evaluativists college students' learning goals and reached that if a students have more sophisticated beliefs, s/he is more likely to adopt mastery goal to learn deeply. Thereafter, studies investigated the association between students' achievement goals and epistemological beliefs with various cognitive and motivational aspects of learning.

Paulsen and Feldman (1999) conducted a correlational study to examine the relation between college students' epistemological beliefs dimensions (viz., simple knowledge, quick learning, and fixed ability) and their motivation (viz., intrinsic goal orientation, extrinsic goal orientation, task value, control of learning, self-efficacy, and test anxiety). Results of the study indicated that; students' intrinsic goal orientation (i.e., mastery goal), which tends to enhance a student's academic performance, was related with sophisticated simple knowledge ($r = -.39$, $p < .01$) quick learning ($r = -.13$, $p < .05$) and fixed ability ($r = -.28$, $p < .01$) dimensions of epistemological beliefs. But students' extrinsic goal orientation (i.e., performance goal), which tends to constrain a student's academic performance, only significantly correlate with naïve simple knowledge dimension($r = .28$, $p < .01$) of epistemological beliefs. Thereafter, Paulsen and Feldman (2005) replicated the previously mentioned studies with the same variable, again with college students. The results of correlation analysis revealed that student' sophisticated beliefs about simple of knowledge ($r = -.27$, $p < .05$) and fixed ability ($r = -.27$, $p < .05$) dimensions were related with high intrinsic goal orientation. Also sophisticated beliefs on fixed ability dimension ($r = -.17$, $p < .05$) correlate high with extrinsic goal orientation but the relationship between simple knowledge dimension and extrinsic goal orientation ($r = .26$, $p < .05$) pointed that students with sophisticated beliefs about simple knowledge less likely to develop extrinsic goals. In addition, hierarchical regression analyses were conducted for each motivational variable with considering interaction between epistemological beliefs dimensions. Analysis conducted to predict intrinsic goal orientation indicated that simple knowledge ($\beta = -.27$, $p < .05$); fixed ability ($\beta = -.26$, $p < .05$); interaction between fixed ability and certain knowledge ($\beta = -.14$, $p < .05$); and interaction between simple knowledge and certain knowledge ($\beta = -.08$, $p < .05$) were significantly predict intrinsic goal orientation and explained 18% variance of the variable. On the other hand, extrinsic goal orientation only significantly predicted by simple knowledge ($\beta = .26$, $p < .05$) and fixed ability ($\beta = -.18$, $p < .05$) but these dimensions accounted 9% variance for extrinsic goal orientation.

In addition, DeBacker and Crowson (2006) proposed a model based on epistemological variables (viz., epistemological beliefs and need for closure), achievement goals (viz., mastery, performance-approach and performance-avoidance goals) and cognitive engagement (viz., meaningful and shallow cognitive engagement). Schommer's (1990) scale was used to assess university epistemological beliefs, but simple knowledge, certain knowledge, and omniscient authority dimensions were used high scores represent naïve beliefs.

Specifically, there was negative link between epistemological beliefs and mastery goal (β = -.40, $p < .05$) on the other hand, there were positive association between epistemological beliefs and performance-approach goal (β = .21, $p < .01$); and epistemological beliefs and performance-avoidance goal (β = .30, $p < .05$). Therefore, results indicated that students' epistemological beliefs and motives influenced their achievement goals and cognitive engagement.

Phan (2009) examined epistemological beliefs as a single factor and proposed a model to explain the relationships among university students' future time perspective, epistemological beliefs, achievement goals (viz., mastery, performance-approach, and performance-avoidance goals), study processing strategies and academic performance. Epistemological beliefs of the students were assessed with Schommer's (1990) scale on innate ability, simple knowledge, quick learning, and certain knowledge dimensions. The model resulted relatively good model fit (RMSEA = .12, GFI = .96, CFI = .90). High scores of epistemological beliefs reflected sophisticated beliefs and vice versa. Epistemological beliefs were related with mastery (β = .32, $p < .05$), performance-approach (β = .18, $p < .05$) and performance-avoidance (β = .12, $p < .05$) goals.

Moreover, Muis and Franco (2009) investigated the relationship among epistemic beliefs, achievement goals, learning strategies, and achievement. The study conducted on the self-reported data collected from undergraduate educational psychology students. Epistemological beliefs of the students were assessed as domain-specific in the source of knowledge, the certainty and simplicity of knowledge, the justification for knowing, and the attainability of truth dimensions. In addition, achievement goals of students were assessed in 2x2 achievement goal framework, namely; mastery-approach, mastery-avoidance, performance-approach, and performance-avoidance achievement goal orientations. Results of the structural equation modeling indicated a moderate to good model fit (χ^2 = 2784.13, *df* = 1398, CFI = .89, RMSEA = .05). Specifically, students' epistemological beliefs regarding certainty and simplicity of knowledge significantly and positively linked to their performance-approach goal orientation (β = .29) and a performance-avoidance goal orientation (β = .14) and its relation with mastery-approach goal orientation was negative (β = -.29). Moreover, students' with more ultimate truth is attainable belief adopted more performance-approach goal orientation (β = .22) and a mastery-approach goal orientation (β = .44). Furthermore, students' justification for knowing belief significantly and negatively related with their performance-approach orientation (β = -.15) and a mastery-avoidance orientation (β = -.16).

A recent national study was conducted by Yılmaz and Şen (2012) on the data collected from university students from secondary science chemistry education. Schommer's (1990) scale was used to assess epistemological beliefs of students', translation and adaptation of the scale (Deryakulu & Büyüköztürk, 2002) gave three-factor structure as; beliefs about that learning depends on effort, beliefs about that learning depends on ability and certainty of knowledge. Besides, students' motivation; extrinsic goal orientation, intrinsic goal orientation, task value, control of learning beliefs, self-efficacy and test anxiety were assessed with self-report scale. Canonical correlation analysis results (*Wilk's Λ* = .807, $\chi^2(18) = 29.306$, $p < .05$) revealed that there was correlation between epistemological beliefs and motivation of the students (r = .35) and the accounted variance was 12.25%. Also, students' motivation accounted 5.4% variance for epistemological beliefs and epistemological beliefs was accounted 6.1% variance for motivation of the students.

Chen and Pajares (2010) investigated association among sixth grade students' implicit theories of science ability (viz., incremental and fixed theory of ability), epistemological beliefs (viz., source of knowing, certainty of knowledge, development of knowledge and justification for knowing dimensions) regarding science course, academic motivation (viz., task goal, performance-approach goal, performance-avoidance goal, self-efficacy and self-efficacy for self-regulation) in science course, and science grade (viz., students' mid-term and end-of-term grades for science course). Students' epistemological beliefs were assessed as domain specific beliefs for science knowledge and knowing; certainty of knowledge and source of knowing dimensions were assessed as naïve beliefs; and development of knowledge and justification for knowing dimensions were assessed as sophisticated also the variables inserted the path analysis as it was assessed. Specifically, the relationship between epistemological beliefs and achievement goal orientation were hypothesized as; sophisticated (i.e., development of knowledge and justification for knowing) epistemological beliefs were linked with task goal; and the naïve beliefs (i.e., certainty of knowledge and source of knowing) were associated with performance-approach and performance-avoidance goals. Although the model was significant ($\chi^2(38, 508) = 121.75$, $p < .0001$, RMSEA = .07, NNFI = .93, CFI = .96), not all hypothesized paths were significant. Particularly, task goal was significantly related with sophisticated justification for knowing dimension of epistemological beliefs but not with development of knowledge dimension. In addition, performance-approach goal were associated significantly with naïve source of knowing beliefs but not with certainty of knowledge dimension. Moreover, performance-avoidance goal were significantly linked with naïve beliefs about certainty of knowledge but not with source of knowing dimension.

In a national study, Kızılgüneş, Tekkaya and Sungur (2009) modeled sixth grade elementary level students' epistemological beliefs (viz., source of knowing, certainty of knowledge, development of knowledge and justification for knowing), motivation (viz., performance goal, learning goal and self-efficacy), learning approach and academic achievement (on classification concept). Low scores represent sophisticated epistemological beliefs for source and certainty of knowledge dimensions; and high scores indicated sophisticated epistemological beliefs for development of knowledge and justification for knowing dimensions. Hypothesized model's result gave good model fit indexes (RMSEA = .07, SRMR = .03, CFI = .98). Specifically, 8% variance of performance goal was explained by source of knowing (β = .16), certainty of knowledge (β = -.20), development of knowledge (β = .12) and justification for knowing (β = -.11) dimensions of epistemological beliefs. Also, students' epistemological beliefs about source of knowing (β = .10), certainty of knowledge (β = -.13), development of knowledge (β = .62) and justification for knowing (β = .08) dimensions of epistemological beliefs accounted for 49% variance of learning goal.

In a more recent study, Pamuk (2014) conducted a study to investigate relationships among science teacher characteristics, constructivist learning environment perceptions, epistemological beliefs, self-regulation and student science achievement. He collected data from 137 science teachers and their 3281 seventh grade students and conducted Hierarchical Linear Modeling

(HLM) analysis to test several models. The effect of teacher level variables (viz., constructivist learning environment, achievement goal orientation, citizenship behavior, students-centered beliefs, epistemological beliefs and self-efficacy), and student level variables which consisted of constructivist learning environment (viz., personal relevance, uncertainty, critical voice, shared control and student negotiation), students' epistemological beliefs (viz., source of knowing, certainty of knowledge, development of knowledge and justification for knowing) and students' motivational beliefs (viz., self-efficacy, task value and metacognitive self-regulation) on students' achievement goal orientation were examined. Specifically, the association between students' epistemological beliefs and their achievement goal orientations indicated that; the relation between sophisticated beliefs about justification for knowing and mastery-approach goal (γ = .375, *SE* = .021, p < .001) was positive. In addition, performance-approach goal was positively predicted by naïve beliefs about certainty of knowledge (γ = .123, *SE* = .023, p < .001), sophisticated beliefs about justification for knowing (γ = .231, *SE* = .022, p < .001) and sophisticated beliefs about development of knowledge (γ = .052, *SE* = .023, p < .05). Moreover, naïve beliefs about certainty of knowledge (γ = .156, *SE* = .026, p < .001), naïve beliefs about source of knowing (γ = .092, *SE* = .024, p < .001), sophisticated beliefs about justification for knowing (γ = .057, *SE* = .025, p < .05) and sophisticated beliefs about development of knowledge (γ = .070, *SE* = .024, p < .01) positively associated with mastery-avoidance goal. Also, naïve beliefs about certainty of knowledge (γ = .216, *SE*

= .022, p < .001) and source of knowing (γ = .079, SE = .025, p < .01) dimensions and sophisticated beliefs about development of knowledge (γ = .084, SE = .018, p < .001) positively affected their performance-avoidance goal.

Although, it was commonly demonstrated that sophisticated epistemological beliefs are predictors of mastery learning goal and naïve beliefs are predictors of performance goal, the aforementioned literature revealed different results in different grade levels and domains. The use of different instruments, and labeling the epistemological beliefs and achievement goals may also be reason leading to difference in the results. In the current study, epistemological beliefs were measured in terms of source of knowing, certainty of knowledge, development of knowledge and justification for knowing, and achievement goals were assessed in terms of mastery-approach, performance-approach, mastery-avoidance and performance-avoidance goals. Specifically, for the association between learners' epistemological beliefs and their achievement goals in 2x2 frame, the common expectation is that while sophisticated beliefs are positively linked to mastery-approach goal, naïve beliefs are positively associated with mastery-avoidance, performance-approach and performance-avoidance goals (see Muis & Franco, 2009). However, while proposing the expected links between epistemological beliefs and achievement goals in the current study, results of the national studies which are similar to the present study concerning grade level and measurement of the variables, was also taken into consideration because, students' epistemological beliefs, and achievement goals are influenced by context (Ames & Archer, 1988; Ames, 1992; Ames, Schunk, & Meece, 1992; Hammer & Elby, 2002; Hammer, 1994; Hofer, 2001; Maehr & Midgley, 1996; Pamuk, 2014; Turner, Meyer, Midgley & Patric, 2003).

Concerning source of knowing dimension of epistemological beliefs, while Kızılgüneş et al. (2009) indicated positive relationship between naïve beliefs about the source of knowing and mastery goals DeBacker and Crowson (2006) showed positive association between sophisticated beliefs about the source of knowing and mastery goals. In these studies mastery-approach and mastery-avoidance goals distinction was not made. On the other hand, the study in which this distinction was made (i.e., Pamuk, 2014) no significant relationship was found between beliefs about the source of knowing and mastery-approach goal. However, the same study revealed positive connection between naïve beliefs about the source of knowing and mastery-avoidance goal. Also, naïve beliefs on source of knowing was found to be positively correlated with performance goals in some studies (e.g., Kızılgüneş et al., 2009), specifically with performance-approach goal (e.g., Chen & Pajares, 2010; DeBacker & Crowson, 2006) and performance-avoidance goal (e.g., DeBacker & Crowson, 2006; Pamuk, 2014).

In the current study, students' beliefs about the source of knowing were assessed so that higher scores on the related dimension indicate sophisticated beliefs in the source of knowing. Accordingly, it was proposed that sophisticated beliefs on source of knowing are negatively linked to performance-approach, performance-avoidance, and mastery-avoidance goals considering abovementioned findings. On the other hand, although the only study, which the researcher came across with concerning the relationship between sophisticated beliefs in source of knowing and mastery-approach goal, revealed no significant association, considering theoretical expectations, a positive link was proposed between sophisticated beliefs in source of knowing and mastery-approach goal. Actually, the students who believe that teachers, textbooks, or scientists are not the only source of knowledge are expected to study for the reasons of learning and understanding science topics deeply accessing different resources and forming their own ideas.

For certainty of knowledge dimension, some researches which did not make mastery-approach, mastery-avoidance goals distinction revealed positive link between sophisticated beliefs and mastery goals (e.g., DeBacker & Crowson, 2006; Kızılgüneş et al., 2009; Phan, 2009). In these studies the mastery goal was measured in terms of mastery-approach goal. Supporting these findings, Muis and Franco (2009) also reported a positive association between sophisticated beliefs about certainty of knowledge and mastery-approach goal. On the other hand, Pamuk (2014), found positive relationship between students' naïve beliefs about certainty of knowledge and their mastery-avoidance goal. Concerning performance goals, except for a few studies (e.g., Kızılgüneş et al., 2009; Phan, 2009), a great majority of the studies (e.g., Chen & Pajares, 2010; DeBacker & Crowson, 2006; Muis & Franco, 2009; Pamuk, 2014) indicated positive association between naïve beliefs about certainty of knowledge and performance goals (i.e., performance-approach and/ or performance-avoidance) consistent with theoretical expectations. In the current study, students' beliefs regarding certainty of knowledge were assessed so that higher scores on the related dimension indicate sophisticated beliefs. Thus, in the current study, it was proposed that sophisticated beliefs about certainty of knowledge is positively associated with mastery-approach goal, on the other hand it is negatively related with mastery-avoidance, performance-approach and performance- avoidance goals.

Concerning development of knowledge dimension, both Kızılgüneş et al. (2009) and DeBacker and Crowson (2006) indicated positive association between sophisticated beliefs about development of knowledge and mastery goals which correspond to mastery-approach goal examined in the current study. Although theoretically a positive association between naïve beliefs about development of knowledge and mastery-avoidance goal is expected, Pamuk (2014) reported a positive link between sophisticated beliefs about development of knowledge and mastery-avoidance goals in his study conducted in Turkey at same grade level and used same scales with the current study. In addition, national studies, having strong similarities with the current study, reported the positive associations of development of knowledge with performance-approach and performance-avoidance goals. More specifically, Kızılgüneş et al. (2009) demonstrated a positive link between sophisticated beliefs about development of knowledge and performance goals Similarly Pamuk (2014) reported the same relationships for performance-approach and performance-avoidance goals. Thus, it appears that students with the belief that science is an evolving, and changing subject tend to adopt avoidance goals as well as performance-approach goal. Accordingly, in the current study, a positive association was proposed between sophisticated beliefs in development of knowledge and mastery-approach goal. In addition, based on the empirical findings from similar samples in some studies (e.g., Kızılgüneş et al., 2009; Pamuk, 2014), it was hypothesized that there are positive relationships between development of knowledge dimension and mastery-avoidance, performance-approach and performance-avoidance goals.

For justification for knowing dimension of epistemological beliefs, Chen and Pajares (2010) and Kızılgüneş et al. (2009) reported positive relationship between sophisticated beliefs about justification for knowing and mastery goals which correspond to mastery-approach goal examined in the present study. In addition, Pamuk (2014) found positive associations between sophisticated beliefs about justification for knowing and mastery-approach and avoidance goals. On the other hand, while Kızılgüneş et al. (2009) demonstrated positive relationship between naïve beliefs about justification for knowing and performance goals, Pamuk (2014) reported positive association between sophisticated beliefs about justification for knowing and performance-approach goal. As mentioned before different results gathered from the different studies may be due to the use of different instruments for assessment of the variables and these variables, epistemological beliefs and achievement goals are highly context depended. Thus, considering the studies conducted especially with similar samples and in different contexts (e.g., Pamuk, 2014), it was expected in the current study that sophisticated beliefs about justification for knowing is positively related with mastery-approach, mastery-avoidance and performance-approach goals. On the other hand, although reviewed literature did not indicate a significant association between justification for knowing dimension and performance-avoidance goal, it was purposed that justification for knowing is negatively linked to performance-avoidance goal. Because, it is predicted that students who believe that there may be more than one way for testing scientific ideas are less likely to study science or engage in scientific activities for the reasons of avoiding negative judgements. Rather they are expected to involve in science tasks and activates to for the reasons of deep understanding, better learning and performance and avoiding misunderstanding testing their ideas in different ways.

2.4.3 Achievement Goals in Relation to Motivational Beliefs

Motivational beliefs were taken into consideration as learners' self-efficacy and task value in the current study. The literature concerning association between self-efficacy and achievement goals, and task value and achievement goals were presented separately.

2.4.3.1 Self-efficacy and Achievement Goals

According Dweck and her colleagues, learners' perceived present ability creates difference on their behavior pattern related with their goal orientation (see Dweck & Leggett, 1988; Elliott & Dweck, 1988). Students who have performance goal orientation differentiate in their behavior pattern whether mastery oriented (i.e., adaptive) or helpless (i.e., maladaptive) according to the level of their perceived ability. If those learners' perceived ability is high they seek challenge and have high persistence on the task, if not they avoid challenge and demonstrate low persistence. On the other hand, perceived present ability level does not create difference on learners' behavior pattern if they have learning (i.e., mastery) goal orientation since in each case they seek for challenge to augment their learning and have high persistence on the task. However, Cury et al. (2006) examined the role of perceived competence on learners' achievement goals whether moderator of relations implicit theory or achievement goal effects as proposed by Dweck socio-cognitive theory or not. Perceived competence was assessed with Dweck's (1999) confidence measure as students' self-efficacy towards math course. And the results of the study indicated that perceived competence is a direct predictor of learners' achievement goals and it was positively related with mastery-approach and performance-approach achievement goals but it negatively associated with mastery-avoidance and performance-avoidance achievement goals.

In addition, learners self-directedness, a component of cognitive structure and operate to notice, evaluate, monitor and regulate the behavior, acts through their self-system in Bandura's (1977b) social cognitive theory. So, self-motivation of the learners depends on their goal setting and self-evaluative reaction to evaluate ongoing process (Bandura & Schunk, 1981). Therefore, Bandura (1986) proposed that self-efficacy is an important factor for individuals' engagement of a task in his social cognitive theory. Self-efficacy perception of individuals may affect their choice of activities, effort, persistence, interest and achievement (Bandura, 1977; Pajares, 1996, 1997; Schunk, 1981, 1995). Also, "students who feel more efficacious about learning should be more apt to engage in self-regulation (e.g., set goals, use effective learning strategies, monitor their comprehension, evaluate their goal progress)" (Schunk & Pajares, 2009, p. 35). In addition, goals take in charge as standards for individuals to judge their capabilities (Bandura, 1986; Bandura & Schunk, 1981; Zimmerman, 2000; Zimmerman & Bandura, 1994). Moreover, the relationship between self-efficacy and achievement goals was examined in various studies as presented below.

Moreover, Elliot and Church (1997) examined competence expectancies as an antecedent of achievement goals. Students', from undergraduate psychology course, achievement goals were assessed as performance-approach, performance-avoidance and mastery goals. Both mastery (F(l, 173) = 24.06, $p < .0001$, $\beta = .34$) and performance-approach (F (l, 172) = 9.35, $p < .01$, $\beta = .21$) goals were significantly and positively predicted by competence expectancies. On the other hand, performance-avoidance goal was negatively affected by competence expectancies (F(1, 172) = 4.31, $p < .05$, $\beta = -.14$).

Wolters, Yu and Pintrich (1996) conducted correlational and regression analysis to examine the relation between seventh and eighth grade students' goal orientation and their motivational beliefs. In addition, students were all participated in classes for mathematics, English, and social studies and, data were collected in two times; at the beginning and at the end of the school year. Students' goal orientation was assessed as, learning, relative ability and extrinsic goal orientation. Learning goal focused on students' learning and understanding the materials. Relative ability was similar to performance-approach goal and it included social comparison, competing with others or not stays back to others. Extrinsic goal orientation was taken as performance goal orientation but not as performance-avoidance since it focused on getting high grades, rewards, or approval from others such as teachers and parents. Also, motivational beliefs in the study represented students' task value, self-efficacy and test anxiety. Specifically, correlational analysis revealed that Self-efficacy positively correlated with learning ($r = .49$, $p < .05$ for time 1; $r = .51$, $p < .05$ for time 2) and relative ability ($r = .35$, $p < .05$ for time 1; $r = .24$, $p < .05$ for time 2) goal orientation while it was negatively correlated with extrinsic goal orientation ($r = -.21$, $p < .05$ for time2; $r = -.25$, $p < .05$ for time 2). Separate regression analysis were conducted with the self-report scores of collected at the beginning of school year to predict students self-efficacy and task value for separate courses; math, English and social studies. Students' gender, grade level, goal orientations and interaction between goal orientations were accounted for the predictors of the analysis. Particularly, predictors explained 30% variance in English and social studies and nearly 25% variance in math course of self-efficacy scores of students. Greater endorsement of learning goal ($\beta = .34$, $p <.001$ for math; $\beta = .41$, $p <.001$ for English; $\beta = .36$, $p <.001$ for social studies) and relative ability ($\beta = .21$, $p <.001$ for math; $\beta = .26$, $p <.001$ for English; $\beta = .27$, $p <.001$ for social studies) goal orientation predicted higher level of self-efficacy. On the contrary, greater extrinsic goal orientation predicted lower level of self-efficacy ($\beta = -.14$, $p <.01$ for math; $\beta = -.13$, $p <.01$ for English; $\beta = -.18$, $p <.001$ for social studies). In addition, interaction between learning and relative ability goal orientations was significant for English ($\beta = - .10$, $p < .01$), and social studies ($\beta = -.15$, $p < .001$) but nor for math, which meant that the effect of a learning goal on self-efficacy was moderated by relative ability goal orientation for English and social studies courses. Also, same regression analysis were conducted for the data collected the end of school year with adding the scores of self-efficacy collected at the beginning of school year (i.e., self-efficacy for time 1) as one of the predictors. Learning, relative ability and extrinsic goal orientations effect on self-efficacy were in the same direction with the previously conducted regression analysis. In addition, self-efficacy for time 1 had positive effect on students' self-efficacy at the end of the year (β = .28, p <.001 for math; β = .33, p <.001 for English; β = .36, p <.001 for social studies) and interaction between learning goal and extrinsic goal orientation was a significant predictor of self-efficacy in English only (β= -.13, p < .01) but not fort her courses.

In a national study, Sungur (2007) proposed and tested a model on the relationships among motivational beliefs, metacognitive strategies use, and effort regulation of 391 high-school students in science courses. Motivational beliefs of the students were assessed as intrinsic goal orientation, task value, control of learning beliefs, and self-efficacy for learning and performance. Results of the path analysis indicated good model fit (χ^2 = 592.30, df = 54, NFI= .90, CFI =.90, GFI= .93, RMSEA= .13). Particularly, students' self-efficacy (β = .12) and also their task value (β = .62) had direct positive effect on their intrinsic goal orientation.

Also, Liem, Lau and Nie (2008) proposed and test a model depend on the relationships among self-efficacy, task value, achievement goals, learning strategies, task disengagement, peer relationship and English achievement of Singaporean ninth grade students. The proposed model was fit well (χ^2 /df =

3.53, CFI = .95, SRMR = .0436, RMSEA = .04, and TLI = .94). Students' achievement goals was taken in trichotomous model, namely; mastery, performance-approach and performance-avoidance goals. Specifically, self-efficacy indicated positive associations with mastery (β = .15, p < .01) and performance-approach (β = .31, p < .01) goals and negatively linked with performance-avoidance goal (β = -.17, p < .01). In addition, task value only significantly related with mastery goal (β = .68, p < .01).

Kıran (2010) investigated sources (viz., mastery experience, vicarious experience, verbal persuasion, and emotional arousal) and consequences (viz., achievement goals, metacognition, and effort regulation) of middle school students' self-efficacy beliefs in science course. A path analysis conducted on the data collected from 1932 eight grade public elementary school students and the model resulted in an acceptable fit (RMSEA = .09, SRMR = .06, GFI = .97, CFI = .96). Specifically, the direct link from students' self-efficacy to their mastery-approach (β = .43), performance-approach (β = .57) and mastery-avoidance (β = .11) were significant and positive. But the association between students' self-efficacy and their performance-avoidance goal orientation was not significant.

In a recent national study, Kahraman and Sungur (2013) conducted a path analysis based on the data collected from 977 Turkish seventh grade elementary school students to explore antecedents and consequences of achievement goals in science course. Specifically, task value and self-efficacy of the students were examined as the antecedents of achievement goal orientation and the goal orientation was studied in 2x2 frame consisting of mastery-approach, mastery-avoidance, performance-approach, and performance-avoidance goals. Results indicated that self-efficacy was directly and significantly associated with only performance-approach goal (β = .09, p <.05), and task value was directly and significantly associated with mastery-approach (β = .34, p <.05) and performance-avoidance (β = .09, p <.05) goal orientations. Also, Kıngır, Tas, Gok and Sungur-Vural (2013) conducted a study to explore the relationships among constructivist learning environment perception variables (viz., personal relevance, uncertainty, shared control, critical voice, student negotiation), motivational beliefs (viz., self-efficacy, intrinsic interest, goal orientation), self-regulation, and science achievement. To test the proposed model self-reported data were collected from eight grade students in science course. Specifically, students' achievement goal orientation was assessed in 2x2 framework, namely; mastery-approach, mastery-avoidance, performance-approach and performance- avoidance goals. The association between students' self-efficacy and achievement goal orientation was proposed and tested within the model which had good model fit indexes (χ^2 = 192.761, df = 7, NFI = .97, CFI = .97, GFI = .97, SRMR = .038). Results of the analysis indicated that constructivist learning environment variables, self-efficacy, intrinsic value and goal orientations account for 52% of the variance in self-regulation. According to results, self-efficacy of the students only related with their mastery-avoidance ($\beta = .49$, $p < .05$) and performance-avoidance ($\beta = .44$, $p < .05$) goals significantly.

Overall, abovementioned studies revealed that self-efficacious students tend to be more focused on learning and understanding (Bandura, 1986, 1997; Dweck & Leggett, 1988; Elliott & Dweck, 1988; Schunk & Pajares, 2009). Accordingly, it was generally reported that learners' self-efficacy is associated with mastery goals (e.g., Liem et al., 2008; Sungur, 2007; Wolters et al., 1996). Concerning mastery-avoidance goal, results also, generally, demonstrated positive associations between self-efficacy and mastery-avoidance goal (e.g., Kıngır et al., 2013; Kıran, 2010). In terms of performance goals, approach and avoidance valence were commonly considered in the above mentioned studies. The findings of the studies showed positive relationships between performance-approach goal of learners and high self-efficacy (e.g., Cury et al., 2006, Elliot & Church, 1997; Kahraman & Sungur, 2013; Kıran, 2010; Wolters et al., 1996). Concerning performance-avoidance goal, although, Kıngır et al. (2013) found positive link between those variables, other studies indicated negative relations (e.g., Cury et al., 2006; Elliot & Church, 1997; Liem et al., 2008).

Accordingly, in the current study, it was proposed that mastery-approach, mastery-avoidance and performance-approach goals have positive associations with elementary students' higher beliefs about their capability to do a given task in science course. But a negative relationship between performance-avoidance goal and high self-efficacy was expected.

2.4.3.2 Task Value and Achievement Goals

Dweck and Elliott (1983) suggested that learning and performance goals associate with subjective values. Additionally, in Eccles, Wigfield and colleagues' (Eccles et. al., 1983) expectancy-value model, it was proposed that goals are one of the determiners of the subjective value of learners. The mentioned goals are broader and they are based on life such as career plan. On the other hand, the goals mentioned in Dweck's model was more specific and varies according to learning situation, so it could be summarized in a way that general goals affect learners' subjective values and subjective values affect more specific goals (Wigfield, 1994b). Also, Bandura and Schunk (1981) pointed that the activation of personal goals or standards do not appear automatically, rather it depends on properties of the goals such as specify level. Another point which should be noticed that, the relationship between expectancy of success and learners goals proposed in the same way with the association between subjective value and learners goals in expectancy-value model, but again it is meaningful to interpret that subjective value as a determinants of specific goals in academic situation as mentioned in the previous part.

As mentioned in self-efficacy part, Wolters et al. (1996) conducted correlational and regression analysis to examine the relation between seventh and eighth grade students' goal orientation also for task value. In the same way with self-efficacy, task value was positively correlated with learning (r = .68, p < .05 for time 1; r = .64, p < .05 for time 2) and relative ability (r = .28, p < .05 for time 1; r = .28, p < .05 for time 2) goal orientation and it was negatively correlated with extrinsic goal orientation (r = -.25, p < .05 for time1; r = -.25, p < .05 for time 2). The regression analysis also were conducted to predict task value of the students from their gender, grade level, goal orientations and interaction between goal orientations for separate courses; math, English and social studies with the self-report scores of collected at the beginning of school year. Analysis indicated that, almost 50% of the variance in task value in each course was explained by the predictors. Greater indication of learning goal (β = .59, p <.001 for math; β = .61, p <.001 for English; β = .59, p <.001 for social studies) and relative ability (β = .19, p <.001 for math; β = .12, p <.01 for English; β = .12, p <.01 for social studies) goal orientation predicted higher level of task value. On the contrary, greater endorsement of extrinsic goal orientation predicted lower level of task value (β = -.11, p <.01 for math; β = -.10, p <.01 for English; β = -.14, p <.001 for social studies). Similar to self-efficacy, interaction between learning and relative ability goal orientations was significant for English (β = - .09, p < .05), and social studies (β = -.14, p < .001) but not for math. Also, same regression analysis were conducted for the data collected the end of school year with adding the scores of task value collected at the beginning of school year (i.e., task value for time 1) as one of the predictors. Learning, relative ability and extrinsic goal orientations effect on self-efficacy were in the same direction with the previously conducted regression analysis. In addition, task value for time 1 had positive effect on students' task value scores of the end of the year ($\beta = .17$, $p <.001$ for math; $\beta = .22$, $p <.001$ for English; $\beta = .24$, $p <.001$ for social studies). Also, none of the interaction between goal orientations was significant.

In a recent national study, Senler and Sungur (2014) studied the relationship between 1794 senior pre-service science teachers' self-regulation and their academic achievement. As task value, control of learning beliefs, test anxiety, mastery-approach goal, performance-approach goal, mastery-avoidance goal, performance-avoidance goal and metacognitive self-regulation were taken as active agent of self-regulation process. Particularly, researchers detected significant and positive relationships between students' mastery-approach goal and task value ($r = .49$, $p < .01$), performance-approach goal and task value ($r = .10$, $p < .01$), and mastery-avoidance goal and task value ($r = .16$, $p < .01$). In addition, performance-avoidance goal negatively and significantly correlated with task value ($r = -.11$, $p < .01$).

Thus, aforementioned literature demonstrated that learners' mastery (i.e., both mastery-approach and mastery-avoidance) goals have positive relationships with task value beliefs (e.g., Kahraman & Sungur, 2013; Senler & Sungur, 2014; Liem et al., 2008). Also, performance-approach goal of students' were found to be positively associated with their task value (e.g., Senler & Sungur, 2014; Wolters et al., 1996). On the other hand, concerning the relationship between performance-avoidance goal and task value, while Senler and Sungur (2014) reported negative association, Kahraman and Sungur (2013) reported a positive link between these variables.

In line with these findings, current study proposed positive associations between elementary students' task value and their mastery-approach, performance-approach and mastery-avoidance goals in science course. On the other hand, a negative relationship was expected between task value and performance-avoidance goal in science course.

2.5 Learning Strategies

Learning strategies globally defined as ‘‘mental processes that learners can deliberately recruit to help themselves learn and understand something new’’ (Brandt, 1988, p. 14). Also, they are essential component of social cognitive model proposed by Dweck and her colleagues, and self-regulated learning models (e.g., Muis, 2007; Pintrich, 2000; Winne & Hadwin, 1998; Zimmerman, 1989, 1990, 1998). In the social cognitive model of Dweck and her colleagues, learning strategies was mentioned to act as adaptive and maladaptive behavior pattern of mastery orientated and helpless individuals and learning strategies were categorized according to way of their use as;

effective or *ineffective strategies* and details of it was mentioned in previous part (see part 2.1 Implicit Theories of Ability). Self-regulated learning is " 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 goals and contextual features in the environment" (Pintrich, 2005, p. 453). Also, Zimmerman (2002) argued that self-regulation process is not only mental ability or an academic performance skill; it is a process that learners transform their mental abilities into academic skills as self-directive. And learners who evaluated as self-regulated learner use more strategies and perform better than learners who are less self-regulated (Pressley & Ghatala, 1990) but "self-regulation itself is not a unitary construct: there is no one set of cognitive, metacognitive, motivational, and behavioral strategies that constitutes the desirable mode of engagement in every setting and task" (Kaplan, 2008, p. 483).

There are different categorizations to define and classify learning strategies according to the related literature. One of classification for learning strategies is *deep* vs. *surface learning strategies* differentiation (Biggs, 1987; Meece, Blumenfeld, & Hoyle, 1988; Miller, Greene, Montalvo, Ravindran, & Nichols, 1996). Deep learning strategies includes metacognitive and effort management strategies such as regulating attention, persistence, relating new information to existing knowledge, and actively monitoring comprehension; on the other hand, surface strategy use includes help seeking or effort-avoidant strategies that maximize short-term retention of information such strategies as memorization and reproduction of the learning materials (Biggs, 1987).

Most commonly used learning strategies classification was done by Pintrich, Smith, Garcia and McKeachie (1991) and researchers defined learning strategies into two broad domains, namely; *cognitive strategies* (i.e., cognitive learning strategies) and *metacognitive strategies* (i.e., metacognitive learning strategies) also this classification was used in the current study. Cognitive learning strategies are “" (Gagné, 1985, p. 55) to choose, get and combine the new knowledge with existing knowledge (Dowson & McInerney, 1998). Also, cognitive learning strategies comprised of *rehearsal*, *elaboration*, *organization* and *critical thinking* for information processing (Pintrich et al., 1991).

In detail, rehearsal strategies encourage learners to continually repeat information to speed up the encoding process in working memory rather than long-term memory (Pintrich et al., 1991; Weinstein & Mayer, 1986). These strategies includes memorizing, listing, reciting, repeating and copying of information, underlining and highlighting the significant part of the information (Weinstein & Mayer, 1986). Also, rehearsal strategies are assumed as surface strategies in learning process (Muis, Winne & Jamieson-Noel, 2007; Pintrich, 2004).

Other cognitive learning strategies type is elaboration. Elaboration strategies facilitate storing information into long-term memory with constructing the new information with their prior knowledge (Pintrich et al., 1991; Weinstein & Mayer, 1986). Learners use these strategies with paraphrasing, summarizing, creating analogies, generative note taking, explaining, forming sentences and mental images, and asking and answering questions (Weinstein & Mayer, 1986). Moreover, elaboration strategies are evaluated as deep strategies in learning process (Muis, Winne & Jamieson-Noel, 2007; Pintrich, 2004).

Another cognitive learning strategies type is organizational strategies. These strategies help learners to select important information and incorporate new information into their schema (Pintrich et al., 1991; Weinstein & Mayer, 1986). Some examples of organization strategies are drawing the main idea from the given text, outlining the text or material to be learned, or various mapping strategies (Weinstein & Mayer, 1986). Also, organization strategies are considered as deep strategies in learning process (Muis, Winne & Jamieson-Noel, 2007; Pintrich, 2004).

Critical thinking strategies are the other cognitive learning strategies type. Critical thinking strategies ensure learners to transfer previously learned knowledge to new situation (Pintrich et al., 1991). Examples of it are problem solving, reaching decisions and making critical evaluations according to predetermined standards (Pintrich et al., 1991). In addition, these strategies are also taken as deep strategies in learning process (Muis, Winne & Jamieson-Noel, 2007; Pintrich, 2004).

Metacognition is “one’s knowledge concerning one’s own cognitive processes and products or anything related to them” (Flavell, 1976, p. 232). Also, Flavell (1976, 1979) as pioneer of metacognition researches indicated that metacognition includes metacognitive knowledge and metacognitive experiences, and metacognitively active learners’ use planning, monitoring, and evaluating to decide the appropriate cognitive learning strategies in their learning process. In early studies four constructs were suggested for metacognition, namely; knowledge of cognition, regulation of cognition, beliefs about cognition, and awareness of cognition (Flavell, 1976, 1979; Brown, 1978, 1987). Metacognitive learning strategies use was examined under regulation of cognition construct related with self-regulation and three main processes of it were identified as *planning*, *monitoring* and *regulating* (Pintrich et al., 1991). According to Hofer, Yu, Pintrich (1998) planning activities "include setting goals for studying, skimming a text before reading, generating questions before reading a text, and doing a task analysis of the problem" (pp. 67-68) also, planning provide learners to use cognitive learning strategies, activate their prior knowledge, and organize and comprehend the new material easier. Monitoring is making evaluation about the assimilated and organized materials (Dowson & McInerney, 1998) and “ monitoring activities include tracking of attention while reading a text material to check for understanding, monitoring comprehension of lecture and use of test-taking strategies (e.g., monitoring speed and adjusting to time available) in exam situation" (Hofer et al., 1998, p. 68). Regulation assist learners to make improvements and adjustment of their cognitive activities and regulating activities help learners to check and correct their behaviors while they are engaging with a task (Pintrich et al., 1991).

Learning strategies use, within the self-regulation concept, is considered with two approaches, namely; aptitude (e.g., Snow, 1996) and event (e.g., Winne, 2001). According to aptitude approach learners have contextualized and stable approach to use learning strategies. On the other hand, event approach claims that learners also metacognitively engage with learning activities and they regulate their learning instantly (e.g., Butler & Winne, 1995; Winne & Hadwin, 1998; Winne, Jamieson-Noel, & Muis, 2002). In addition, Pintrich (2004) asserted an empirically supported claim that is "students may use different strategies for different courses and that their motivation for different courses certainly varies" (p. 394). Also, course level differentiation of students' strategy use was considered in Motivated Strategies for Learning Questionnaire (MSLQ; Pintrich et al., 1991) which the one is of the most commonly used scale to assess students learning strategies use. Also, students' self-regulatory strategies uses are display differences at different grade level (e.g., Baas, Castelijns, Vermeulen, Martens & Segers, 2015; Zimmerman & Martines-Pons, 1990).

In the subsequent sections, the literature concerning students' learning strategies use in relation to implicit theories of ability, epistemological beliefs, motivational beliefs and achievement goals were examined in detail. In addition the association between cognitive and metacognitive learning strategy use was presented.

2.5.1 Learning Strategies in Relation to Implicit Theories of Ability

Dweck's social-cognitive model propose that students who have incremental theory of intelligence and entity theory of intelligence create distinctive pattern while using strategies **(**Diener & Dweck, 1978, 1980; Dweck, 1986; Dweck et al., 1995; Dweck & Leggett, 1988, Elliott & Dweck, 1988). Accordingly, students who believe that intelligence as increasable and controllable display adaptive pattern and use more effective strategies. On the other hand, students who believe that intelligence is stable and uncontrollable demonstrate maladaptive pattern and use ineffective strategies.

There are limited studies which include the relationship between implicit theory of intelligence and learning strategies. Therefore, the studies were examined regardless of their academic domain and subjects' grade level to reveal the general tendency. Also, the different conceptualizations of the variables especially for learning strategies arise from variation of used scales.

Stipek and Gralinski (1996) constructed a model to test the third-sixth grade students' beliefs about intelligence and school performance on math and social studies. Although, the model tested separately for third and fourth grades students (i.e., young) and fifth and sixth grades students (i.e., older) for different terms (i.e., fall and spring), it gave similar results. The model provides evidence about the relationships between ability-performance beliefs (assessed as entity theory of intelligence), performance goal, active cognitive learning strategies, superficial cognitive learning strategies and achievement. There were both direct and indict positive association between entity belief and cognitive learning strategies. The indirect relationship was mediated by performance goal. There was a direct effect of ability-performance beliefs on superficial cognitive learning strategies.

Bråten and Olaussen (1998) also reported that Norwegian college students' conception of intelligence accounted for significant variance (5.8%, $p < .01$) in the students' learning strategies use (consist of information processing, study aids, self-testing) when sex, age and self-efficacy were partially out. Additionally, researches grouped the students according to their conception of intelligence (low scores represent that intelligence is fixed, high scores represent that intelligence could be developed) and self-efficacy as they are high or low. They found significant difference in groups regarding learning strategies use ($F(3, 175) = 4.56$, $p < .01$).The difference were between high conception of intelligence - high self-efficacy group and low conception of intelligence - high self-efficacy group and, high conception of intelligence - high self-efficacy group and low conception of intelligence-high self-efficacy group.

Ommundsen (2003) conducted a study to examine the implicit theories of ability (viz., incremental/learning, stable, gift, and general) and self-regulation strategies (viz., metacognitive/elaboration, effort regulation and help seeking) of ninth grade junior high schools students in physical education classes. In correlation analysis significant relationships were gathered between general ability and help seeking (r = -.20, p <.01); stable and metacognitive/elaboration (r = -.25, p < .01), effort regulation (r = -.39, p < .01), help seeking (r = -.23, p < .01); gifted and help seeking (r = -.17, p < .01); incremental/learning and metacognitive/elaboration (r = .50, p < .01), effort regulation (r = .30, p < .01), help seeking (r = .30, p < .01). Hierarchically regression analysis revealed that learning/incremental theory of ability was a strong unique predictor of reported use of metacognitive and elaboration strategies (β = .47, p < .001) and the theory assessing the ability as stable was the negative predictor of the strategies (β = -.16, p < .001) when gender was partially out. In addition, students were grouped according to students' profile as high or low learning/incremental theory of ability and high or low fixed (i.e., stable, general, gifted) theory of ability to conduct one-way multivariate analysis of variance. The group differences were gathered for metacognitive/elaboration strategies (F(33, 641) = 16, 2, p < .001); effort regulation (F(22, 785) = 7, 3, p < .001) and help seeking ($F(13, 966) = 5, 5, p < .001$). Also high learning /incremental theory groups, regardless of variation in fixed theory of ability, reported using metacognitive/elaboration strategies significantly more strongly than the low learning/incremental theory groups. Moreover, high incremental theory groups, regardless of variation in fixed theory of ability, reported using effort regulation significantly more strongly than the groups have high fixed /low incremental theory of ability. Furthermore, the group with high incremental /low fixed ability beliefs was reported higher effort regulation than the groups with low incremental/low fixed theory of ability group. In terms of help seeking high incremental theory groups, regardless of variation in fixed theory of ability, reported using help seeking strategy more than the group with high fixed/low incremental theory of ability.

Ommundsen, Haugen and Lund (2005) examined Norwegian college students' the relationship between implicit theories of ability and self-regulation strategies, namely; motivation/diligence (i.e., students' self-discipline and willingness to work hard), concentration (i.e., students' concentration and attention), information processing (i.e., students' use of imaginary and verbal elaboration, acquiring knowledge and reasoning), and self-handicapping (i.e., proactive self-handicapping strategies). Results of the multiple regression analysis indicated that there were positive relationships between incremental theory and motivation/diligence ($\beta = .24$, $p <.05$; $\beta = .13$, $p <.05$) and concentration ($\beta = .21$, $p < .05$; $\beta = .13$, $p < .05$). Moreover, incremental theory had but weak and trivial relation with information processing ($\beta = .06$, $p > .05$; $\beta = .07$, $p > .05$) and self-handicapping ($\beta = -.08$, $p > .05$; $\beta = -.09$, $p > .05$). Also, fixed theory had a positive relation with self- handicapping ($\beta = .31$, $p < .05$; $\beta = .31$, $p < .05$).

In a study conducted by Abdullah (2008) in Malaysia with primary school students, the effect of self-efficacy, effort-beliefs, entity-beliefs, intrinsic goal orientation, and extrinsic goal orientation on self-regulated learning were examined. Self-regulated learning was assessed with the students’ cognitive and metacognitive learning strategies and resource management strategies. Variables significantly explained the 27% of variance in self-regulated learning. But the contribution of the entity theory of intelligence were insignificant to the model ($\beta = -.02$, $p > .05$).

In a more recent study, Doron, Stephan, Boiché and Scanff (2009) studied on undergraduate students’ coping strategies to approaching examination, implicit theories of ability and perceived control. Coping strategies were assessed as two dimensional. The first one was problem-focused strategies, including active coping, planning, seeking social support for instrumental reasons, and acceptance. The second one was emotion-focused coping consisting of seeking social support for emotional reasons, positive reinterpretation, humor, venting of emotions as adaptive strategies and behavioral disengagement, denial, blame, and distraction as maladaptive emotional-focused coping strategies.

Result of the multiple regression analysis revealed that incremental beliefs of ability positively associated with problem-focused strategies; active coping ($\beta = .17$, $p < .05$), planning ($\beta = .21$, $p < .05$), seeking social support for instrumental reasons ($\beta = .16$, $p < .05$) and emotion-focused strategies; seeking social support for emotional reasons ($\beta = .16$, $p < .05$) and venting of emotions ($\beta = .11$, $p < .05$). In addition, students' entity beliefs of ability were affiliated positively with behavioral disengagement ($\beta =.16$, $p < .05$) and venting of emotions ($\beta = .10$, $p < .05$). Also, mediational analysis indicated that entity theory related with active coping ($\beta = -.11$, $p < .05$), acceptance ($\beta = -.12$, $p < .05$) and behavioral disengagement ($\beta = .20$, $p < .05$) through perceived control.

Although aforementioned studies did not directly concentrate on cognitive and metacognitive learning strategies use, based on Dweck and her collegues' studies (e.g., Diener & Dweck, 1978, 1980; Dweck, 1986; Dweck et al., 1995; Dweck & Leggett, 1988; Elliott & Dweck, 1988), it can be deduced that incremental theories of ability are positively related with cognitive and metacognitive learning strategy use. Therefore, current study proposed positive associations of elementary students' beliefs about malleability of science ability with cognitive and metacognitive learning strategies use in science course.

2.5.2 Learning Strategies in Relation to Epistemological Beliefs

Ryan (1984) proposed that students' epistemological beliefs affect their information processing strategies. Also, Kardash and Howell (2000) reported that students with more sophisticated beliefs use more strategies than students' who had more naïve knowledge beliefs on specific topic. Afterwards, the relationship between students' beliefs about nature of knowledge and knowing and their learning strategies was hypothesized and tested within different cognitive and motivational approaches.

Bråten and Strømsø (2005) investigated the contribution of epistemological beliefs and theories of intelligence to motivation and metacognitive self-regulation strategies of Norwegian postsecondary education students, namely; business administration students and education faculty students. Epistemological beliefs of the students was assessed with the scale adapted from Schommer's (1990) scale, low scores represented sophisticated beliefs, consisting of speed of knowledge acquisition, certainty of knowledge, knowledge construction and modification, and control of knowledge acquisition dimensions. Also, students' implicit theory of intelligence was assessed in incremental and fixed theories of intelligence dimensions. Multiple regression analyses were performed separately for the two academic contexts (viz., business administration and education), to predict metacognitive strategies with gender, epistemological beliefs and implicit theories of intelligence. Results revealed that all predictors together explained a significant portion of the variance in students' self-regulatory strategies for the education faculty students ($F(7, 98) = 4.48$, $p < .001$, $R^2 = .24$) and for the business administration students ($F(7, 164) = 4.01$, $p < .001$, $R^2 = .15$). Specifically, belief about knowledge construction and modification ($\beta = -.40$, $p < .001$) of education faculty students detected the only significant predictor of the self-regulatory strategies and for the business administration students both beliefs about the control of knowledge acquisition ($\beta = -.22$, $p < .01$) and beliefs about knowledge construction and modification ($\beta = -.19$, $p < .05$) were the significant predictors.

In addition, Dahl, Bals, and Turi (2005) examined the association between Norwegian university students' epistemological belief dimensions and learning-strategy use. Students epistemological beliefs were assessed on simple knowledge (viz., beliefs avoiding integrating material, seeking single answers, avoiding ambiguity and depending on authority), certain knowledge (viz., beliefs certainty of knowledge), innate ability (viz., beliefs about individuals can't learn how to learn, the ability to learn is innate, learning occurs with the first effort and success is unrelated to hard work), and quick learning (viz., beliefs that actual process of learning is quick and one should avoid criticizing authority) domains (Schommer, 1998). In addition, students' learning strategies were assessed regarding their use of cognitive learning strategies, namely; rehearsal, elaboration, critical thinking, organization, and metacognitive learning strategies. Full regression model analyses were conducted to test the predictive value of epistemological beliefs on each learning strategy of the students. Particularly, students' epistemological beliefs on simple knowledge dimension negatively and significantly predicted students' rehearsal strategies (β = -.30, R^2 = .11, F(4,76) = 2.33, t = -2.60, p < .01), organization strategies (β = -.38, R^2 = .25, F(4,76) = 6.16, t = -3.64, p < .001), and metacognitive self-regulation strategies (β = -.34, R^2 = .23, F(4,76) = 5.65, t = -3.21, p < .01). In addition, students' innate ability beliefs contributed significantly to the use of elaboration strategies (β = -.39, R^2 = .22, F(4,76) = 5.24, t = -3.37, p < .001), critical thinking strategies (β = -.50, R^2 = .25, F(4,76) = 6.22, t = -2.60, p < .001), and metacognitive self-regulation strategies (β = -.25, R^2 =.23, F(4,76) = 5.65, t = - 2.16, p < .05).

Paulsen and Feldman (2007) investigated the conditional and interaction effects of university students' each epistemological beliefs dimensions (viz., ability to learn, the speed of learning, the structure of knowledge and the stability of knowledge dimensions) on cognitive (viz., elaboration, rehearsal, organization and metacognitive) and behavioral (viz., effort regulation, management of time and study environment, peer learning, help seeking) learning strategies. Specifically, each cognitive learning strategy was regressed on all dimensions of epistemological beliefs (high scores represented naïve beliefs of the students) and all possible two-way interactions between the four dimensions of epistemological beliefs. Students' epistemological beliefs on simple knowledge dimension significantly predicted students' use of elaboration strategies (β = -.18, R^2 = .1620, $F(10,491) = 9.49$, $p < .05$), rehearsal strategies (β = .21, R^2 = .25, $F(10,491) = 6.16$, $p < .05$). In addition, fixed ability beliefs of students predicted significantly their elaboration strategies (β = -.26), rehearsal strategies (β = -.24), organization strategies (β = -.26, R^2 = .1114, $F(10,491) = 6.16$, $p < .05$) and metacognition strategies (β = -.35, R^2 = .1649, F (10,491) = 9.70, $p < .05$) use. Moreover, students' beliefs regarding certainty of knowledge dimension predicted their organization strategies use (β = .09) significantly. Besides, interaction between fixed ability and simple knowledge dimensions predicted significantly elaboration (β = -.13) and metacognition (β = -.12) strategies use; interaction between certain knowledge and quick learning dimensions predicted significantly rehearsal (β = .08) and metacognition (β = .10) strategies use. The interaction between fixed ability and certainty knowledge increased significantly 2.87% R^2 value on elaboration strategy use and it means that the effect of on fixed ability belief on elaboration strategy moderated by certainty knowledge belief. Although the interaction between certain knowledge and quick learning significantly predicted rehearsal strategy and R^2 increased .85% with interaction terms, its effect was not significant. The regression analysis to predict metacognitive strategies of the students revealed that the interaction term effect increased 2.24% amount of R^2 which indicated that the effect of fixed ability belief of the on the strategy were moderated by students certainty knowledge and quick learning beliefs.

On the contrary to related literature, Özkan (2008) explored the relationships between seventh grade elementary students' epistemological beliefs about science, learning approaches (viz., meaningful and rote learning approaches), self-regulated learning strategies, and their science achievement (viz., scores students got from the science achievement test prepared by the researcher) in a national study. Epistemological beliefs of the students was assessed in source of knowing, certainty of knowledge, development of knowledge and justification for knowing dimensions but the factor analysis results was given three-factor structure as; source/certainty, development and justification dimensions. In addition, self-regulated learning strategies variable include students' cognitive learning strategies, namely; rehearsal, elaboration, organization and critical thinking and metacognitive learning strategies together in one-factor structure. Direct linked between each dimension of epistemological beliefs of the students and their self-regulated learning strategies were proposed but results of the structural equation modeling analysis (χ^2 = 548.45, *df* = 159, GFI = .958, AGFI = .944, RMR = .048, SRMR = .048, RMSEA = .044) revealed that none of those links were significant. But the researcher indicated that students' beliefs about knowledge and knowing may influence self-regulated strategies through their mediating influence on learning approach.

In a recent study, Alpaslan, Yalvac, Loving and Willson (2015) explored the association among ninth-eleventh grade physics students' epistemological beliefs and their self-regulation. Students' epistemological beliefs were assessed on four dimensions; justification for knowing, certainty of knowledge, source of knowing and development of knowledge. Students' self-regulation represented their goal orientations (viz., extrinsic and intrinsic goal orientations) and their learning strategy use (viz., rehearsal, elaboration, organization, critical thinking and metacognitive self-regulation). Results of the path analysis indicated good model fit indexes ($\chi^2 = 23.54$, $df = 12$, CFI = .98, AIC = 5567.0, BIC = 5714.2, RMSEA = .05, SRMR= .03). According to results of the direct relationships, justification of knowledge belief were significantly and inversely linked to rehearsal strategies ($\beta = -.14$, $p < .01$), source of knowing belief was directly and positively related to metacognitive self-regulation ($\beta = .17$, $p < .001$) and development of knowledge belief was significantly and positively associated with and organization strategies ($\beta = .15$, $p < .001$). Moreover, mediation of extrinsic goal orientation beliefs on source of knowing and development of knowledge gave significant result in rehearsal ($\beta = .18$ and $\beta = .11$, $p < .01$), elaboration ($\beta = .26$ and $\beta = .24$, $p < .01$), and organization ($\beta = .12$ and $\beta = .11$, $p < .05$) strategies, and critical thinking ($\beta = .30$ and $\beta = .27$, $p < .01$). Also, source of knowing indirectly predicted metacognitive self-regulation strategies through the mediating role of extrinsic goal orientation ($\beta = .07$, $p < .05$).

In national study, Pamuk (2014) conducted a study to investigate relationships among science teacher characteristics, constructivist learning environment perceptions, epistemological beliefs, self-regulation and student science achievement. He collected data from 137 science teachers and their 3281 seventh grade students and conducted Hierarchical Linear Modeling analysis to test several models. The effect of teacher level variables (viz., constructivist learning environment, achievement goal orientation, citizenship behavior, students-centered beliefs, epistemological beliefs and self-efficacy), and student level variables; constructivist learning environment (viz., personal relevance, uncertainty, critical voice, shared control and student negotiation), students' epistemological beliefs (viz., source of knowing, certainty of knowledge, justification for knowing and development of knowledge) on students' metacognitive self-regulation (i.e., metacognitive learning strategies) was examined. Specifically, results of the analyses indicated that naïve certainty beliefs (γ = .091, *SE* = .020, p < .001) and sophisticated beliefs about justification for knowing (γ = .147, *SE* = .023, p < .001) positively predicted students' metacognitive self-regulation.

In general, there was not any consistency in the reported results concerning the relationship between epistemological beliefs and students' use of cognitive and metacognitive learning strategies in the aforementioned literature. The source of this inconsistency may be the use of different factor structures for the variables. Although, some of the studies reported significant relationships between sophisticated epistemological beliefs about source of knowing (e.g., Alpaslan et al., 2015), certainty of knowledge (e.g., Paulsen & Feldman, 2007), development of knowledge (e.g., Alpaslan et al., 2015) and justification for knowing (e.g., Pamuk, 2014) dimensions and learning strategy use, most of them could not detect significant associations (e.g., Bråten & Strømsø, 2005; Dahl et al., 2005; Özkan, 2008) and some researchers proposed that it might arise from the mediational role of achievement goal orientations (e.g., Alpaslan et al., 2015; Özkan, 2008). However, the current study it was hypothesized that students' sophisticated epistemological beliefs positively linked with both their cognitive and metacognitive learning strategies use. Because students with sophisticated epistemological beliefs believe that scientific knowledge can be constructed by the individual (i.e., sophisticated beliefs about source of knowing), there may be multiple answers for a given scientific question (i.e., sophisticated beliefs about certainty of knowledge), scientific knowledge changes (i.e., sophisticated beliefs about development of knowledge) and there may be different ways of testing scientific ideas new ideas (i.e., sophisticated beliefs about justification for knowing). Thus, these students are expected use various cognitive and metacognitive strategies while learning science and constructing and testing their scientific ideas.

2.5.3 Learning Strategies in Relation to Motivational Beliefs

Motivational beliefs were taken into consideration as learners' self-efficacy and task value in the current study. The literature concerning association between self-efficacy and learning strategies, and task value and learning strategies were presented separately.

2.5.3.1 Self-efficacy and Learning Strategies

Dweck and her colleagues proposed a socio-cognitive model (e.g., Bandura & Dweck, 1985; Diener & Dweck, 1978, 1980; Dweck, 1975; Dweck et al., 1995; Dweck & Legget, 1988; Dweck & Reppucci, 1973; Elliott & Dweck, 1988; Leggett & Dweck, 1986), which was mentioned in part 2.1 Implicit Theories of Ability, the model is one of the initiator in the related literature to construct the connection between learners use of learning strategies and their motivational beliefs. According to the model, learners display two different behavior pattern, namely; mastery (i.e., adaptive) and helpless (i.e., maladaptive). Learners behave in helpless pattern have low perceived present ability for the task and do not use effective learning strategies such as problem-solving strategies, nearly 60% of strategies they use is ineffective strategies which does not yield a solution. Also, those learners who follow maladaptive pattern seek for unchallenging tasks and attribute their failure to their inadequate ability. On the contrary, learners behaving in mastery oriented pattern have high perceived present ability for the task, they seek for challenging task and they use more effective strategies, extensive solution-oriented self-instruction and self-monitoring. Ames and Archer (1988) conducted a similar study done by Dweck and her colleagues (see Dweck & Leggett, 1988; Elliott & Dweck, 1988). And researchers (i.e., Ames & Archer ,1988) detected positive the effect of junior high/high school students' perceived ability on their learning strategy use (viz., information processing, self-planning, and self-monitoring strategies), task choice (viz., challenging task or not) and attitude for English, math, science, and social studies class.

From Bandura's social cognitive theory perspective, Zimmerman and Martinez-Pons (1990) conducted one of the initial studies to examine the relationship between learning strategies and fifth, eighth, and eleventh grades academically gifted students' self-efficacy. Researchers proposed the association based on the Bandura's (1986) triadic reciprocal determinism model of social cognition which represents learners' personal processes, the environment, and their behavior. Accordingly, Zimmerman and Martinez-Pons (1990) affirmed that students' strategy use directly connected with their perception of capabilities and in case of detecting a deficiency in their performance, students' self-efficacy which will affect their ensuing motivation and also their choice of those strategies. Also, researchers detected the relationships between students' both verbal and mathematic self-efficacies effect on their strategy use. In addition, while presenting a general framework for the relationship between motivation and self-regulated learning, Pintrich (1999) claimed that middle school students' self-efficacy positively correlated with their cognitive and metacognitive learning strategies use based on the study conducted by Pintrich and De Groot (1990). The mentioned study (i.e., Pintrich & De Groot, 1990) was conducted on the self-report data collected from 173 seventh graders from eight science and seven English classes' students. Students' cognitive strategies use was assessed with items representing rehearsal, elaboration and organizational strategies, and metacognitive and effort management strategies were presented as self-regulatory strategies. Results indicated that self-efficacy of the students positively correlate with both cognitive strategies use (r = .33, p < .001) and self-regulation (r = .44, p <. 001). Also, students who have high in self-efficacy reported more cognitive strategies use (adjusted M = 5.41, F (1, 164) = 4.24, p < .04, MS_e = .43) and self-regulatory strategies (adjusted M = 5.31, F (1, 164) = 8.16, p < .005, MS_e = .38) than students low in self-efficacy (cognitive strategy adjusted M = 4.97; self-regulation adjusted M = 4.74). Therefore, the connection between self-efficacy of students and their learning strategies use was examined in many studies and some of the examples were presented below.

In addition, Bråten and Olaussen (1998) examined the association between Norwegian college students' self-efficacy and their learning strategies use. Learning strategies were assessed as information processing (viz., elaborate and organize information, monitor comprehension, and relate new material to prior knowledge), study aids (viz., use and generation of diverse technical solutions and materials), self-testing (viz., monitoring or checking students' own understanding). Also, to assess the self-efficacy of the participants a global measure of self-efficacy was used. Result of hierarchically ordered regression analysis indicated that students' self-efficacy accounted for significant variance (4.3%, $p < .01$) in the students' use of learning strategies when sex, age partially out.

In a national study, Yumuşak, Sungur and Çakıroğlu (2007) conducted a canonical correlation analysis to examine the relationship between motivational beliefs (viz., intrinsic goal orientation, extrinsic goal orientation, task value, control of learning beliefs, self-efficacy for learning and performance test anxiety) and strategy use (viz., cognitive strategies use [rehearsal, elaboration, organization and critical thinking], metacognitive strategies use, time and study environment, effort regulation, peer learning, and help seeking) among Turkish high school students in biology. Results was revealed that correlation was .31 (10% overlapping variance) between motivational variables set ($r = .46$ for intrinsic goal orientation, $r = .83$ for task value, $r = .68$ for self-efficacy for learning and performance, and $r = -.49$ for test anxiety) and strategy use variables set ($r = .65$ for elaboration, $r = .41$ for organization strategy use, $r = .65$ for critical thinking, $r = .60$ for metacognitive self-regulation, $r = .69$ for time and study environment, $r = .84$ for effort regulation, and $r = .39$ for peer learning). The percentage of variance values displayed that the first canonical variate pair extracts 28% of variance from the motivational beliefs variables and 32% of variance from the cognitive and metacognitive strategies use variables. Motivational beliefs variate accounted for 3% of the variance in strategy use variables and strategy use variate accounts for 3% of the variance in the motivational beliefs variables.

In another national study, Kıran (2010) investigated sources (viz., mastery experience, vicarious experience, verbal persuasion, and emotional arousal) and consequences (viz., achievement goals, metacognition, and effort regulation) of middle school students' self-efficacy beliefs in science course. A path analysis conducted on the data collected from 1932 eight grade public elementary school students and the model resulted in an acceptable fit (RMSEA = .09, SRMR= .06, GFI= .97, CFI= .96). Specifically, students' metacognition was assessed as their metacognitive strategy use and results of the analysis indicated that self-efficacy (β= .42) significantly and positively predicted their metacognition.

In a recent national study, Kıngır et al. (2013) conducted a study, specifically regarding science course, to explore the relationships among constructivist learning environment perception variables (viz., personal relevance, uncertainty, shared control, critical voice, student negotiation), and eight grade students' motivational beliefs (viz., self-efficacy, intrinsic interest, goal orientation), self-regulation, and science achievement. Specifically, self-regulation variable represents students' cognitive and metacognitive learning strategies. The association between achievement goal orientation and self-regulation was proposed and tested within the model which had good model fit indexes (χ^2 = 192.761, df = 7, NFI = .97, CFI = .97, GFI = .97, SRMR = .038). Results of the analysis indicated that constructivist learning environment variables, self-efficacy, intrinsic value and goal orientations account for 52% of the variance in students' cognitive and metacognitive learning strategy use. Particularly, students' self-efficacy (γ = .06, p > .05) was not significantly associated with their strategy use.

In a more recent national study, Taş and Çakir (2014) investigated the association between middle school students' active strategy use and motivational beliefs in science course. Active strategies were assumed as facilitator strategies to construct the knowledge based on the previous ones as similar to cognitive learning strategies. Also, motivational belies was assessed as self-efficacy, task value, personal achievement goal orientations and perceived parent goal emphases for science course. A four-step hierarchical multiple regression analysis was conducted to predict strategy use. Domain specifically assessed self-efficacy and task value variables were entered in the fourth step of the analysis and they accounted 8% variation for strategy use. Specifically, both self-efficacy (β = .04, p < .001) and task value (β = .03, p < .001) of the students for science course significantly anticipated their active strategy use in the course.

Overall, aforementioned literature indicated that students with high self-efficacy use more learning strategies while engaging in academic tasks (e.g., Ames & Archer, 1988; Bråten & Olaussen, 1998; Yumuşak et al., 2007). Particularly, it was consistently reported that students believing that they have enough capability to do the given task use more cognitive learning strategies (e.g., Pintrich & De Groot, 1990; Tas & Cakir, 2014) and metacognitive learning strategies (e.g., Kıran, 2010; Pintrich & De Groot, 1990). Therefore, it was proposed that students having high self-efficacy use more cognitive and metacognitive learning strategies.

2.5.3.2 Task Value and Learning Strategies

As mentioned in the previous parts Dweck and her colleagues (see Elliott & Dweck, 1988; Dweck & Leggett, 1988) also mentioned the association between learners' choice of task preference as challenging or not and their strategy use. It was expressed that learners who avoid challenging task demonstrated less effort and persistence, also they use more ineffective strategies. On the other hand, challenge seeking students struggle with difficulties and persist more on the task and try to solve problems with more effective strategies. Also, expectancy-value theory of motivation indicates that learner' expectations about their capabilities and value of the activity plays important role on choice and performance (Wigfield & Eccles, 2000). Therefore, the association between learners' tasks value and their learning strategies use was examined in the self-regulation frame (Pintrich, 1999). For example, Pintrich and De Groot (1990) reported that positive correlation between seventh grade students' cognitive strategies use and intrinsic value ($r = .63$, $p < .001$), and self-regulatory strategies (composed of metacognitive and effort management strategies) and intrinsic value ($r = .73$, $p <.001$). In addition, researchers indicated that students with high in intrinsic value were more likely to use cognitive strategies, (adjusted M = 5.58, $F(1, 164) = 45.93$, $p < .0001$, $MS_e = .43$) and self-regulatory strategies (adjusted M = 5.49, $F(1, 164) = 68.40$, $p < .0001$, $MS_e = .38$) than students low in intrinsic value (cognitive strategies adjusted M = 4.80, self-regulation adjusted M = 4.56). Therefore, the connection between task value of students and their learning strategies use was examined in many studies and some of the examples were presented below.

Sungur (2007) proposed and tested a model on the relationships among motivational beliefs, metacognitive strategies use, and effort regulation of 391 high-school students in science courses. Motivational beliefs of the students were assessed as intrinsic goal orientation, task value, control of learning beliefs, and self-efficacy for learning and performance. Results of the path analysis indicated good model fit ($\chi^2 = 592.30$, $df = 54$, NFI= .90, CFI =.90, GFI= .93, RMSEA= .13). Task value had the second strongest effect ($\beta = .16$) on metacognitive strategies use after intrinsic goal orientation. Also, effect of the self-efficacy on metacognitive strategies use was detected as positive ($\beta = .15$).

Thus, the literature on the relationship between task value and learning strategies reveal that they have positive relationship (e.g., Yumuşak et al., 2007). Specifically, it was consistently indicated that students who have high task value use more cognitive learning strategies (e.g., Pintrich & De Groot, 1990; Taş & Çakir, 2014) and also metacognitive learning strategies (e.g., Pintrich & De Groot, 1990; Sungur, 2007). Accordingly, it was hypothesized that students' high task value positively associated with both cognitive and metacognitive learning strategies in the present study.

2.5.4 Learning Strategies in Relation to Achievement Goals

Various studies in the literature pointed out the role of achievement goals in students' strategy use in their learning (e.g., Ames, 1984; Bandura & Dweck, 1985; Leggett & Dweck, 1986). According to the findings, students adopting mastery goal tend to demonstrate adaptive learning patterns and use deep learning strategies (Ames & Archer, 1988; Dweck & Leggett, 1988; Elliot & McGregor, 2001; Elliot, McGregor, & Gable, 1999; Harackiewicz, Barron, Tauer, Carter & Elliot, 2000). On the other hand, students holding performance goal demonstrate maladaptive learning pattern and they are likely to use surface learning strategies. Related researches also demonstrated that students' achievement goals and learning strategy use are shaped according to situational demand and context specific (Ames & Archer, 1988; Somoncuoğlu & Yıldırım, 1999) and there is need for the studies investigating the relationship between achievement goals and learning strategies use in different domains. Therefore, the present study aimed to examine the association between elementary students' learning strategies and achievement goal orientation in science.

Dupeyrat and Mariné (2005) constructed a model based on Dweck's social-cognitive theory of motivation with high school students' (who dropped out of the school and return to school to get high school diploma) implicit theories of intelligence (viz., incremental and entity theory of intelligence) achievement goals (viz., mastery, performance and work-avoidance goals), cognitive engagement (viz., deep strategies addressing elaborating and organization information; shallow strategies addressing rote memorization; and effort addressing feedback for homework) and achievement (viz., graduation grade). Researcher proposed the relationship between entity theory and performance goal and work-avoidance; incremental theory and mastery goal; performance goal and shallow strategies; work avoidance and shallow strategies, deep strategies and effort; mastery goal and deep strategies and effort; and achievement and shallow strategies, deep strategies and effort. Results showed that performance goal positively associated with shallow strategies ($\beta = .33$, $p < .01$), work avoidance goal negatively related with deep strategies ($\beta = -.29$, $p < .01$) and mastery goal positively linked with both deep strategies ($\beta = .48$, $p < .001$) and effort ($\beta = .28$, $p < .05$).

In another study, Wolters (2004) examined the relationships among of junior high school students' perceived classroom goal structures, personal goal orientations, persistence, procrastination, choice, their use of cognitive and metacognitive learning strategies, and mathematics grade. Specifically, personal goals orientations were assessed in terms of mastery goal, performance-approach goal and performance-avoidance goal. The correlation analysis indicated that both mastery-approach (r = .52, p <.05 for cognitive learning strategies; r = .53, p <.05, for metacognitive learning strategies) and performance-approach (r = .12, p <.05 for cognitive learning strategies; r = .12, p <.05, for metacognitive learning strategies) goals positively correlate with students' cognitive and metacognitive learning strategies. In addition, performance-avoidance goal negatively correlate with metacognitive learning strategies (r = -.10, p <.05) but the association between performance-avoidance goal and cognitive learning strategies was not significant. Moreover, a three-step hierarchical regression was conducted to predict learning strategy, achievement outcomes and motivational variables. In the first step, gender and standardized achievement of students were entered and the variables did not predict cognitive learning strategies significantly (F(2, 522) =3.39, p =.04), they predict metacognitive learning strategies significantly (F(2, 522) = 6.00, p< .01) but the explain variance was very small such as 2%. In the second step, classroom goal structure was added, the model yield significant contribution to both learning strategies and the increased in the explained variance for cognitive learning strategies was 16% (F(2, 520) = 58.42, p < .01) and it was 18% for metacognitive learning strategies (F(2, 520) = 49.04, p < .01). In the third step, students' personal achievement goals and their self-efficacy scores were added to analysis as predictors and the increased amount of variance for cognitive strategies was 14% (F (4, 516) = 27.09, p < .01) and 16% for metacognitive learning strategies (F (4, 516) = 30.01, p < .01). But only mastery orientation significantly predicted cognitive (β = .47, p < .01) and metacognitive learning strategies (β = .47, p < .01).

Similarly, Muis and Franco (2009) investigated the relationship among epistemic beliefs, achievement goals, learning strategies, and achievement. The study conducted on the self-reported data collected from undergraduate educational psychology students. Achievement goals of students were assessed in 2x2 achievement goal framework, namely; mastery-approach, mastery-avoidance, performance-approach, and performance-avoidance goal orientations. Moreover, researchers assessed students' rehearsal, elaboration, critical thinking, and metacognitive self-regulation strategies use (rehearsal strategies considered as shallow-processing strategies, and elaboration, critical thinking, and metacognitive self-regulation strategies considered as deep-processing strategies) and their final grade for their education psychology course. Results of the structural equation modeling indicated a moderate to good fit (χ^2 = 2784.13, df = 1398, CFI = .89, RMSEA = .05). Specifically, students' mastery-approach goal orientation significantly and positively linked to the use of elaboration (β = .94), critical thinking (β = .72), metacognitive self-regulation (β = .97), and rehearsal (β = .82) strategies; and mastery-avoidance orientation negatively related with the use of elaboration strategies (β = -.19). Also, students' performance-approach goal orientation significantly and positively associated with the use of critical thinking strategies use (β =.18) but its relation with the use of metacognitive self-regulation strategies was negative ($\beta = .14$).

More recently, Rastegar, Jahromi, Haghighi and Akbari (2010) examined association among Persian university students', from basic sciences fields, epistemological beliefs, achievement goals, mathematics self-efficacy, cognitive engagement and mathematics achievement. Students' achievement goal orientation was assessed in three dimensions, namely; performance-avoidance goal, performance-approach goal and mastery goal. As cognitive engagement students' use of cognitive and metacognitive strategies were assessed in a similar way to the current study. These strategies were formed from subscale of cognitive engagement of MSLQ. Particularly, results of the structural equation modeling revealed that students' cognitive engagement significantly and positively related with their performance-avoidance goal ($\beta = .19$), performance-approach goal ($\beta = .21$), and mastery goal ($\beta = .25$).

In a recent study, Alpaslan et al. (2015) examined the association among ninth-eleventh grade physics students' epistemological beliefs and their self-regulation. Students' self-regulation represented their goal orientations (viz., extrinsic and intrinsic goal orientations) and their learning strategies use (viz., rehearsal, elaboration, organization, critical thinking and metacognitive self-regulation). For both extrinsic and intrinsic goal orientations, it was proposed that goal orientations are linked with rehearsal, elaboration, organization, critical thinking and metacognitive self-regulation learning strategy use separately. Results of the path analysis indicated good model fit indexes (χ^2= 23.54, *df*= 12, CFI = .98, AIC = 5567.0, BIC = 5714.2, RMSEA = .05, SRMR= .03). Specifically, the results of the analysis indicated that intrinsic goal orientation significantly predicts use of critical thinking ($\beta = -.11$, $p < .05$) and metacognitive self-regulation ($\beta = .13$, $p < .01$). Also, extrinsic goal orientation was significantly related to use of rehearsal ($\beta = .49$, $p < .01$), elaboration ($\beta = .71$, $p < .01$), organization ($\beta = .29$, $p < .01$), and critical thinking ($\beta = .77$, $p < .01$).

In a study conducted in Turkey, Kıran (2010) investigated sources (viz., mastery experience, vicarious experience, verbal persuasion, and emotional arousal) and consequences (viz., achievement goals, metacognition, and effort regulation) of middle school students' self-efficacy beliefs in science course. A path analysis conducted on the data collected from 1932 eight grade public elementary school students and the model resulted in an acceptable fit (RMSEA = .09, SRMR= .06, GFI= .97, CFI= .96). Specifically, students' metacognition was assessed as their metacognitive strategies use and direct links from students' achievement goal orientations to their metacognition were proposed and tested. According to results, only mastery-approach (β= .34) and performance- approach (β = .09) goal orientations significantly affected students' metacognition.

Kadıoglu and Uzuntiryaki-Kondakci (2014) also conducted a study to examine the association between Turkish students' learning strategies and their goal orientations in ninth-evelenth grade high school chemistry course. Achievement goal orientation was assessed on 2x2 achievement goal framework, namely; mastery-approach, mastery-avoidance, performance-approach and performance-avoidance goals; and learning strategies included rehearsal, elaboration, organization, critical thinking, and metacognitive self-regulation. A canonical regression analysis was conducted between learning strategy variate and goal orientation variate. All types of leaning strategies were positively correlated with learning strategy variate; and rather than performance-avoidance goal all other goal orientation variable significantly and positively correlate with goal orientation variate. In addition, five separate HLM analyses were run for each learning strategy type. According to results of HLM analyses; all learning strategies were significantly and positively predicted separately by performance-approach ($\beta = 3.94$ for rehearsal, $\beta = 4.52$ for elaboration, $\beta = 3.06$ for organization, $\beta = 4.21$ for critical thinking, and $\beta= 3.88$ for metacognitive self-regulation) and mastery-approach ($\beta = 7.95$ for rehearsal, $\beta = 10.88$ for elaboration, $\beta = 10.95$ for organization, $\beta = 7.86$ for critical thinking, and $\beta= 13.27$ for metacognitive self-regulation) but mastery-avoidance and performance-avoidance goals' contribution were not significant.

Another study conducted in Turkey was carried out by Kıngır et al. (2013) to explore the relationships among constructivist learning environment perception variables (viz., personal relevance, uncertainty, shared control, critical voice, student negotiation), motivational beliefs (viz., self-efficacy, intrinsic interest, goal orientation), self-regulation, and science achievement. To test the proposed model regarding science course, the self-reported data was collected from eight grade students. Specifically, self-regulation variable includes students' cognitive and metacognitive learning strategies and students' achievement goal orientation was assessed in 2x2 framework, namely; mastery-approach, mastery-avoidance, performance-approach and performance- avoidance goals. The association between achievement goal orientation and self-regulation was proposed and tested within the model which had good model fit indexes (χ^2 = 192.761, *df* = 7, NFI = .97, CFI = .97, GFI = .97, SRMR = .038).Results of the analysis indicated that constructivist learning environment variables, self-efficacy, intrinsic value and goal orientations account for 52% of the variance in self-regulation. Particularly, only performance-approach (β = .11, p< .05) was significantly and positively linked to self-regulation since others were not significantly related.

In a separate study, Kahraman and Sungur (2011) examined the relation of 115 elementary school seventh grade students' self-efficacy and achievement goals (viz., mastery-approach, mastery-avoidance, performance-approach, and performance-avoidance goals) with their metacognitive learning strategy use in science course. Results of the multiple linear regression analysis (*R*= .70, *F* = 11.09, *p* < .05) indicated that only mastery-approach goal orientation (β = .22,

$p < .05$) and self-efficacy significantly ($\beta = .65$, $p < .001$) predicted metacognitive strategies use of the students. In other words, mastery-avoidance ($\beta = -.07$, $p = .49$), performance-approach ($\beta = .07$, $p = .53$), and performance-avoidance ($\beta = .06$, $p = .57$) goals did not predict significantly students' metacognitive strategies use in science course.

In a more recent national study, Taş and Çakir (2014) investigated the association between middle school students' active strategy use (i.e., cognitive learning strategy use) and motivational beliefs (viz., self-efficacy, task value, personal achievement goal orientations and perceived parent goal emphases for science course) in science course. Particularly, personal achievement goal orientations of the students included mastery, performance-approach and performance-avoidance goal orientation. A four-step hierarchical multiple regression analysis was conducted to predict strategy use. Personal goal orientations were entered in the third step of the analysis which created an additional 33% of the variance in active learning strategies. Also, results revealed that only mastery goal orientation ($\beta = .62$, $p < .001$ for step 3; $\beta = .35$, $p < .001$ for step 4) predict students' active strategy use in science course but not performance-approach or performance-avoidance goal orientations.

Overall, both national and international literature regarding the relationship between achievement goals and learning strategies revealed that students who set mastery goal use more cognitive learning strategies while engaging in a given task (e.g., Alpaslan et al., 2015; Taş & Çakir, 2014; Wolters, 2004). In addition, there are some studies in which a positive relationship was reported for mastery-avoidance goal and cognitive learning strategies use (e.g., Muis & Franco, 2009). Similarly, students having performance goal were also reported that they use cognitive learning strategies (e.g., Alpaslan et al., 2015) regardless of deep or surface. Particularly, for both performance-approach (e.g., Dupeyrat & Mariné, 2005; Kadıoglu & Uzuntiryaki-Kondakci, 2014; Kıngır et al., 2013; Muis & Franco, 2009; Wolters, 2004) and performance-avoidance (e.g., Rastegar et al., 2010) goals. In addition for metacognitive learning strategy use, there is consistency in the aforementioned studies that those students set mastery goal (e.g., Alpaslan et al., 2015; Rastegar et al., 2010; Wolters, 2004) especially the mastery-approach goal (e.g., Kadıoglu & Uzuntiryaki-Kondakci, 2014; Kahraman & Sungur, 2011; Kıngır et al., 2013; Kıran, 2010; Muis & Franco, 2009). Also, commonly it was reported that students' performance-approach goal is positively related with their metacognitive learning strategy use (e.g., Kadıoglu & Uzuntiryaki-Kondakci, 2014; Kıngır et al., 2013; Kıran, 2010; Wolters, 2004). Moreover, Muis and Franco (2009) found significant negative relationship between students' performance-avoidance goal and their metacognitive learning strategies use. On the other hand, Sungur & Şenler (2009) reported positive relationships between both approach and avoidance goals and metacognition. The authors attributed these findings to the competitive and examination oriented educational system of Turkey where the study was conducted. According to

Sungur and Şenler (2009), in competitive learning environments, avoidance goals can act as a driving force for better performance which requires high levels of cognitive and metacognitive engagement. Accordingly, the current study conducted in Turkey proposed that both cognitive and metacognitive learning strategy use of the elementary students is positively related with their all achievement goals (i.e., mastery-approach, mastery-avoidance, performance-approach, and performance-avoidance goals) in science course.

2.5.5 Cognitive Learning Strategies in Relation to Metacognitive Learning Strategies

Theoretically, metacognitive learning strategies use was derived from regulation of metacognition (Pintrich et al., 1991). Metacognitive skills such as metacognitive learning strategies are conceptualized as *higher-order cognition about cognition* which means that those metacognitive learning strategies draw on cognitive process (Flavell 1979; Nelson, 1999) and the conceptualizations emphasized the supervisory role of metacognitive skills to initiate and control cognitive process. “Cognitive activities are needed for the *execution* of task-related processes on the object level, whereas metacognitive activity represents the *executive* function on the meta-level for regulating cognitive activity” (Veenman, 2012, p. 27). The association between cognitive and metacognitive learning strategies use was examined and reported for different tasks which need different strategy use. For example Kasımi (2012) reported strong positive relationship between cognitive and metacognitive reading strategies (*r*

= .84, p < .001). A metaphoric representation for the relationship between metacognitive skills and cognitive ones in learning process is that; while metacognitive learning strategies represent the driver, cognitive learning strategies serve as vehicle under the control of metacognitive learning strategies (Veenman, 2012).

Heikkilä and Lonka's (2006) study indicated significant associations between university students' cognitive strategies such as mastery orientation, task-irrelevant behavior, success expectations and reflective thinking, and students' regulation of their learning like self-regulation, external regulation and lack of regulation. In a similar study, Phakiki (2006) investigated the relationships among cognitive strategies (viz., comprehending, retrieval and memory strategies), metacognitive strategies (viz., planning, monitoring and evaluating strategies) and foreign language reading test performance, through structural equation modeling (SEM) based on the data collected from 358 university students. Results indicated a good model fit (χ^2= 612.470, df = 330, p = .00, CFI = .92, RMSEA = .049), and significant direct links were found between monitoring and memory (β = .96); and evaluate and retrieve strategies (β = .62).

Saçkes (2010) proposed and tested a model based on the data collected from 52 preservice early childhood education program's students. More specifically, the researcher examined the association between participants' cognitive, metacognitive, and motivational variables in conceptual change of cause of the lunar phases. While the data about cognitive, metacognitive, and motivational variables collected through self-report scales, semi-structured interviews were done with preservice teachers to investigate their conceptual change on cause of the moon phases before and after instructions. Also, the hypothesized model was tested with partial least square path analysis. According to the results, the direct link between preservice teachers' use of metacognitive strategies and deep-level cognitive strategies was significant and positive ($\beta = .66$, $p < .001$).

In general, abovementioned literature indicated that students' who use more cognitive learning strategies tend to use more metacognitive learning strategies (e.g., Heikkilä & Lonka, 2006; Kasımi, 2012; Phakiti, 2006; Saçkes, 2010). Accordingly, a positive relationship between cognitive learning strategies and metacognitive learning strategies was expected in the current study.

2.6 Procrastination

Procrastination in different settings was reported in the literature with different forms, such as *everyday procrastination*, *work-related procrastination*, *decisional procrastination* and *academic procrastination* (Sokolowska, 2009). Everyday procrastination is difficultly in scheduling time for life routine activities and obeying the schedule (Lay & Brokenshire, 1997; Lay, 1986). Since tasks are usually fulfilled in teams in workplaces, work-related procrastination was affects the performance of team and more costly than academic procrastinations (Hammer & Ferrari, 2002). Decisional procrastination is identified as inability to decide on time and repeating postponement (Effert & Ferrari, 1989; Ellis & Knaus, 1977). Academic procrastination, which is the interested form of the current study, had not been studied until the 1980s (Schouwenburg, 2004) and also there is not a consensus about the definition and conceptualization of academic procrastination in the related literature. But nearly all definitions include *delay* as a key word. The most commonly used definition academic procrastination is “the act of needlessly delaying tasks to the point of subjective discomfort” (Solomon & Rothblum, 1984, p. 503). Similarly, Senécal, Koestner and Vallerand (1995) defined academic procrastination as students’ needlessly delaying academic activities are associated with motivational difficulties which result discontinuing to pursue initial academic goals, waiting until last minute to create a pressure to start. In another aspect, Urdan and Midgley (2001) defined academic procrastination as intentional decisions and intentional production of impediments to success. Scher and Osterman (2002) also defined procrastination in a similar fashion as “a substantial hindrance to success” (p. 385). Hess, Sherman and Goodman (2000) identified academic procrastination as “the tendency to delay a task to the point that one becomes frustrated about not completing it” (p. 61). Specifically, academic procrastination is a students’ tendency to intentionally postpone such academic tasks such as reading assignments, homework and studying for examinations despite of its negative outcomes (Howell & Watson, 2007; Senécal et al., 1995; Steel, 2007).

Moreover, people procrastinate less when they get older and learn more (Beswick, Rothblum, & Mann, 1988; Stead, Shanahan, & Neufeld, 2010; Steel, 2007). More than 80% of the Turkish adolescents procrastinate with spending one hour each day and more than 40% of them spend three or more hour with procrastinating during school days (Klassen & Kuzucu, 2009).

Also some categorizations are used to describe the academic procrastination such as; adaptive and maladaptive (e.g., Schraw, Wadkins & Olafson, 2007); functional and dysfunctional (e.g., Ferrari, 1994); optimistic and pessimistic (e.g., Lay, 1987); active and passive (e.g., Chu & Choi, 2005). According to the categorizations negative ones (i.e., maladaptive, dysfunctional, pessimistic, passive) reflects the traditional concepts of procrastination which have disturbing effect; on the other hand, those positive ones (i.e., adaptive, functional, optimistic, active) are more positive and defined as not having disturbing effect while engaging an academic task.

Procrastination is viewed in the literature as arise from general personality or situation. The studies in which procrastination are related with personality is often guided by Big Five personality factors and their results indicated the deficiency in conscientiousness (e.g., Schouwenburg & Lay, 1995; van Eerde, 2004). Also, in other studies considering the procrastination as a trait connect procrastination with different traits such as perfectionism, fear of failure, self-handicapping, sensation-seeking and proneness to boredom (Sokolowska, 2009). On the other hand, some researcher take into account of procrastination as related with task and situation (e.g., Senécal et. al., 1997; Steel, 2007). In those studies the link between procrastination and task-related variables were proved such as time pressure, task aversion and time-management, in addition motivational variables also considered to subscribe procrastination (Sokolowska, 2009).

Past research about procrastination tries to explain it from various perspectives according to different theoretical approaches such as psychoanalytic, behaviorism, cognitive and cognitive-behavioral approaches. One of them is the psychoanalytic approach but according to the approach empirical testing of procrastination is difficult (Ferrari, Johnson & McCown, 1995). Starting from Freud's (1953) study, which connects the avoidance behaviors with ego protection, procrastination has been explained with psychoanalytic approach to protect the individuals' ego from the risk of failure. The most popular study about the etiology of procrastination from the psychoanalytic approach was done by Burka and Yuen (1983). Accordingly, procrastination is a form of self-protection, because it was expected that performance is reflection of ability and reflection of self-worth and failure of a task indicates lack of ability and a low self- worth. Therefore, students feel fear of failure because of the emphasis on academic success while defining self-worth and they prefer to procrastinate to protect their self-esteem. Missildine (1963) related the procrastination with individuals' childhood experience which is named as *procrastination syndrome* owing to parenting style such as unrealistic expectations from their children. In a similar fashion, Rothblum, Solomon and Murakami (1986) proposed that critical and demanding parents might affect children's task avoidance; later Ferrari and Olivette (1994) presented the effect of authoritarian parenting style on children's procrastination and Davis (1999) indicated positive association between astination. Also, Spock (1971) proposed that parents, who imposed their children achievement-oriented tasks, creates unconscious feeling in children towards them as anger when their children fail at task and children started to delay the achievement-orientated task, that reminiscent of childhood reflects the children' future life as no insight to their behavior and they could not finished the tasks they starts and become an active procrastinator individuals. From another aspect, the relationship between action and time is taken to consideration to explain the procrastination from psychodynamic perspective (Beaedsworth, 1999). According to Beaedsworth (1999) procrastinators' procrastinate because past have impact on their affects and the relation effect individuals' present and future action.

According to behaviorism if a behavior is previously reinforced it continue to exist (Skinner, 1953). The situation also is valid for procrastinators since their procrastination probably was reinforced or helps procrastinators to reach success (Bijou, Morris, & Parsons, 1976). Also, correlational studies support the relationships between reinforcement and procrastination (e.g., McCown & Johnson, 1991). Another aspect of the behaviorism is the punishment. An early study about it was carried out by Solomon and Rothblum (1984) and the factor analysis results of the study was indicated that mostly accounted factor was *aversiveness of task* which is being unpleasant to do the task. Also, subsequent empirical studies display that procrastination is not a personal temperament, it is a behavior which depends on the interaction with ask and context (Moon & Illingworth, 2005). For example, the result of the study conducted by Ferrari and Emmons (1995) extrapolated that punishment in near future decrease the students' procrastination and Senécal et al. (1995) tested type of task (viz., interesting/easy, interesting/difficult, boring/easy, and boring/difficult) on students' procrastination and find out that students presenting themselves as procrastinator more probably delay boring/ difficult tasks and also Ferrari and Tice (2000) evidenced that the students identified as procrastinator, procrastinate more if they engage with trivial, boring and unimportant tasks. Moreover, escaping or avoiding condition could be evaluated in the contemporary learning theory as explanation of procrastination in terms of behaviorism, accordingly escape of the procrastinator from a task occur after starting to do a task but at some point it will be aborted and will not be completed, on the other hand avoiding condition occur as postponement of starting to do the task (Ferrari et al., 1995). Furthermore, anxiety was suggested as the discriminative stimulus for procrastination by Burka and Yuen (1983) and Solomon and Rothblum (1984). Since phobias are seen as learned behavior, the relationships between procrastination and phobic task avoidance were also discussed under behavioral literature (Ferrari et al., 1995).

There are also procrastination studies according to cognitive and cognitive-behavioral approach. Ellis and Knaus (1977) are pioneers of the examination of procrastination with cognitive-behavioral approach; according to their clinical experiences they supposed that procrastinators are not sure about their ability to complete a task so procrastination is related with procrastinators' irrational fears and self-criticism. Also, fear of failure was detected as a reason of procrastination in factor analysis with nearly 50% of variance accounted for procrastination in the study of Solomon and Rothblum (1984). Therefore, procrastinators avoid choosing tasks that give diagnostic information about their ability (Ferrari, 1991c) to protect themselves (Ferrari et al., 1995). Also, procrastinators may postpone a task to gain extra time (Ferrari, 1992) rather than because of a poor time management skills but they may procrastinate because of complex interaction of cognitive, affective and behavioral components (Solomon & Rothblum, 1984).

Academic procrastination was also examined in the frame of self-regulation in the related literature. Self-regulated learning is defined as "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 goals and the contextual features of the environment" (Pintrich, 2000, p. 453). If there is a discrepancy between individuals' current behavior and ideal or standard behaviors, individuals operate the self-regulation process (Duval & Wicklund, 1972). Procrastination is considered as the failure in students' self-regulation and maladaptive behavioral outcome (e.g., Howell & Buro, 2009; Senécal et al., 1995; Steel, 2007; Tuckman, 1991; Tuckman & Sexton, 1989). Self-regulation failure is categorized as underregulation and misregulation forms, namely; underregulation form is the failure of an individual to control oneself and misregulation is described as failure in exerting control which do not bring desired or alternative results (Baumeister, Heatherton & Tice, 1993). Underregulation arises from lack of motivation and effort to set standards for ideal behavior; low self-monitoring and adaptation capacity, on the other hand ineffective effort to pursue the motivation, set standards for ideal behavior, monitor oneself and regulate behaviors cause misregulation (Doerr & Baumeister, 2010). Procrastination was discussed as both underregulation and misregulation form of self-regulation failure in the literature (Balkıs & Duru, 2015). In the current study, procrastination was conceptualized mainly using the self-regulation framework. Accordingly, The Tuckman Procrastination Scale (Tuckman, 1991) grounded within self-regulation literature was used to measure elementary students' procrastination tendencies in science. Specifically, the scale was adopted to assess the students' intentional delay of science course tasks such as delaying studying for examinations, preparation of project homework.

In the subsequent sections, the literature concerning procrastination in relation to implicit theories of ability, epistemological beliefs, motivational beliefs, achievement goals and learning strategies were examined in detail.

2.6.1 Procrastination in Relation to Implicit Theories of Ability

In the early implicit theory literature, students with entity theory of intelligence were described as those tend to demonstrate maladaptive behavior pattern and students with incremental theory of intelligence were specified as showing adaptive behavior pattern (e.g., Ames, 1984; Bandura & Dweck, 1985; Leggett & Dweck, 1986). Students' adaptive and maladaptive patterns were characterized differently by Dweck (1986, p. 1040);

> The adaptive ("mastery-oriented") pattern is characterized by challenge seeking and high, effective persistence in the face of obstacles. Children displaying this pattern appear to enjoy exerting effort in the pursuit of task mastery. In contrast, the maladaptive ("helpless") pattern is characterized by challenge avoidance and low persistence in the face of difficulty. Children displaying this pattern tend to evidence negative affect (such as anxiety) and negative self-cognitions when they confront obstacles.

Therefore, students' beliefs about the ability direct them to indicate adaptive or maladaptive motivational patterns. Although, studies about the connection between students' procrastination and their implicit theory of intelligence is very little, other maladaptive motivational patters such as, self-handicapping and persistency could be evaluated as clues about the association between students' procrastination and their implicit theory of intelligence. Since procrastination could be considered as parallel to a self-handicapping in terms of leading to waste of time, poor performance and increasing stress when comparing the procrastinators with the non-procrastinators also procrastinators give up and not persistent to complete a task (Chu & Choi, 2005). Also, Kasimatis, Miller and Marcussen (1996) indicated that students with incremental theory persist highly when they faced with challenging tasks but students' with entity theory give up when they are subject of difficulty. In addition, the positive relationships between self-handicapping and procrastination was mentioned in some meta-analysis conducted on procrastination (e.g., Steel, 2007; van Eerde, 2003) and Rhodewalt (1994) reported that self-handicapping had positive association with concepts parallel to entity theory of ability.

In another study, testing the effect of implicit theory on students self-handicapping, Ommundsen (2001b) constructed a model to test the relationships between implicit theories of ability (viz., incremental/learning assessed as incremental theory; stable, gift and general assessed as entity theory) goal orientation (viz., task and ego goal orientation) and self-handicapping of 9^{th} grade Norwegian students in physical education class. The results of the study demonstrated that participants' responses indicating implicit theory of ability as stable (β = .22, p <.001) and general (β =.14, p <.001) had positive effect on their self-handicapping. In addition mediational analysis signed that the association between that implicit theory of ability as stable and self-handicapping was mediated by task goal orientation and again the results of the analysis revealed the positive effect of implicit theory of ability as stable on self-handicapping. Also, mediational analysis display that the relationship between incremental/ learning theory of ability and self-handicapping were mediated by task goal orientation. More specifically, incremental/ learning theory of ability was found to be positively linked to task goal orientation which has a negative association with self-handicapping. This indicated that preventive effect of an incremental/learning theory of ability on self-handicapping was mediated by students' task goal orientation.

In addition, Ommundsen et al. (2005) found the association between implicit theory of ability and self-handicapping strategies. More specifically, the result of the study revealed that incremental theory had weak and non-significant relationship with self-handicapping (β = -.08, p >.05; β = -.09, p >.05), on the other hand, fixed theory had a positive, significant relation with self-handicapping (β = .31, p <.05; β = .31, p <.05).

During the review of the related literature, the researcher of the current study came across one study which specifically examined the relationship between implicit theory of intelligence and procrastination. It was conducted by Howell and Buro (2009) to examine the association between implicit theory of intelligence, procrastination and achievement goals of undergraduate students. Correlation between procrastination and incremental theory was negative (r = −.10, p <.05) and entity theory was positive (r = .15, p <.01). The regression analysis indicated that implicit theory accounted significant but small amount of variance (2.1%) in procrastination (F(2,391) = 4.28, p <.01). The association between procrastination and entity theory was (β = .13, p <.05) and the association between procrastination and incremental beliefs was negative but not significant ($\beta = -.02$, $p > .05$).

In general, aforementioned studies provide an insight that the relationship is negative between incremental theories of ability and procrastination (Howell & Buro, 2009; Ommundsen, 2001b), and positive for entity theories of ability and procrastination (Howell & Buro, 2009; Ommundsen et al., 2005; Ommundsen, 2001b). Since students' beliefs about malleability of ability was the concern of the current study, considering these findings it was hypothesized elementary students who believe that science ability can change and be improved are less likely to procrastinate in science course.

2.6.2 Procrastination in Relation to Epistemological Beliefs

Epistemological beliefs are "what individuals believe about how knowing occurs, what counts as knowledge and where it resides, and how knowledge is constructed and evaluated" (Hofer, 2004b, p. 1). Epistemological beliefs play an important role in learning process (e.g., Buehl, 2003; Schommer, 1990; Schommer, Crouse, & Rhodes, 1992). Thomas and Rohwer (1987) indicated that students' beliefs are act as filter and they help interpretation of learning and its component. Besides, students' motivation and self-regulation was effected by their epistemological beliefs (Bråten & Strømsø, 2005). Moreover, Schommer (1990) pointed out that the effect of epistemological beliefs on psychological explanations and interpretation of some academic problems were overlooked. As one of the academic problems, procrastination is considered as the failure in students' self-regulation resulting in maladaptive behavioral outcome (e.g., Howell & Buro, 2009; Senécal et al., 1995; Steel, 2007; Tuckman, 1991; Tuckman & Sexton, 1989). Thus, there is a need for studies investigating the relationship between epistemological beliefs and procrastination. Actually, according to Schraw et al. (2007) one of the antecedents of procrastination involves self. Accordingly, individuals' beliefs including their epistemological beliefs and skills can have influence on their tendency to procrastinate.

The only study accessed on the association between college students' epistemological beliefs and procrastination was conducted by Boffeli (2007). Since it was the first study exploring the relationship between epistemological beliefs and procrastination, researcher constructed a theoretical base for the relationship considering the similarities between the procrastination and performance-avoidance goal. In a more simplistic definition performance-avoidance goal means avoiding poor performance relative to others and students with performance-avoidance goal are considered as they follow maladaptive academic pattern since studies generally indicated the negative relationships between students' self-regulation and performance-avoidance goal. The Epistemic Beliefs Inventory (Bendixen, Schraw, & Dunkle, 1998; Schraw, Dunkle, & Bendixen, 1995) was used as epistemological beliefs measurement in omniscient authority, simple knowledge, certain knowledge, quick learning, and fixed ability dimensions. Also, the PASS (Solomon & Rothblum, 1984) was used to measure the academic procrastination in the study. A six-step hierarchical multiple regression analysis were conducted with self-report epistemological beliefs (viz., omniscient authority, simple knowledge, certain knowledge, quick learning, and fixed ability), procrastination and gender variables. In the first step of the analysis resulted that gender (β = -.18, p <.05) accounted for 3.3% variance of students' procrastination ($F(1,131) = 4.476$, $p < .05$). In the second step, gender (β = -.20, p <.05), omniscient authority (β = -.07, p >.05) were added to analysis but R^2 change was not significant ($F(2, 130) = 2.528$, $p > .05$, R^2=.037). In the third step, gender (β = -.19, p <.05), omniscient authority (β = -.01, p >.05), and simple knowledge (β = .28, p <.01) entered into the equation and 10.8% variance was accounted for procrastination ($F(3, 129) = 5.211$, $p < .01$). In the fourth step, the analysis was conducted with gender (β = -.19, p <.05), omniscient authority (β = -.03, p>.05), simple knowledge (β = .28, p <.01), and certain knowledge (β = .05, p >.05) as predictor, also, the R^2 change was not significant ($F(4, 128) = 3.990$, $p < .01$, R^2=.111). In the fifth step, gender (β = -.17, p <.05), omniscient authority (β = -.03, p >.05), simple knowledge (β =.22, p <.05), certain knowledge (β =.03, p >.05), and quick learning (β =.18, p <.05) entered into equation and the variables accounted for 13.8% variances of procrastination ($F(5, 127) = 4.058$, $p < .01$). In the sixth step, gender (β = -.17, p <.05), omniscient authority (β = -.03, p >.05), simple knowledge (β = .22, p <.05), certain knowledge (β =-.03, p >.05), quick learning (β =.19, p >.05), and fixed ability (β = -.02, p >.05) were entered as predictor variables in the analysis, and all the predictor variables accounted for 13.8% of procrastination but the R^2 change was not significant (F(6, 126) = 3.361, p < .01). In a summary, simple knowledge and quick learning was significant predictor of procrastination and also after controlling gender; omniscient authority, simple knowledge, certain knowledge, and quick learning accounted for 10.5 variance in the procrastination. Therefore, students' naïve, less sophisticated or immature personal epistemological beliefs were found to support their academic procrastination.

Accordingly, in the current study, it was predicted that elementary students with sophisticated epistemological beliefs are less likely to procrastinate in science course. In other words, a negative relationship was proposed between sophisticated epistemological beliefs and procrastination. Indeed, students with sophisticated epistemological beliefs believe that scientific knowledge can change and be constructed by the individuals and there are different ways of testing scientific ideas such as experimentation or observation. They also believe that different solutions can be proposed for a given scientific question. Thus, it is reasonable to expect that students with sophisticated epistemological beliefs are more likely to be active participants of science classes doing experiments, observations to construct their own scientific knowledge and ideas.

2.6.3 Procrastination in Relation to Motivational Beliefs

Motivational beliefs were taken into consideration as learners' self-efficacy and task value in the current study. The literature concerning association between self-efficacy and procrastination, and task value and procrastination were presented separately.

2.6.3.1 Self-Efficacy and Procrastination

Self-efficacy theory indicated that when adequate level of ability and motivation exist, individual's efficacy beliefs are strongly related with how they will engage with an activity in terms of their task choice, initiation, persistence, resilience and performance (Bandura, 1986, 1997). Bandura (1986) asserted that students have "'self-directive capabilities that enable them to exercise some control over their thoughts, feelings, and actions by the consequences that they produce for themselves" (p. 335). So, weak self-efficacy beliefs reason avoidance behavior and strong self-efficacy beliefs increase initiation and persistence (Bandura, 1986). In addition, "students with low self-efficacy for learning may avoid tasks, whereas those who feel efficacious should participate more eagerly" (Schunk & Zimmerman, 2006, p. 356) Therefore, procrastination was contemplated as behavior avoidance (Haycock, McCarthy & Skay, 1998) and the association between self-efficacy and procrastination was hypothesized and tested in the related literature. For example, in the self-report procrastination scale development study with college students, Tuckman (1991) reported the inverse relationships between

General Self-Efficacy Scale (Sherer, Maddux, Mercandante, Prentice-Dunn, Jacobs, & Rogers, 1982) and the Tuckman Procrastination Scale (TPS; Tuckman, 1991; $r = -.47$, $p < .001$).

Additionally, Haycock et al. (1998) investigate the association between domain specific self-efficacy and procrastination. Efficacy expectation, individuals beliefs about their capabilities to do a specific task (Bandura, 1986), was used as indicators of students' self-efficacy and it was assessed as efficacy-level; ($r = -.40$), cumulative efficacy strength ($r = -.50$)and average efficacy strength($r = -.39$) and showed negative correlation with university students' procrastination. In addition, a regression analysis accounted for 29% variance of procrastination, used predictors in the analysis was efficacy-level, cumulative efficacy strength, average efficacy strength, trait anxiety, state anxiety, sex and age. According to the results cumulative efficacy strength, assesses as sum of ratings, was the only variable significantly predict procrastination ($\beta = -.02$, $p = .04$).

In another study, Wolters (2003) studied university students' procrastination from self-regulated learning perspective. The researcher examined the relationship between procrastination and self-efficacy in this manner and the correlation between variables was negative ($r = -.29$, $p < .001$ for the study 1; $r = -.35$, $p < .001$for the study 2). In two-step hierarchical regression analysis, motivational beliefs, achievement goals and self-efficacy, were entered in the first step of the analysis and self-efficacy negatively predicted procrastination in the step ($\beta = -.28$, $p < .01$ for the study 1; $\beta = -.35$, $p < .001$ for the study 2). Learning strategies, cognitive and metacognitive learning strategies were added to analysis in the second step of the hierarchical regression analysis and again self-efficacy negatively predicted procrastination ($\beta = -.23$, $p < .01$ for the study 1; $\beta = -.35$, $p < .001$ for the study 2).

In a separate study, Wolters (2004) examined the relationship between junior high school students' self-efficacy and procrastination while exploring the motivational, cognitive and achievement related components of achievement goal theory. The association between self-efficacy and procrastination was negative (r = -.44, p <.05). Also, a three-step hierarchical regression was executed to predict learning strategy, achievement outcomes and motivational engagement. But any significant relationship between self-efficacy and procrastination was not detected in the regression analysis.

In addition, Klassen, Krawchuk and Rajani (2008) examined the relationships among academic procrastination, self-regulation, academic self-efficacy, self-esteem, and self-efficacy for self-regulation. The correlational analysis indicated negative association between self-efficacy and procrastination(r = -.18, p <.01) of students but in three-step hierarchical regression analysis self-efficacy did not significantly accounted for procrastination.

Cao (2012) examined passive (i.e., academic) procrastination and active procrastination from self-regulated perspective. The data was collected from undergraduate level and educational psychology students, There was not any significant difference among passive procrastinators, active procrastinators and non-procrastinators their educational psychology self-efficacy ($F(2,122) = 2.19$, $p = .12$; $\eta^2 = .04$). Neither passive nor active procrastinators' self-efficacy level was weaker than non-procrastinators. In addition, there was not any difference among passive procrastinators', active procrastinators' and non-procrastinators' self-efficacy beliefs ($F(2,122) = 1.37$, $p = .26$; $\eta^2 = .02$). Also, self-efficacy belief ($\beta = .12$, $p > .05$ for passive procrastination; $\beta = -.16$, $p > .05$ for active procrastination) did not significantly predicted passive ($F(21,124) = 5.17$, $p < .001$) or active ($F(21,124) = 2.81$, $p < .001$) procrastination in regression analysis conducted with self-regulated related variables which were educational psychology self-efficacy, self-efficacy, task value, anxiety, achievement goals, motivation orientations, learning strategies and resource management. In the regression analysis, educational psychology self-efficacy did not significantly predict passive procrastination ($\beta = .11$, $p > .05$) but it was positively associated with active procrastination ($\beta = .62$, $p < .05$ for active procrastination).

Apart from the aforementioned studies conducted mainly in western countries, there are numerous studies conducted in Turkey examining the relationship between procrastination and self-efficacy. For example, Aydoğan (2008) investigated the interplay between academic procrastination, self-esteem, state anxiety and self-efficacy of high-school students. Correlation analysis between students' self-efficacy and academic procrastination was trivial ($r = -.05$, $p > .05$). Also, the association did not give significant results in hierarchical regression analysis which means that self-efficacy did not predict students' academic procrastination ($\beta = .05$, $p > .05$).

In addition, Akbay (2009) explored the relationships between self-efficacy and procrastination based on the collected data from different grade level and different department of undergraduate students. Correlation analysis indicated significant negative relationships between self-efficacy and procrastination ($r = -.22$, $p < .001$). Also, the result was supported with conducted multiple regression ($\beta = -.130$, $p < .001$) and hierarchical regression ($\beta = -.130$, $p < .001$) analyses and academic motivation, academic self-efficacy and academic attributional style significantly predicted procrastination. While the results of the analyses were similar the analysis conducted on male student's' sample, it was differentiated in female students' sample since self-efficacy was not significant predictor of procrastination in female students' sample according to the multiple regression analysis ($\beta = -.121$, $p = .113$).

Also, Uzun Özer (2010) constructed and tested a model to examine the relationships among undergraduate students' procrastination and cognitive, affective and behavioral variables. Variables of the model were emotional intolerance, discomfort intolerance, emotional irresponsibility, anxious overconcern, self-efficacy, self-esteem, self-regulation and procrastination. Self- regulation was assessed with Self Control Schedule (SCS), developed by Rosenbaum (1980), to get information about students' control strategies when faced with problems. The correlation between the procrastination and academic self-efficacy was negative (r = -.22; p < .001). The model indicated good model fit indices (χ^2= 6.52, *df* = 5, RMSEA = .02, GFI = .99, AGFI = .99, NFI = .99). According to the model students' academic self-efficacy and procrastination had negative association (β = -.07, p < .01), also academic self-efficacy mediate the effect of discomfort intolerance and emotional irresponsibility on procrastination. In addition the correlation between self-regulation and procrastination was (r = -.47, p < .001) and self-regulation was the strongest predictor of procrastination (β = -.38, p < .01).

In another study, Kandemir (2010) tested a model which included personality traits (viz., perfectionism perception of familial criticism, sense of perfectionism and responsibility), goal orientations (viz., learning approach and learning avoidance), academic self-efficacy belief, self-esteem and procrastination of undergraduate students. The direct connection between students' self-efficacy and procrastination was not significant (β = -.06, t = -1.55). Also, indirect association between students' self-efficacy and procrastination were examined with Sobel test and it was reported that the relationship were significantly mediated by learning avoidance (*tsobel* = -1.71,

p =.000), learning approach (*tsobel* =-2.64, p =.000) and responsibility (*tsobel* = -4.23, p =.000).

In a more recent national study, Özer and Altun (2011) studied with undergraduate students from different faculties and departments. Researchers tested the relationships among, reasons of academic procrastination (viz., fear of failure, laziness, risk taking behavior, and rebellion against control), hope, perfection, external locus of control, self-esteem, consciousness, academic self-efficacy, achievement goals, gender and grade level with canonical correlation. Two set of variables were used; the first set consisted of fear of failure, laziness, risk taking behavior, and rebellion against control. The second set of variables, predictors, were hope, perfection, external locus of control, self-esteem, consciousness, academic self-efficacy, achievement goals, gender and grade level According to the results the first canonical correlation was .64 and the remaining three were zero. In addition, with all four canonical correlation (χ^2_{44} =71.50, p < .00) and first canonical correlation removed (χ^2_{30} =30.60, p > .44) and chi-square test were not significant. Also the first canonical correlation was more appropriate the explained the relationship between variables sets. In this case predictors were performance-avoidance, consciousness, academic self-efficacy, hope, external locus of control, social and inner perfection and the correlation was significant and .64 (.41 overlapping variance). Specifically, the correlation of students’ academic self-efficacy with the procrastination set was -.62 for the data set.

Overall, the literature on the relationship between procrastination and self-efficacy demonstrated that they are negatively related (e.g., Akbay ,2009; Haycock et al., 1998; Klassen et al., 2008; Tuckman, 1991; Uzun Özer, 2010; Wolters, 2003; Wolters, 2004; Özer & Altun, 2011). Accordingly, a negative link between self-efficacy and procrastination was proposed considering both empirical findings and theoretical conceptualization of these two constructs in the present study.

2.6.3.2 Task Value and Procrastination

Task value is the appeal that provides engagement of individuals with a given task. It depends on individuals' preferences, and it is related with their need and goals, and characteristics of tasks (Eccles et.al. 1983; Eccles & Wigfield, 1995). Researches indicated that task value influences individuals' achievement-related choices, persistence and performance distinctively in different academic domains (Wigfield & Eccles, 2000). And high level of task values is associated with high level of task engagement of individuals and vice versa (Eccles, 2005). If learners could not engage with the task, they may avoid the task and the task aversion could lead to procrastination (Ackerman & Gross, 2005; Solomon & Rothblum, 1984). Also, Steel (2007) pointed the association between students' perception of task and procrastination. Students who are more likely delay the tasks perceives tasks as uncomfortable, boring or difficult (Pychyl, Lee, Thibodeau, & Blunt, 2000; Solomon & Rothblum, 1984). Although the connection between students' task value and procrastination is pointed and the examination of the association is commonly suggested for future studies in the related literature, there are limited studies about this association.

In of these studies, Corkin (2012) examined the influence of classroom dimensions (viz., instructor support, course organization, academic press, and course situational interest) and motivational beliefs (viz., self-efficacy and task value) of college students on their procrastination for mathematical courses. Researcher tested the mediational role of students motivational beliefs between college classroom climate and procrastination with different path models but fit indices of the models were not accounted for good results. On the other hand, all bivariate correlation between variables was significant. And researcher conducted a two-step hierarchical multiple linear regression analysis. In the first step of analysis, four classroom climate variables: instructor support, course organization, academic press, and course situational interest were entered ($F(4,247) = 6.75$, $p <.001$. $R^2 = 9\%$) and in the second step motivational beliefs; self-efficacy and task value were added ($F(6,247) = 15.28$. $p < .001$, $R^2 = 26\%$). Moreover, self-efficacy ($\beta = -.21$, $p < .001$) and task value ($\beta = -.33$. $p < .001$) were both significant negative predictors of procrastination of college students in math courses.

Cao (2012) conducted a study from self-regulated perspective on university students who were active procrastinators, passive procrastinators and non-procrastinators. Results, indicated that there was significant difference (F(2,122) = 7.44, p = .01; η^2 = .11) among three groups in terms of task value. On the other hand, different regression analyses for academic (i.e., passive) and active procrastination were conducted to examine how educational psychology self-efficacy, self-efficacy for learning, task value, anxiety, achievement goals (viz., mastery-approach, performance-approach, mastery-avoidance, performance-avoidance, and work-avoidance), motivation orientations (viz., intrinsic and extrinsic goal orientation), learning strategies (viz., rehearsal, elaboration, organization, critical thinking, and metacognitive self-regulation) and resource management (viz., managing time and study environment, effort management, peer learning and help-seeking). According to the results, the model predict 41% variance of academic procrastination (F(21,124) = 5.17, p < .001) and test anxiety (β = .29, p < .001), organization, (β = .29, p < .02) and time and environment management (β = .29, p < .01). In addition, the model also gave significant result (F(21,124) = 2.81, p < .001), the variables accounted for 23% variance of active procrastination and educational psychology self-efficacy was the only variable which significantly predicted active procrastination (β = .62, p < .001). But task value (β = -.16, p > .05 for passive procrastination; β = .07, p > .05 for active procrastination) was not significant predictor of academic or active procrastination.

Hensley (2013) investigated passive and active procrastination (viz., outcome satisfaction, intentional decision to procrastinate, and ability to meet deadlines) of undergraduate human anatomy students. The study examine forms of procrastinations' association with background variables, motivational beliefs (viz., belief about the speed of knowledge acquisition, self-efficacy, and task value), and grades. Three-step hierarchical regression analysis was conducted to predict passive procrastination, ability to meet deadlines, satisfying outcomes and intentional decision. The variables entered in the steps were respectively; (1) the background variables of gender and academic ability score, (2) the domain-general belief about the speed of knowledge acquisition and the domain-specific self-efficacy and task value beliefs, and (3) the interaction of self-efficacy and task value. The model gave significant results and explained variance of active procrastination components were between approximately 14% ($F(6, 299) = 8.16$, $p < .001$ for intentional decision to delay); and 36% ($F(6, 299) = 26.97$, $p < .001$ for ability to meet deadlines). Specifically, the accounted variance for passive procrastination was increased 29% in the second step ($\beta = -.47$, $p < .001$ for self-efficacy; $\beta = -.13$, $p < .001$ for task value; $\beta = .02$, $p > .05$ for speed beliefs), also addition of interaction of self-efficacy and task value ($\beta = -.50$, $p < .001$ for self-efficacy; $\beta = -.18$, $p < .01$ for task value; $\beta = .03$, $p > .05$ for speed beliefs $\beta = -.15$, $p < .01$ for interaction of self-efficacy and task value) gave 2% increase in the variance of procrastination. Also, the interaction of the self-efficacy and task value analysis of the study revealed that the level of task value of students do not make any effect on students passive procrastination if students have low self-efficacy level but if students have high self-efficacy the level of the task value make distinction on students passive procrastination.

In a more recent study, Taura, Abdullah, Roslan and Omar (2015) conduct a mediational study on college students' self-efficacy, task value, self-regulation strategies (viz., metacognitive learning strategies, time management and effort regulation) and active procrastination of college students. According to the conducted structural equation modeling (χ^2= 322.926, *df*= 164, GFI = .93, CFI = .96, NFI = .93, RMSEA = .05), researchers got the result that self-efficacy (β = .252, $p < .05$) and task value (β = .180, $p < .05$) had direct effect on self-regulation strategies of students. Since the correlation between self-efficacy and self-regulation strategies (r = .59, $p < .001$) and task value and self-regulation strategies(r = .55, $p < .001$) were significant and positive and also the model indicated that the relational between students self-regulation strategies and active procrastination were significant (β = .370, $p < .05$), it was concluded that self-efficacy and task value had indirect effects throughout self-regulation strategies on active procrastination of students.

Thus, related literature on the association between procrastination and task value suggest that if qualities of a given task do not create a desire on learners to do them, those learners are more prone to procrastinate the task (e.g., Corkin, 2012; Hensley, 2013; Taura et al., 2015). Therefore, it was proposed that there is negative association between procrastination and task value in the current study.

2.6.4 Procrastination in Relation to Achievement Goals

Procrastinators try to protect their self-esteem and evaluate their self-worth rely upon their ability on a task and consider their ability based on a completeness of the task (Burka & Yuen, 1983). Also, when comparing procrastinators with non-procrastinators, it was detected that procrastinators leave the most attractive cognitive tasks undone compared with the tasks that they can show their ability socially (Ferrari, 1991b) and they tend to avoid show full performance on tasks which is based on cognitive and thinking ability if their performance is only known by themselves (Ferrari, 1991a). So, procrastinators avoid providing self-relevant cognitive ability information to protect their self-esteem and public image (Ferrari, 1991c). Also, if procrastinators have opportunity to select tasks, they tend to prefer easy and non-diagnostic (not taking performance feedback) tasks in that way they could defense themselves as they do not prefer to work on *useless* tasks since effortful and meaningful tasks could threat their self-esteem (Ferrari, 1991c). In addition, procrastinators fail to complete more effortful, anxiety provoking and nonpleasurable academic tasks and they tend to complete academic tasks that provide them opportunity to show their skills and creating self-confidence (Scher & Ferrrari, 2000). Therefore, the association between students' reasons (i.e., achievement goals) to engage a learning activity and their procrastination was a concern of the current study.

While exploring the measurement and correlates of procrastination among 3rd, fourth and fifth grade elementary students, Scher and Osterman (2002) obtained the result that procrastination negatively correlate with task orientation (r = -.40, p < .05) and positively correlate with avoidance orientation (r = .33, p < .05). In the study, task orientation assessed as "a tendency to approach tasks that provide mastery" and avoidance orientation assessed as "a tendency to avoid tasks which are difficult or require a lot of effort" (Scher & Osterman, 2002, p. 389).

Also, Wolters (2003) investigated the university students' procrastination from self-regulated learning perspective. He examined the association among university students' procrastination, motivational beliefs and learning strategy use with two studies (the first one is the main study and the second one is a replication of the main study with adding performance-avoidance goal) based on students' self-reports. Achievement goals were considered in motivational beliefs concept. Achievement goals were assessed as mastery, performance-approach and work avoidance (i.e., tendency to work on simple tasks without much effort) orientations. Bivariate correlations indicated that procrastination negatively associated with mastery orientation (r = – .25, p < .001 for the study 1; r = – .32, p < .001 for the study 2) but positively related with performance-approach (r = .27, p < .001for the study 1; r = .29, p < .001 for the study 2), work-avoidance (r = .36, p < .001, for the study 1; r = .25, p < .01 for the study 2) and performance-avoidance (r = .22, p < .01 for the study 2) goal orientations. Two-step hierarchical regression analysis were conducted in the studies, in the first step motivational beliefs, achievement goals and self-efficacy, were entered and in the second step learning strategies, cognitive and metacognitive learning strategies, were added to analysis to predict the procrastination of the students. In the first study, motivational beliefs accounted for 22% variance of procrastination (F(4, 163) = 11.26, p < .001) but only work-avoidance goal significantly (β = .36, p < .001) predicted the procrastination among achievement goals and in the second step the explained variance increased 3% with adding learning strategies (ΔF(2, 161) = 3.19, p < .05) and also work-avoidance goal significantly (β = .37, p <.001) was the only significant predictor of procrastination among achievement goals. In the replication study, same procedure was traced in the previous study with adding performance-avoidance goal to achievement goals. In the first step, 28% of the variance was accounted for procrastination by students' motivational beliefs (F(5, 146) = 11.39, p < .001), similar to first study only work-avoidance goal significantly (β = .25, p < .01) predicted the procrastination among achievement goals. In addition, the accounted variance of procrastination was increased to 33% (ΔF(2, 144) = 5.13, p < .01) and both performance-approach (β = .17, p = .05) and work-avoidance (β = .24, p <.01) goal significantly predicted procrastination among achievement goals in the second step of the replication hierarchical regression analysis.

In addition, Wolters (2004) conducted a comprehensive study based on the self-report of junior high school students' perceived classroom goal structures, personal goal orientations, persistence, procrastination, choice, their use of cognitive and metacognitive learning strategies, and mathematics grade. Students' personal achievement goals were assessed as mastery, performance-approach and performance-avoidance goals. Correlational analysis between procrastination and personal achievement goal orientation scores indicated that; mastery (r = -.48, p < .05) goal negatively related with procrastination whereas performance-avoidance goal (r = .18, p < .05) was positively related with procrastination but the correlation between performance-approach goal and procrastination was not give a significant result. In addition, a three-step hierarchical regression was executed to predict learning strategy, achievement outcomes and motivational variables such as procrastination. In the first step, gender and standardized achievement of students were entered and the variables did not predict the procrastination significantly (F(2, 522) = 1.31, p = .27); in the second step, classroom goal structure composing of mastery and performance-approach goal structure were added and 9% variance accounted for procrastination (F(2, 520) = 27.00, p < .01) and in the third step, students' personal achievement goals and their self-efficacy scores were added to analysis as predictors and the variables increased the explained variance of procrastination to 24% ($F(4, 516) = 46.32$, $p < .01$). Also, the regression analysis result indicated that procrastination was negatively predicted by mastery ($\beta = -.32$, $p < .01$) and positively by performance-avoidance ($\beta = .15$, $p < .01$) goals and performance-approach goal did not have significant effect on procrastination.

Moreover, McGregor and Elliot (2002, Study 2) examined the procrastination of undergraduate students while preparing for examination. The regression analysis indicated that students' verbal and math SAT scores ($\beta = .22$, $p < .01$) and performance-avoidance goal ($\beta = .32$, $p < .01$) were significant predictors of procrastination but not their mastery and performance-approach goal.

With using 2x2 achievement goal framework Howell and Watson (2007) explored the undergraduate students' achievement goal orientations associations with procrastination. Procrastination of the students was assessed with two scales; the PASS (Solomon & Rothblum, 1984) and the TPS (Tuckman, 1991). The correlation analysis between achievement goals and the PASS scores indicated that students procrastination negatively related with mastery-approach goal ($r = -.18$, $p < .05$) but positively correlated with mastery-avoidance goal ($r = .18$, $p < .01$). In addition, the correlation analysis of between the achievement goals and the TPS's scores yield only significant result for mastery-approach goal ($r = -.25$, $p < .001$), although, the correlation between mastery-avoidance goal and procrastination ($r = .14$, $p = .08$) was nonsignificant, it fell short of statistical significance. The first step of hierarchical regression analysis indicated that achievement goals accounted for 8% variance of the PASS's scores ($F(4,165) = 3.57$, $p < .01$). Accordingly, procrastination was only predicted by mastery-approach ($\beta = -.21$, $p < .01$) and mastery-avoidance ($\beta = .22$, $p < .01$) goals. In the second step, achievement goals, learning strategy use were explain 22% variance of the PASS scores (ΔF $(5,160) = 5.54$, $p < .001$) but any of the achievement goals was significant predictor. Moreover, another hierarchical regression analysis results was conducted for the TPS's scores, the first step analysis display that achievement goals explains 10% variance was accounted for procrastination ($F(4,164) = 4.50$, $p < .01$). Significant predictors of the analysis were mastery-approach ($\beta = -.30$, $p < .001$) and mastery-avoidance ($\beta = .16$, $p < .05$) goals. Achievement goals and learning strategy use were together inserted the second step of hierarchical regression analysis ($\Delta F(5,159) = 10.79$, $p < .001$) and the explained variance of procrastination was increased to 33% and only performance-approach goal ($\beta = .16$, $p < .05$) was the significant predictor of the procrastination.

Howell and Buro (2009) checked out the associations between undergraduate students' procrastination and implicit theories of ability and between procrastination and achievement goals, also researchers conducted a mediational analysis to test whether or not achievement goals mediate the relationships between implicit theories of ability and procrastination.

According to the results of the correlation analysis between the implicit theory and procrastination; incremental theory correlated negatively (r = −.10, p < .05) with procrastination whereas entity theory of ability positively (r = .15, p < .01) correlated with procrastination. Moreover, students' incremental theory of ability only significantly related with their performance-avoidance goal (r =−.12, p < .05), and their entity theory positively correlated with master-avoidance (r = .14, p < .01), performance-approach (r = .10, p < .05) performance-avoidance (r = .10, p < .05) goals, also entity theory of ability was negatively correlated with students' mastery-approach goal (r = −.11, p < .05). Furthermore, procrastination negatively associated with mastery-approach (r =−.36, p < .001) and performance-approach (r = −.15, p < .01) goals and the relationship between procrastination and mastery-avoidance was positive (r =.14, p < .01). In the regression analysis in the first step the implicit theories were entered firstly as the predictors of the procrastination and it accounted 2.1% variance of procrastination significantly (F(2,391) = 4.28, p < .01), then in the second step achievement goals entered as predictors and the explained variance increased to 20% (ΔF(4,387) = 22.12, p < .001) and mastery-approach goal (β = −.41, p < .001) and mastery-avoidance goal (β = .26, p < .001) significantly predicted students' procrastination. For the mediational analysis, researchers conducted a regression analysis between implicit theory of ability and achievement goals and got the result that; only entity theory was the significant and positive predictor of mastery-avoidance goal (β = .15, p < .05). Considering the preceding regression analysis between procrastination and achievement goals which indicated that mastery-approach and mastery-avoidance goals were negative predictors of procrastination, a mediational analysis was executed to check the mediational role of mastery-avoidance goal the association between entity theory and procrastination. Another regression analysis were carried out, accordingly master-avoidance goals and entity theory were predictors of procrastination and the results gave significant relation (F (3,390) = 4.67, $p < .01$) but only mastery-avoidance goal was the direct predictors of procrastination ($\beta = .12$, $p < .02$).Also, the results of the *z'* test confirm the mediational role of the mastery-avoidance goal ($z' = 1.79$, $p < .01$) between entity theory of ability and procrastination.

In a study conducted in Turkey, Kandemir (2010) constructed a model with undergraduate students' personality traits, goal orientations, academic self-efficacy belief, self-esteem and procrastination. Goal orientation was assessed as learning approach and learning avoidance in the study. The relationship between learning approach and procrastination was significant and negative ($\beta = -.11$, $t = -2.63$), and the relationship between learning approach and procrastination was not significant ($\beta = -.06$, $t = -1.74$).

Özer and Altun (2011) tested the relationships among, reasons of academic procrastination (viz., fear of failure, laziness, risk taking behavior, and rebellion against control), hope, perfection, external locus of control, self-esteem, consciousness, academic self-efficacy, achievement goals, gender and grade level with canonical correlation based on the data collected from undergraduate students from different faculty and department. The first data set consisted of fear of failure, laziness, risk taking behavior, and rebellion against control and the second set of variables, predictors, were hope, perfection, external locus of control, self-esteem, consciousness, academic self-efficacy, achievement goals, gender and grade level. Achievement goals were assessed as a trichotomous model, namely; learning, performance-approach and performance-avoidance goals. According to the results the first canonical correlation was .64 and the remaining three were zero. In addition, with all four canonical correlation (χ^2_{44} = 71.50, p < .00) and first canonical correlation removed (χ^2_{30} = 30.60, p > .44) and chi-square test were not significant. In addition the first canonical correlation was more appropriate the explained the relationship between variables sets. In this case predictors were performance-avoidance, consciousness, academic self-efficacy, hope, external locus of control, social and inner perfection and the correlation was significant and .64 (.41 overlapping variance). Specifically, the correlation of students' performance-avoidance goal with the procrastination set was .82 and it was the strongest predictor. Also, performance-avoidance goal was the single variables which correlated with all of the variables with procrastination data set which consisted of reasons of procrastination.

Cao (2012) examined undergraduate students' passive (i.e., academic) procrastination and active procrastination in a study from self-regulated perspective including achievement goals (viz., mastery-approach, performance-approach, mastery-avoidance and performance-avoidance goals). According to the one-way ANOVA results, there was not significant difference among passive procrastinators', active procrastinators' and non-procrastinators mastery-avoidance ($F(2,122) = .42$, $p = .66$; $\eta^2 = .01$) and performance-approach ($F(2,122) = 3.10$, $p = .05$; $\eta^2 = .05$) goals. On the other hand, mastery-approach ($F(2,122) = 3.88$, $p = < .05$; $\eta^2 = .06$) and performance-avoidance ($F(2,122) = 5.33$, $p = < .05$; $\eta^2 = .08$) goals were significantly different among three groups. But, there was not difference between passive and active procrastination in terms of mastery-approach and performance-avoidance goals. Moreover, any of the achievement goals significantly predicted neither passive nor active procrastination in regression analysis conducted with self-regulated related variables which were educational psychology self-efficacy, self-efficacy, task value, anxiety, achievement goals, motivation orientations, learning strategies and resource management.

Ganesan, Mamat, Mellor, Rizzuto and Kolar (2014) examined the relationship between 2x2 achievement goals and procrastination of non-Western undergraduate students in Malesia. Both mastery-approach ($r = .23$, $p < .001$) and performance-approach ($r = .15$, $p < .01$) goals were significantly and positively correlate with procrastination. On the contrary, avoidance dimensions of mastery ($r = -.02$, $p > .05$) and performance ($r = -.01$, $p > .05$) goals indicated negative but trivial correlation with procrastination. Moreover, regression analysis revealed that achievement goals accounted 7.9% of the variance in procrastination, ($F(4, 445) = 9.52$, $p < .001$) but only mastery-approach ($\beta = -.27$, $p < .001$) and performance-avoidance ($\beta = -.13$, $p < .01$) goals contribute significantly.

Overall, aforementioned literature indicated that students who focused on leaning and understanding, procrastinate less (e.g., Howell & Buro, 2009; Howell & Watson, 2007; Kandemir, 2010; Scher & Osterman, 2002), but students who study to avoid misunderstanding tend to procrastinate more (e.g., Howell & Buro, 2009; Howell & Watson, 2007). Also, it was reported that students with performance-approach (e.g., Ganesan et al., 2014; Wolters, 2003) and performance-avoidance goals (e.g., Elliot, 2002, Study 2; Scher & Osterman, 2002; Wolters, 2003) are likely to procrastinate more. Accordingly, in current study it was proposed that elementary students' mastery-approach goal has negative association with their procrastination but their mastery-avoidance, performance-approach and performance-avoidance goals are positively related with their procrastination in science course.

2.6.5 Procrastination in Relation to Learning Strategies

Procrastinators have weak skills in systematic and disciplined working; also they are not good at planning and managing their time (Lay, 1992; Lay & Schouwenburg, 1993). In addition, Milgram, Dangour and Raviv (1992) reported that students who had lower levels of learned resourcefulness were more prone to procrastinate. And, learning strategies, any behaviors or thoughts, helps encoding process with integrating and retrieving knowledge (Weinstein, 1988; Weinstein & Mayer, 1986). Therefore, students' learning strategies use reflects their motivation, cognitive process and behaviors in learning process. In accordance with the mentioned studies, the occurrence of the relationship between students' procrastination and their learning strategies emerged and tested.

For instance, Wolters (2003) examined the association among university students' procrastination, motivational beliefs and learning strategy use in two self-reported studies. The relationships between the variables were explored by correlational and two-step hierarchical regression analysis with two studies, the second study was conducted in same way by adding performance-avoidance goal dimension as replication to the first one. In hierarchical regression analysis, motivational beliefs, achievement goals and self-efficacy, were entered in the first step of the analysis and learning strategies, cognitive and metacognitive learning strategies were added to analysis in the second step to predict the procrastination of the students. Procrastination negatively correlated with cognitive ($r = -.20$, $p < .01$ for the study 1; $r = -.31$, $p < .05$ for the study 2) and metacognitive ($r = -.24$, $p < .01$ for the study 1; $r = -.33$, $p < .001$for the study 2) learning strategies. Both cognitive ($\beta = .03$, $p = .78$) and metacognitive ($\beta = -.22$, $p = .06$) learning strategies did not significantly predict procrastination in the regression analysis of the first study but metacognitive learning strategies (β = -.26, p < .05) were the significant predictor of procrastination but not cognitive learning strategies (β = .01, p = .93) in the regression analysis of the second study.

In addition, Howell and Watson (2007) studied the association of undergraduate students' procrastination with achievement goals and learning strategies use. Researchers used two different scales as measure of procrastination; the PASS (Solomon & Rothblum, 1984) and the TPS (Tuckman, 1991). Also, researchers used two scales to assess the learning strategy use of students. For cognitive and metacognitive strategies MSLQ and for deep processing, surface processing, and disorganization Elliot, McGregor, and Gable's (1999) scale were used. Correlation of the learning strategies gave similar results for the PASS and the TPS that were; students' procrastination scores negatively associated with cognitive (r = -.28, p < .001 for the PASS; r = -. 35, p < .001 for the TPS) and metacognitive (r = -.29, p < .001 for the PASS; r = -.40, p <.001 for the TPS) strategies on the other hand, it was positively correlated with their disorganization (r = .34, p < .001 for the PASS; r = .41, p < .001 for the TPS). Two different hierarchical regression analyses, with same procedure, were conducted for the procrastination scores gathered with different scales. In the first step of the analyses, four achievement goals were analyzed and in the second step learning strategies entered to the analyses. The hierarchical analysis for the PASS scores revealed that; 8% of variances was accounted for procrastination in the first step and the explained variance was increased to 22% after addition to learning strategies ($\Delta F(5,160) = 5.54$, $p < .001$), but only cognitive strategies ($\beta = -.26$, p < .05) and disorganization ($\beta = .26$, $p < .01$) were the significant predictors of the PASS scores. Moreover, the hierarchical analysis for the TPS's scores indicated that; in the first step achievement goals accounted for 10% of variance in students' procrastination and it raised to 33% after adding learning strategies (ΔF (5,159) = 10.79, $p < .001$), cognitive ($\beta = -.21$, $p < .05$) and metacognitive ($\beta = -.28$, $p < .01$) learning strategies were the negative significant predictor and disorganization ($\beta = .36$, $p < .001$) was the positive predictor of the procrastination among the learning strategies.

In another study, Klingsieck, Fries, Horz and Hofer (2012) surveyed the relationships between procrastination and learning strategies (viz., cognitive and metacognitive learning strategies) of German university students. Negative associations between the variables were detected both for cognitive ($r = -.38$, $p < .01$, for distance university students; $r = -.35$, $p < .01$, for traditional university students) and metacognitive ($r = -.38$, $p <.01$, for distance university students; $r = -.46$, $p < .01$, for traditional university students) learning strategies and totally learning strategies ($r = -.41$, $p < .01$, for distance university students; $r = -.46$, $p < .01$, for traditional university students). Also, the relationships between the variables were examined with two different two-step hierarchical regression analysis for traditional and distance university students differently. Results of the analysis were nearly same, procrastination was the strongest predictor of learning strategies and had medium effect size (f^2 = .19 for distance university students; f^2 = .27 for traditional university students) for both traditional (β = – .44, p < .01) and distance (β = – .39, p < .01) university students' samples.

Moreover, Motie, Heidari and Sadeghi (2012) conducted a correlational study on senior high school students of Tehran to check which self-regulation elements predict procrastination. The results of the study indicated that while metacognitive strategies (β = – .27, p < .05) negatively predict procrastination, organization strategy (β = .20, p < .05), which is a cognitive strategy, positively predict it.

In the study conducted by Cao (2012), undergraduate students' procrastination, as passive procrastination and active procrastination, was examined in terms of self-regulated learning. Rehearsal, elaboration, organization, critical thinking and metacognitive self-regulation were assessed as learning strategies. Passive and active procrastinators were weakly used strategies, rather than critical thinking, (F(2,122) = .43, p = .65; η^2 = .01) than non-procrastinators but any significant difference was not detected between passive and active procrastinators in terms of strategy use. In addition, different regression analyses for academic (i.e., passive) and active procrastination were conducted to examine how educational psychology self-efficacy, self-efficacy for learning, task value, anxiety achievement goals (viz., mastery-approach, performance-approach, mastery-avoidance, performance-avoidance, and work avoidance goals), motivation orientations (viz., intrinsic and extrinsic goal orientation), learning strategies (viz., rehearsal, elaboration, organization, critical thinking, and metacognitive self-regulation) and resource management (viz., managing time and study environment, effort management, peer learning and help-seeking). According to the results, the model predict 41% variance of academic procrastination ($F(21,124) = 5.17$, $p < .001$) and test anxiety ($\beta = .29$, $p < .001$), organization, ($\beta = .29$, $p < .02$) and time and environment management ($\beta = .29$, $p < .01$). In addition, the model also gave significant result ($F(21,124) = 2.81$, $p < .001$), the variables accounted for 23% variance of active procrastination and educational psychology self-efficacy was the only variable which significantly predicted active procrastination ($\beta = .62$, $p < .001$). In detail, rehearsal ($\beta = .10$, $p > .05$), elaboration ($\beta = .26$, $p > .05$) and critical thinking ($\beta = .02$, $p > .05$) positively but non-significantly predict academic procrastination; on the other hand metacognitive self-regulation ($\beta = -.07$, $p > .05$) was negatively and non-significantly accounted for academic procrastination. Moreover, rehearsal ($\beta = -.00$, $p > .05$), elaboration ($\beta = -.01$, $p > .05$), organization ($\beta = -.12$, $p > .05$) and metacognitive self-regulation negatively ($\beta = -.29$, $p > .05$) and non- significantly related with active procrastination but only critical thinking ($\beta = .18$, $p > .05$) positively and non-significantly predict active procrastination.

Overall, relevant literature revealed a negative association between learners' procrastination and cognitive learning strategies use (e.g., Howell & Watson, 2007; Klingsieck et al., 2012; Wolters, 2003), although some of the studies indicated the reverse (e.g., Cao, 2012; Motie et al., 2012). Also, it was indicated that learners' procrastination was negatively associated with their metacognitive learning strategies use (e.g., Howell & Watson, 2007; Klingsieck et al., 2012; Motie et al., 2012; Wolters, 2003). Accordingly, in the present study it was proposed that elementary students' procrastination was negatively related with both their cognitive and metacognitive learning strategies use in science course.

2.7 Science Achievement

In the subsequent sections, the literature concerning learners' achievement in relation to implicit theories of ability, epistemological beliefs, motivational beliefs, learning strategies and procrastination were examined in detail.

2.7.1 Science Achievement in Relation to Implicit Theories of Ability

Individuals' belief about ability has an important role in their achievement motivation (Dweck, 2006). Also Dweck and her colleagues proposed that individuals' beliefs about the nature of ability influence their achievement goals, task choice, strategies they use on academic tasks, persistence and performance the tasks and their performance (Dweck, 2002; Dweck et al., 1995; Dweck & Legget, 1988; Hong et al., 1999). For example, if students with same capability and achievement are exposed to different orientations for implicit theories of intelligence as entity and incremental theory, they are likely to put forth different outputs (Hong et al., 1999). Although the number of the studies on science domain was very limited, the association between students' implicit theories of ability and their performance was examined for different grade levels and domains in the related literature. Following paragraphs provide a review of some of these studies.

Blackwell et al., (2007) conducted an experimental study with the aim of manipulating seventh grade students' implicit theory of ability. Researchers designed and conducted advisory classes during spring term. During 8-week work shop experimental group was treated as intelligence was malleable, on the contrary, the instruction was given to control group as intelligence was fixed. Although a decrease in students' math grades between their spring of 6th grade and fall of seventh grade test scores had detected as a whole sample, in a few months of intervention the downward trajectory of experimental group ceased which indicates the significant effect of experimental condition (fall of seventh grade test scores and spring of seventh grade test scores; $b = .53$, $t = 2.93$, $p < .05$).

Also, Good, Aronson and Inzlich (2003) conducted an experimental study to improve math achievement of seventh grade students', who were exposed to stereotype threat for being female, minority and low-income, standardized math test scores. Students were mentored by college students to encourage them either to view intelligence as malleable or to attribute academic difficulties to transition to junior high school which is a novel educational setting for them. The study was conducted in four conditions; the first group was in incremental condition and students were directed to notice that intelligence is expandable; the second group of students was in attribution condition and they were directed to learn that many students experience difficulty when they translate to a new situation; the third group represented the combined condition for both incremental and attribution conditions; and the fourth group of students were in antidrug control condition. In terms of math achievement test performance, all students' scores increased in three experimental conditions ($F(3,125) = 7.24$, $p = .001$) and the gap between female's and male's math achievement scores disappeared in those groups ($F(1,125) = 4.30$, $p = .04$).

In addition, the study of Cury et al. (2006) revealed that implicit theory of ability has significant direct effect on math performance of students whose age varied between 12 and 14. The performance of the students were negatively predicted by entity theory ($\beta = -.14$) and positively anticipated by incremental theory ($\beta = .19$).

On the contrary, Robins and Pals (2002) detect no difference ($r = -.09$, $p < .10$) in entity and incremental theorists undergraduate students' perceived performance which was assessed a question asking students to gauge their last semester academic performance was either success or failure. In addition, students who have entity theories of intelligence had higher standardized test scores for verbal and mathematical scores (r = .20, p < .05) but their Grade Point Average (GPA) was not better (r = .03 for high school GPA; r = .03 for college GPA). In addition, Chen and Pajares (2010) investigated association among sixth grade students' implicit theories of science ability, epistemological beliefs regarding science course, academic motivation in science course and science grade. Specifically, researcher proposed that students' implicit theories of ability are directly link to their science achievement. In addition, students' implicit theories of ability were assessed as dichotomously, namely; their incremental and entity theory of science ability. Also, students' science achievement score was the composed of their mid-term and end-of-term grades for science course. Results of path analysis conducted to test the significance of the total model indicated a well fit model indices (χ^2 (38, 508) = 121.75, p < .0001, RMSEA = .07, NNFI = .93, CFI = .96). But direct effect of both incremental (β = .000) and entity (β = .000) theory of science ability were insignificant.

In general, abovementioned literature demonstrated that learners' belief about malleability of ability positively related with their academic achievement (e.g., Blackwell et al., 2007; Cury et al., 2006; Good et al., 2003). Accordingly, a positive association between elementary students' incremental theory of science ability and their science achievement was hypothesized in the present study.

2.7.2 Science Achievement in Relation to Epistemological Beliefs

Students' epistemological beliefs alter their learning, cognition and motivation (Hofer & Pintrich, 1997; Perry, 1981). In addition, students' epistemological beliefs contain individuals' choice of comprehension standards and these standards play role on academic performance such as complex topics or complex academic tasks (Ryan, 1984). Also, Schommer (1993) offered that both direct and indirect link between epistemological beliefs and academic achievement should be examined and confirmed. Depending on the model taken as base for epistemological beliefs with respect to domain generality or domain specificity, results of the association with academic achievement varied.

In one of the studies examining the relationship between epistemological beliefs and achievement, Schommer (1993) studied with high school students from different grade levels. Students' GPA scores were regressed on their epistemological beliefs, and GPA was predicted by all dimensions of epistemological beliefs. The correlation analysis of the results revealed that students who have less naïve beliefs about quick learning (r = -.26), simple knowledge (r = -.20), certain knowledge (r = -.12) and fixed ability (r = -.15) have better GPA scores. The results of regression analyses gave indicated the same relationships for students beliefs in quick learning ($F(1, 863) = 61.87$, $p < .001$), simple knowledge ($F(1, 862) = 15.28$, $p < .001$), certain knowledge ($F(1, 861) = 7.05$, $p < .01$), and fixed ability ($F(1, 860) = 6.27$, $p < .01$). Moreover, in another study, Schommer, Brookhart, Hutter and Mau (2000) examined the seventh and eighth grade students' epistemological beliefs relation with their GPA. Results of regression analysis indicated that students who had less beliefs in fixed ability to learn ($F(1, 356) = 28.47$, $p < .001$, $\beta = -.24$) and quick learning ($F(1, 356) = 8.65$, $p < .01$, $\beta = -.18$) got the better GPA.

A similar study was conducted by Schommer-Aikins and Easter (2006) with the data collected from college students about their ways of knowing (viz., connected knowing and separate knowing), epistemological beliefs (viz., beliefs about knowledge structure, knowledge stability, learning speed, and learning ability) and academic performance. Zero-order correlation analysis resulted that speed was the only variable correlate with students grade ($r = .31$, $p < .01$) between epistemological beliefs and speed was the only dimension taken for further two path analyses. In the first analysis, speed was directly linked to connected knowing ($\beta = .252$, $p < .05$), separate knowing ($\beta = .252$, $p < .05$) and academic performance ($\beta = .252$, $p < .05$). In the second analysis, the association between ways of knowing and academic performance was mediated by speed dimension of the epistemological and its direct link positive with academic performance ($\beta = .31$, $p < .05$).

Hofer (2000) also examined the link between students' epistemological beliefs and their GPA scores while examining the domain differences of personal epistemology. She and assesses college students' domain specific epistemological beliefs with certainty/ simplicity, justification, source and attainability of truth dimensions in psychology and science; and domain general epistemological beliefs with certainty/ simplicity dimension. Regarding discipline-focused beliefs, students' less sophisticated beliefs about certainty/simplicity of knowledge in psychology were negatively correlated with both their grades in psychology (r = -. 31, $p < .01$) and their overall GPA (r = -. 22, $p < .01$); and less sophisticated beliefs about certainty/simplicity of knowledge regarding science course were also significantly correlated with students overall GPA's ($r = -.12$, $p < .01$). Also, less sophisticated domain general beliefs on certainty/simplicity dimension were negatively related with students' overall GPA's (r = -. 28, $p < .01$), psychology grade (r = -. 31, $p < .01$) and science grade (r = -. 17, $p < .01$).

Conley et al., (2004) examined the relationship between fifth grade students' epistemological beliefs about science and their achievement (combination of mathematic and reading achievement test scores from a standard achievement test). Students' epistemological beliefs were measured at the beginning and at end of the nine week hands on science unit in source of knowing, certainty of knowledge, development of knowledge and justification for knowing dimensions. Results of the analysis showed that, students' epistemological beliefs about source of knowing and certainty of knowledge became more sophisticated but there were not any significant changes in development of knowledge and justification for knowing dimensions. In terms of achievement, zero-order correlations were conducted and they were indicated that students sophisticated beliefs about nature of knowledge and knowing in all dimensions were positively related with their achievement scores both in time 1 and time 2 measurements (source of knowing r = .39 for time 1; r = .46 for time 2), certainty of knowledge (r = .49 for time 1; r = .51 for time 2), development of knowledge (r = .29 for time 1; r = .27 for time 2), justification for knowing (r = .28 for time 1; r = .22 for time 2).

In a study conducted in Turkey, Kızılgüneş (2007) investigated the effect of sixth grade students' epistemological beliefs, achievement motivations (viz., learning goal orientation, performance goal orientation and self-efficacy) and learning approaches on achievement in classification concepts in science. Correlational analysis indicated that there were positive relations between students' achievement score and their meaningful learning approach (r = .34, $p < .01$); students' achievement score and learning goal orientation (r = .21, $p < .01$); and students' achievement score and sophisticated epistemological beliefs (r =. 29, $p < .01$). Also multiple regression analysis indicated that only epistemological beliefs ($\beta = .15$, $p < .05$) and learning approach ($\beta = .27$, $p < .05$) were the significant predictor of the achievement (F= 27.37, $p < .05$) and stepwise multiple regression analysis revealed that learning approach accounted for 12% variance of science achievement and epistemological beliefs accounted for 2% variance of science achievement.

In addition, Özkan (2008) explored the relationships between seventh grade Turkish elementary students' epistemological beliefs about science, learning approaches (viz., meaningful and rote learning), self-regulated learning strategies, and their science achievement (assessed with a science achievement test prepared by the researcher) in a national study. Epistemological beliefs of the students were assessed as source of knowing, certainty of knowledge, development of knowledge dimensions and justification for knowing but the factor analysis results was given three-factor structure as; source/certainty, development and justification. Structural equation modeling analysis' results (χ^2 = 548.45, *df* = 159, GFI = .958, AGFI = .944, RMR = .048, SRMR = .048, RMSEA = .044) pointed out, the link between students' sophisticated epistemological beliefs and science achievement was only significant for source/ certainty dimension (β = .90, p < .05).

Yeşilyurt (2013) reported that elementary students' scientific epistemological beliefs are at moderate level on the authority and honesty dimension, at very high level on the process of knowledge production dimension, at moderate level on the resource of knowledge dimension, at very high level on the intelligence dimension, and above the average on the mutative knowledge dimension. Students' achievement was classified as their last term grades, namely; failed a course, not failed any course; have honor degree and have high honor degree. In addition, all dimensions rather than knowledge production dimension were related with students' achievement dimension. In addition, students with highest belief in the authority and honesty dimension were the students who failed the course, students with lowest belief in authority and honesty dimension was the students who have high honor degree in the course. Moreover, students with highest beliefs in the intelligence dimension were the students with honor and high honor degree. Furthermore, students with highest beliefs in the mutative knowledge dimension were the students with high honor degree.

In a more recent study conducted in Turkey, Pamuk (2014) investigated relationships among science teacher characteristics, constructivist learning environment perceptions, epistemological beliefs, self-regulation and student science achievement. He collected data from 137 science teachers and their 3281 seventh grade students and conducted Hierarchical Linear Modeling analysis to test several models. The effect of teacher level variables (viz., constructivist learning environment, achievement goal orientation, citizenship behavior, students-centered beliefs, epistemological beliefs and self-efficacy), and student level variables which consisted of constructivist learning environment (viz., personal relevance, uncertainty, critical voice, shared control and student negotiation), students' epistemological beliefs (viz., source of knowing, certainty of knowledge, justification for knowing and development of knowledge) and students' motivational beliefs (viz., self-efficacy, achievement goal orientation, task value and metacognitive self-regulation) on students' science achievement were investigated. Specifically, naïve certainty of knowledge beliefs of students (γ = -.065, *SE* = .015, p < .001) were negatively and sophisticated justification for knowing of knowing (γ = .060, *SE* = .020, p < .01) positively predicted students' science achievement. In another model, the effects of students' epistemological beliefs and constructivist learning environment perception on their science achievement were examined. Particularly, results of the model indicated that students' naïve epistemological beliefs; source of knowing (γ = -.039, *SE* = .019, p < .05) and certainty of knowledge (γ = -.046, *SE* = .022, p < .05) were negatively predicted science achievement and students' sophisticated beliefs on justification for knowing (γ = .045, *SE* = .021, p < .05) made positive effect on their science achievement. In addition, the effect of student level variables; epistemological beliefs and constructivist learning environment perception, task value and self-efficacy on science achievement was tested. Specially, results of the model showed that naïve beliefs about certainty of scientific knowledge (γ = -.039, *SE* = .019, p < .05) was negative predictor of the science achievement.

Overall, aforementioned studies suggest that learners' sophisticated epistemological beliefs positively associated with their achievement (e.g., Kızılgüneş, 2007; Schommer, 1993), specifically positive relationships of sophisticated beliefs about source of knowing (e.g., Conley et al., 2004; Özkan, 2008; Pamuk, 2014; Yeşilyurt; 2013), certainty of knowledge (e.g., Conley et al., 2004; Hofer, 2000; Schommer, 1993; Pamuk, 2015) , development of knowledge (e.g., Conley et al., 2004) and justification for knowing (e.g., Conley et al., 2004; Pamuk, 2015) dimensions with academic achievement were also reported. Accordingly, in the present study it was proposed that elementary students' sophisticated epistemological beliefs for science regarding source of knowing, certainty of knowledge, development of knowledge and justification of knowing dimensions positively linked with their science achievement.

2.7.3 Science Achievement in Relation to Motivational Beliefs

Motivational beliefs were taken into consideration as learners' self-efficacy and task value in the current study. The literature concerning association between self-efficacy and achievement, and task value and achievement were presented separately.

2.7.3.1 Self-efficacy and Science Achievement

Self-efficacy beliefs of individuals are defined as ‘‘people's judgments of their capabilities to organize and execute courses of action required to attain designated types of performances’’ (Bandura, 1986, p. 391). Also, it was hypothesized in Bandura's (1977a, 1982, 1986) social cognitive theory that self-efficacy influence individuals' choice, effort, persistence, and task performance. In addition, it was also proposed in Eccles, Wigfield and colleagues' expectancy-value model that expectancies for success are key determinants of achievement-related choices and performance (e.g., Eccles, 1987, 1993, 2005; Eccles et al., 1983; Wigfield & Eccles, 1992, 2000, 2002). Also, it is about the answer of individuals when they ask themselves "Can I do this task in this situation" (Linnenbrink & Pintrich, 2003, p. 120). In addition, the meta-analysis conducted by Multon, Brown and Lent (1991) with examining 38 studies (23 of them conducted with elementary school students) conducted with 4998 students between 1981 and 1988 in terms of the relationship between students' self-efficacy and academic performance (i.e., standardized tests, classroom-related tests and basic skill tasks) indicated a positive association between self-efficacy and academic performance. Students' self-efficacy beliefs was accounted for 14% of variance in their academic performance with the moderate effect size (r = .38).

Bandura (1997) asserted that "self-efficacy beliefs should be measured in terms of particularized judgments of capability that may vary across realms of activity, different levels of task demands within a given activity domain, and under different situational circumstances" (p. 6) to foresee individuals' academic performance from their self-efficacy beliefs. For example, Linnenbrink and Pintrich (2002) pointed out that self-efficacy of students changed for solving algebra problems and geometry problems. Also, the association between self-efficacy and performance of the learners relies on complexity and the variety of skills that the tasks require (Bandura & Schunk, 1981). There are plenty of researches conducted on the students' domain specific self-efficacy beliefs' relation with science achievement. Therefore, some of the researches from related literature were presented below.

Sungur and Güngören (2009) conducted a study based on sixth-eight grades students' environment perceptions, self-regulation and science achievement. Self-regulated learning was consisted of students' motivation and strategy use. In addition, students' motivation was assessed as motivational beliefs, composed of self-efficacy and intrinsic value, and goal orientation, assessed as mastery and performance goals. Moreover, students' strategy use was measured in terms of cognitive and metacognitive learning strategy use. Specifically, SEM analysis result indicated that students' strategy use negatively but insignificantly related with their science GPA scores ($\beta = -.04$). And motivational beliefs of students associated significantly and positively strategy use ($\beta = .36$) and students' science achievement ($\beta = .11$).

In addition, Chen and Pajares (2010) investigated association among sixth grade students' implicit theories, epistemological beliefs, academic motivation and science grade regarding science course. Specifically, self-efficacy and self-efficacy for self-regulation were taken as part of academic motivation and science grade was assessed as students' mid-term and end-of-term grades for science course. A path analysis was conducted to examine the relation among the variables and the proposed model was significant (χ^2 (38, 508) = 121.75, p < .0001, RMSEA = .07, NNFI = .93, CFI = .96). Particularly, the direct relationships between students' self-efficacy and science achievement (β = .383), and self-efficacy for self-regulation and science achievement (β = .137) were significant and positive.

Also, in a national study Yerdelen (2013) examine the relationships among seventh grade students' perception of classroom learning environment, self-regulation, science achievement, and their science teachers' beliefs and occupational well-being regarding science course. Researcher conducted a nationwide cross-sectional study with 372 science teachers and their 8198 seventh grade students and she analyzed data with HLM analysis by testing by several models. Specifically, she investigated the effect of classroom learning environment, students' gender and self-regulation variables (viz., self-efficacy, metacognitive self-regulation and achievement goal orientation) effect on students' science achievement (Model 2). Self-efficacy, which was taken as a component of students' self-regulation, was accounted for the strongest predictor (γ = .340, SE = .015, p < .001) of science achievement.

Moreover, Hıdıroğlu (2014) proposed a path model among seventh grade elementary students' perceptions of classroom goal structures (motivating tasks, autonomy support, and mastery evaluation), engagement (behavioral, emotional, cognitive and agentic engagement), self-efficacy and science achievement regarding science course. Sample of the study consisted of 744 seventh grade students and variables of the study were assessed in course level specify. The model was indicted good model fit values (χ^2 = 7.63, *df* =3, GFI = .99, CFI = .99, SRMR = .00 RMSEA =.04) Specifically, the path analysis indicated that self-efficacy of the students had significant positive association with their engagement, namely; behavioral (β = .39), emotional (β = .37), cognitive (β = .41) and agentic (β = .06), and students' science achievement (β = .15).

On the contrary, Kıngır et al. (2013) conducted a study to explore the relationships among constructivist learning environment perception variables (viz., personal relevance, uncertainty, shared control, critical voice, student negotiation), motivational beliefs (viz., self-efficacy, intrinsic interest, goal orientation), self-regulation, and science achievement. The model was tested with the self-reported data regarding science course which was collected from eight grade students. Specifically, students' achievement score was gathered from a multiple-choice exam covering sixth and seventh grade science curriculum. The association between students' self-efficacy and science achievement proposed and tested within the model which had good model fit indexes (χ^2 = 192.761, *df* = 7, NFI = .97, CFI = .97, GFI = .97, SRMR = .038). Results revealed that self-efficacy was a negative and significant predictor of the science achievement (β = -.12, $p < .05$) of the students.

Thus, abovementioned studies suggested that self-efficacy of the learners positively related with their achievement (e.g., Chen & Pajares, 2010; Hıdıroğlu, 2014; Sungur & Güngören, 2009; Yerdelen, 2013). Accordingly, in the current study it was proposed that elementary students' self-efficacy level regarding science course positively linked with their science achievement.

2.7.3.2 Task Value and Science Achievement

In expectancy-value model, Eccles, Wigfield and colleagues' proposed that learners' subjective task value is the direct predictor of learners' achievement-related choices, persistance and performance (e.g., Eccles, 1987, 1993, 2005; Eccles et al., 1983; Eccles & Wigfield, 1995; Meece et al., 1990; Wigfield, 1994a; Wigfield & Eccles, 1992, 2000, 2002). Also, it was asserted that individuals who give importance to the given task and/or enjoy while doing the task and/or believe that the task serve for their future plan and/or think that the task not need more cost prefer more challenging tasks, show more vigor and persistence while working on the task and exhibit high performance. It was also emphasized that subjective task value of the learners is task specific and it is about the answer of individuals when they ask themselves "What do I think of this task" (Pintrich et.al., 1991, p. 11). Also, the association between students' subjective task value about tasks of science course and their achievement was investigated in the related literature and some of the studies examining the relation were presented below.

Yumuşak et al. (2007) examined the contribution of motivational beliefs, namely; intrinsic goal orientation, extrinsic goal orientation, task value, control of learning beliefs, self-efficacy for learning and performance test anxiety to Turkish high school students' biology course achievement. In the multiple regression analysis motivational beliefs significantly accounted for 10% of the variation in students' achievement (R = .32, F = 9.623, p < .05). According to the results only extrinsic goal orientation (β = -.22, p < .001) and task value (β = .16, p < .01) contributed significantly to the prediction of students' achievement scores.

Also, Senler and Sungur (2014) studied the relationship between 1794 senior pre-service science teachers' self-regulation and their academic achievement. Accordingly, task value, control of learning beliefs, test anxiety, mastery-approach goal, performance-approach goal, mastery-avoidance goal, performance-avoidance goal and metacognitive self-regulation were taken as active agent of self-regulation process. Specifically, a positive correlation between students' task value and GPA scores (r = .16, p < .01) were detected.

Hensley (2013) examined the effect of the domain-specific self-efficacy and task value beliefs of undergraduate human anatomy students on their exam grade and course grade in anatomy course. A three-step hierarchical regression analysis was conducted to predict exam grade and course grade in anatomy course. The variables entered in the steps were respectively; (1) the background variables of gender and academic ability score, (2) the domain-general belief about the speed of knowledge acquisition and the domain-specific self-efficacy and task value beliefs, and (3) passive procrastination, satisfying outcomes and intentional decision. Result for exam grade and course grade nearly gave similar results. Specifically, in terms of motivational beliefs while self-efficacy was a significant and positive predictor of exam ($\beta = .32$, $p < .001$ for step 2; $\beta = .23$, $p < .01$ for step 3) and course grade ($\beta = .37$, $p < .001$ for step 2; $\beta = .24$, $p < .001$ for step 3), task value accounted negative and non-significant results for exam ($\beta = -.08$, $p > .05$ for step 2; $\beta = -.08$, $p > .05$ for step3) and course grade ($\beta = -.05$, $p > .05$ for step 2; $\beta = -.08$, $p > .05$ for step3). Also, Mohammadi, Rouhi and Davaribina (2012) indicated the same results for very different domain from science. The study conducted a study based on the relationship between university students', from English literature department in an Iran University, motivational strategies and their academic achievement. Motivational strategies were assessed as intrinsic goal orientation, extrinsic goal orientation, task value, control of learning beliefs, self-efficacy and test anxiety, and their achievement scores were gathered through asking an average from students directly. Regression analysis indicated that students motivational strategies was significantly accounted for 39% of variation in their achievement scores ($R = .62$, F (6,130) = 13.63, $p < .05$). Particularly, while self-efficacy was significantly and positively ($\beta =.44$, $p < .01$) predicting students' achievement, task value was not significantly ($\beta = .06$, $p =.63$) anticipated students' achievement scores.

In addition, Pamuk (2014) reported nearly same results for seventh grade students in science course with Hensley (2013) and Mohammadi et al., (2012). The researcher conducted a study to investigate relationships among science teacher characteristics, constructivist learning environment perceptions, epistemological beliefs, self-regulation and student science achievement. He collected data from 137 science teachers and their 3281 seventh grade students and conducted Hierarchical Linear Modeling analysis to test several models. The effect of teacher level variables (viz., constructivist learning environment, achievement goal orientation, citizenship behavior, students-centered beliefs, epistemological beliefs and self-efficacy), and student level variables which consisted of constructivist learning environment (viz., personal relevance, uncertainty, critical voice, shared control and student negotiation), students' epistemological beliefs (viz., source of knowing, certainty of knowledge, justification for knowing and development of knowledge) and students' motivational beliefs (viz., self-efficacy, achievement goal orientation, task value and metacognitive self-regulation) on students' science achievement were examined. Specifically, rather than performance-avoidance goal (γ = -.037, SE = .015, p < .05) any of the motivational belief variables did not significantly predict science achievement scores. In another model, the effect of student level variables; epistemological beliefs and constructivist learning environment perception, task value and self-efficacy on science achievement was tested. Specially, results of the model showed self-efficacy (γ = .052, SE = .024, p < .05) positively affected science achievement.

Overall, both expectancy-value theory (e.g., Eccles, 1987, 1993, 2005; Eccles et al., 1983; Eccles & Wigfield, 1995; Meece et al., 1990; Wigfield, 1994a; Wigfield & Eccles, 1992, 2000, 2002) and abovementioned studies indicated positive association between task value and achievement of learners (e.g., Senler & Sungur, 2014; Yumuşak et al., 2007). Therefore, it was hypothesized for the current study that there is positive relationship between elementary students' task value regarding science course and their science achievement.

2.7.4 Science Achievement in Relation to Learning Strategies

It is commonly indicated in the literature that learning strategies could mediate individuals and context, and academic achievement (e.g., Butler & Winne, 1995; Pintrich, 2000; Zimmerman, 2000). Also, in one of the earliest study conducted by Zimmerman and Martinez-Pons (1986) revealed that the prediction for being high or low achievers 93% correlate with tenth grade students' strategy use. In another study, Zimmerman and Martinez-Pons (1988) indicated that nearly 80% of the variance in achievement accounted by students and their teachers rating about the students' strategy utilization. In addition, it was reported by Pintrich and De Groot (1990) that seventh grade students' higher levels of cognitive and metacognitive strategies use were associated with higher levels of achievement on all classroom tasks and assignments.

Muis and Franco (2009) investigated the relationship among epistemic beliefs, achievement goals, learning strategies, and achievement. The study conducted on the self-reported data collected from undergraduate educational psychology students. Researchers assessed students' rehearsal, elaboration, critical thinking, and metacognitive self-regulation strategies use (rehearsal strategies considered as shallow-processing strategies, and elaboration, critical thinking, and metacognitive self-regulation strategies considered as deep-processing strategies) and their final grade for their education psychology course. Results of the structural equation modeling indicated a moderate to good fit (χ^2 = 2784.13, *df* = 1398, CFI = .89, RMSEA = .05). Specifically, students' metacognitive self-regulation, elaboration, critical thinking and rehearsal strategies positively predicted achievement (β = .69, β = .76, β = .29 and β = .14)

Dupeyrat and Mariné (2005) constructed a model based on Dweck's social-cognitive model of motivation with high school students' who dropped out of the school and return to school to get high school diploma. The variables of the study were implicit theories of intelligence (viz., incremental, entity theory), achievement goal orientation (viz., mastery, performance and work avoidance goals), cognitive engagement (viz., deep strategies addressing elaborating and organization information, shallow strategies representing rote memorization and effort as feedback for homeworks) and achievement (i.e., graduation grade). The results of indicated no relationship between students' shallow strategy use and achievement; and their deep strategy use and achievement.

Rastegar et al. (2010) examined association among Persian university students', from basic sciences fields, epistemological beliefs, achievement goals, mathematics self-efficacy, cognitive engagement and mathematics achievement. As cognitive engagement students' cognitive and metacognitive strategies were assessed in a similar way to the current study. These strategies were formed from subscale of cognitive engagement of MSLQ. In addition, students' math course score was also considered as the math performance. Specifically, results of the structural equation modeling indicated that 42% of variance accounted for mathematical achievement. Also, cognitive strategies were significantly and negatively related with students' mathematical performance (β =-.10) while metacognitive strategies were significantly and positively associated with their mathematical performance (β =.55).

Özkan (2008) explored the relationships between seventh grade elementary students' epistemological beliefs about science, learning approaches (meaningful and rote learning), self-regulated learning strategies, and their science achievement (scores students got from the science achievement test prepared by the researcher) in a national study. Self-regulated learning strategies variable include students' cognitive learning strategies, namely; rehearsal, elaboration, organization and critical thinking and metacognitive learning strategies together in one-factor structure. Results of the structural equation modeling analysis, (χ^2 = 548.45, *df* = 159, GFI = .958, AGFI = .944, RMR = .048, SRMR = .048, RMSEA = .044) revealed that, the link between students' self-regulated learning strategies and science achievement was significant and positive (β = .42).

Yumuşak et al. (2007) investigated the contribution of cognitive (viz., rehearsal, elaboration, organization and critical thinking), metacognitive strategies use, time and study environment, effort regulation, peer learning, and help seeking to Turkish high school students' achievement in biology course. A multiple regression analysis was conducted to predict students' biology achievement test scores; according to analysis cognitive and metacognitive strategies use significantly accounted for 9% of the variation in students' achievement (R = .29, F = 5.299, p < .05). Specifically, rehearsal strategy use (β = -.22, p < .001), organization strategy use (β = .13, p < .05), management of time and study environment (β = .15, p < .05), and peer learning (β = -.12, p < .05) contributed significantly to the prediction of students' achievement scores and accounted for 10% of the variation in students' achievement.

Akyol, Sungur and Tekkaya (2010) examined how well seventh grade students' cognitive (viz., rehearsal, elaboration, organization and critical thinking strategies) and metacognitive learning strategy use (i.e., metacognitive self-regulation strategies) in science course to predict their science achievement. Results of the multiple linear regression analysis indicated that cognitive and metacognitive self-regulation strategy use explained 6.9% variance of students' science achievement (R = .26, F(5, 1511) = 22.37, p <

.05). Although elaboration, organization, and metacognitive self-regulation strategies were found to be statistically significant positive predictor of science achievement, metacognitive self-regulation strategy use was best predicted students' achievement in science ($\beta = .11$, $sr = .064$).

Kaya and Kablan (2013) conducted a national study with the data collected from 574 fourth grade primary school students to investigate the relationships between students' strategy use and science achievement. A self-report scale was used to assessed students' cognitive- metacognitive strategies (viz., rehearsal, elaboration, organization, critical thinking, and metacognitive self-regulation) and resource management (viz., managing time and study environment, effort regulation, peer learning, and help seeking). Also students' achievement was assessed with the modified questionnaire from TIMSS conducted in 2007. A multiple regression analysis results revealed that effort regulation ($\beta = .18$), metacognitive self-regulation ($\beta =.17$) and critical thinking ($\beta = .15$) explained approximately 13% of the variance in science scores.

Kıngır et al. (2013) conducted a study to explore the relationships among constructivist learning environment perception variables (viz., personal relevance, uncertainty, shared control, critical voice, student negotiation), motivational beliefs (viz., self-efficacy, intrinsic interest, goal orientation), self-regulation, and science achievement. The model was tested with the self-reported data regarding science course which was collected from eight grade students. Specifically, self-regulation variable represents students' cognitive and metacognitive learning strategies and students' achievement score was gathered from a multiple-choice exam covering 6 and 7 science curriculum. The association between self-regulation and science achievement proposed and tested within the model which had good model fit indexes (χ^2 = 192.761, *df* = 7, NFI = .97, CFI = .97, GFI = .97, SRMR = .038). According to the results of the analysis, constructivist learning environment variables, goal orientations, self-efficacy, intrinsic value and self-regulation were found to explain 41% of the variance in science achievement. More specifically, the relationship between students' self-regulation and their science achievement was positive and significant ($\beta = .36$, $p < .05$).

On the other hand, Yerdelen (2013) examine the relationships among seventh grade students' perception of science classroom learning environment, self-regulation in science course, science achievement, and their science teachers' beliefs and occupational well-being. Researcher conducted a nationwide cross-sectional study with 372 science teachers and their 8198 seventh grade students and she analyzed data with HLM analysis by testing by several models. Specifically, she investigated the effect of classroom learning environment, students' gender and self-regulation variables (viz., self-efficacy, metacognitive self-regulation and achievement goal orientation) effect on students' science achievement (Model 2). Results of the study did not display any significant effect of metacognitive self-regulation of students on their science-achievement.

Thus, abovementioned studies indicated that learners who use more learning strategies had higher achievement (e.g., Kıngır et al., 2013; Özkan, 2008; Pintrich & De Groot, 1990; Zimmerman & Martinez-Pons, 1986, 1988). Although there were mixed results for the association between learners' achievement and their cognitive learning strategy use, overall the mentioned studies signed that both cognitive (e.g., Akyol et al., 2010; Kaya & Kablan, 2013; Muis & Franco, 2009; Yumuşak et al., 2007) and metacognitive (e.g., Akyol et al., 2010; Kaya & Kablan, 2013; Muis & Franco, 2009; Rastegaret al., 2010) learning strategies had positive links with academic achievement. Accordingly, in the current study positive associations between elementary students' cognitive learning strategy use in science course and their science achievement, and their metacognitive cognitive learning strategy use in science course and achievement in science course were also hypothesized.

2.7.5 Science Achievement in Relation to Procrastination

Study habits distinguish underachieving students from overachieving students (Lum, 1960) and educational psychology provides an explanation for the differences in students' achievement level by procrastination based mainly on cognitive-behavioral factors (Boffeli, 2007). Procrastination is defined as "a substantial hindrance to success" (Scher & Osterman, 2002, p. 385). Related literature based on the procrastination of the students in academic setting provide the association between students' procrastination and their GPA, catching up the deadlines, completing tasks and spending time on preparing for a task (van Eerde, 2003). Number of studies examining the relationship between young students' academic procrastination and academic achievement is very rare; nearly all studies were conducted on college or undergraduate students. Also, working with the students from psychology or psychology related courses is another common tendency, nearly there is not any study investigating the effect of students' procrastination on their achievement such as in science and science related courses.

Furthermore, there is not a consensus about the existence of relationship between procrastination and students' academic achievement and if the relationships exit different results were also indicated in the literature. Steel (2007) and van Eerde (2003) revealed that students' procrastination has negative association with their achievement scores such assignment grades, final exam scores, course GPA and cumulative GPA in their meta-analysis. Moreover, Wolters (2004) considered the prior standardized mathematical achievement scores of junior high school students and their mathematical course grades, while exploring the motivational, cognitive and achievement related components of achievement goal theory. As motivational engagement procrastination integrated into the study and correlational analysis was indicated that while procrastination significantly and negatively related with course grade (r = -.40, p < .05), it was not significantly related with statewide standardized mathematical achievement test scores (r = -.07, p > .05). Further, a three-step hierarchical regression was executed to predict learning strategy, achievement outcomes and motivational engagement such as procrastination. The statewide standardized mathematical achievement test scores was entered the analysis in the first step and any significant relationships were not detected in three steps of analysis between the achievement test and procrastination. In addition, Çakıcı (2003) reported negative relationships between high school (r = -.27, p <.01) and undergraduate (r = -.391, p <.01) students GPA's and their academic procrastination. Besides, Klassen et al. (2008) investigated characteristics of negative procrastinators among undergraduate students and the researchers reached that negative procrastinators had lower GPA's, higher levels of daily and task procrastination, lower predicted and actual class grades, and lower self-efficacy for self-regulation. Also, Bezci and Sungur (2013) tested the effect of procrastination and gender on elementary students' science achievement and the result of the regression analysis indicated negative association between procrastination and science achievement (β = -.19, p <.05).

In addition, the correlation analysis between procrastination and grades yield nonsignificant (r = -.03, p > .05), result for distance university students but it was significant and negative(r = -.18, p <.01), for traditional university students in the study done by Klingsieck et al. (2012). As well, the explained variance of students grade was 2.8 % for traditional students (β= -.18, p <.01) and the effect of procrastination was totally mediated by learning strategies ($a \times b = -.09$, $z = -3.20$, $p < .01$; Sobel, 1982). Also, Howell and Watson (2007) did not detected any association between the procrastination scores of the PASS scores and undergraduate psychology students' course grade ($r = -.12$, $p > .05$), and the TPS scores and their grades ($r = -.08$, $p > .05$). Moreover, Mendelson (2007) did not detect any association between undergraduate students', from Liberal Arts and Science college, procrastination and GPA ($\beta = -.10$, $p > .05$; $r = -.06$, $p > .05$), and procrastination and exam scores ($\beta = -.13$, $p > .05$; $r = -.11$, $p > .05$) in a path model including students' achievement anxiety, procrastination, flow and academic performance. Also, the association between students' procrastination and academic performance, GPA and exam scores did not mediated by their flow scores.

On the other hand, McGregor and Elliot (2002, Study 2) conducted a regression analysis to predict procrastination with achievement goals and scholastic assessment test scores (SAT), results of the analysis indicated the positive association between undergraduate students' scholastic assessment test scores and procrastination ($\beta = .22$, $p < .01$).

To sum up, the number of studies based on young students' procrastination level and achievement is insufficient. Additionally, there is need for more the studies examining the association between students' procrastination and achievement but rather than psychology or psychology related courses since most of the studies regarding the association were done on psychology or psychology related courses' achievement scores.

Overall, aforementioned literature suggests a negative relationship between procrastination and achievement (e.g., Çakıcı, 2003; Klassen et al., 2008; Klingsieck et al., 2012; Steel, 2007; van Eerde, 2003). Accordingly, it was hypothesized that elementary students' procrastination in science course negatively associated with their science achievement in the present study.

2.8 Summary of Findings

Achievement Goals in Relation to Implicit Theories of Ability

Aforementioned literature indicated;

- positive association between incremental theory of ability and mastery goals (e.g., Dweck, 1986; Ommundsen, 2001b; Robins & Pals, 2002) and entity theory of ability and performance goals (e.g., Cury et al., 2006; Dweck, 1986; Ommundsen, 2001b; Robins & Pals, 2002).

Achievement Goals in Relation to Epistemological Beliefs

Aforementioned literature indicated;

- positive relationship between naïve beliefs about the source of knowing and mastery goals (e.g., Kızılgüneş et al., 2009) and mastery-avoidance goal (e.g., Pamuk, 2014).

- positive correlation between naïve beliefs on source of knowing and performance-approach goal (e.g., Chen & Pajares, 2010) and performance-avoidance goal (e.g., Kızılgüneş et al., 2009; Pamuk, 2014).
- positive link between sophisticated beliefs of certainty of knowledge and mastery goals was reported (e.g., Kızılgüneş et al., 2009; Muis & Franco, 2009).
- positive relation between naïve beliefs about certainty of knowledge and performance-avoidance goal (e.g., Chen & Pajares, 2010) and both performance-approach and performance-avoidance goals (e.g., Muis & Franco, 2009; Pamuk, 2014)
- positive link between sophisticated beliefs about development of knowledge and mastery goals (e.g., Kızılgüneş et al., 2009) and mastery-avoidance goal (e.g., Pamuk, 2014).
- positive association between sophisticated beliefs about development of knowledge and both performance-approach and performance-avoidance goals (e.g., Kızılgüneş et al., 2009; Pamuk, 2014).
- positive correlation between sophisticated beliefs about justification for knowing and both mastery-approach and mastery-avoidance goals (e.g., Chen & Pajares, 2010; Kızılgüneş et al., 2009; Pamuk, 2014).
- positive relationships between naïve beliefs about justification for knowing and performance goals (e.g., Muis & Franco, 2009; Kızılgüneş et al., 2009).

Achievement Goals in Relation to Motivational Beliefs

Aforementioned literature indicated;

- positive link between self-efficacy and mastery goals (e.g., Liem et al., 2008; Sungur, 2007; Wolters et al., 1996), self-efficacy and mastery-approach goal (e.g., Cury et al., 2006; Elliot & Church, 1997; Kıran, 2010), and self-efficacy and mastery-avoidance goal (e.g., Cury et al., 2006; Elliot & Church, 1997; Kıran, 2010).
- positive association between self-efficacy and performance-approach goal (e.g., Cury et al., 2006, Elliot & Church, 1997; Kahraman & Sungur, 2013; Kıran, 2010; Wolters et al., 1996).
- negative relationship between self-efficacy and performance-avoidance goal (e.g., Cury et al., 2006; Elliot & Church, 1997; Liem et al., 2008).
- positive correlation between task value and mastery (i.e., both mastery-approach and mastery-avoidance) goals (e.g., Kahraman & Sungur, 2013; Senler & Sungur, 2014; Liem et al., 2008)
- positive association between performance-approach goal and task value (e.g., Senler & Sungur, 2014; Wolters et al., 1996).
- positive link between task value and performance-avoidance goal (e.g., Senler & Sungur, 2014) and also negative link between them (e.g., Kahraman & Sungur, 2013).

Learning Strategies in Relation to Implicit Theories of Ability

Aforementioned literature indicated;

- positive association between learning (i.e., both for cognitive and metacognitive) strategies and incremental theories of ability (e.g., Diener & Dweck, 1978, 1980; Dweck, 1986; Dweck et al., 1995; Dweck & Leggett, 1988, Elliott & Dweck, 1988).

Learning Strategies in Relation to Epistemological Beliefs

Aforementioned literature indicated;

- positive relationship between sophisticated epistemological beliefs about source of knowing (e.g., Alpaslan et al., 2015), certainty of knowledge (e.g., Paulsen & Feldman, 2007), development of knowledge (e.g., Alpaslan et al., 2015) and justification for (e.g., Pamuk, 2014) dimensions, and learning strategies use.

Learning Strategies in Relation to Motivational Beliefs

Aforementioned literature indicated;

- positive link between self-efficacy and learning strategies (e.g., Ames & Archer, 1988; Bråten & Olaussen, 1998; Yumuşak et al., 2007) and specifically for cognitive learning strategies (e.g., Pintrich & De Groot, 1990; Tas & Cakir, 2014) and metacognitive learning strategies (e.g., Kıran, 2010; Pintrich & De Groot, 1990).

- positive correlation task value and learning strategies (e.g., Yumuşak et al., 2007) and specifically for cognitive learning strategies (e.g., Pintrich & De Groot, 1990; Taş & Çakir, 2014) and metacognitive learning strategies (e.g., Pintrich & De Groot, 1990; Sungur, 2007).

Learning Strategies in Relation to Achievement Goals

Aforementioned literature indicated;

- positive association between cognitive learning strategy use and both mastery-approach and mastery-avoidance goals (e.g., Alpaslan et al., 2015; Kadıoglu & Uzuntiryaki-Kondakci, 2014; Muis & Franco, 2009; Tas & Cakir, 2014; Wolters, 2004) .
- significant relation between cognitive learning strategies and performance goals (e.g., Alpaslan et al., 2015), specifically for performance-approach goal (e.g., Dupeyrat & Mariné, 2005; Kadıoglu & Uzuntiryaki-Kondakci, 2014; Kıngır et al., 2013; Muis & Franco, 2009; Wolters, 2004) and performance-avoidance goal (e.g., Rastegar et al., 2010).
- positive correlation between metacognitive learning strategy use and mastery goals (e.g., Alpaslan et al., 2015; Rastegar et al., 2010; Wolters, 2004) especially the mastery-approach goal (e.g., Kadıoglu & Uzuntiryaki-Kondakci, 2014; Kahraman & Sungur, 2011; Kıngır et al., 2013; Kıran, 2010; Muis & Franco, 2009).

- positive relationship between metacognitive learning strategy use and performance-approach goal (e.g., Kadıoglu & Uzuntiryaki-Kondakci, 2014; Kıngır et al., 2013; Kıran, 2010; Wolters, 2004).
- mixed results concerning the relationship between metacognitive learning strategy use and performance-avoidance goal depending on context of the study: some studies demonstrate a negative relationship (e.g., Muis & Franco, 2009) and some studies demonstrate a positive relation (e.g., Sungur & Şenler, 2009).

Cognitive Learning Strategies in Relation to Metacognitive Learning Strategies

Aforementioned literature indicated;

- positive link between cognitive learning strategies use and metacognitive learning strategies use (e.g., Heikkilä & Lonka, 2006; Kasımi, 2012; Phakiti, 2006; Saçkes, 2010).

Procrastination in Relation to Implicit Theories of Ability

Aforementioned literature indicated;

- negative correlation between procrastination and incremental theory of ability (e.g., Howell & Buro, 2009; Ommundsen et al., 2005; Ommundsen, 2001b).

Procrastination in Relation to Epistemological Beliefs

Aforementioned literature indicated;

- positive relationship between procrastination and naïve epistemological beliefs (e.g., Boffeli, 2007).

Procrastination in Relation to Motivational Beliefs

Aforementioned literature indicated;

- negative link between procrastination and self-efficacy (e.g., Akbay ,2009; Haycock et al., 1998; Klassen et al., 2008; Tuckman, 1991; Uzun Özer, 2010; Wolters, 2003, 2004; Özer & Altun, 2011).
- negative correlation between procrastination and task value (e.g., Corkin, 2012; Hensley, 2013; Taura et al., 2015).

Procrastination in Relation to Achievement Goals

Aforementioned literature indicated;

- negative association between procrastination and mastery-approach goal (e.g., Howell & Buro, 2009; Howell & Watson, 2007; Kandemir, 2010; Scher & Osterman, 2002).
- positive correlation between procrastination and mastery-avoidance goal (e.g., Howell & Buro, 2009; Howell & Watson, 2007).
- positive relationship between procrastination and both performance-approach goal (e.g., Ganesan et al., 2014; Wolters, 2003), and also

performance-avoidance goal (e.g., Elliot, 2002, Study 2; Scher & Osterman, 2002; Wolters, 2003).

Procrastination in Relation to Learning Strategies

Aforementioned literature indicated;

- negative link between procrastination and cognitive learning strategy use (e.g., Howell & Watson, 2007; Klingsieck et al., 2012; Wolters, 2003), and also metacognitive learning strategy use (e.g., Howell & Watson, 2007; Klingsieck et al., 2012; Motie, Heidari & Sadeghi, 2012; Wolters, 2003).

Science Achievement in Relation to Implicit Theories of Ability

Aforementioned literature indicated;

- positive correlation between academic achievement and incremental theory of ability (e.g., Blackwell et al., 2007; Cury et al., 2006; Good et al., 2003).

Science Achievement in Relation to Epistemological Beliefs

Aforementioned literature indicated;

- positive association between of sophisticated epistemological beliefs and academic achievement (e.g., Kızılgüneş, 2007; Schommer, 1993), specifically for sophisticated beliefs about source of knowing (e.g., Conley et al., 2004; Özkan, 2008; Pamuk, 2014; Yeşilyurt; 2013), certainty of knowledge (e.g., Conley et al., 2004; Hofer, 2000; Schommer, 1993; Pamuk, 2015) , development of knowledge (e.g., Conley et al., 2004) and justification for knowing (e.g., Conley et al., 2004; Pamuk, 2015).

Science Achievement in Relation to Motivational Beliefs

Aforementioned literature indicated;

- positive relationship between academic achievement and self-efficacy (e.g., Chen & Pajares, 2010; Hıdıroğlu, 2014; Sungur & Güngören, 2009; Yerdelen, 2013) and also task value (e.g., Senler & Sungur, 2014; Yumuşak et al., 2007).

Science Achievement in Relation to Learning Strategies

Aforementioned literature indicated;

- positive link between academic achievement and learning strategies (e.g., Kıngır et al., 2013; Özkan, 2008; Pintrich & De Groot, 1990; Zimmerman & Martinez-Pons, 1986, 1988), and specifically cognitive learning strategy use (e.g., Akyol et al., 2010; Kaya & Kablan, 2013; Muis & Franco, 2009; Yumuşak et al., 2007) and metacognitive learning strategies use (e.g., Akyol et al., 2010; Kaya & Kablan, 2013; Muis & Franco, 2009; Rastegar et al., 2010).

Science Achievement in Relation to Procrastination

Aforementioned literature indicated;

- negative relationship between procrastination and achievement (e.g., Çakıcı, 2003; Klassen et al., 2008; Klingsieck et al., 2012; Steel, 2007; van Eerde, 2003).

CHAPTER III

METHOD

This chapter addresses the method of the study in seven sections namely; design of the study, population and sampling, instruments, data collection, threats of internal validity, data analysis, and limitations and assumptions.

3.1 Design of the Study

The present study aimed to explore relationships among seventh grade elementary students' implicit theories of ability, epistemological beliefs, motivational beliefs, learning strategies, procrastination, and their science achievement by proposing and testing a path model. Accordingly, this study is a correlational study which relies on the data from self-report instruments.

3.2 Population and Sampling

Target population of the study is all seventh grade public elementary students in Ankara. The accessible population consisted of all seventh graders in elementary public schools in Etimesgut, Keçiören and Yenimahalle districts of Ankara. This was the population to which results of the present study is to be generalized. Cluster random sampling integrated with convenience sampling was used to obtain a sample representative of accessible population; Etimesgut, Keçiören and Yenimahalle districts of the Ankara were selected using convenience sampling during the sampling procedure. Then, cluster random sampling was utilized considering schools in Etimesgut, Keçiören and Yenimahalle districts as clusters. During selection of the schools, total numbers of the schools for each district were obtained from Education Directorates of each district, namely; there were 42 public elementary schools in Etimesgut, 74 public elementary schools in Keçiören and 89 public elementary schools in Yenimahalle. Then, numbers were assigned to each school and table of random numbers was used to identify the schools to be included in the study. Nearly 20 % of the schools in each district were randomly selected. Eventually, 11 public elementary schools from Etimesgut, 15 public elementary schools from Keçiören and 20 public elementary schools from Yenimahalle were selected and included in the present study. Table 3.1 presents the number of the schools and the number of the seventh grade elementary students in each school involved in the study.

Table 3.1 Number of Schools and Corresponding Students

Number of schools	Number of seventh grade students	Percentage of students (%)
Schools in Etimesgut		
School 1	153	3.39
School 2	19	0.42
School 3	74	1.64
School 4	37	0.82
School 5	103	2.28
School 6	99	2.20
School 7	149	3.30
School 8	67	1.49
School 9	68	1.51
School 10	53	1.18
School 11	146	3.24

Table 3.1 Number of Schools and Corresponding Students (continued)

Number of schools	Number of seventh grade students	Percentage of students (%)
Schools in Keçiören		
School 12	98	2.17
School 13	89	1.97
School 14	84	1.86
School 15	89	1.97
School 16	139	3.08
School 17	255	5.65
School 18	110	2.44
School 19	325	7.21
School 20	95	2.11
School 21	217	4.81
School 22	140	3.10
School 23	133	2.95
School 24	82	1.82
School 25	108	2.39
School 26	48	1.06
Schools in Yenimahalle		
School 27	72	1.60
School 28	4	0.09
School 29	20	0.44
School 30	53	1.18
School 31	196	4.35
School 32	118	2.62
School 33	116	2.57
School 34	50	1.11
School 35	9	0.20
School 36	42	0.93
School 37	123	2.73
School 38	125	2.77
School 39	41	0.91
School 40	71	1.57
School 41	56	1.24
School 42	46	1.02
School 43	116	2.57
School 44	151	3.35
School 45	63	1.40
School 46	58	1.29
Total	4510	100.00

A total of 4510 seventh grade students from 46 elementary schools participated in the study. There were 2246 (49.8%) girls and 2255 (50.0%) boys in the sample with a mean age of 13.12 (*SD* = .38). Their average science grade in previous semester was 3.72 (*SD* = 1.09). Approximately half of the participants (48.8%) were from families with two children. More than one-quarter of students' mothers (31.2%) graduated from primary school while more than one-quarter of students' fathers graduated from high school (32.7 %). Although majority of students' mothers (69.1%) were unemployed, their fathers (85.1%) were employed. There were few students (4.5%) having lower than ten books in their homes. Most of the students (35.0 %) had 26-100 books in their homes. A few the participants (9.9%) reported that their families never buy daily newspapers. Majority of the participants had a separate study room (85.8%), computer (87.9%) and internet connection (73.6 %) in their houses. Detailed information about the background characteristics related to students' gender, age, number of sibling, last term science grade, mothers' educational level, fathers' educational level, mothers' employment status, fathers' employment status, number of reading materials at home, presence of a separate study room, frequency of buying a daily newspaper, presence of a computer and presence of an internet connection were provided in Table 3.2.

Table 3.2 Background Characteristics of Students

	Frequency(*f*)	Percent (%)
Gender		
Girl	2246	49.8
Boy	2255	50.0
Age		
16	12	0.3
15	14	0.3
14	511	11.3
13	3917	86.9
12	30	0.7
11	1	0.0
Other	2	0.0
Number of Sibling		
0	418	9.3
1	220	48.8
2	1259	27.9
3	412	9.1
4	138	3.1
5 or more	67	1.5
Last Term Science Grade		
1	161	3.6
2	434	9.6
3	1168	25.9
4	1444	32.0
5	1253	27.8
Mother's Educational Level		
Illiterate	90	2.0
Primary school	1405	31.2
Secondary school	849	18.8
High school	1349	29.9
University	647	14.3
Ms	119	2.6
PhD	12	0.3
Fathers' Educational Level		
Illiterate	21	0.5
Primary school	744	16.5
Secondary school	803	17.8
High school	1474	32.7
University	1122	24.9
Ms	207	4.6
PhD	41	0.9
Mothers' Employment Status		
Employed	1191	24.8

Table 3.2 Background Characteristics of Students (continued)

	Frequency(*f*)	Percent (%)
Unemployed	3118	69.1
Offensively employed	78	1.7
Retired	148	3.3
Fathers' Employment Status		
Employed	3837	85.1
Unemployed	78	1.7
Offensively employed	117	2.6
Retired	347	7.7
Number of Reading Materials at Home		
0-10 books	213	4.5
11-25 books	1054	22.2
26-100 books	1640	35.0
101-200 books	816	17.4
More than 200 books	937	19.6
Presence of a Separate Study Room		
Have a separate study room	3870	85.8
Do not have a separate study room	589	13.1
Frequency of Buying a Daily Newspaper		
Never	448	9.9
Sometimes	2843	63.0
Always	1146	25.4
Presence of a Computer		
Have a computer	3965	87.9
Do not have a computer	492	10.9
Presence of an Internet Connection		
Have an internet connection	3321	73.6
Do not have internet connection	1122	24.9

3.3 Instruments

In the study, seven instruments were used to gather relevant data, namely; Background Characteristics Survey, the Implicit Theories of Science Ability Scale (ITSAS), the Epistemological Beliefs Questionnaire (EBQ), the Achievement Goal Questionnaire (AGQ), the Motivated Strategies for Learning Questionnaire (MSLQ), the Tuckman Procrastination Scale (TPS) and the Science Achievement Test (SAT). The name of the instruments and the variables assessed were summarized in Table 3.3

Table 3.3 Data Collection Instruments and Variables

Instruments	Variables
	Gender
	Age
	Number of Sibling
	Last Term Science Grade
	Mother's Educational Level
Background Characteristics Survey	Father's Educational Level
	Mother's Employment Status
	Father's Employment Status
	Number of Reading Materials at Home
	Presence of a Separate Study Room
	Frequency of Buying a Daily Newspaper
	Computer
	Internet Connection
ITSAS (Dweck, 1999)	Entity Theory of Ability
	Source of Knowing
	Certainty of Knowledge
EBQ (Conley, Pintrich, Vekiri & Harrison, 2004)	Development of Knowledge
	Judgment for Knowing
	Mastery-Approach Goal
AGQ (Elliot & McGregor, 2001)	Performance-Approach Goal
	Mastery-Avoidance Goal
	Performance-Avoidance Goal

Table 3.3 Data Collection Instruments and Variables (continued)

Instruments	Variables
MSLQ (Pintrich, Smith, Garcia & McKeachie, 1991)	Cognitive Learning Strategies Metacognitive Learning Strategies Self-Efficacy Task Value
TPS (Tuckman, 1991)	Procrastination
SAT (Yerdelen, 2013)	Science Achievement

3.3.1 Background Characteristics Survey

There were 13 items that investigated background characteristics of students in terms of gender, age, last term science course grade, number of siblings, parents' educational level and their employment status, number of reading materials at home, frequency of buying a daily newspaper, presence of a separate study room, a computer and an internet connection (see Appendix A).

3.3.2 The Implicit Theories of Science Ability Scale

A three-item self-report implicit theory of intelligence scale depicting entity theory of intelligence was developed by Dweck and Henderson (1988). Six validation studies done by Dweck, Chiu and Hong (1995) which indicated that implicit theories of intelligence measure is independent of the participants' sex and age (β ranged from -.26 to .12, *ns*) and respondents' political affiliation and religion (β ranged from .096 to .30, *ns*). In addition, the theories measure is not confounded with self-presentation concerns as measured by the Self-

Monitoring Scale (Snyder, 1974; β = 0.04, *ns*) and Social Desirabilty Scale (Paulhus, 1984; β = .024, *ns*). Moreover, discriminate validity study revealed that cognitive ability (SAT scores; β = -11.03, *ns*) and self-esteem (Coopersmith, 1967; β = .39, *ns*) were unrelated with the implicit theories of intelligence measure. Validation studies also showed that the measure has high internal reliability (alpha ranged from .94 to .98 for sample sizes ranging from 32 to 184) and test- retest reliability value has been found to be high ($r = .80$, $N = 62$, over a 2-week period). Later, Dweck (1999) published the instrument as Implicit Theories of Intelligence Scale for Children-Self Form, adding three items for incremental theory of intelligence. The latter instrument was revised by Chen and Pajares (2009) to assess students' beliefs about abilities specifically in science similar to the current study. The following paragraphs provide detailed information about the Implicit Theories of Intelligence Scale for Children-Self Form and ITSAS.

Implicit Theories of Intelligence Scale for Children-Self Form (Dweck, 1999) is a six- point Likert scale ranging from 1 (*strongly agree)* to 6 (*strongly disagree*). The instrument includes two subscales, namely; *entity theory of intelligence* (3 items) and *incremental theory of intelligence* (3 items). While entity theory of intelligence focus on students' beliefs that intelligence is fixed, stable and unchanging (e.g., "You have a certain amount of intelligence, and you really can't do much to change it"), incremental theory of intelligence reflects students' beliefs that intelligence can change and improve with time and experience (e.g., “No matter who you are, you can change your intelligence a lot”).

Later, Chen and Pajares (2009) revised the Implicit Theories of Intelligence Scale for Children-Self Form to adopt the items to measure students’ beliefs about their abilities in science rather than just in general intellectual abilities. Stipek and Gralinski’s (1996) assumption that adolescent students could have subject-specific ability beliefs guided Chen and Pajares’ work. Thus, during adaption of the Implicit Theories of Intelligence Scale for Children-Self Form, items were worded to focus students on the school science subject. Three of the revised items aimed to measure students’ entity theory of science ability (e.g., ‘‘You have a certain amount of science ability, and you really can’t do much to change it”) and three others aimed to measure their incremental theory of science ability (e.g., ‘‘No matter who you are, you can change your science abilities a lot”). Working with 508 sixth grade students attending science course, Chen and Pajares found that alpha coefficient for entity theory of ability subscale was .69 while that of incremental theory was .79. The authors named the revised instrument as the Implicit Theories of Science Ability Scale.

In the present study the ITSAS was adapted into Turkish (see Appendix B). And the translated version of the scale was examined by two other experts from the science education department in a large public university for its content validity. They also evaluated the quality of items in terms of their clarity and sentence structure. Additionally, the grammar structure of the translated items was examined by an instructor from Academic Writing Center located in a university. Considering the suggestions by the experts, the items were revised. Next, conveniently selected ten elementary students were asked to judge items in terms of their clarity. In general, students explained that together with entity theory of science ability, items of incremental theory of science ability were too repetitive. Considering the students' opinions and Dweck et al.'s (1995) suggestion that incremental theory of ability's items are likely to persuade students, only the items assessing the entity theory of science ability were decided to be included in Turkish version of the instrument. Indeed, using items depicting incremental theory of science ability together with entity theory of science ability items create a drift toward incremental theory of science ability choices over items even for the participants with entity theory of science ability since incremental theory of science ability's items are highly compelling and more socially desirable (Hong, Chiu, Dweck, Lin & Wan, 1999). For this reason, only items depicting entity theory of science ability were used in several studies (e.g., Chiu, Hong & Dweck, 1997; Dweck et al., 1995; Hong et al., 1999). However, the scores obtained from the entity theory of science ability items were reverse coded in the current study (i.e. for both pilot and main study) so that higher scores indicate higher levels of the belief that science ability can change and be improved with time and experience (i.e. incremental theory of science ability).

Thus, considering the abovementioned studies and students' opinion about the scale, only three-item subscale assessing entity theory of science ability was pilot tested during the adaptation of the ITSAS into Turkish. The instrument was pilot tested with 109 (62 girls and 47 boys) of seventh grade public elementary school students. Results of reliability analyses of the pilot study revealed that Turkish version of the ITSAS has sufficiently high internal consistency (Cronbach's alpha = .75). And before conducting confirmatory factor analysis (CFA), assumptions for it were checked. Accordingly, missing data analysis was conducted and the sample size of the data was checked which was large enough to conduct to CFA. Afterwards, assumptions concerning normality and linearity; outliers; absence of multicollinearity and singularity; and residuals were examined. Although any violation for the assumptions was not detected, considering a possible violation of multivariate normality, a CFA conducted with robust maximum likelihood estimation method. And the results of the CFA of the pilot study indicated that unidimensional factor structure of the ITSAS was saturated and model fit was perfect (RMSEA = .00, SRMR =.00, NFI = 1.00, CFI = 1.00, GFI = 1.00). Additionally, the lambda ksi estimates presented in Table 3.4 showed that items had large factor loadings for the pilot study. Overall, the ITSAS was found to provide a valid and a reliable measure of students' implicit theories of science ability.

Table 3.4 The Lambda ksi Estimates of the Pilot Study of the ITSAS

Question	LX Estimate	Subscale
q1	.67	
q2	.76	Incremental Theory of Ability
q3	.57	

According to above mentioned literature review and evidences, a CFA was performed to validate the factor structure of the ITSAS for the main study through the linear structural relations (LISREL) 8.80. The proposed model for the analysis was just-identified model since parameters of the model were uniquely estimated. Assumptions of structural equation modeling (SEM), explained in the following 3.6 Data Analysis part, were checked before the analysis. Firstly, missing data analysis was conducted and it was ensured that sample size was large enough to conduct CFA. Then, assumptions concerning normality and linearity; outliers; absence of multicollinearity and singularity; and residuals were examined. As presented in Appendix K, the items had univariate normality but there might be violation of multivariate normality. Therefore, robust maximum likelihood estimation method was used. In addition, outliers were considered in terms of univariate and multivariate and they were cleared before the analysis. Moreover, bivariate correlations between the items were examined (see Appendix L) for absence of multicollinearity and singularity and the program did not give any warning messages for their existence. Also, residuals of the analysis were taken in the consideration with provided modification indices. However, suggested modifications were be supported by the related literature and results of the CFA without any modifications revealed perfect model fit (RMSEA = .00, SRMR =.00, NFI = 1, CFI = 1.00, GFI = 1.00). Factor loadings as indicated by the lambda ksi values Table 3.5 were sufficiently high. In addition, Cronbach's alpha coefficient was found to be .71.

Table 3.5 The Lambda ksi Estimates of the ITSAS

Question	LX Estimate	Subscale
q1	.67	
q2	.76	Incremental Theory of Ability
q3	.57	

3.3.3 Epistemological Beliefs Questionnaire

The EBQ (Conley et al., 2004) is a self-report instrument on a five point Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). Conley et al. (2004) adapted the EBQ from Elder's (1999) work with elementary students. The final instrument has 26 items in four subscales, namely; *source of knowing* (5 items), *certainty of knowledge* (6 items), *development of knowledg*e (6 items), and *justification for knowing* (9 items). The source of knowing subscale composes of items concerning beliefs about knowledge residing in external authorities (e.g., "Everybody has to believe what scientists say").The certainty of knowledge subscale measures individuals' belief about singularity of a right answer (e.g., "All questions in science have one right answer"). The development of knowledge subscale has items regarding beliefs about science as an evolving and changing subject (e.g., "Some ideas in science today are different than what scientists used to think"). The justification for knowing subscale includes items related to the role of experiments and how individuals justify knowledge (e.g., “In science, there can be more than one way for scientists to test their ideas”).

During its adaptation, Conley et al. (2004) administered the EBQ to 187 fifth grade students in two different time periods. The source of knowing and the certainty of knowledge dimensions were recoded so that a higher score represented more sophisticated epistemological belief. The alpha coefficients were .81(time 1) and .82(time 2) for the source of knowing, .78 (time 1) and .79 (time 2) for the certainty of knowledge, .57(time 1) and .66(time 2) for the development of knowledge, .65(time 1) and .76(time 2) for the justification for knowing. Results of CFA for time1 were indicated a very good fit (CFI= .90, NNFI= .89, RMSEA= .038, RMR= .062) and the results were similar for time 2 beliefs.

The EBI was translated and adapted into Turkish by Özkan (2008). During its validation for Turkish elementary students, the researcher conducted a pilot study with 156 seventh grade students and a main study with 1240 seventh grade students. In the main study, with the guidance of the results of the pilot study, the researcher excluded negatively loaded two items to increase the reliability of the scale. In addition, exploratory factor analysis conducted in the pilot study suggested three factor-structures. While, the development of knowledge and the justification for knowing dimensions appeared as separate factors as expected, the source of knowing and the certainty of knowledge dimensions were found to merge in the factor analysis. In the main study, the CFA results for three-factor structure indicated a good model fit (AGFI= .91, RMSEA= .06, SRMR= .06). The alpha coefficients were .77 for the justification for knowing, .59 for the development of knowledge and .70 for the source/certainty dimension; also the reliability of the whole instrument with 24 items was .76.

In the present study the Turkish version of EBI (see Appendix C) was used to measure students' epistemological beliefs. Factor structure of the instrument was tested through CFA and results supported 4-factor structure. For the confirmatory data analysis the source of knowing and certainty of knowledge dimensions were recoded, in that way the higher scores represented sophisticated beliefs. Before running the CFA, missing data analysis was conducted and it was ensured that sample size was sufficient to conduct CFA. Then, underlying assumptions of normality and linearity; outliers; absence of multicollinearity and singularity; and residuals were checked. As presented in Appendix K, the items had univariate normality but there might be violation of multivariate normality. Therefore, robust maximum likelihood estimation method was used. In addition, outliers were considered in terms of univariate and multivariate and they were cleared before the analysis. Moreover, bivariate correlations between the items were examined (see Appendix L) for absence of multicollinearity and singularity and the program did not give any warning messages for their existence. Also residuals of the analysis were taken in the consideration with provided modification indices. However, suggested modifications were not supported by the related literature and results of the CFA without any modifications revealed good model fit (see Table 3.6). The proposed model for the analysis was over-identified model.

Table 3.6 The CFA Results of the EBQ

Scale name	RMSEA	SRMR	NFI	CFI	GFI
EBI	.04	.05	.95	.96	.95

The lambda ksi estimates presented in Table 3.7 showed that items had large factor loadings. In addition, the alpha coefficient was found to be .74 for the source of knowing dimension, .71 for the certainty of knowledge, .57 for the development of knowledge and .75 for the justification for knowledge. Therefore EBI appeared to provide a valid and a reliable measure of students' epistemological beliefs in four dimensions.

Table 3.7 The Lambda ksi Estimates of the EBQ

Question	LX Estimate	Subscale
q1	.53	
q6	.59	
q10	.60	Source of Knowing
q15	.58	
q19	.68	
q2	.45	
q7	.27	
q12	.61	Certainty of Knowledge
q16	.63	
q20	.65	
q23	.61	

Table 3.7 The Lambda ksi Estimates of the EBQ (continued)

Question	LX Estimate	Subscale
q4	.36	
q8	.41	
q13	.35	Development of Knowledge
q17	.52	
q21	.43	
q25	.53	
q3	.49	
q5	.43	
q9	.53	
q11	.52	
q14	.58	Justification for Knowing
q18	.52	
q22	.44	
q24	.49	
q26	.50	

3.3.4 The Achievement Goal Questionnaire

The AGQ, developed by Elliot and McGregor (2001), was used to measure students' achievement goals. It is a self-report instrument on a five-point Likert scale ranging from 1 (*never*) to 5 (*always*). It consists of 15 items in four subscales, namely; *mastery-approach goal* (3 items), *performance-approach goal* (3 items), *mastery-avoidance goal* (3 items) and *performance-avoidance goal* (6 items). Mastery-approach goal focuses on learning and understanding (e.g., "I desire to completely master the material that presented in this class") Performance-approach goal emphasizes showing abilities to others (e.g., "it is important for me to do better than other students"). Mastery-avoidance goal concerns avoiding not learning or misunderstanding (e.g., "I just want to avoid doing poorly in this class"). Performance-avoidance goal focuses on avoiding failure in comparison to others (e.g., “My goal for this class is to avoid performing poorly”).

Elliot and McGregor (2001) tested the AGQ with 180 undergraduate students and internal consistency reliabilities of this sample were .87 for the mastery-approach goal, .92 for the performance-approach goal, .89 for the mastery-avoidance goal, and .83 for the performance-avoidance goal. A CFA was conducted in order to assess proposed factor structure. The results indicated that a good model fit (RMSEA = .04, TLI = .99, CFI = .99).

The AGQ was translated and adapted into Turkish by Senler and Sungur (2007). The researchers conducted a validation study with 616 middle school students. The coefficient alpha values for the sample were found to be .81 for the mastery-approach goal, .69 for the performance-approach goal, 65 for the mastery-avoidance goal and .64 for the performance-avoidance goal. Results of both exploratory factor analysis and CFA supported the four factor structure of the instrument (GFI = .92, CFI = .92, NFI = .90, SRMR = .07).

In the present study, Turkish version of the AGQ (see Appendix D) was used to assess elementary students’ achievement goals in science course. In order to validate the four-factor structure, CFA was conducted using the LISREL 8.80. Before running the CFA, missing data analysis was conducted and it was ensured that sample size was large enough to conduct the analysis. Then, assumptions of normality and linearity; outliers; absence of multicollinearity and singularity; and residuals were checked. As presented in Appendix K, the items had univariate normality but there might be a violation of multivariate normality. Therefore, robust maximum likelihood estimation method was used. In addition, outliers were considered in terms of univariate and multivariate and they were cleared before the analysis. Moreover, bivariate correlations between the items were examined (see Appendix L) for absence of multicollinearity and singularity and the program did not give any warning messages for their existence. Also residuals of the analysis were taken in the consideration with provided modification indices. However, suggested modifications were supported by the related literature and results of the CFA without any modifications revealed good model fit (see Table 3.8). The proposed model for the analysis was over-identified model.

Table 3.8 The CFA Results of the AGQ

Scale name	RMSEA	SRMR	NFI	CFI	GFI
AGQ	.06	.05	.94	.95	.95

The lambda ksi estimates presented in Table 3.9 indicated that items had large factor loadings. In addition, the alpha coefficients were found to be.65 for the mastery-approach goal, .64 for the performance-approach goal, .73 for the mastery-avoidance goal and .73 for the performance-avoidance goal. Therefore AGQ appeared to provide a valid and a reliable measure of students' achievement goals four dimensions in the present study.

Table 3.9 The Lambda ksi Estimates of the AGQ

Question	LX Estimate	Subscale
q1	.59	
q4	.56	Mastery-Approach Goal
q6	.70	
q3	.54	
q7	.66	Performance-Approach Goal
q11	.63	
q8	.61	
q10	.74	Mastery-Avoidance Goal
q12	.74	
q2	.43	
q5	.64	
q9	.55	Performance-Avoidance Goal
q13	.53	
q14	.66	
q15	.54	

3.3.5 The Motivated Strategies for Learning Questionnaire

The MSLQ is 81-item self-report instrument developed by Pintrinch et al. (1991). Students rate themselves on a seven point Likert scale ranging from 1 (*not at all true of me*) to 7 (*very true of me*). The instrument has two main sections, namely; motivation section and learning strategies section. In the motivation section, there are 31 items assessing different aspects of students' motivation in a course in six subscales, namely; intrinsic goal orientation (4 items), extrinsic goal orientation (4 items), *task value* (6 items), control of learning beliefs (4 items), *self -efficacy for learning and performance* (8 items), and test anxiety (5 items). Learning strategies section consists of 50 items that assess students' use of different cognitive and metacognitive strategies. These items are loaded on nine factors, namely; *rehearsal* (4 items), *elaboration* (6 items), *organization* (4 items), *critical thinking* (5 items), *metacognitive self-regulation* (12 items), time and study environment (8 items), effort regulation (4 items), peer learning (3 items) and help seeking (4 items). Among these factors in learning strategies section, rehearsal, elaboration, organization, and critical thinking subscales represent cognitive learning strategies and metacognitive self-regulation represents metacognitive learning strategies.

Pintrich, Smith, Garcia and McKeachie (1993) conducted a validation study for the MSLQ with a sample of 380 college students from different majors. The Cronbach's alpha coefficients were found to be ranging from .62 to .93 on the Motivation Section. For the learning strategies section, the reliability coefficients varied between .52 and .80. CFA results indicated that six subscales had a reasonable model fit for motivation section (χ^2/df = 3.49, GFI = .77, AGFI = .73, RMR = .07). Also CFA results of learning strategies section with its nine subscales indicated a reasonable model fit (χ^2/df = 2.26, GFI = .78, AGFI = .75, RMR = .08).

The MSLQ was translated and adapted into Turkish by Sungur (2004). The Turkish version of the questionnaire was tested with 319 tenth and 169 eleventh grade high school students for biology course. The reliability values for the motivation section varied between .54 and .89. Also, the reliability coefficients for the learning strategies section ranged from .57 to .81. CFA results indicated that Turkish version of the MSLQ had similar fit indices for the motivation section one (χ^2/df = 5.3, GFI = .77, RMR = .11) and for the learning strategies section with the original version of the instrument (χ^2/df = 4.5, GFI = .71, RMR = .08).

Within the scope of the present study, seven subscales of the MSLQ (Appendix E) were used, namely; self-efficacy for learning and performance and task value subscales from the motivation section and rehearsal, elaboration, organization, critical thinking, and metacognitive self-regulation subscales from the learning strategies section.

In motivation section, self-efficacy for learning and performance subscale assesses students' judgments about their abilities to succeed in a science and their expectancies for success (e.g., "I believe I will receive an excellent grade in this class"). Task value subscale concerns students' beliefs related to a task's being interesting, important, and useful (e.g., "I think I will be able to use what I learn in this course in other courses").

In learning strategies section, considering Wolters' (2003) classification, items of rehearsal (e.g., " When I study for this class, I practice saying the material to myself over and over"), elaboration (e.g., "When reading for this class, I try to relate the material to what I already know"), organization (e.g., "When I study the readings for this course, I outline the material to help me organize my thoughts")and critical thinking subscales (e.g., " I often find myself questioning things I hear or read in this course to decide if I find them convincing") were consolidated to assess students' overall cognitive learning strategy use in science. In this section, metacognitive self-regulation subscale items assesses the extent to which students' use various metacognitive learning strategies such as planning, monitoring, and evaluating (e.g., "If the course materials are difficult to understand, I change the way I read the material").

In order to validate the proposed factor structure in the current study, a CFA was performed using the LISREL 8.80. Before running the CFA, missing data analysis was conducted and it was ensured that sample size is sufficient enough to conduct the analysis. Then, underlying assumptions normality and linearity; outliers; absence of multicollinearity and singularity; and residuals were examined. As presented in Appendix K, the items had univariate normality but there might be violation of multivariate normality. Therefore, robust maximum likelihood estimation method was used. In addition, outliers were considered in terms of univariate and multivariate and they were cleared before the analysis. Moreover, bivariate correlations between the items were examined (see Appendix L) for absence of multicollinearity and singularity and the program did not give any warning messages for their existence. Also residuals of the analysis were taken in the consideration with provided modification indices. However, suggested modifications were not supported by the related literature and results of the CFA without any modifications revealed good model fit (see Table 3.10). The proposed model for the analysis was an over-identified model.

Table 3.10 The CFA Results of the MSLQ

Scale name	RMSEA	SRMR	NFI	CFI	GFI
MSLQ(Motivation Section)	.05	.03	.99	.99	.95
MSLQ(Learning Strategies Section)	.05	.04	.98	.98	.92

The lambda ksi estimates were presented in Table 3.11 and they showed that items had sufficiently high factor loadings both for the motivation section and for the learning strategies section, respectively. In addition, in the present study, overall, reliabilities were high enough for each subscale to conduct further analysis: the alpha coefficient was .82 for task value subscale and .88 for self-efficacy for learning and performance in motivation section and .91 for cognitive learning strategies and .80 for metacognitive learning strategies in learning strategies section.

Table 3.11 The Lambda ksi Estimates of the MSLQ

The Motivation Section		
Question	LX Estimate	Subscale
q2	.70	
q3	.69	
q5	.70	Self -Efficacy for Learning and Performance
q6	.68	
q8	.72	
q9	.75	
q13	.66	
q14	.70	
q1	.54	
q4	.68	
q7	.68	Task Value
q10	.70	
q11	.68	
q12	.72	

Table 3.11 The Lambda ksi Estimates of the MSLQ (continued)

The Learning Strategies Section		
Question	LX Estimate	Subscale
q1	.50	
q4	.53	
q5	.58	
q7	.60	
q9	.63	
q10	.58	
q11	.53	
q12	.61	Cognitive Learning Strategies
q13	.65	
q18	.51	
q20	.57	
q21	.66	
q22	.64	
q23	.68	
q24	.64	
q25	.64	
q26	.59	
q27	.61	
q31	.55	
q2	.21	
q3	.56	
q6	.54	
q8	.52	
q14	.56	Metacognitive Learning Strategies
q15	.63	
q16	.52	
q17	.01	
q19	.67	
q28	.65	
q29	.65	
q30	.65	

3.3.6 The Tuckman Procrastination Scale

The TPS is a self-report instrument developed by Tuckman (1991) to measure procrastination tendencies. It is a four point Likert scale ranging from 1 (*strongly agree*) to 4 (*strongly disagree*).

During the scale's development procedure, 72-item scale was administered to 50 junior and senior college students (Tuckman, 1991). According to the results of factor analysis 35-item scale was generated from the original one. Afterwards, the 35- item scale was administered to 183 junior and senior college students. Based on the factor analysis results, 19 items were eliminated from the scale. Concurrent validity of the 16-items TPS was supported by the correlation with self-reported self-efficacy (*r* = -.47) and self-regulated performance (*r* = -.54). The reliability value of 35-item scale was .90 and .86 for 16-item scale. Both 35- item version and 16-item version of the TPS produced single factor structure and these items intend to assess students' tendencies to delay task or control task schedules or their inefficient abilities on their self-regulation (e.g., "I needlessly delay finishing jobs, even when they're important").

16-item version of the TPS was adapted to Turkish by Uzun Özer, Saçkes and Tuckman (2009). While the original scale was a four point Likert scale ranging from 1 (*strongly agree*) to 4 (*strongly disagree*) the translated and adapted version was a five point Likert scale. "Unsure" response was added the students' response to increase the reliability (Uzun Özer et al., 2009). The researchers conducted a validation study with 236 college students and they extracted two items according to their exploratory factor analysis. Cronbach's alpha coefficient for the scale was reported as .90. The CFA with 14 items indicated an acceptable model fit (χ^2/df =1.8, CFI = 0.95, CSDT = 44.70, GFI = 0.93, RMSEA = 0.06).

In the present study the Turkish version of 16-item TPS was used to measure elementary students' procrastination tendencies in science. Since grasping the meaning of the item "I delay making tough decisions" was difficult for elementary school level students and this item was eliminated from the scale prior to the administration. The 15-item TPS (see Appendix F) was pilot tested with 339 (171 girls and 168 boys) of seventh grade public elementary school students. Result pilot study revealed that Turkish version of the TPS has sufficiently high internal consistency (Cronbach's alpha = .91). And before conducting CFA analysis assumptions for it was checked. Before missing data analysis was conducted and the sample size of the data was checked which was large enough to conduct to CFA. Afterwards, assumptions concerning normality and linearity; outliers; absence of multicollinearity and singularity; and residuals were examined. Although any violation for the assumptions was not detected, considering a possible violation of multivariate normality, a CFA analysis conducted with robust maximum likelihood estimation method. And the CFA was conducted using the LISREL 8.80. CFA results of the pilot study indicated that unidimensional factor structure of the TPS was saturated and model fit was good (see Table 3.12).

Table 3.12 The CFA Results of the TPS of the Pilot Study

Scale name	RMSEA	SRMR	NFI	CFI	GFI
TPS	.09	.05	.96	.96	.91

Additionally, the lambda ksi estimates presented in Table 3.13 showed that items had acceptable factor loadings for the pilot study. Overall, the TPS was found to provide a valid and a reliable measure of students' procrastination.

Table 3.13 The Lambda ksi Estimates of the TPS of the Pilot Study

Question	LX Estimate	Subscale
q1	.70	
q2	.63	
q3	.56	
q4	.63	
q5	.70	
q6	.43	
q7	.64	
q8	.68	Procrastination
q9	.58	
q10	.64	
q11	.63	
q12	.66	
q13	.68	
q14	.70	
q15	.69	

In order to validate the factor structure of the TPS for the main study CFA was conducted using the LISREL 8.80. Before running the CFA, missing data analysis was conducted and it was ensured that sample size is sufficient enough to conduct the analysis. Then, underlying assumptions normality and linearity; outliers; absence of multicollinearity and singularity; and residuals were examined. As presented in Appendix K, the items had univariate normality but there might be violation of multivariate normality. Therefore, robust maximum likelihood estimation method was used. In addition, outliers were considered in terms of univariate and multivariate and they were cleared before the analysis. Moreover, bivariate correlations between the items were examined (see Appendix L) for absence of multicollinearity and singularity and the program did not give any warning messages for their existence. Also residuals of the analysis were taken in the consideration with provided modification indices. However suggested modifications were not supported by the related literature and results of the CFA without any modifications revealed good model fit (see Table 3.14) and any respecification in the model did not be done. In addition, the alpha coefficient for 15-item scale was .87.

Table 3.14 The CFA Results of the TPS

Scale name	RMSEA	SRMR	NFI	CFI	GFI
TPS	.08	.06	.95	.95	.91

The lambda ksi estimates presented in Table 3.15 showed items' factor loadings for the TPS was at acceptable levels.

Table 3.15 The Lambda ksi Estimates of the TPS

Question	LX Estimate	Subscale
q1	.61	
q2	.52	
q3	.61	
q4	.68	Procrastination
q5	.70	
q6	.32	
q7	.54	

Table 3.15 The Lambda ksi Estimates of the TPS (continued)

Question	LX Estimate	Subscale
q8	.66	
q9	.61	
q10	.62	
q11	.41	Procrastination
q12	.62	
q13	.44	
q14	.65	
q15	.42	

3.3.7 The Science Achievement Test

The SAT was developed by Yerdelen (2013) to assess seventh grade elementary students' science achievement (see Appendix G). It is a 14 multiple-choice item test covering the content of seventh grade elementary science and technology curriculum for the first semester. The elementary science and technology curriculum is implemented countrywide in all elementary schools in Turkey.

There are three main units covered in the first of seventh grade curriculum, namely; body systems (BS), force and motion (FM), and electricity (EC). 14 multiple-choice questions were selected from a pool of items used in previous years' level determination exam for seventh grade students. Level determination exam is administered countrywide by the Ministry of National Education. While selecting the items, in addition to the external contextual factors such as purpose, grade level, time and administration, Yerdelen (2013) also considered internal test attributes like number of objectives (BS = 27, FM

= 31 and EC = 32), number of class hours (BS = 30, FM = 16 and EC = 16) and percentage in the curriculum (BS = 20.8 %, FM = 11.1% and EC = 11.1%). Accordingly, there are seven questions related to the body systems unit, four questions related to the force and motion unit and also four questions related to the electricity unit in the test. Items were classified according to the Bloom's taxonomy as knowledge level questions (q.9 and q.11), comprehension level questions (q.1, q.4, q.5, q.6, q.7, q.8, q.10, q.12, q.13 and q.14) and application level questions (q.2 and q.3).The reliability coefficient of SAT was computed by Kuder Richardson 20 (KR) formula and found to be .78 in Yerdelen's (2013) study.

The SAT was administered to assess the science achievement of the seventh grade students in the present study and KR 20 for the test was .75.

3.4 Data Collection

In the current study, firstly, the research problem was identified and the related literature was reviewed. Previous studies were searched from Educational Resources Information Center (ERIC), the Ebscohost, Science Direct and International Dissertations Abstracts databases, National Thesis Center, TUBITAK-ULAKBIM, and library of Middle East Technical University (METU). After the literature review, the hypothesized path model was proposed. Then, data collection instruments were selected. Next, elementary schools where the study was to be conducted were identified and necessary permission was taken from the Ministry of Education for the administration of the instruments (see Appendix H). The pilot and main study were conducted during the 2011-2012 academic year. The data were collected with using four page optical forms for the ease of administration and data entry.

During data collection, students, teachers and administrators were informed about the purpose of the study and necessary explanations were done before administration. Participants were granted that the study would not affect their neither physically nor psychologically. Besides, the participants were informed that the results of the study would not affect any school grades ensuring that name of the schools or students were not collected. Students who refused to participate in the study were not compelled and participants were given the chance to withdraw at any time they feel discomfort. Directions written on the instruments were read loudly to students and it was explained that there were no right or wrong response in the self-report instrument and their opinions were important. The administration process nearly took 40 minutes.

Ethical principles were also considered in the current study. The instruments, used in this study, and the planned design of the study were checked and approved by the ethics committee of METU. Additionally, instruments and planned design of the study were examined and deemed suitable to conduct the study by the Ministry of education. Students' voluntarily participate in the study. Also consent forms were prepared before the data collection procedure for both students and their parents (see Appendix I). These forms included information concerning aim and procedure of the research and e-mail addresses and phone numbers of the researcher. Instead of using students' names, numbers were assigned to each optical form to provide confidentiality of participants. As well as, participants were informed about the aim of the study and the data collection procedure. Consequently, the current study was conducted by considered the ethical concerns.

3.5 Preventing Threats to Internal Validity of the Study

Internal validity of a correlational study means that the obtained relationships between the variables should be explicit, that is the association should not be interrupt by any factor which is not in the scope of the study (Fraenkel & Wallen, 2006). The possible threats to internal validity of a correlational study are subject characteristics, loss of subjects (i.e., mortality), instrumentation and location. Necessary precautions were taken considering the possible threats to internal validity for the current study. While selecting the sample of the current study sample, it was focused on only seventh grade elementary students since the variables of the current study could be affected by the age of the participants as subject characteristics. Also, regarding the instrumentation threat same data collector was used to standardized data collection process and prevent the effect of data collector characteristics on the participants of the current study. In addition, with applying the instruments of the present study in and only one time another precaution was taken for loss of the participants.

Although, the conditions were tried to be standardized considering the lighting, ventilation and noise in the classrooms during the administration of the instrument and the test, location threat was possible for the current study because participants were taken from different schools and different classroom conditions.

3.6 Data Analysis

Descriptive statistical analysis, assumption check and reliability analysis were conducted with SPSS 22 for Windows in the current study. Two special types of SEM, namely; CFA and path analysis were conducted using the LISREL 8.80. SEM is a collection of statistical techniques to test the relationships between one or more independent variable/s with one or more dependent variable/s and it has some special types of analysis such as CFA and path analysis (Tabachnick & Fidell, 2007). SEM could be conducted with different computer programs, namely; EQS, AMOS, SAS CALIS and LISREL. The LISREL 8.80 for Windows (Jöreskog & Sörborn, 2006) were used in the current study. SEM has five basic steps which are model specification, model identification, model estimation, model testing, and model modification (Boomsma as cited in Schumacker &Lomax, 2004). SEM has assumptions about sample size and missing data; normality and linearity; outliers; absence of multicollinearity and singularity; and residuals (Tabachnick & Fidell, 2007). Specifically, path analysis was conducted to test the proposed model in the current study.

3.6.1 Descriptive Statistics

Descriptive statistics are used to describe the characteristics' of the sample, to check any violations of assumptions of statistical analysis and to address specific research questions (Pallant, 2013). Mean, standard deviation, range of scores, skewness, kurtosis, frequencies and percent of variables are examples of descriptive statistics and they are utilized according to type of variable; continues or categorical (Pallant, 2013).

In the current study, means, standard deviations, minimum and maximum values, frequencies, percent of variables were examined by utilizing SPSS 22.

3.6.2 Steps in Structural Equation Modeling

As mentioned above, two special types of SEM, namely; CFA and path analysis were conducted in the presents study. SEM has five steps, namely; model specification, model identification, model estimation, model testing, and model modification (Boomsma as cited in Schumacker &Lomax, 2004). Their requirements were presented below.

3.6.2.1 Model Specification

Hypothesis of the model are specified according to the relevant literature and it is the phase to construct a model (Kline, 2011; Tabachnick & Fidell, 2007). These could be represented by either drawing a model diagram or describing by series of equations (Kline, 2011). The representation of the model is done by determining every relationship and parameter of interest in the model (Schumacker & Lomax, 2004). To avoid the specification error a careful review of theory and a model reflecting the true picture of reality is needed (Kline, 2011; Olobatuyi, 2006).

3.6.2.2 Model Identification

In a specified model, sample data are used to estimate the parameters of the model and these parameters are used to calculate the population covariance matrix if the model is identified (Tabachnick & Fidell, 2007). There are three steps in model identification (Tabachnick & Fidell, 2007).

The first step involves counting the number of observations and parameters in the model. If v is the number of observed variables, then the number of observations equals v (v + 1)/2 when means are not analyzed" (Kline, 2011, p.101). And the number of parameters is "direct effects on endogenous variables from other variables, either exogenous or endogenous; and the variances and covariances of exogenous variables" (Kline, 2011, p.96). So the degrees of freedom (df_m) of the model is equal the differences between number of observation (p) and number of parameters (q) of the model (Kline, 2011). According to the degrees of freedom (df_m) there are three levels of model identification (Schumacker &Lomax, 2004; Kline, 2011; Tabachnick & Fidell, 2007);

a) Underidentified: It is the model that one or more parameters of the model may not uniquely estimated ($df_m < 0$).

b) Just-identified: It is the model that parameters of the model uniquely estimated ($df_m=0$).

c) Overidentified: It is the model that parameters of the model can be estimated with more than one way ($df_m > 0$).

Sufficient identification of the model is possible if the degree of freedom of the model is at least zero ($df_m \geq 0$) (Schumacker &Lomax, 2004; Kline, 2011; Tabachnick & Fidell, 2007).

The second step involves the assigning a metric scale for every the latent variable (Schumacker &Lomax, 2004; Kline, 2011; Tabachnick & Fidell, 2007). Also, error terms of observed variables represented in the model as latent variable and they need a scaling. The LISREL scales the latent variables in two ways; a reference variable is assigned to a latent variable by the researcher as the first way and if researchers do not assign a reference variable by fixing the coefficient to a non-zero value, the program will standardized the latent variable as the second way (Jöreskog & Sörborn, 1993).

The third step in model identification is to determine the types of structural model, whether it is recursive or nonrecursive. Recursive models are straight forward (Kline, 2011). Nonrecursive models include feedback loops between dependent variables with correlated error terms between these variables (Kline, 2011; Tabachnick & Fidell, 2007). If there are correlation between dependent variables' error terms, the model labeled as whether a bow-free pattern or bow pattern depend on the existence of unidirectional effects between the dependent variables (Kline, 2011). A bow-free pattern has correlated error terms between endogenous variables but there is not direct effect between them and the model can be treated as recursive model in the analysis (Kline, 2011). On the other hand, there is direct effect between the dependent variables with correlated error terms between those variables in a bow pattern and they are treated as nonrecursive model in the analysis.

3.6.2.3 Model Estimation

There are different methods to estimate the population parameter such as; unweighted or ordinary least squares, generalized least squares and maximum likelihood (Schumacker & Lomax, 2004). But the SEM used maximum likelihood as a default in many model-fitting programs (Kline, 1998). maximum likelihood has three assumptions, these are; large sample size, continues scales and multivariate normality (Brown, 2006). Non-normality in maximum likelihood analysis may not affect parameter estimation but it creates biased standard errors and gives poor results χ^2 test for overall model fit since assumption of a linear model become invalid with extreme non-normality (Brown, 2006). Therefore, using robust standard errors and χ^2 test is better for non-normal and continuous variables (Bentler as cited in Brown, 2006). As maximum likelihood, robust maximum likelihood provide the same parameters but it corrects the standard errors and χ^2 test for non-normality in large samples so it is the best approach to use robust maximum likelihood method for non-normally distributed data (Brown, 2006).

3.6.2.4 Model Testing

Model testing includes the testing how well the data fit the theoretically proposed model (Jöreskog & Sörbom, 1993; Schumacker & Lomax, 2004). The main goal of the researchers using the SEM and its applications such as path analysis and CFA is to get statistical significant models besides the practically meaningful models. There are three commonly used criteria to check the statistical significance and theoretical meaning of a model in literature (Schumacker & Lomax, 2004). The first one is non- statistical significance of chi square test and root mean square error of approximation (RMSEA) to judge the statistical significance of the model as global model fit criteria (Schumacker & Lomax, 2004). The second one is the individual parameter estimates for the paths and it refers to t value of 1.96 at the .05 level of significance (Schumacker & Lomax, 2004). The direction and magnitude of the parameter estimates is the third criteria for the statistical significance (Schumacker & Lomax, 2004).

Different model fit indices are reported in literature but most widely reported are root mean square error of approximation (RMSEA), standardized root mean square residual (SRMR), normed fit index (NFI), comparative fit index

(CFI) and goodness-of-fit index (GFI) (Kline, 2011). In addition, Chi Square (χ^2) model test is used with small sample size and it gives statistical significant result in large samples (Kelloway, 1998; Kline, 2011).

3.6.2.5 Model Modification

If data do not fit the theoretically proposed model, respecification of the model is done with examining the modification indices (Schumacker & Lomax, 2004; Raykov& Marcoulides, 2006). Modification indices are given in the output of the LISREL program. There is not any certain rule for how large a modification index should be, but statistically the highest modification index and related parameters are considered first if it has theoretical sound and do not contradict with the related literature (Raykov& Marcoulides, 2006).

3.6.3 Assumptions of Structural Equation Modeling

This part includes requirements to conduct a Structural Equation Modeling. According to Tabachnick and Fidell (2007) sample size and missing data; normality and linearity; outliers; absence of multicollinearity and singularity; and residuals should be examined. Sample size and missing data; normality and linearity; and outliers should be checked before conducting analysis (Schumacker &Lomax, 2004; Kline, 2011; Tabachnick & Fidell, 2007). In addition, absence of multicollinearity and singularity assumption is ensured in SEM programs if the program is converged and programs do not abort the analysis and give any warning messages about covariance matrix's singularity

(Tabachnick & Fidell, 2007). Moreover, residuals are reported in the output (Schumacker &Lomax, 2004; Tabachnick & Fidell, 2007).

3.6.3.1 Sample Size and Missing Data

SEM necessitates large sample size but there is no a general agreement about it. At this point considering the minimum sample size according to analysis is required. The minimum sample size according to *N:q* rule (N is number cases and q is number of parameters in the model) would not be less than is 10:1 (Jackson as cited in Kline, 2011). In the current study the ratio for 10:1 were used to check the sample size for both CFA and path analysis.

According to Tabachnick and Fidell, (2007) missing data is a widespread problem in the data analysis procedure but rather than the amount of it, its distribution pattern is more important. The distribution of the missing data occurs in two ways in a data set, namely; random and nonrandom. Nonrandom missing data distribution creates an important problem for generalizability of results. On the other hand, random distribution of missing data causes less serious problem. The missing percentage equal or less than 5% from a large sample in a random pattern creates less serious problem and handling methods of it creates similar results. Schumacker and Lomax (2004) stated that there are ways to handling the missing data including deleting subjects, replacing the missing data and using robust statistical procedures.

In the current study, students with no answer any of the whole scales or test subtracted from the analysis completely. The missing percentages of the remaining data were less than 5% (see Appendix J). The missing data about background characteristics of students were remained as it was. The missing data for SAT were replaced by zero assuming that if students do not attempt an item, this indicates that students do not know the answer. The missing values of items of the ITSAS, EBQ, AGQ, MSLQ and TPS were replaced with items' mode values. The mode values of each item for each classroom were calculated and replacement procedure was done separately for each classroom because assessed variables may be influenced by classroom context.

3.6.3.2 Normality and Linearity

SEM is based on multivariate normality assumption. Multivariate normality means that; normal univariate distribution of all individual variables, normal bivariate distribution of any pair of the variables, and linear and homoscedastic bivariate scatterplots (Kline, 2011). Multivariate nonnormality can be detected from univariate distribution of variables and univariate normality can be checked by using skewness and kurtosis values in a single variable (Kline, 2011). Absolute skewness value for a variable greater than 3 and absolute kurtosis value for a variable greater than 10 described as extreme (Kline, 2011).

In the current study, skewness and kurtosis value for variables were used to detect the univariate and multivariate non-normality. Also, multivariate skewness and kurtosis values in the output were checked for each path analysis and CFA.

Linearity means that there is a straight-line relationship between two variables and SEM techniques need to examine the linear relationships between variables (Schumacker &Lomax, 2004; Tabachnick & Fidell, 2007). According to Tabachnick and Fidell (2007) testing linearity between all variables is not feasible so the scatter plots between selected variables could be examined to assess the linearity.

In the current study, bivariate scatter plots of variables were examined for path analysis. Although, variables have at least five response categories could be treated as continues if sample size is large and variables have approximately normal distribution (Bentler & Chou, 1987; Cohen, Cohen, West & Aiken, 2003).

3.6.3.3 Outliers

Outliers are data which are different from other data or split off the data at that point (Stevens, 2009; Tabachnick & Fidell, 2007). There are two types of outliers, namely; univariate outliers and multivariate outliers. Extreme value on a variable causes univariate outliers. Unusual combination of two or more variables' scores generates multivariate outliers. Univariate outlier can be detected with standardized scores, z scores, on one or more continues variables. In large samples z scores around 4 in absolute value considered as potential outliers (Stevens, 2009). The combination of scores on different dependent variables is strange if there is multivariate outlier (Pallant, 2013). It can be detected by Mahalonobis' distances determining the critical chi-square value at alpha level .001, using number of independent variables as degrees of freedom (Tabachnick & Fidell, 2007).

In the current study, z scores were used to detect the univariate outliers and Mahalonobis distances were used to identify multivariate outliers for CFA and path analysis.

3.6.3.4 Absence of Multicollinearity and Singularity

If there is perfect linear combination or extremely high correlation between the variables of the model, the required matrices cannot be inverted in SEM programs such as the LISREL, and the program gives a warning message (Tabachnick & Fidell, 2007). Additionally, bivariate correlations between variables could indicate the presence of multicollinearity and singularity in the data if they are equal or above the .90 (Tabachnick & Fidell, 2007).

In the current study, warning messages of the LISREL were examined in terms of presence of multicollinearity and singularity, since the program is very sensitive towards multicollinearity and singularity and does not conduct the analysis if they exist between the variables. In addition, bivariate correlation between variables of CFA and path analysis were checked for absence of multicollinearity and singularity.

3.6.3.5 Residuals

Residuals in SEM is residual covariances, they should be small and around zero with symmetrical frequency distribution (Tabachnick & Fidell, 2007). Since interpreting fitted residuals is difficult, standardized residuals are preferable and they are interpreted as z scores (Brown, 2006). While positive standardized residuals indicate the model's parameters underestimate of the relationship between two indicators to some extent, negative standardized residuals suggested the overestimation (Brown, 2006). However, sample size affects the size of standardized residuals and indicating criteria for them is difficult (Brown, 2006). If large standardized residuals are found analyzing the Lagrange Multiplier (LM) test is helpful and the LISREL provide univariate LM test as Modification Indices in the output (Tabachnick & Fidell, 2007).

In the current study, standardized residuals' statistics provided by the LISREL were examined with Modification Indices of the CFA and path analysis.

3.6.4 Assessing Model Fit

Chi Square (χ^2) model test, root mean square error of approximation (RMSEA), standardized root mean square residual (SRMR), normed fit index (NFI), comparative fit index (CFI) and goodness-of-fit index (GFI) were reported as model fit indices in the current study. The descriptions of the used model fit indices and their critical values for interpretation were presented in this part.

Chi Square (χ^2): Chi Square value compares observed and estimated variance-covariance matrices (Kelloway, 1998). A significant χ^2 value reveals that the observed and estimated variance-covariance matrices differ and a nonsignificant χ^2 points that the matrices are similar value (Kelloway, 1998; Kline, 2011; Schumacker & Lomax, 2004). To demonstrate the constructed model fit the data a nonsignificant χ^2 value is compared with tabeled χ^2 value for the given degrees of freedom (Schumacker & Lomax, 2004).Since the sample size of the present study is large (4510 participants) and chi square is sensitive to sample size and tends to indicate a significant value (Schumacker & Lomax, 2004; Kline, 2011), chi-square is not an appropriate goodness-of-fit criterion for the current study.

Root Mean Square Error of Approximation (RMSEA): The RMSEA is a badness-of-fit index and measure the error of approximation based on the difference between the model fit to sample covariance matrix and to the population covariance matrix (Kline, 2011). The value larger than .10 indicate bad model fit (Browne & Cudeck as cited in Tabachnick & Fidell, 2007).

Standardized root mean square residual (SRMR): The SRMR measures the overall difference between the observed and predicted correlations according to covariance residual (Kline, 2011). The value range between 0 to 1 and values less than .08 indicate good model fit (Hu & Bentler as cited in Tabachnick & Fidell, 2007).

Normed Fit Index (NFI): The NFI is used interpret the percentage improvement in the specified model over the baseline model which assumes that there is no relation between the observed variables (Kelloway, 1998). The value range between 0 to 1 and values larger .90 indicate good model fi fit (Hu & Bentler as cited in Raykov& Marcoulides, 2006).

Comparative Fit Index (CFI): The CFI measures relative improvement in fit of the constructed model over the baseline model and the index is related with noncentral χ^2 distribution (Kelloway, 1998; Kline, 2011). The value range between 0 to 1 and values greater than .90 indicate good model fit (Bentler as cited in Kelloway, 1998).

Goodness-of-Fit Index (GFI): The GFI is based on the ratio of the sum of the squared differences between the observed and reproduced matrices to the observed variances (Schumacker & Lomax, 2004). The value range between 0 to 1 and values greater than .90 indicate good model fi fit (Hu & Bentler as cited in Raykov& Marcoulides, 2006).

The interpretations of the commonly used fit indexes are done according to some critical values. These critical values for model fit indexes are presented in the Table 3.16.

Table 3.16 Interpretation of Most Commonly Used Model Fit Indexes

Model fit index	Acceptable Range	Interpretation
Chi-square	Tabled χ^2 value	Compares obtained χ^2 value with tabled value for given df.
Root mean square error of approximation (RMSEA)	0 (perfect fit) to 0.1 (fair fit)	Value below .05 indicates very good fit.
Standardized root mean square residual (SRMR)	0 (the best fit) to 1 (no fit)	Value below.08 indicates acceptable fit.
Normal Fit Index (NFI)	0 (no fit) to 1(the best fit)	Value close to .90 indicates a good fit.
Comparative Fit Index (CFI)	0 (no fit) to 1(the best fit)	Value close to .90 indicates a good fit.
Goodness-of-fit index (GFI)	0 (no fit) to 1 (the best fit)	Value close to .90 indicates a good fit.

3.6.5 Path Analysis

Path analysis, a special type of SEM, provides developing and testing theories based on the three major steps, these steps are; drawing a path diagram according to a theory or a set of hypothesis, calculating path coefficients using regression technique and deciding the indirect effects (Olobatuyi, 2006). In the present study path analysis was run to examine the patterns of relationships among seventh grade elementary students' implicit theories of abilitys, epistemological beliefs, motivational beliefs, learning strategies, procrastination, and their science achievement by using the LISREL 8.80 for Window with SIMPLIS command language.

3.6.5.1 Definition of Terms

Definition of the most frequently used terms in path analysis and CFA are represented below.

Path Diagram: It is a graphical representation of the variables with direct and indirect effect (Kline, 2011; Olobatuyi, 2006). Common path diagram symbols were presented in Figure 3.1.

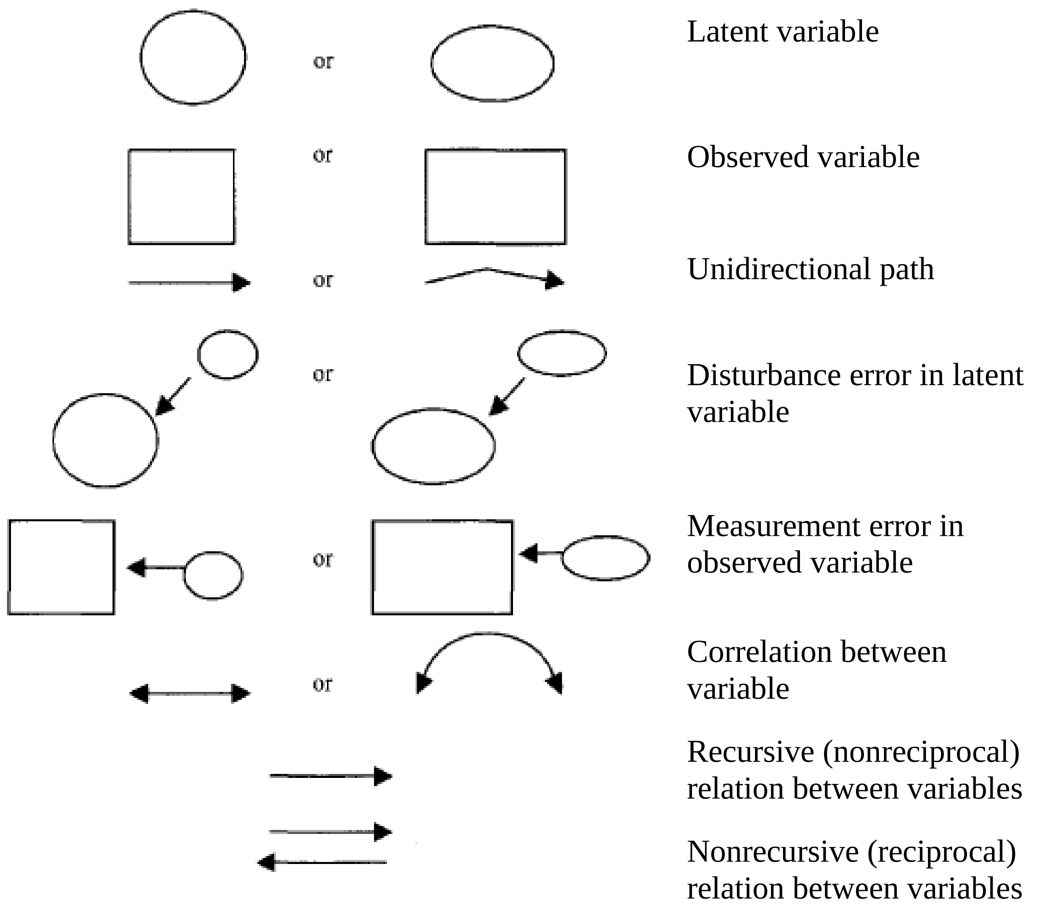


Figure 3.1 Common Path Diagram Symbols. From *A Beginner's Guide to Structural Equation Modeling* (p.153), by R. E. Schumacker and R. G. Lomax, 2004, Mahwah, NJ: Erlbaum. Copyright (2004) by Lawrence Erlbaum Associates, Inc. Reprinted with permission.

Path Coefficient: It is a numerical interpretation of the relationship between variables in the path analysis. Path coefficient calculated as the amount of change in the dependent variable when the independent variable is changed one unit (Olobatuyi, 2006). It is represented by symbol "P_{ij}" (i: dependent variable; j: independent variable).

Coefficient of Determination (index of association): It indicates that how much of a variance of a variable is explained by other variables. It is represented by R^2 in multivariate analysis and it shows the proportion of variation in dependent variable which is explained by the independent variable(s) (Olobatuyi, 2006).

The Measurement Coefficients: λ_y and λ_x indicates the relationships between latent variables and observed variables known as factor loading. Also, they are used as validity coefficients as well (Schumacker & Lomax, 2004).

The Structure Coefficients: β (beta) and γ (gamma) are structure coefficients. While β indicates the relationships between dependent variables, γ represent the relationships between dependent and independent variable, but both of them give strength and direction of the relationship between variables (Schumacker & Lomax, 2004).

Residual (error term; disturbance term): It is unexplained part of the dependent variable after subtracting the part that is explained by independent variable(s) from total variance in the dependent variable. It is represented by "E" (Olobatuyi, 2006).

Endogenous Variable (dependent variable): It is the variable that its variation is explained by independent variable and represented by “Y” (but commonly “X” is used for any variable in path analysis; Olobatuyi, 2006).

Exogenous Variable (independent variable): It is the variable that it affects the dependent variable and represented by “X” (Olobatuyi, 2006).

Latent Variable (constructs or factors): It is the variable that is not directly observed or measured and inferred from other variable(s) (Schumacker & Lomax, 2004).

Observed Variable (measured or indicator variable): It is a set of variables used to infer a latent variable (Schumacker & Lomax, 2004).

Direct Effect: It is the effect of a variable on another one which is not mediated by other variables (Olobatuyi, 2006).

Indirect Effect: It is the effect of one variable on another variable and the effect is mediated by at least one other variable (Schumacker & Lomax, 2004; Olobatuyi, 2006). It is calculated by multiplying the path coefficients of the paths through intervening variables (Olobatuyi, 2006).

Total Effect: It is the sum of the direct and indirect effect of independent variable on dependent variable (Olobatuyi, 2006).

3.6.5.2 Benefits and Limitations of Path Analysis

The pioneer of the path analysis, Sewall Wright, developed the method to study the direct and indirect effect to solve complex genetic problems (Schumacker & Lomax, 2004; Olobatuyi, 2006). Then the path analysis technique was adapted to social science to test the theoretical relationships.

The main advantage of the path analysis is that it provides the clear and distinctive results for the theoretical relationships. Also, the path analysis gives chance to researchers to assess different relationships between variables and compare these relationships between groups of study. Another advantage of it is computing results about dependent variable such as path coefficients (i.e., gives the magnitude of change in the dependent variable when the independent variable is changed) and residual (i.e., unexplained part of the dependent variable; Olobatuyi, 2006). The other one is that researchers are able to measure and examine the direct effect, indirect effect and unanalyzed correlation between variables. Also, path analysis gives path diagrams as an output of the analysis to provide visual representations of complex models and these representations facilitate the readers understanding. Path diagrams give researchers opportunity to construct theories, test the qualification of theories and measurements and also test the concurrence between theories and observation (Kline, 2011; Schumacker & Lomax, 2004; Olobatuyi, 2006).

Path analysis is a complex form of regression analysis and it is more powerful than it. An ordinary regression analysis only gives mathematical correlational results but path analysis makes it possible to examine the causal process between the relationships and interpret the alternative paths and their direct and indirect effects (Olobatuyi, 2006). According to Schumacker and Lomax (2004), examination of causal modeling with path analysis could be possible between two variable if there are; i) time order between variables, ii) covariation or correlation between variables, iii) control for other causes. Another difficulty faced with conducting the path analysis in social sciences is the violation of assumptions especially the interval level scale and linearity (Olobatuyi, 2006). Path analysis is useful to test more than one hypothesis in a single path diagram but its use for hypothesis including feedback loops are very restricted (Olobatuyi, 2006). Also, sometimes misleading path diagrams are validated and the results indicate merely a statistical fantasy. Leaving out the interpretation of path diagrams' results to the readers may also cause misinterpretations.

CHAPTER IV

RESULT

This chapter addresses results of the study in three sections namely; descriptive statistics, assumption of path analysis and steps of path analysis. In the descriptive statistics part, mean, standard deviation, and frequency distributions of the variables were analyzed. To check the assumptions of path analysis; sample size and missing data, normality and linearity, outliers, absence of multicollinearity and singularity, and residuals were examined. Also, model specification, model identification, model estimation and model testing were presented in the steps of path analysis part. In addition, directions and significance of the paths indicating the relationships between variables of the model were reported in the result of path analysis part.

4.1 Descriptive Statistics

Descriptive statistics for the variables of the study were represented in this part. Accordingly, the part includes the mean (*M*), standard deviation (*SD*), minimum (*Min.*) and maximum (*Max.*) values of each variable and each item. Also, responses of participants were reported as percentages (%) for each item.

4.1.1 Descriptive Statistics for the Implicit Theories of Ability

In the current study, in order to measure students' implicit theories of ability specifically about science, the subscale of the Implicit Theories of Science Ability Scale (ITSAS; adapted from Implicit Theories of Intelligence Scale for Children-Self Form developed by Dweck, 1999) assessing entity theory of ability about science was utilized. The mean score of entity theory of ability scale was 3.55 (*SD* = 1.36) on six-point scale suggesting that students tend to possess the belief that science ability cannot be changed and improved at moderate levels (see Table 4.1).

Table 4.1 Descriptive Statistics of the ITSAS

Subscale	*M*	*SD*	*Min.*	*Max.*
Entity Theory of Ability	3.55	1.36	1.00	6.00

Percentages of students' responses on six-point scale ranging from "strongly disagree" to "strongly agree" for each item and these items' mean values were displayed in the Table 4.2. Mean scores at item level also revealed that seventh grade students have a moderate level of tendency to believe that science ability belief cannot be changed and improved. According to the findings, there were bipolar accumulation on two sides; 21.30% mostly disagree and 21.70% strongly agree for the first item which states that "You have a certain amount of science ability, and you really can't do much to change it". More than half of the students agreed (i.e., strongly agreed, agreed, or mostly agreed) with the second item stating that “Your science ability is something about you that you can’t change very much”. Approximately one-fifth of the students (20.30 %,) mostly agreed with the third item stating that “You can learn new things, but you can’t really change your basic science ability”. Before the path analysis, items were reverse coded so that higher scores indicate having higher levels of incremental theory of ability about science.

Table 4.2 Descriptive Statistics for the ITSAS's Items

				Percentage (%)					
Subscale	Items	*M*	*SD*	Strongly Disagree	Disagree	Mostly Disagree	Mostly Agree	Agree	Strongly Agree
Entity Theory of Ability	1. You have a certain amount of science ability, and you really can't do much to change it.*	3.36	1.71	21.30	15.00	12.80	21.70	16.00	13.20
	2. Your science ability is something about you that you can't change very much.*	3.58	1.71	16.40	15.80	13.90	18.40	18.60	16.90
	3. You can learn new things, but you can't really change your basic science ability.*	3.71	1.71	15.20	13.70	13.10	20.30	18.10	19.50

*Item was used as reversed coded in the path analysis.

4.1.2 Descriptive Statistics for Epistemological Beliefs

Epistemological beliefs of the participants were examined under four subscales, namely; source of knowing, certainty of knowledge, development of knowledge and justification for knowing for science course. The mean scores of the Epistemological Beliefs Questionnaire's (EBQ, Conley, Pintrich, Vekiri & Harrison, 2004) subscales ranged from 2.64 (*SD* = .85) to 4.27 (*SD* = .50) on five-point scale (see Table 4.3).

The highest mean score was gathered on justification for knowing subscale (*M* = 4.27, *SD* = .50) which indicates that the participants of the current study had sophisticated beliefs about the role of experiments and how individuals justify knowledge since the mean value was very close to highest point, five. Also, the mean score of the development of knowledge dimension (*M* = 3.87, *SD* = .56) suggested that participants of the study had sophisticated beliefs about the possibilities of change in scientific knowledge depend on the progress of science. Considering the fact that the highest score represented the naïve beliefs for certainty of knowledge and source of knowing dimensions, the mean score of source of knowing subscale (*M* = 2.64, *SD* = .85) suggested that students tend to hold naive beliefs on source of knowing dimension. On the other hand, the mean score on certainty of knowledge subscale (*M* = 3.07, *SD* = .80) indicated that students have less naive beliefs on this dimension compared to source of knowing dimension.

Table 4.3 Descriptive Statistics of the EBQ's Subscale

Subscales	*M*	*SD*	*Min.*	*Max.*
Source of Knowing*	2.64	.85	1.00	5.00
Certainty of Knowledge *	3.07	.80	1.00	5.00
Development of Knowledge	3.87	.56	2.00	5.00
Justification for Knowing	4.27	.50	2.44	5.00

*The subscale was used as reversed coded in the path analysis to get sophisticated beliefs.

Indeed, item level analysis of students' responses revealed that the lowest mean score (M = 2.24, SD = 1.19) was obtained from the first item of the source of knowing dimension "Everybody has to believe what scientists say" as seen in the Table 4.4. Mainly, mean scores of the all items, except the item 15, belonging to source of knowing subscale were lower than mid-point on five-point scale and very close to each other so students responses indicated that they were mainly have sophisticated beliefs about the source of scientific knowledge. Specifically, nearly half of the participants responded as never and rarely on the item 1, 6, 10 and 19, disagree with the idea that scientific knowledge, exist in external authorities. On the other hand, the mean score for the item 15 "If you read something in a science book, you can be sure it's true" was 3.23 (SD = 1.08) which was the highest mean value for source of knowing subscale and less than quarter of the participants responded as the item as "never" and "rarely".

Mean values were ranged from 2.39 (*SD* = 1.29) to 4.14 (*SD* = 1.06) on certainty of knowledge subscale (see Table 4.4). The item 12 “Scientists pretty much know everything about science; there is not much more to know” had the lowest mean 2.39 (*SD* = 1.29) and more than half of the participants responded to the item as “never” and “rarely” which indicates that they had low naïve beliefs about the item. On the contrary, more than 75% of the participants responded the item seven “The most important part of doing science is coming up with the right answer” as “often” and “always” so the item had the highest mean value (*M* = 4.14, *SD* = 1.06) and indicated that most of the students had naïve beliefs about the item. Roughly, the most frequent answer to item 2, 16, 20 and 23 was “sometimes”, suggesting that participants had moderate naïve beliefs about the uniqueness of scientific knowledge.

Concerning the development of knowledge subscale (see Table 4.4), item 13 which states that “There are some questions that even scientists cannot answer” had the highest mean value (4.26, *SD* = 1.01). Consistent with students’ responses to this item, rest of the items had high mean value on five-point scale for development of knowledge subscale and they ranged from 3.67 (*SD* = 1.03) to 3.96 (*SD* = .95). More than half of the participants had the belief that science has evolving characteristic as revealed by “often” and “always” responses to the all items of development subscale.

Participants responded consistently for the justification for knowing subscale since the mean values for all items were equal or higher than 4.00 (see Table 4.4). For instance, more than 90% of students gave “often” or “always” responses for item five “In science, there can be more than one way for scientists to test their ideas” which had the highest mean 4.53 (*SD* = .79). Also, more than 70% of the participants responded the all items as “often” and “always” which indicates that they appreciate the role of experiments and use of data to support scientific claims.

Table 4.4 Descriptive Statistics of the EBQ's Items

				Percentage (%)				
Subscales	Items	*M*	*SD*	Never	Rarely	Sometimes	Often	Always
Source	1. Everybody has to believe what scientists say.*	2.24	1.19	34.70	27.40	22.50	9.50	5.90
	6. In science, you have to believe what the science books say about stuff.*	2.29	1.23	34.30	26.60	21.00	11.90	6.20
	10. Whatever the teacher says in science class is true.*	2.84	1.32	20.50	22.90	22.20	21.60	12.90
	15. If you read something in a science book, you can be sure it's true.*	3.23	1.08	7.50	14.80	37.10	28.70	12.00
	19. Only scientists know for sure what is true in science.*	2.62	1.26	25.90	17.40	24.20	23.70	8.70
Certainty	2. All questions in science have one right answer.*	3.27	1.38	13.60	17.40	22.70	20.10	26.10
	7. The most important part of doing science is coming up with the right answer.*	4.14	1.06	2.90	6.40	13.10	28.80	48.80

Table 4.4 Descriptive Statistics of the EBQ's Items (continued)

Subscales	Items	*M*	*SD*	Percentage (%) Never	Rarely	Sometimes	Often	Always
Certainty	12. Scientists pretty much know everything about science; there is not much more to know.*	2.39	1.29	33.80	23.70	20.50	14.00	8.00
	16. Scientific knowledge is always true.*	3.06	1.20	11.50	21.40	30.00	24.20	13.00
	20. Once scientists have a result from an experiment, that is the only answer.*	2.73	1.28	20.70	25.50	24.60	18.40	10.80
	23. Scientists always agree about what is true in science.*	2.80	1.28	19.00	24.50	24.90	20.20	11.40
Development	4. Some ideas in science today are different than what scientists used to think.	3.82	1.00	2.90	5.00	28.00	35.00	29.10
	8. The ideas in science books sometimes change.	3.67	1.03	4.60	6.10	28.70	38.50	22.00

Table 4.4 Descriptive Statistics of the EBQ's Items (continued)

				Percentage (%)				
Subscales	Items	*M*	*SD*	Never	Rarely	Sometimes	Often	Always
Development	13. There are some questions that even scientists cannot answer.	4.26	1.01	3.40	3.70	10.00	28.70	54.10
	17. Ideas in science sometimes change.	3.96	.95	2.50	4.60	18.10	44.00	30.80
	21. New discoveries can change what scientists think is true.	3.71	.98	2.50	6.60	32.00	35.70	23.20
	25. Sometimes scientists change their minds about what is true in science.	3.82	.95	2.60	5.50	24.30	42.80	24.80
Justification	3. Ideas about science experiments come from being curious and thinking about how things work.	4.30	.86	1.20	2.30	12.70	33.00	50.90
	5. In science, there can be more than one way for scientists to test their ideas.	4.53	.79	1.40	1.50	6.30	24.60	66.30

Table 4.4 Descriptive Statistics of the EBQ's Items (continued)

Subscales	Items	*M*	*SD*	Percentage (%) Never	Rarely	Sometimes	Often	Always
Justification	9. One important part of science is doing experiments to come up with new ideas about how things work	4.21	.85	1.20	2.10	14.20	39.40	43.10
	11. It is good to try experiments more than once to make sure of your findings.	4.04	.89	1.80	2.90	18.60	42.70	34.00
	14. Good ideas in science can come from anybody, not just from scientists.	4.35	.83	1.00	2.40	9.90	34.30	52.40
	18. A good way to know if something is true is to do an experiment.	4.36	.87	1.60	2.60	9.40	30.90	55.60
	22. Good answers are based on evidence from many different experiments.	4.25	.93	1.90	3.70	11.40	33.60	49.50
	24. Ideas in science can come from your own questions and experiments.	4.00	.93	1.80	3.80	21.70	39.20	33.50

Table 4.4 Descriptive Statistics of the EBQ's Items (continued)

				Percentage (%)				
Subscales	Items	*M*	*SD*	Never	Rarely	Sometimes	Often	Always
	26. It is good to have an idea before you start an experiment.	4.41	.88	1.80	2.20	8.80	27.30	59.90

*Item was used as reversed coded in the path analysis.

In order to determine whether the level of epistemological beliefs of students about science course differs significantly, a one-way repeated measure of analysis of variance (ANOVA) was conducted. Before the analysis, it was ensured that all underlying assumptions were satisfied. In addition, source of knowing and certainty of knowledge dimensions were recoded, so that way the higher scores represented sophisticated beliefs for all dimensions. Result showed a statistically significant difference in means among four epistemological belief subscales (Wilk‘s Lambda = .31, $F(3, 4507) = 3331.66$, $p = .000$, $\eta^2 = .69$). Holm‘s sequential Bonferroni procedure was conducted as pairwise comparisons to determine which means differ from each other significantly (see Table 4.5). Examination of the pairwise comparisons revealed that students have significantly more sophisticated beliefs about the source of scientific knowledge ($M = 3.36$, $SD = .85$) compared to the beliefs about the certainty of knowledge in science ($M = 2.93$, $SD = .80$; $t\ (4509) = 43.86$, $p = .00$). The magnitude of the difference was large ($d = .65$). In addition, students' beliefs about the justification for knowing in science course ($M = 4.27$, $SD = .50$) was found to be more sophisticated than their beliefs about the source of scientific knowledge ($t\ (4509) = 110.64$, $p = .00$) with a large effect size ($d = 1.65$), their beliefs about the certainty of scientific knowledge ($t\ (4509) = 86.93$, $p = .00$) with large effect size ($d = 1.30$), and their beliefs about development of knowledge in science ($M = 3.87$, $SD = .56$; $t(4509) = 49.65$, $p = .00$) with large effect size ($d =.74$). Additionally, participants' beliefs about the development of scientific knowledge ($M = 3.87$, *SD* = .56) was found to be more sophisticated than their beliefs about the source of scientific knowledge ($t(4509) = 81.11$, $p = .00$) and the effect size was large ($d = 1.21$) and their beliefs about the certainty of knowledge in science ($t(4509) = 55.98$, $p = .00$) also the effect size of the difference was large ($d = .83$). Overall, result revealed that students' beliefs about the justification for knowing in science were significantly more sophisticated than the rest of the epistemological beliefs dimensions. Students were found to have the least sophisticated beliefs on certainty of knowledge dimension.

Table 4.5 Pairwise Comparisons of the EBQ's Subscales

Pairs	*t*	*df*	*p*	Cohen's *d*
Certainty - Source	43.86	4509	.00	.65
Justification - Source	110.64	4509	.00	1.65
Development - Source	81.11	4509	.00	1.21
Justification -Certainty	86.93	4509	.00	1.30
Development -Certainty	55.98	4509	.00	.83
Development -Justification	49.65	4509	.00	.74

4.1.3 Descriptive Statistics for Achievement Goals

Achievement goals were assessed with the Achievement Goal Questionnaire (AGQ, Elliot & McGregor, 2001) under four subscales; mastery-approach goal, performance-approach goal, mastery-avoidance goal, and performance-avoidance goal for science course. As showed in the Table 4.6 the highest mean value ($M = 4.57$, $SD = .51$) of was obtained from mastery-approach goal subscale and the lowest mean score ($M = 3.51$, $SD = 1.04$) was obtained for mastery-avoidance goal subscale. In general, the mean scores on the approach goals were higher than that of avoidance goals.

Table 4.6 Descriptive statistics of the AGQ's Subscales

Subscales	*M*	*SD*	*Min.*	*Max.*
Mastery-Approach Goal	4.57	.51	3.00	5.00
Performance-Approach Goal	4.41	.68	2.00	5.00
Mastery-Avoidance Goal	3.51	1.04	1.00	5.00
Performance-Avoidance Goal	3.77	.86	1.00	5.00

Item level analysis of students' responses (see Table 4.7) revealed that mean values ranged from 4.49 (*SD = .71*) to 4.60 (*SD = .64*) on mastery-approach goal subscale items. Roughly, 90% of students responded the items of the subscale as "often" and "always" on five-point scale. The descriptive statistics for the mastery-approach goal subscale indicates that most of the participants are likely to study for the reasons of learning and understanding in science classes.

The mean item scores were high and ranged from 4.30 (*SD* = .99) to 4.55 (*SD* = .77), concerning performance-approach goal (see Table 4.7). Just a few students responded to the items related with performance-approach goal as "never" and "rarely" and most of them gave "often" and "always" answers. The lowest mean value (*M* = 4.30, *SD* = .99) of the performance-approach goal subscale belonged to the item seven "My goal in this class is to get a better grade than most of the other students". Overall, item level analysis suggested that students tend to compete with and try to be better than their peers in science classes.

Mean scores of mastery-avoidance goal subscale items ranged from 3.37 (*SD* = 1.34) to 3.72 (*SD* = 1.27) and the mean values of the items were very close to each other and the range was narrow (see Table 4.7). Also, there was nearly an equal distribution on the frequencies of "sometimes", "often" and "always" responses for the items of mastery-avoidance goal dimension. So students had at moderate level mastery-avoidance goal to avoid not grasping the materials of science course.

The lowest mean score was 3.34 (*SD* = 1.37) and the highest one was 4.28 (*SD* = 1.11) on performance-avoidance goal subscale (see Table 4.7). The range was the broadest one among other subscales. The item five "My fear of performing poorly in this class compared to others is often what motives me" had the lowest mean 3.34 (*SD* = 1.37) and the quarter of the participants disagreed with the item and responded it as "never" and "rarely". On the contrary, 82.5% of the students responded the item two "My goal for this class is to avoid performing poorly compared to the rest of the class" as "often" and "always", and the item had the highest mean value 4.28 (*SD* = 1.11) on the performance-avoidance goal subscale.

Table 4.7 Descriptive Statistics of the AGQ's Items

Subscales	Items	*M*	*SD*	Never	Rarely	Sometimes	Often	Always
				Percentage (%)				
Mastery-Approach	1. It is important for me to understand the content of this course as thoroughly as possible.	4.60	.64	.00	.70	6.30	25.40	67.50
	4. I want to learn as much as possible from this class.	4.63	.63	.00	.70	6.10	22.40	70.70
	6. I desire to completely master the material presented in this class.	4.49	.71	.00	1.30	9.00	29.70	60.10
Performance-Approach	3. It is important for me to do better than other students.	4.55	.77	.50	2.20	7.30	22.00	68.00
	7. My goal in this class is to get a better grade than most of the other students.	4.30	.99	2.70	3.70	11.20	26.40	56.10
	11. It is important for me to do well compared to others in this class.	4.38	.93	1.70	3.10	11.40	23.40	60.40

Table 4.7 Descriptive Statistics of the AGQ's Items (continued)

				Percentage (%)				
Subscales	Items	*M*	*SD*	Never	Rarely	Sometimes	Often	Always
Mastery-Avoidance	8. I worry that I may not learn all that I possibly could in this class.	3.72	1.27	9.10	8.30	19.70	27.60	35.30
	10. I am often concerned that I may not learn all that there is to learn in this class.	3.37	1.34	12.80	13.00	24.30	23.70	26.20
	12. Sometimes I'm afraid that I may not understand the content of this class as thoroughly as I'd like.	3.44	1.26	10.10	12.00	26.20	26.90	24.80
Performance-Avoidance	2. My goal for this class is to avoid performing poorly compared to the rest of the class.	4.28	1.11	5.40	3.30	8.70	22.50	60.00
	5. My fear of performing poorly in this class compared to others is often what motives me.	3.34	1.37	15.90	10.10	23.40	25.40	25.20
	9. I just want to avoid doing poorly in this class compared to others.	3.76	1.35	11.80	6.70	15.30	25.80	40.40

Table 4.7 Descriptive Statistics of the AGQ's Items (continued)

				Percentage (%)				
Subscale	Items	*M*	*SD*	Never	Rarely	Sometimes	Often	Always
Performance-Avoidance	13. I just want to avoid doing poorly in this class.	4.20	1.12	5.20	4.60	10.00	25.40	54.80
	14. My fear of performing poorly in this class is often what motivates me.	3.50	1.37	13.10	11.00	20.00	24.80	31.20
	15. My goal for this class is to avoid performing poorly.	3.53	1.46	16.40	9.40	15.10	23.10	36.00

In order to determine whether the level of achievement goals of students about science course differs, a one-way repeated measure of ANOVA was conducted. Before the analysis, it was ensured that all underlying assumptions were satisfied. Result showed a statistically significant difference in means among four achievement goals subscales (Wilk‘s Lambda = .46, $F(3, 4507) = 1746.05$, $p = .00$, $\eta^2 = .54$). Holm‘s sequential Bonferroni procedure was conducted as pairwise comparisons to determine which means differ from each other significantly (see Table 4.8). Examination of the pairwise comparisons revealed that students’ mastery-approach goal for science course ($M = 4.57$, $SD = .51$) was significantly higher than their mastery-avoidance goal ($M = 3.51$, $SD = 1.04$; $t\ (4509) = 65.70$, $p = .00$) and the magnitude of the difference was large ($d = .99$). In addition, students’ mastery-approach goal ($M = 4.57$, $SD = .51$) was found to be at higher levels than their performance-approach goal ($M = 4.41$, $SD = .68$; $t(4509) = 15.72$, $p = .00$) with a medium effect size ($d = .23$) and their performance-avoidance goal ($M = 3.77$, $SD = .86$; $t(4509) = 57.25$, $p = .00$) and the effect size was large ($d = .85$). Moreover, students’ performance-approach goal for science course was found to be at higher levels than their mastery-avoidance goal ($t(4509) = 54.17$, $p = .00$) with large effect size ($d = .81$) and their performance-avoidance goal ($t(4509) = 51.99$, $p = .00$) with large effect size ($d =.77$). Furthermore, participants’ performance-avoidance goal for science course was significantly higher than their mastery-avoidance goal ($t(4509) = 17.89$, $p = .00$) also the effect size of the difference was large ($d =.27$). Overall, result suggested that students hold significantly higher levels of approach goals than avoidance goals. Among the approach goals, students tend to be more mastery goal oriented than performance goal oriented.

Table 4.8 Pairwise Comparisons of AGQ's Subscales

Pairs	*t*	*df*	*p*	Cohen's *d*
Mastery-Approach-Mastery-Avoidance	65.70	4509	.00	.99
Mastery-Approach-Performance-Approach	15.72	4509	.00	.23
Mastery-Approach-Performance-Avoidance	57.25	4509	.00	.85
Performance-Approach-Mastery-Avoidance	54.17	4509	.00	.81
Performance-Avoidance-Mastery-Avoidance	17.89	4509	.00	.27
Performance-Approach-Performance-Avoidance	51.99	4509	.00	.77

4.1.4 Descriptive Statistics for Self-Efficacy

Data about participants' self-efficacy were collected using the self-efficacy for learning and performance subscale of MSLQ (Pintrich, Smith, Garcia & McKeachie, 1991) on seven-point scale. Items were about the students' self-evaluation about their ability in science course and also their confidence in their skills to perform tasks of science course (Pintrinch et al., 1991). The mean value for the variable was 5.27 (*SD* = 1.20).

All items' mean scores of the self-efficacy for learning and performance subscale were higher than the mid-point of the seven-point scale and ranged from 4.76 (*SD* = 1.77) to 5.58 (*SD* = 1.58) as shown in the Table 4.9. Also, more than half of the participants indicated their agreement with rating all items as 5, 6, or 7 which means that they feel self-efficacious in science classes. On the other hand, the percentages of the students who disagree with the items of scale were quite small, less than quarter of the sample. For instance, 9.50% of the students responded the item three “I’m confident I can understand the basic concepts taught in this course” as 1, 2 or 3 to indicate they did not agree with item but higher than 75% of the participants

agreed with the item.

Table 4.9 Descriptive Statistics of the MSLQ's Self-Efficacy for Learning and Performance Subscale's Items

Scales	Items	*M*	*SD*	Percentage (%)						
				not at all true of me 1	2	3	4	5	6	very true of me 7
Self-Efficacy	1. I believe I will receive an excellent grade in this class.	5.31	1.59	2.40	3.60	7.80	16.30	16.90	22.20	30.70
	2. I'm certain I can understand the most difficult material presented in the readings for this course.	4.83	1.75	5.50	5.80	10.70	18.70	19.00	18.30	22.10
	3. I'm confident I can understand the basic concepts taught in this course.	5.54	1.47	1.50	2.30	5.70	14.20	19.00	22.40	34.90
	4. I'm confident I can understand the most complex material presented by the instructor in this course.	4.76	1.77	6.10	6.10	11.60	18.50	18.00	19.20	20.60
	5. I'm confident I can do an excellent job on the assignments and tests in this course.	5.38	1.56	2.20	3.10	7.20	15.20	18.40	21.90	32.10

Table 4.9 Descriptive Statistics of the MSLQ's Self-Efficacy for Learning and Performance Subscale's Items (continued)

Scales	Items	*M*	*SD*	Percentage (%) not at all true of me 1	2	3	4	5	6	very true of me 7
	6. I expect to do well in this class.	5.45	1.53	1.70	3.10	6.90	14.70	17.60	22.40	33.50
	7. I'm certain I can master the skills being taught in this class.	5.33	1.64	3.90	3.00	6.90	14.30	17.40	23.10	31.30
	8. Considering the difficulty of the course, the teacher, and my skills, I think I will do well in this class.	5.58	1.58	2.90	2.50	5.20	13.70	14.20	22.10	39.40

4.1.5 Descriptive Statistics for Task Value

Task-value evaluations of the students for science course were obtained using task-value subscale of MSLQ (Pintrich et al., 1991). Task-value items provides information for the students' beliefs about course material in terms of being interesting, important and useful (Pintrinch et al., 1991). Responses of the participants were assessed on seven-point scale and the mean score of the variable was quite high (*M* = 5.49, *SD* = 1.18).

The highest mean value 5.81 (*SD* = 1.47) belong to the item two which states that "It is important for me to learn the course material in this class". Moreover, all items' mean scores of the task-value subscale were higher than the mid-point of the seven-point scale and very close to each other as presented in the Table 4.10. The percentages of the students who rated their agreement with the all items as 5, 6 or 7 changed between 63.40% and 80.60%. Thus, the percentages of the students who disagree with the items of scale were quite small, less than 20% of the sample. Overall, descriptive statistics suggests that students perceive science classes as interesting, useful and important at high levels.

Table 4.10 Descriptive Statistics of the MSLQ's Task Value Subscale's Items

Scales	Items	*M*	*SD*	Percentage (%) not at all true of me 1	2	3	4	5	6	very true of me 7
Task Value	1. I think I will be able to use what I learn in this course in other courses.	5.06	1.84	6.30	4.90	8.40	16.90	15.10	16.30	32.00
	2. It is important for me to learn the course material in this class.	5.81	1.47	1.50	2.00	4.80	11.50	14.50	17.90	48.00
	3. I am very interested in the content area of this course.	5.15	1.73	4.50	4.40	7.90	16.70	18.00	18.10	30.40
	4. I think the course material in this class is useful for me to learn.	5.76	1.50	1.70	2.20	5.50	10.90	14.00	20.00	45.70
	5. I like the subject matter of this course.	5.32	1.72	4.50	3.90	6.70	14.30	15.80	20.20	34.50
	6. Understanding the subject matter of this course is very important to me.	5.81	1.48	1.70	2.00	5.10	10.60	13.50	19.80	47.30

4.1.6 Descriptive Statistics for Cognitive Learning Strategies

In learning strategies section of MSLQ (Pintrich et al., 1991), items of rehearsal, elaboration, organization and critical thinking subscales were used to assess participants' overall cognitive learning strategies use for science course. The mean score of the cognitive learning strategies use of the participants' responses was 4.93 (*SD* = 1.12).

Although the mean scores' of the items were generally around 5.00, the range was from 3.88 (*SD* = 2.02) to 5.63 (*SD* = 1.61) on seven-point scale as shown in the Table 4.11. In addition, the percentages of the students who indicated their agreement with items selecting 5, 6 or 7 changed between 38.20% and 76.30%. Item five "When I study for this course, I go through the readings and my class notes and try to find the most important ideas" had the highest mean value and students had the highest percentage of agreement on this items. In general, descriptive statistics suggests that students tend to use various

strategies in science classes at moderate to high levels.

Table 4.11 Descriptive Statistics of the MSLQ's Cognitive Learning Strategies Subscale's Items

Scales	Items	*M*	*SD*	Percentage (%)						
				not at all true of me 1	2	3	4	5	6	very true of me 7
Cognitive Learning Strategies	1. When I study the readings for this course, I outline the material to help me organize my thoughts.	4.99	1.87	7.20	5.10	8.00	17.90	15.10	16.50	30.10
	2. I often find myself questioning things I hear or read in this course to decide if I find them convincing.	4.81	1.82	7.10	5.60	9.50	20.40	17.10	15.60	24.70
	3. When I study for this class, I practice saying the material to myself over and over.	5.43	1.74	3.90	4.10	7.30	12.70	14.30	16.60	41.00
	4. When I study for this course, I go through the readings and my class notes and try to find the most important ideas.	5.63	1.61	2.70	3.00	5.70	12.20	13.80	18.40	44.10
	5. When studying for this course, I read my class notes and the course readings over and over again.	5.03	1.79	5.40	5.10	9.30	17.30	16.20	17.70	29.00

Table 4.11 Descriptive Statistics of the MSLQ's Cognitive Learning Strategies Subscale's Items (continued)

Scales	Items	*M*	*SD*	Percentage (%) not at all true of me 1	2	3	4	5	6	very true of me 7
Cognitive Learning Strategies	6. When a theory, interpretation, or conclusion is presented in class or in the readings, I try to decide if there is good supporting evidence.	4.75	1.79	6.60	5.90	10.60	21.40	16.90	16.40	22.40
	7. I make simple charts, diagrams, or tables to help me organize course material.	3.88	2.02	18.30	10.80	13.90	18.60	12.60	11.30	14.30
	8. I treat the course material as a starting point and try to develop my own ideas about it.	4.89	1.73	4.50	6.10	9.90	19.80	18.60	17.20	23.90
	9. When I study for this class, I pull together information from different sources, such as lectures, readings, and discussions.	5.15	1.72	4.00	4.70	9.10	16.30	17.00	18.50	30.40
	10. I memorize key words to remind me of important concepts in this class.	4.61	2.07	12.40	7.40	9.80	16.40	12.90	14.00	27.10
	11. I try to relate ideas in this subject to those in other courses whenever possible.	4.75	1.85	8.10	5.90	10.10	17.80	17.80	17.80	22.60

Table 4.11 Descriptive Statistics of the MSLQ's Cognitive Learning Strategies Subscale's Items (continued)

Scales	Items	*M*	*SD*	Percentage (%) not at all true of me 1	2	3	4	5	6	very true of me 7
Cognitive Learning Strategies	12. When I study for this course, I go over my class notes and make an outline of important concepts.	4.89	1.88	7.10	6.20	10.40	16.00	15.60	16.80	27.90
	13. When reading for this class, I try to relate the material to what I already know.	5.19	1.67	3.50	4.20	8.30	16.70	17.80	19.90	29.60
	14. I try to play around with ideas of my own related to what I am learning in this course.	5.02	1.66	3.60	4.80	9.40	19.20	19.10	18.90	25.00
	15. When I study for this course, I write brief summaries of the main ideas from the readings and my class notes.	5.02	1.85	6.20	6.00	8.80	15.20	16.50	17.20	30.10
	16. I try to understand the material in this class by making connections between the readings and the concepts from the lectures.	5.20	1.66	3.50	4.00	8.00	16.90	18.20	19.60	29.80

Table 4.11 Descriptive Statistics of the MSLQ's Cognitive Learning Strategies Subscale's Items (continued)

Scales	Items	*M*	*SD*	Percentage (%) not at all true of me 1	2	3	4	5	6	very true of me 7
Cognitive Learning Strategies	17. Whenever I read or hear an assertion or conclusion in this class, I think about possible alternatives.	4.93	1.69	4.60	4.40	10.30	19.70	19.40	18.50	23.10
	18. I make lists of important items for this course and memorize the lists.	4.65	1.96	9.20	8.20	11.30	16.10	14.90	15.50	24.70
	19. I try to apply ideas from course readings in other class activities such as lecture and discussion.	4.92	1.86	7.20	5.60	9.00	17.10	16.70	16.00	28.30

4.1.7 Descriptive Statistics for Metacognitive Learning Strategies

Metacognitive learning strategies were assessed using MSLQ (Pintrich et al., 1991) to get information about students' metacognitive self-regulatory activities for science course. The mean value of the subscale was 5.06 (*SD* = 1.01), which was above the mid-point of the seven-point scale.

As shown in the Table 4.12 the minimum mean score among the items was 4.50 (*SD* = 2.00) and the maximum one was 5.63 (*SD* = 1.63). Moreover, all the mean values of the subscale were higher than 4.50 and above the mid-point of the scale. Roughly, more than half of the participants rated items of the scale as 5, 6 or 7 to indicate their agreement with items. Item three "When I become confused about something I'm reading for this class. I go back and try to figure it out" had both the highest mean value 5.63 (*SD* = 1.63) and highest agreement 76.80% of the participants. In addition, item two "When reading for this course. I make up questions to help focus my reading." had the lowest mean 4.50 (*SD* = 2.00) and 30.80 % of students rated the item as 1, 2 or 3 to indicate their disagreement with the item.

Table 4.12 Descriptive Statistics of the MSLQ's Metacognitive Learning Strategies Subscale's Items

Scales	Items	*M*	*SD*	Percentage (%) not at all true of me 1	2	3	4	5	6	very true of me 7
Metacognitive Learning Strategies	1. During class time I often miss important points because I'm thinking of other things.*	4.93	2.03	9.00	7.70	8.50	14.10	10.60	17.10	33.00
	2. When reading for this course. I make up questions to help focus my reading.	4.50	2.00	11.50	7.90	11.40	17.70	14.00	14.80	22.60
	3. When I become confused about something I'm reading for this class. I go back and try to figure it out.	5.63	1.63	3.10	3.00	5.50	11.60	13.20	20.20	43.40
	4. If course readings are difficult to understand. I change the way I read the material.	4.98	1.79	6.40	4.70	7.90	18.50	17.20	18.70	26.50
	5. Before I study new course material thoroughly. I often skim it to see how it is organized.	5.16	1.70	4.00	4.40	9.00	15.20	17.60	21.10	28.70
	6. I ask myself questions to make sure I understand the material I have been studying in this class.	5.07	1.81	5.50	5.10	9.50	15.70	15.60	18.30	30.30

Table 4.12 Descriptive Statistics of the MSLQ's Metacognitive Learning Strategies Subscale's Items (continued)

Scales	Items	*M*	*SD*	Percentage (%) not at all true of me 1	2	3	4	5	6	very true of me 7
Metacognitive Learning Strategies	7. I try to change the way I study in order to fit the course requirements and the instructor's teaching style.	4.85	1.81	7.10	4.70	9.70	19.00	18.00	17.10	24.40
	8. I often find that I have been reading for this class but don't know what it was all about.*	4.60	2.07	11.80	8.50	10.00	15.60	12.70	14.50	26.80
	9. I try to think through a topic and decide what I am supposed to learn from it rather than just reading it over when studying for this course.	5.41	1.65	3.20	2.90	6.90	16.40	15.10	18.30	37.10
	10. When studying for this course I try to determine which concepts I don't understand well.	5.31	1.64	3.30	3.50	7.30	15.50	18.00	20.60	31.90
	11. When I study for this class. I set goals for myself in order to direct my activities in each study period.	5.38	1.63	3.10	3.50	7.00	14.50	17.40	20.00	34.60

Table 4.12 Descriptive Statistics of the MSLQ's Metacognitive Learning Strategies Subscale's Items (continued)

Scales	Items	*M*	*SD*	Percentage (%) not at all true of me 1	2	3	4	5	6	very true of me 7
	12. If I get confused taking notes in class. I make sure I sort it out afterwards.	4.96	1.86	6.90	5.90	9.20	15.30	15.40	20.00	27.40

*Items were used as reversed coded both in descriptive statistical analyses and path analysis.

4.1.8 Descriptive Statistics for Procrastination

Procrastination behavior of the students for science course was assessed with 15 items of the Tuckman Procrastination Scale (TPS, Tuckman, 1991). The mean value for the variable was 2.29 (*SD* = .80) on five-point scale.

As presented in the Table 4.13 mean scores of the items ranged from 1.99 (*SD* = 1.27) to 2.65 (*SD* = 1.46). The mean values of all items were lower than the midpoint of the rating scale. Also, the percentages of the students rated their disagreement with items of the scale as "strongly disagree" or "agree" changed between 49.90% and 72.40%. The highest frequency was obtained from "Strongly disagree" response for all items. For example, the frequency of "strongly disagree" response was 51.20 % of students for item five "I manage to find an excuse for not doing something." Which was also had the lowest mean value 1.99 (*SD* = 1.27). These results suggest that, students have low levels of procrastination tendencies in science classes.

Table 4.13 Descriptive Statistics of the TPS's Items

				Percentage (%)				
Scale	Items	*M*	*SD*	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
Procrastination	1. I needlessly delay finishing jobs, even when they're important.	2.13	1.36	49.00	17.90	12.20	12.60	8.30
	2. I postpone starting in on things I don't like to do.	2.65	1.46	31.80	19.10	16.50	17.30	15.30
	3. When I have a deadline, I wait until the last minute.	2.32	1.44	42.80	19.60	12.30	13.00	12.30
	4. I keep putting off improving my work habits.	2.17	1.29	42.50	23.80	15.10	11.40	7.20
	5. I manage to find an excuse for not doing something.	1.99	1.27	51.20	21.20	11.80	9.00	6.90
	6. I put the necessary time into even boring tasks, like studying.*	2.02	1.17	43.00	31.00	13.30	6.70	5.90
	7. I am an incurable time waster.	2.53	1.40	33.00	20.40	18.80	15.60	12.20

Table 4.13 Descriptive Statistics of the TPS's Items (continued)

Scale	Items	*M*	*SD*	Percentage (%) Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
Procrastination	8. I'm a time waster now but I can't seem to do anything about it.	2.08	1.33	49.20	20.20	12.60	9.40	8.50
	9. When something's too tough to tackle, I believe in postponing it.	2.46	1.34	33.40	21.40	21.00	14.70	9.60
	10. I promise myself I'll do something and then drag my feet.	2.52	1.36	31.70	22.10	19.20	16.40	10.60
	11. Whenever I make a plan of action, I follow it.*	2.09	1.22	42.60	26.60	16.50	7.70	6.70
	12. Even though I hate myself if I don't get started, it doesn't get me going.	2.32	1.37	40.60	19.10	18.10	11.90	10.20
	13. I always finish important jobs with time to spare.*	2.21	1.22	37.30	27.10	19.40	10.10	6.10
	14. I get stuck in neutral even though I know how important it is to get started.	2.59	1.33	28.60	21.30	22.50	17.30	10.20

Table 4.13 Descriptive Statistics of the TPS's Items (continued)

				Percentage (%)				
Scale	Items	*M*	*SD*	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
	15. Putting something off until tomorrow is not the way I do it.*	2.30	1.32	38.20	23.20	18.00	11.40	9.10

* Items were used as reversed coded both in descriptive statistical analyses and path analysis.

4.1.9 Descriptive Statistics for Science Achievement Test

The mean value of Science Achievement Test (SAT, Yerdelen, 2013) was 8.14 (*SD* = 3.22). Students' scores on the achievement test ranged from 0 to 14.

4.2 Assumptions of Path Analysis

In this part, assumptions of path analysis as a special type of structural equation modeling were checked. Assumptions of path analysis are sample size and missing data, normality and linearity, outliers, absence of multicollinearity and singularity, and residuals (Tabachnick & Fidell, 2007) and they were examined in the following parts.

4.2.1 Sample Size and Missing Data

According to *N:q* rule (*N* is number cases and *q* is number of parameters in the model) and ratio would not be less than is 10:1 (Jackson, as cited in Kline, 2011). In the current study the number of parameter was 113 and the minimum sample size could be 1130 and the sample size of the current study was 4510. There were not any missing data in the variables of the path analysis since replacement was done based on items as explained in the method chapter.

4.2.2 Normality and Linearity

Univariate and multivariate normality were checked through skewness and kurtosis value of variables of path analysis. There were not any skewness value greater than 3 and kurtosis value greater than 10 in terms of univariate normality (see Table 4.14).

Table 4.14 Univariate Normality Statistics

	Skewness		Kurtosis	
	Statistic	Std. Error	Statistic	Std. Error
Mastery-Approach Goal	-1.17	.04	.68	.07
Mastery-Avoidance Goal	-.49	.04	-.47	.07
Performance-Approach Goal	-1.26	.04	1.05	.07
Performance-Avoidance Goal	-.73	.04	.13	.07
Incremental Theory of Ability	.11	.04	-.88	.07
Source of Knowing	.07	.04	-.49	.07
Certainty of Knowledge	-.76	.04	.48	.07
Justification for Knowing	-.76	.04	.48	.07
Development of Knowledge	-.26	.04	-.01	.07
Procrastination	.37	.04	-.56	.07
Cognitive Learning Strategies	-.25	.04	-.45	.07
Metacognitive Learning Strategies	-.29	.04	-.38	.07
Self-efficacy	-.51	.04	-.35	.07
Task Value	-.67	.04	-.24	.07
Science Achievement	-.08	.04	-.87	.07

Although, there was not any threat to univarite normality of variables, there could be multivariate non-normality. The LISREL reported that the skewness value was 9.89 and kurtosis value was 289.14 for multivariate normality suggesting a violation from multivariate normality. Therefore, robust maximum likelihood was used as model estimation method for continues and multivariately non-normal variables of the current study.

As suggested by Tabachnick and Fidell (2007 the scatter plots between selected variables could be examined to assess the linearity, as testing it between all variables is not feasible. Following the Tabachnick and Fidell (2007)'s recommendation, the scatter plots of mastery-approach achievement goal and self-efficacy; cognitive learning strategies and procrastination; and science achievement and metacognitive learning strategies were randomly selected and examined for linearity as presented in the Figure 4.1. Although their shapes did not indicate a perfect linearity, all variables were assumed to be linearly related, if at all.

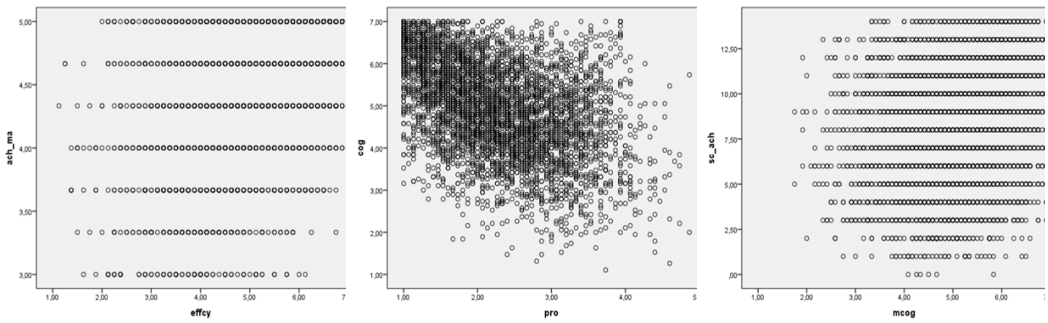


Figure 4.1 Scatterplot of the Selected Variables

4.2.3 Outliers

Outlier analysis was conducted in two steps. In the first one, the univariate outliers of the data was checked. The z-scores higher than 4, z-scores around 4 in absolute value considered as potential outliers (Stevens, 2009), were deleted for each item of scales and for the each variable of path analysis. Then, the multivariate outliers were checked with Mahalonobis' distance. There were not any data points greater than critical value of Mahalonobis' distance which was 37.70 (see Table 4.15).

Table 4.15 Multivariate Outlier Analysis Result for the Path Analysis

	Min.	*Max.*	*M*	*SD*
Mahalonobis' Distance	1.62	37.19	11.00	5.36

4.2.4 Absence of Multicollinearity and Singularity

The analysis of the study was conducted without any warning messages given by the LISREL program related with presence of multicollinearity and singularity. Also, none of the bivariate correlations between the variables of the study (see Table 4.16) were equal or above .90. Therefore, there were not multicollinearity and singularity in the data se of the current study.

Table 4.16 Bivariate Correlations of the Variables

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Mastery-Approach Goal	1														
Mastery-Avoidance Goal	.16**	1													
Performance-Approach Goal	.33**	.22**	1												
Performance-Avoidance Goal	.12**	.49**	.44**	1											
Incremental Theory of Ability	.07**	-.13**	-.06**	-.22**	1										
Source of Knowing	.01	.14**	.08**	.24**	-.27**	1									
Certainty of Knowledge	.00	.15**	.11**	.28**	-.30**	.69**	1								
Justification for Knowing	.34**	.10**	.24**	.11**	.01	-.00	.03	1							
Development of Knowledge	.17**	.09**	.13**	.10**	-.09**	-.00	.01	.49**	1						
Procrastination	-.40**	.03*	-.17**	.00	-.12**	.07**	.08**	-.30**	-.07**	1					
Cognitive Learning Strategies	.44**	.16**	.27**	.16**	-.03	.16**	.14**	.41**	.25**	-.44**	1				
Metacognitive Learning Strategies	.49**	.11**	.27**	.11**	.04**	.07**	.04**	.44**	.24**	-.57**	.83**	1			
Self-Efficacy	.47**	.04**	.29**	.08**	.02	.10**	.08**	.39**	.24**	-.44**	.70**	.70**	1		
Task Value	.50**	.10**	.28**	.09**	.01	.09**	.06**	.43**	.25**	-.45**	.69**	.69**	.77**	1	
Science Achievement	.22**	-.04**	.06**	-.12**	.17**	-.25**	-.31**	.25**	.11**	-.19**	.15**	.21**	.23**	.20**	1

**Correlation is significant at the 0.01 level (2-tailed).
*Correlation is significant at the 0.05 level (2-tailed).

4.2.5 Residuals

Most of the residuals in the path analysis were zero and rest of them around zero. Additionally, the median of the standardized residual was .00, the smallest one was -4.82 and the largest one was 12.65. Residuals of the analysis were taken in the consideration with provided modification indices as suggested by Tabachnick and Fidell, (2007). However, suggested modifications were not supported by the related literature.

4.3 Steps of Path Analysis

This part includes model specification, model identification, model estimation and model testing.

4.3.1 Model Specification

The path analysis were conducted in order to examine the relationships among seventh grade elementary students' the implicit theories of ability, epistemological beliefs, achievement goals, self-efficacy, task value learning strategies, procrastination and achievement specifically for science course. Also the syntax of the path analysis could be found in Appendix M.

The following paths were proposed related with science course;

- Paths were specified from students' incremental theory of ability, epistemological beliefs (i.e., source of knowing, certainty of knowledge, development of knowledge and justification for knowing) and motivational beliefs (i.e., self-efficacy and task value) to their achievement goals (i.e., mastery-approach goal, performance-approach goal, mastery-avoidance goal and performance-avoidance goal)
- Students' incremental theory of ability, epistemological beliefs, motivational beliefs and achievement goals were linked to their learning strategies (i.e., cognitive learning strategies and metacognitive learning strategies) use. In addition, a path from metacognitive learning strategies use was defined to cognitive learning strategies use.
- Paths were proposed from incremental theory of ability, epistemological beliefs, motivational beliefs, achievement goals and learning strategies use to students' procrastination behavior.
- Students' incremental theory of ability, epistemological beliefs, motivational beliefs, learning strategies use and procrastination were linked to their science achievement.

4.3.2 Model Identification

Model identification has three necessities; the degrees of freedom of the model should be at least zero ($df_m \geq 0$) (Schumacker & Lomax, 2004; Kline, 2011), a metric scale should be assigned for every the latent variable (Kline, 2011) and the model should be recursive.

In the current study, the degrees of freedom was 7 and higher than zero. In addition, all error terms of observed variables scaled by the LISREL program, as standardizing the variables. Also, the proposed model had a bow-free pattern according to Kline (2011) and it could be treated as recursive model in the analysis.

4.3.3 Model Estimation

The LISREL program provides the maximum likelihood method as a default method (Kline, 1998) but large sample size, continues scales and multivariate normality should be provided for maximum likelihood method (Brown, 2006). Robust maximum likelihood method was offered if the variables are non-normal and continuous variables (e.g., Bentler, as cited in Brown, 2006). Because, variables of the study did not ensure the multivariate normality, robust maximum likelihood method was used in the current study.

4.3.4 Model Testing

The proposed model was examined utilizing a path analysis with the LISREL 8.80 for Windows (Jöreskog & Sörborn, 2006). Since χ^2 criterion is very sensitive to sample size and tends to give significant results above sample size 200 (Schumacker &Lomax, 2004). Besides, the result of the analysis indicated a good fit of theoretically constructed model (see Table 4.17). Also the expended goodness of fit statistics could be found in Appendix N.

Table 4.17 Result of the Proposed Model

RMSEA	SRMR	NFI	CFI	GFI
.09	.02	.99	.99	.99

Significant and non-significant, positive and negative paths of the result of the path analysis were represented in the Figure 4.2.

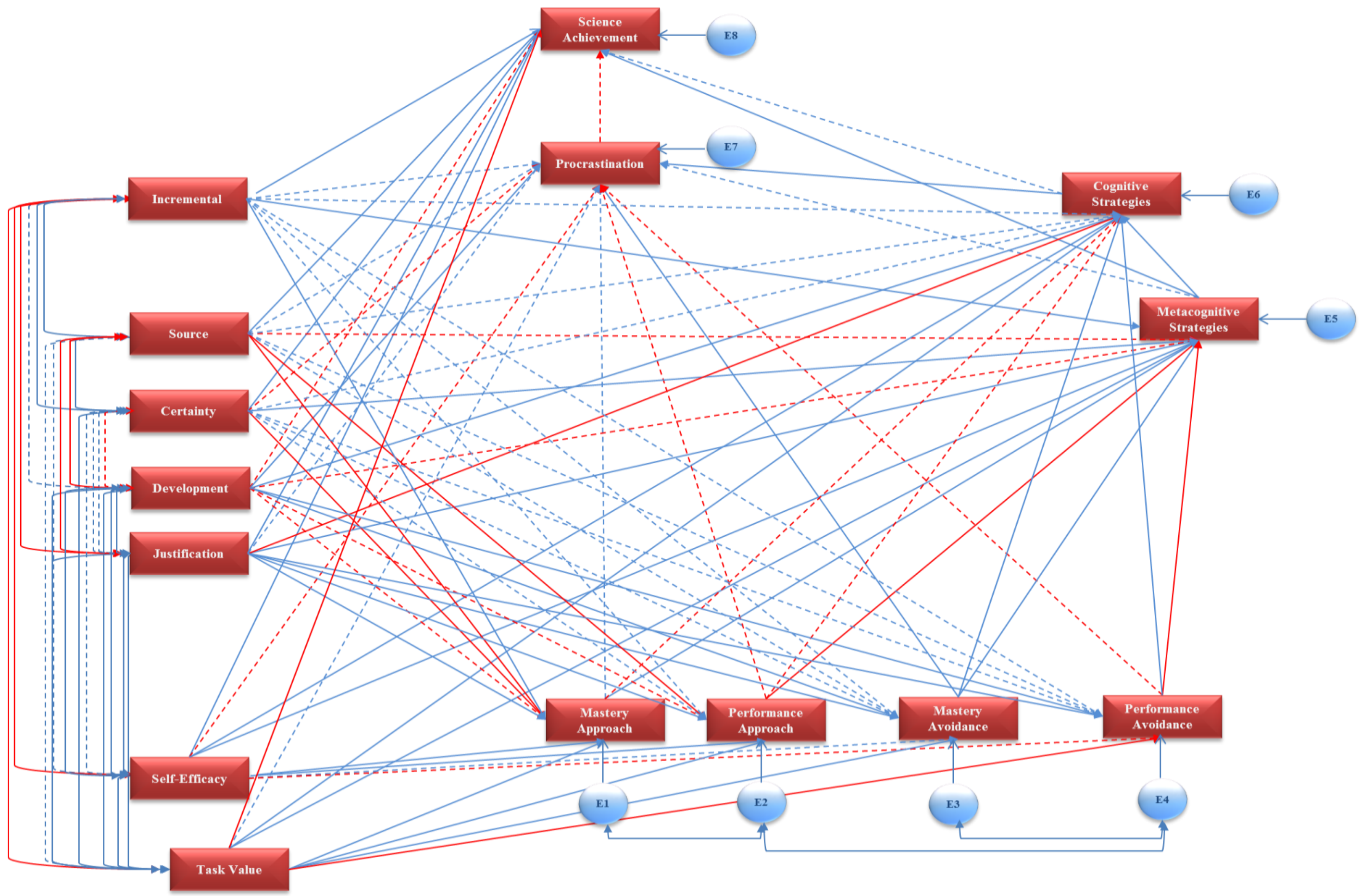


Figure 4.2 The Model According to the Path Analysis Result
*The solid lines indicate positive paths and the dotted lines indicate negative paths
**The blue lines indicate significant paths and the red lines indicate non-significant paths

4.4 Result of Path Analysis

Relationships of the variables were examined under this topic. Also, explained variance of achievement goals, cognitive learning strategies use, procrastination and science achievement with directions and significance of the proposed paths were reported.

4.4.1 Achievement Goals

Achievement goals of seventh grade students were examined under four dimensions, namely; mastery-approach goal, performance-approach goal, mastery-avoidance goals and performance-avoidance goals. According to the result of the path analysis; 29 % of variance on mastery-approach goal, 12% of variance on performance-approach goal, 5% of variance on mastery-avoidance goal and 12% of variance on performance-avoidance goal were explained with the proposed model. The following subsections present the result of the path analysis concerning the achievement goals in relation to implicit theories of ability, epistemological beliefs, and motivational beliefs in detail.

4.4.1.1 Achievement Goals in Relation to Implicit Theories of Ability

This part addresses the research question 1.1 which is related to the relationship between Turkish elementary school students' achievement goals (i.e., mastery-approach goal, performance-approach goal, mastery-avoidance goal and performance-avoidance goal) and their implicit theories of ability (i.e., incremental theory of ability) regarding science course was examined.

According to the result of path analysis, students' implicit theories of ability specifically for science were found to be related with their achievement goals (see Table 4.18). Specifically, students' incremental theory of ability specifically about science was found to be significantly and positively linked to their mastery-approach goal ($\gamma = .05$, $p < .05$) in science classes. Thus, it appeared that students with the view that science ability can change and be improved are likely to adopt mastery-approach goal emphasizing learning and understanding in science classes. On the other hand, students' incremental theory of ability were found to be significantly and negatively related to their performance-approach goal ($\gamma = -.05$, $p < .05$), mastery-avoidance goal ($\gamma = -.08$, $p < .05$) and performance-avoidance goal ($\gamma = -.14$, $p < .05$). Overall, these findings suggested that students with incremental theory of ability are less likely to hold avoidance goals and performance-approach goal.

Table 4.18 Achievement Goals in Relation to Incremental Theory of Ability

	Direct Effect		Indirect Effect		Total Effect	
	Stand. Coeff.	t-value	Stand. Coeff.	t-value	Stand. Coeff.	t-value
Incremental Theory of Ability						
Mastery-Approach	.05	3.78*	-	-	.05	3.78
Performance-Approach	-.05	-3.20*	-	-	-.05	-3.20
Mastery-Avoidance	-.08	-5.11*	-	-	-.08	-5.11
Performance-Avoidance	-.14	-8.76*	-	-	-.14	-8.76

* Significant path

4.4.1.2 Achievement Goals in Relation to Epistemological Beliefs

In this part, the research question 1.2 which addressed the relationship between elementary school students' achievement goals (i.e., mastery-approach goal, performance-approach goal, mastery-avoidance goal and performance-avoidance goal) and epistemological beliefs (i.e., source of knowing, certainty of knowledge, development of knowledge and justification for knowing) regarding science course was investigated.

Result of the path analysis, indicated that students' sophisticated beliefs about source of knowledge dimension of epistemological beliefs were negatively associated with their avoidance goals in science classes (see Table 4.19). Particularly, students' sophisticated beliefs about source of scientific knowledge was found to be negatively related to their mastery-avoidance goal (γ = -.06, p < .05) and performance-avoidance goal (γ = -.07, p < .05) in science classes. These findings implied that students with the belief that knowledge does not reside in external authorities (i.e., teachers, textbooks, or scientists) are likely to adopt lower levels of avoidance goals in science classes. On the other hand, the proposed relationships between source of knowing dimension mastery-approach goal (γ = .01, p > .05) and performance-approach goal (γ = .02, p > .05) were found to be non-significant.

Table 4.19 Achievement Goals in Relation to Source of Knowing Dimension

	Direct Effect		Indirect Effect		Total Effect	
	Stand. Coeff.	t-value	Stand. Coeff.	t-value	Stand. Coeff.	t-value
Source of Knowing						
Mastery-Approach	.01	.68	-	-	.01	.68
Performance-Approach	.02	.89	-	-	.02	.89
Mastery-Avoidance	-.06	-3.03*	-	-	-.06	-3.03
Performance-Avoidance	-.07	-3.73*	-	-	-.07	-3.73

* Significant path

Concerning students' sophisticated beliefs about certainty of scientific knowledge, it was found to be significantly and negatively linked to their performance-approach goal (γ = -.09, p < .05), mastery-avoidance goal (γ = -.08, p < .05) and performance-avoidance goal (γ = -.18, p < .05) in science classes (see Table 4.20). These findings implied that students with the belief that scientific knowledge is not always true or scientist do not always agree about what is true in science are less likely to study for the reasons of demonstrating their abilities to others, avoiding misunderstanding or getting the worst grade in science classes.

Table 4.20 Achievement Goals in Relation to Certainty of Knowledge Dimension

	Direct Effect		Indirect Effect		Total Effect	
	Stand. Coeff.	t-value	Stand. Coeff.	t-value	Stand. Coeff.	t-value
Certainty of Knowledge						
Mastery-Approach	.01	.64	-	-	.01	.64
Performance-Approach	-.09	-4.58*	-	-	-.09	-4.58
Mastery-Avoidance	-.08	-3.76*	-	-	-.08	-3.76
Performance-Avoidance	-.18	-8.93*	-	-	-.18	-8.93

*Significant path

On the other hand, students' sophisticated beliefs about development of scientific knowledge were found to be significantly and positively linked to only mastery-avoidance goal (γ = .05, p < .05) and performance-avoidance goal (γ = .04, p < .05) in science classes (see Table 4.21). No significant relationships were found between development of knowledge dimension of epistemological beliefs and students' mastery-approach goal (γ = -.02, p > .05) and performance-approach goal (γ = .00, p > .05). These findings suggested that students with the belief that science is an evolving and changing subject are likely to adopt avoidance goals in science classes.

Table 4.21 Achievement Goals in Relation to Development of Knowledge Dimension

	Direct Effect		Indirect Effect		Total Effect	
	Stand. Coeff.	t-value	Stand. Coeff.	t-value	Stand. Coeff.	t-value
Development of Knowledge						
Mastery-Approach	-.02	-1.43	-	-	-.02	-1.43
Performance-Approach	.00	-.24	-	-	.00	-.24
Mastery-Avoidance	.05	2.64*	-	-	.05	2.64
Performance-Avoidance	.04	2.41*	-	-	.04	2.41

*Significant path

In addition, result of the path analysis regarding the relationship between epistemological beliefs and achievement goals revealed that students' sophisticated beliefs about justification for knowing scientific knowledge were significantly and positively associated with their achievement goals in science classes (see Table 4.22). Specifically, students' sophisticated beliefs about justification for knowing scientific knowledge was positively and significantly linked to their mastery-approach goals ($\gamma = .15$, $p < .05$), performance-approach goal ($\gamma = .13$, $p < .05$), mastery-avoidance goal ($\gamma = .06$, $p < .05$) and performance-avoidance goal ($\gamma = .07$, $p < .05$) in science classes. These findings indicated that students' sophisticated beliefs about the role of experiments and how individuals justify knowledge tend to hold all types of achievement goals at higher levels.

Table 4.22 Achievement Goals in Relation to Justification for Knowing Dimension

	Direct Effect		Indirect Effect		Total Effect	
	Stand. Coeff.	t-value	Stand. Coeff.	t-value	Stand. Coeff.	t-value
Justification for Knowing						
Mastery-Approach	.15	8.98*	-	-	.15	8.98
Performance-Approach	.13	7.17*	-	-	.13	7.17
Mastery-Avoidance	.06	3.56*	-	-	.06	3.56
Performance-Avoidance	.07	3.86*	-	-	.07	3.86

*Significant path

4.4.1.3 Achievement Goals in Relation to Motivational Beliefs

This part addresses the research question 1.3 which is related to the relationship between Turkish elementary school students' achievement goals (i.e., mastery-approach goal, performance-approach goal, mastery-avoidance goal and performance-avoidance goal) and their motivational beliefs (i.e., self-efficacy and task value) regarding science course was examined.

Result of the analysis revealed that students' self-efficacy in science was positively and significantly linked to their mastery-approach goal (γ = .19, p < .05) and performance-approach goal (γ = .16, p <.05) in science classes (see Table 4.23). This result implied that, students who feel self-efficacious in science classes are more likely to adopt approach goals. In other words, they tend to emphasize learning, understanding as well as getting the best grades in science classes. On the other hand, a negative and significant associating was found between self-efficacy and mastery-avoidance goal (γ = -.10, p < .05). Thus, it appeared that self-efficacious students are less likely to adopt mastery-avoidance goals.

Table 4.23 Achievement Goals in Relation to Self-Efficacy

	Direct Effect		Indirect Effect		Total Effect	
	Stand. Coeff.	t-value	Stand. Coeff.	t-value	Stand. Coeff.	t-value
Self-Efficacy						
Mastery-Approach	.19	8.70*	-	-	.19	8.70
Performance-Approach	.16	7.02*	-	-	.16	7.02
Mastery-Avoidance	-.10	-4.29*	-	-	-.10	-4.29
Performance-Avoidance	-.01	-.52	-	-	-.01	-.52

*Significant path

Concerning task value beliefs in science classes (see Table 4.24), it was found to be significantly and positively linked to students' mastery-approach goal (γ = .30, p < .05), performance-approach goal (γ = .09, p < .05) and mastery-avoidance goal (γ = .12, p < .05). Thus, it appeared that students who perceive science classes as interesting, useful, and important tend to adopt approach goals as well as mastery-avoidance goal.

Table 4.24 Achievement Goals in Relation to Task Value

	Direct Effect		Indirect Effect		Total Effect	
	Stand. Coeff.	t-value	Stand. Coeff.	t-value	Stand. Coeff.	t-value
Task Value						
Mastery-Approach	.30	13.20*	-	-	.30	13.20
Performance-Approach	.09	3.95*	-	-	.09	3.95
Mastery-Avoidance	.12	5.21*	-	-	.12	5.21
Performance-Avoidance	.05	1.95	-	-	.05	1.95

*Significant path

4.4.1.4 Summary of Findings Concerning Achievement Goals

Summary of the findings concerning the achievement goals in relation to the implicit theories of ability, epistemological beliefs and motivational beliefs regarding science course were presented in the following part as seen in Figure 4.3.

Concerning implicit theories of ability the result revealed that students' incremental theory of ability about science was positively linked with their mastery-approach goal. On the other hand, students' incremental theory of ability negatively related with their performance-approach, mastery-avoidance and performance-avoidance goals. In addition, result of the path analysis concerning the relationship between epistemological beliefs and achievement goal revealed that sophisticated beliefs about justification for knowing and development of knowledge are positively linked to avoidance goals. In addition, justification for knowing dimension was found to be positively associated with approach goals. Concerning source of knowing and certainty of knowledge dimensions, sophisticated beliefs on these dimensions appeared to be negatively linked to avoidance goals. Certainty of knowledge dimension is also found to be negatively related to performance-approach goal. According to the result, students' self-efficacy was positively related with approach goals but it was negatively related with mastery-avoidance goal. In addition, task value was positively connected with approach goals and mastery-avoidance goal.

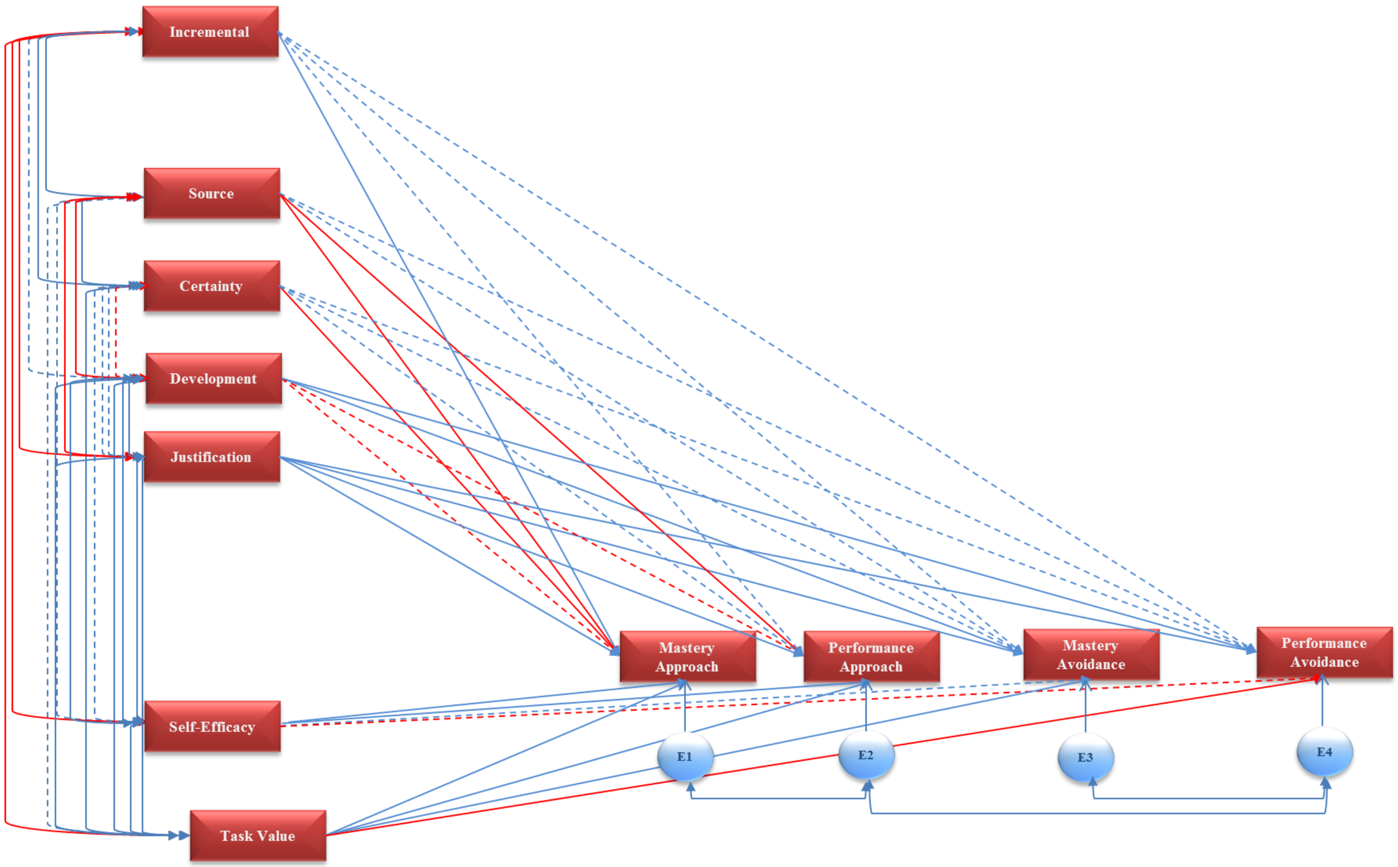


Figure 4.3 Achievement Goals' Links with Other Variables According to the Path Analysis' Result
*The solid lines indicate positive paths and the dotted lines indicate negative paths.
**The blue lines indicate significant paths and the red lines indicate non-significant path

4.4.2 Learning Strategies

Learning strategies use of seventh grade students were examined under two dimensions, namely; cognitive learning strategies and metacognitive learning strategies. According to the result of the path analysis, 74 % of variance on cognitive learning strategies use and 58 % of variance on metacognitive learning strategies use in science course were explained by the proposed model. The following sub-sections present the result of the path analysis concerning the learning strategies in relation to implicit theories of ability, epistemological beliefs, motivational beliefs, achievement goals in detail. Also, findings regarding the cognitive learning strategies in relation to metacognitive learning strategies were reported.

4.4.2.1 Learning Strategies in Relation to Implicit Theories of Ability

In this part, the research question 1.4 which addressed the relationship between elementary school students' learning strategies (i.e., cognitive learning strategies and metacognitive learning strategies) and their implicit theories of ability (i.e., incremental theory of ability) regarding science ability was investigated.

As shown in Table 4.25, students' implicit theories of ability was found to be significantly and positively linked to students' metacognitive learning strategies use ($\gamma = .03$, $p < .05$). This finding implied that students with the view that science ability can be improved tend to metacognitively active in science classes. On the other hand, a negative association was found between implicit theories of ability and cognitive learning strategies use (γ = -.02, p < .05).

Table 4.25 Learning Strategies in Relation to Incremental Theory of Ability

	Direct Effect		Indirect Effect		Total Effect	
	Stand. Coeff.	t-value	Stand. Coeff.	t-value	Stand. Coeff.	t-value
Incremental Theory of Ability						
Cognitive Learning Strategies	-.02	-2.21*	.01	1.50	-.01	-.74
Metacognitive Learning Strategies	.03	2.57*	.00	-.10	.03	2.54

*Significant path

4.4.2.2 Learning Strategies in Relation to Epistemological Beliefs

This part addresses the research question 1.5 which is related to the relationship between Turkish elementary school students' learning strategies (i.e., cognitive learning strategies and metacognitive learning strategies) and their epistemological beliefs (i.e., source of knowing, certainty of knowledge, development of knowledge and justification for knowing) regarding science course was examined.

As presented in Table 4.26, students 'sophisticated beliefs about source of scientific knowledge was found to be negatively related to their cognitive learning strategies use (γ = -.04, p < .05). This result suggests that students with sophisticated beliefs about the source of scientific knowledge tend to use cognitive learning strategies at lower levels. On the other hand, no relationship was found between ’sophisticated beliefs about source of scientific knowledge and metacognitive learning strategies use.

Table 4.26 Learning Strategies in Relation to Source of Knowing Dimension

	Direct Effect		Indirect Effect		Total Effect	
	Stand. Coeff.	t-value	Stand. Coeff.	t-value	Stand. Coeff.	t-value
Source of Knowing						
Cognitive Learning Strategies	-.04	-3.40*	-.02	-2.32	-.06	-4.19
Metacognitive Learning Strategies	-.03	-1.71	.00	.01	-.03	-1.84

*Significant path

Concerning the certainty of knowledge dimension, the result of the study (see Table 4.27) indicated a significant students sophisticated beliefs about certainty of scientific knowledge was negatively related with their cognitive learning strategies use (γ = -.04, p < .05), while the link between those beliefs and metacognitive strategies was positive (γ = .02, p < .05). That is, students believing that there could be more than one answer of a scientific question use less cognitive strategies but those students use more metacognitive learning strategies.

Table 4.27 Learning Strategies in Relation to Certainty of Knowledge Dimension

	Direct Effect		Indirect Effect		Total Effect	
	Stand. Coeff.	t-value	Stand. Coeff.	t-value	Stand. Coeff.	t-value
Certainty of Knowledge						
Cognitive Learning Strategies	-.05	-4.30*	.01	.80	-.04	-2.86
Metacognitive Learning Strategies	.03	1.97*	-.01	-1.60	.02	1.61

*Significant path

Result of the analysis (see Table 4.28) revealed those students' sophisticated beliefs about the development of knowledge positively linked with their cognitive learning strategies (γ = .02, p < .05) which means that students who believe that scientific knowledge could be constructed by oneself use more cognitive learning strategies in science course. On the other hand the association between development of knowledge dimension and metacognitive learning strategies use was non-significant.

Table 4.28 Learning Strategies in Relation to Development of Knowledge Dimension

	Direct Effect		Indirect Effect		Total Effect	
	Stand. Coeff.	t-value	Stand. Coeff.	t-value	Stand. Coeff.	t-value
Development of Knowledge						
Cognitive Learning Strategies	.02	2.71*	.00	.14	.03	2.26
Metacognitive Learning Strategies	.00	-.31	.00	.02	.00	-.30

*Significant path

In addition, students ’sophisticated beliefs about justification for knowing scientific knowledge was positively connected with their metacognitive learning strategies use ($\gamma = .13$, $p < .05$) according the result (see Table 4.29). It implies that students believing that experiments in science are used to support arguments and develop new ideas use more metacognitive learning strategies in science course. However, the relationship between students’ justification for knowing and their cognitive learning strategies use was non-significant.

Table 4.29 Learning Strategies in Relation to Justification for Knowing Dimension

	Direct Effect		Indirect Effect		Total Effect	
	Stand. Coeff.	t-value	Stand. Coeff.	t-value	Stand. Coeff.	t-value
Justification for Knowing						
Cognitive Learning Strategies	.00	.24	.10	11.58	.10	8.33
Metacognitive Learning Strategies	.13	10.37*	.02	6.33	.15	12.01

*Significant path

4.4.2.3 Learning Strategies in Relation to Motivational Beliefs

In this part, the research question 1.6 which addressed the relationship between elementary school students’ learning strategies (i.e., cognitive learning strategies and metacognitive learning strategies) and their motivational beliefs (i.e., self-efficacy and task value) regarding science course was investigated.

Students' motivational beliefs were examined in terms of their self-efficacy and task value. As shown in Table 4.30 result of the analysis indicated that students' self-efficacy was positively related with their cognitive ($\gamma = .16$, $p < .05$) and metacognitive learning strategies use ($\gamma = .35$, $p < .05$) in science course. It means that students believing their capabilities to be successful in science class use more cognitive and metacognitive learning strategies.

Table 4.30 Learning Strategies in Relation to Self-Efficacy

	Direct Effect		Indirect Effect		Total Effect	
	Stand. Coeff.	t-value	Stand. Coeff.	t-value	Stand. Coeff.	t-value
Self-Efficacy						
Cognitive Learning Strategies	.16	11.35*	.23	18.95	.39	22.03
Metacognitive Learning Strategies	.35	20.20*	.02	4.67	.37	21.11

*Significant path

Regarding the task value of the students, result (see Table 4.31) demonstrated that students task value was positively associated with their cognitive ($\gamma = .11$, $p < .05$) and metacognitive ($\gamma = .31$, $p < .05$) learning strategies use in science course which pointed out that students believing that science course material are interesting, important and have utility highly control their cognitive activities and also highly regulate their knowledge about their cognitive process, products and everything related with them for learning process in science course.

Table 4.31 Learning Strategies in Relation to Task Value

	Direct Effect		Indirect Effect		Total Effect	
	Stand. Coeff.	t-value	Stand. Coeff.	t-value	Stand. Coeff.	t-value
Task Value						
Cognitive Learning Strategies	.11	7.74*	.22	17.46	.33	19.03
Metacognitive Learning Strategies	.31	17.28*	.04	7.77	.35	19.44

*Significant path

4.4.2.4 Learning Strategies in Relation to Achievement Goals

This part addresses the research question 1.7 which is related to the relationship between Turkish elementary school students' use of learning strategies (i.e., cognitive learning strategies and metacognitive learning strategies) and their achievement goals (i.e., mastery-approach goal, performance-approach goal, mastery-avoidance goal and performance-avoidance goal) regarding science course was examined.

Result of the analysis (see Table 4.32) showed that students' mastery-approach goal was positively related with their metacognitive learning strategies use ($\beta = .11$, $p < .05$). It implies that students focusing on learning and mastering task use metacognitive learning strategies at higher level in science course. But the association between mastery-approach goal and cognitive learning strategies use was insignificant.

Table 4.32 Learning Strategies in Relation to Mastery-Approach Goal

	Direct Effect		Indirect Effect		Total Effect	
	Stand. Coeff.	t-value	Stand. Coeff.	t-value	Stand. Coeff.	t-value
Mastery-Approach Goal						
Cognitive Learning Strategies	.00	-.51	.07	8.86	.07	5.54
Metacognitive Learning Strategies	.11	8.99*	-	-	.11	8.99

*Significant path

According to the result (see Table 4.33) students' performance-approach goal was not significantly related with their cognitive and metacognitive learning strategies use.

Table 4.33 Learning Strategies in Relation to Performance-Approach Goal

	Direct Effect		Indirect Effect		Total Effect	
	Stand. Coeff.	t-value	Stand. Coeff.	t-value	Stand. Coeff.	t-value
Performance-Approach Goal						
Cognitive Learning Strategies	-.01	-.85	.00	.05	.06	-.64
Metacognitive Learning Strategies	.00	.05	-	-	.03	.05

*Significant path

Concerning students' mastery-avoidance goal, the result revealed (see Table 4.34) that students' mastery-avoidance goal positively link with their use of cognitive (β = .05, p < .05) and metacognitive (β = .03, p < .05) learning strategies. Those findings illustrated that students avoiding from misunderstanding and not learning science course material use more cognitive and metacognitive learning strategies use in the course.

Table 4.34 Learning Strategies in Relation to Mastery-Avoidance Goal

	Direct Effect		Indirect Effect		Total Effect	
	Stand. Coeff.	t-value	Stand. Coeff.	t-value	Stand. Coeff.	t-value
Mastery-Avoidance Goal						
Cognitive Learning Strategies	.05	5.08*	.02	2.73	.06	5.66
Metacognitive Learning Strategies	.03	2.74*	-	-	.03	2.74

*Significant path

Result of the analysis (see Table 4.35) showed that students' performance-avoidance goal positively linked with their cognitive learning strategies use ($\beta = .02$, $p < .05$) which means that students setting goal for avoiding inferiority in comparison to others use cognitive learning strategies at higher level in science course. On the other hand, there was not any significant association between performance-avoidance goal and metacognitive learning strategies.

Table 4.35 Learning Strategies in Relation to Performance-Avoidance Goal

	Direct Effect		Indirect Effect		Total Effect	
	Stand. Coeff.	t-value	Stand. Coeff.	t-value	Stand. Coeff.	t-value
Performance-Avoidance Goal						
Cognitive Learning Strategies	.02	2.21*	.01	1.63	.04	2.81
Metacognitive Learning Strategies	.02	1.63	-	-	.02	1.63

*Significant path

4.4.2.5 Cognitive Learning Strategies in Relation to Metacognitive Learning Strategies

In this part, the research question 1.8 which addressed the relationship between elementary school students' cognitive and metacognitive learning strategies use in science course was examined.

Result of the analysis (see Table 4.36) indicated a positive relationship between students' cognitive learning strategies use and their metacognitive learning strategies use (β = .63, p < .05). Students who make more regulation in their knowledge about their cognitive process and products for their learning process in science course, show more control on their cognitive activities to choose, get and combine the new knowledge with existing knowledge related with science course.

Table 4.36 Cognitive Learning Strategies in Relation to Metacognitive Learning Strategies

	Direct Effect		Indirect Effect		Total Effect	
	Stand. Coeff.	t-value	Stand. Coeff.	t-value	Stand. Coeff.	t-value
Metacognitive Learning Strategies						
Cognitive Learning Strategies	.63	47.78*	-	-	.63	47.78

*Significant path

4.4.2.6 Summary of Findings Concerning Learning Strategies

Summary of the findings concerning the students' learning strategies use in relation to the implicit theories of ability, epistemological beliefs, motivational beliefs and achievement goals regarding science course were presented in the following part as seen in Figure 4.4. Also, the association between cognitive learning strategies and metacognitive learning strategies was presented.

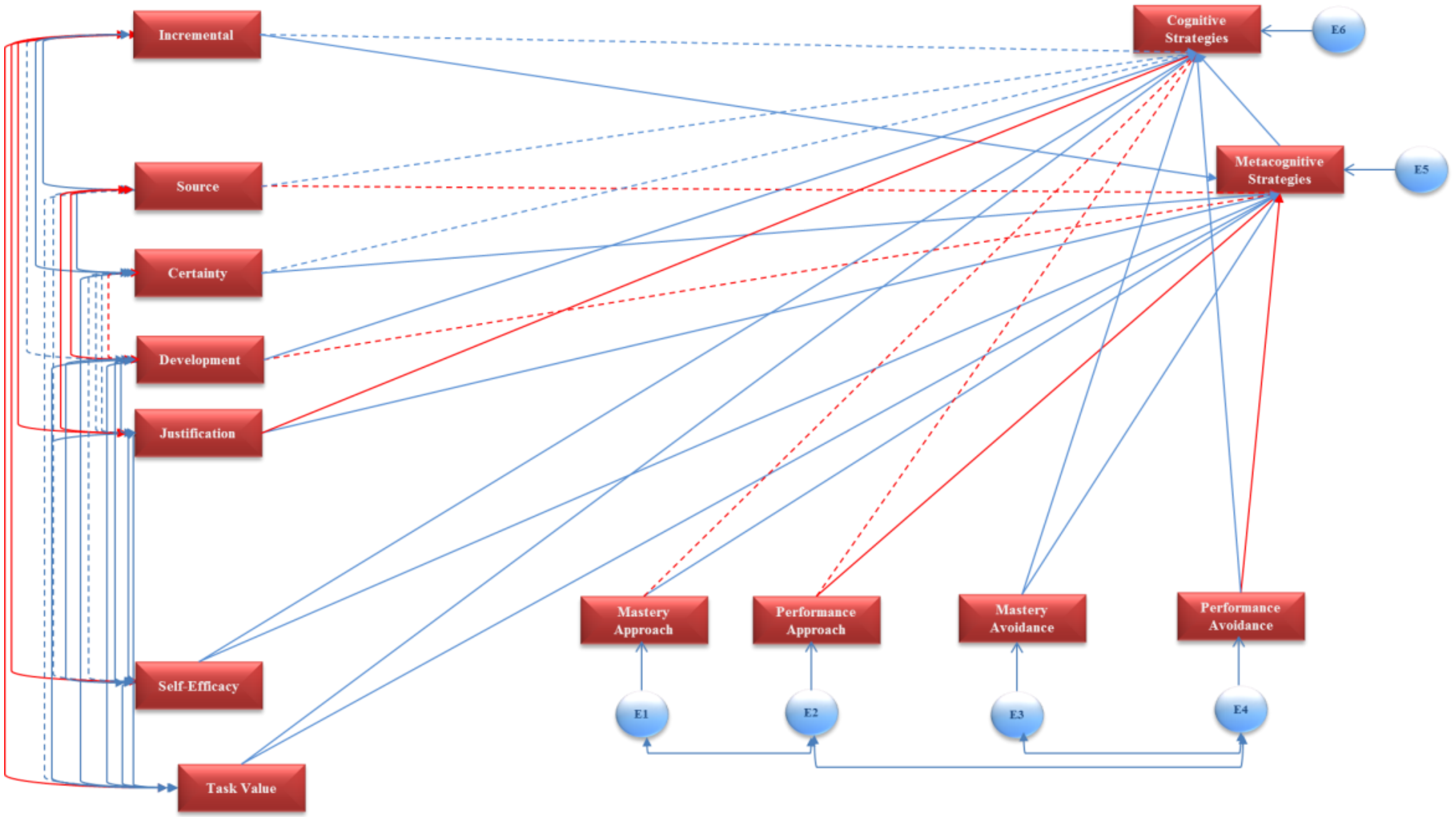


Figure 4.4 Learning Strategies' Links with Other Variables According to the Path Analysis' Result
*The solid lines indicate positive paths and the dotted lines indicate negative paths
**The blue lines indicate significant paths and the red lines indicate non-significant path

Result of the path analysis pointed out that while seventh grade elementary students' incremental theory of ability specifically for science was negatively related with their use of cognitive learning strategies, it was positively associated with those students' metacognitive learning strategies use in the course. Besides, students' sophisticated beliefs about source of knowing and certainty of knowledge dimensions were negatively linked with their cognitive learning strategies use. However, sophisticated beliefs about development of knowledge dimension were positively connected with students' use of cognitive learning strategies. In addition, concerning the certainty of knowledge and justification for knowing dimensions, sophisticated beliefs were positively associated with metacognitive learning strategies use. In addition, higher motivational beliefs, self-efficacy and task value, were positively related with both cognitive and metacognitive learning strategies. Concerning achievement goals, avoidance goals positively linked with cognitive learning strategies. Also, mastery goals were positively connected with metacognitive learning strategies. According to the path analysis result, the connection between cognitive learning strategies and metacognitive learning strategies use was positive.

4.4.3 Procrastination

Procrastination of seventh grade students regarding science course was examined. According to the result of the path analysis, 38 % of variance on procrastination was explained with the proposed model. The following sub-sections present the result of the path analysis concerning the procrastination in relation to implicit theories of ability, epistemological beliefs, motivational beliefs, achievement goals and learning strategies in detail.

4.4.3.1 Procrastination in Relation to Implicit Theories of Ability

In this part, the research question 1.9 which addressed the relationship between elementary school students' procrastination in science course and their implicit theories of ability (i.e., incremental theory of ability) about science was investigated.

Result of the analysis (see Table 4.37) indicated that students' procrastination in science course was negatively associated with their incremental theory of ability about science ($\gamma = -.04$, $p < .05$). It implies that students believing that science ability is malleable and changeable procrastinate tasks of science course at lower level.

Table 4.37 Procrastination in Relation to Incremental Theory of Ability

	Direct Effect		Indirect Effect		Total Effect	
	Stand. Coeff.	t-value	Stand. Coeff.	t-value	Stand. Coeff.	t-value
Incremental Theory of Ability						
Procrastination	-.04	-3.23*	-.03	-4.78	-.07	-4.96

*Significant path

4.4.3.2 Procrastination in Relation to Epistemological Beliefs

This part addresses the research question 1.10 which is related to the relationship between Turkish elementary school students' procrastination in science course and their epistemological beliefs (i.e., source of knowing, certainty of knowledge, development of knowledge and justification for knowing) specifically for science was examined.

In terms of source of knowing dimension of epistemological beliefs, result of the analysis revealed (see Table 4.38) that students' sophisticated beliefs about source scientific knowledge was negatively linked with their procrastination ($\gamma = -.07$, $p < .05$). In other words, students believing that scientific knowledge can be constructed by oneself procrastinate at lower level in science course.

Table 4.38 Procrastination in Relation to Source of Knowing Dimension

	Direct Effect		Indirect Effect		Total Effect	
	Stand. Coeff.	t-value	Stand. Coeff.	t-value	Stand. Coeff.	t-value
Source of Knowing						
Procrastination	-.07	-3.89*	.00	.01	-.07	-3.55

*Significant path

Result of the path analysis (see Table 4.39) revealed that certainty of knowledge dimension of epistemological beliefs was not significantly related with students' procrastination.

Table 4.39 Procrastination in Relation to Certainty of Knowledge Dimension

	Direct Effect		Indirect Effect		Total Effect	
	Stand. Coeff.	t-value	Stand. Coeff.	t-value	Stand. Coeff.	t-value
Certainty of Knowledge						
Procrastination	-.02	-1.39	-.02	-2.84	-.05	-2.50

*Significant path

According to result (see Table 4.40), students' sophisticated beliefs about the development of knowledge dimension of epistemological beliefs was positively linked with their procrastination ($\gamma = .11$, $p < .05$). That is students believing the evolving feature of scientific knowledge procrastinate at higher level.

Table 4.40 Procrastination in Relation to Development of Knowledge Dimension

	Direct Effect		Indirect Effect		Total Effect	
	Stand. Coeff.	t-value	Stand. Coeff.	t-value	Stand. Coeff.	t-value
Development of Knowledge						
Procrastination	.11	7.90*	.01	1.87	.12	8.00

*Significant path

Result of the analysis (see Table 4.41) pointed out that students' sophisticated beliefs about justification for knowing dimension was negatively associated with their procrastination ($\gamma = -.08$, $p < .05$). It implies that students believing that experiments in science are used to support arguments and develop new ideas have fewer tendencies to procrastinate in science course.

Table 4.41 Procrastination in Relation to Justification for Knowing Dimension

	Direct Effect		Indirect Effect		Total Effect	
	Stand. Coeff.	t-value	Stand. Coeff.	t-value	Stand. Coeff.	t-value
Justification for Knowing						
Procrastination	-.08	-5.54*	-.08	-11.31	-.16	-10.63

*Significant path

4.4.3.3 Procrastination in Relation to Motivational Beliefs

In this part, the research question 1.11 which addressed the relationship between elementary school students' procrastination and their motivational beliefs (i.e., self-efficacy and task value) regarding science course was investigated.

Result of the path analysis (see Table 4.42) revealed that students' self-efficacy in science was not significantly related with their procrastination in science course.

Table 4.42 Procrastination in Relation to Self-Efficacy

	Direct Effect		Indirect Effect		Total Effect	
	Stand. Coeff.	t-value	Stand. Coeff.	t-value	Stand. Coeff.	t-value
Self-Efficacy						
Procrastination	-.04	-1.85	-.18	-15.49	-.22	-10.81

*Significant path

For task value, result of the analysis (see Table 4.43) indicated that students task value was negatively connected with their procrastination (γ = -.08, p < .05). It means that students believing that science course material are interesting, important and have utility have less tendency to procrastinate in science course.

Table 4.43 Procrastination in Relation to Task Value

	Direct Effect		Indirect Effect		Total Effect	
	Stand. Coeff.	t-value	Stand. Coeff.	t-value	Stand. Coeff.	t-value
Task Value						
Procrastination	-.08	-3.60*	-.17	-14.28	-.25	-11.91

*Significant path

4.4.3.4 Procrastination in Relation to Achievement Goals

This part addresses the research question 1.12 which is related to the relationship between Turkish elementary school students' procrastination and their achievement goals (i.e., mastery-approach goal, performance-approach goal, mastery-avoidance goal and performance-avoidance goal) regarding science course.

Result of the path analysis (see Table 4.44) demonstrated that students' mastery-approach goal was negatively related with their procrastination (β = -.14, p < .05) in science course. In implies that students concentrating on learning the in science course procrastinate less.

Table 4.44 Procrastination in Relation to Mastery-Approach Goal

	Direct Effect		Indirect Effect		Total Effect	
	Stand. Coeff.	t-value	Stand. Coeff.	t-value	Stand. Coeff.	t-value
Mastery-Approach Goal						
Procrastination	-.14	-9.44*	-.05	-8.25	-.19	-12.18

*Significant path

The relationship between students' performance-approach goal and their procrastination in science course was not significant (see Table 4.45).

Table 4.45 Procrastination in Relation to Performance-Approach Goal

	Direct Effect		Indirect Effect		Total Effect	
	Stand. Coeff.	t-value	Stand. Coeff.	t-value	Stand. Coeff.	t-value
Performance Approach Goal						
Procrastination	-.01	-.71	.00	-.18	-.01	-.74

*Significant path

In terms of mastery-avoidance goal result of the analysis (see Table 4.46) demonstrated that, students' mastery-avoidance goal positively related with their procrastination in science course ($\beta = .09$, $p < .05$) which means that students avoiding misunderstanding and not learning in science course procrastinate at higher level.

Table 4.46 Procrastination in Relation to Mastery-Avoidance Goal

	Direct Effect		Indirect Effect		Total Effect	
	Stand. Coeff.	t-value	Stand. Coeff.	t-value	Stand. Coeff.	t-value
Mastery-Avoidance Goal						
Procrastination	.09	6.69*	-.01	-1.83	.08	5.68

*Significant path

In addition, students' performance-avoidance goal was not significantly related with their procrastination in science course (see Table 4.47).

Table 4.47 Procrastination in Relation to Performance-Avoidance Goal

	Direct Effect		Indirect Effect		Total Effect	
	Stand. Coeff.	t-value	Stand. Coeff.	t-value	Stand. Coeff.	t-value
Performance-Avoidance Goal						
Procrastination	-.01	-.39	-.01	-1.22	-.01	-.81

*Significant path

4.4.3.5 Procrastination in Relation to Learning Strategies

In this part, the research question 1.13 which addressed the relationship between elementary school students' procrastination and their use of learning strategies (i.e., cognitive learning strategies and metacognitive learning strategies) regarding science course was examined.

According to the result of the path analysis (see Table 4.48), students procrastination in science course was positively linked with their cognitive learning strategies use (β = .09, $p < .05$). That is students who use more cognitive learning strategies to control their cognitive activities procrastinate at higher level.

Table 4.48 Procrastination in Relation to Cognitive Learning Strategies

	Direct Effect		Indirect Effect		Total Effect	
	Stand. Coeff.	t-value	Stand. Coeff.	t-value	Stand. Coeff.	t-value
Cognitive Learning Strategies						
Procrastination	.09	3.80*	-	-	.09	3.80

*Significant path

Result of the path analysis (see Table 4.49) revealed that the association between students' procrastination in science course and metacognitive learning strategies use was negative (β = -.05, $p < .05$). It implies that students who make more regulation in their knowledge about their cognitive process, products and everything related with learning process procrastinate less in science course.

Table 4.49 Procrastination in Relation to Metacognitive Learning Strategies

	Direct Effect		Indirect Effect		Total Effect	
	Stand. Coeff.	t-value	Stand. Coeff.	t-value	Stand. Coeff.	t-value
Metacognitive Learning Strategies						
Procrastination	-.05	-20.45*	.06	3.78	-.44	-23.56

*Significant path

4.4.3.6 Summary of Findings Concerning Procrastination

Summary of the findings concerning the procrastination in relation to the implicit theories of ability, epistemological beliefs, motivational beliefs, achievement goals and learning strategies regarding science course were presented in the following part as seen in Figure 4.5.

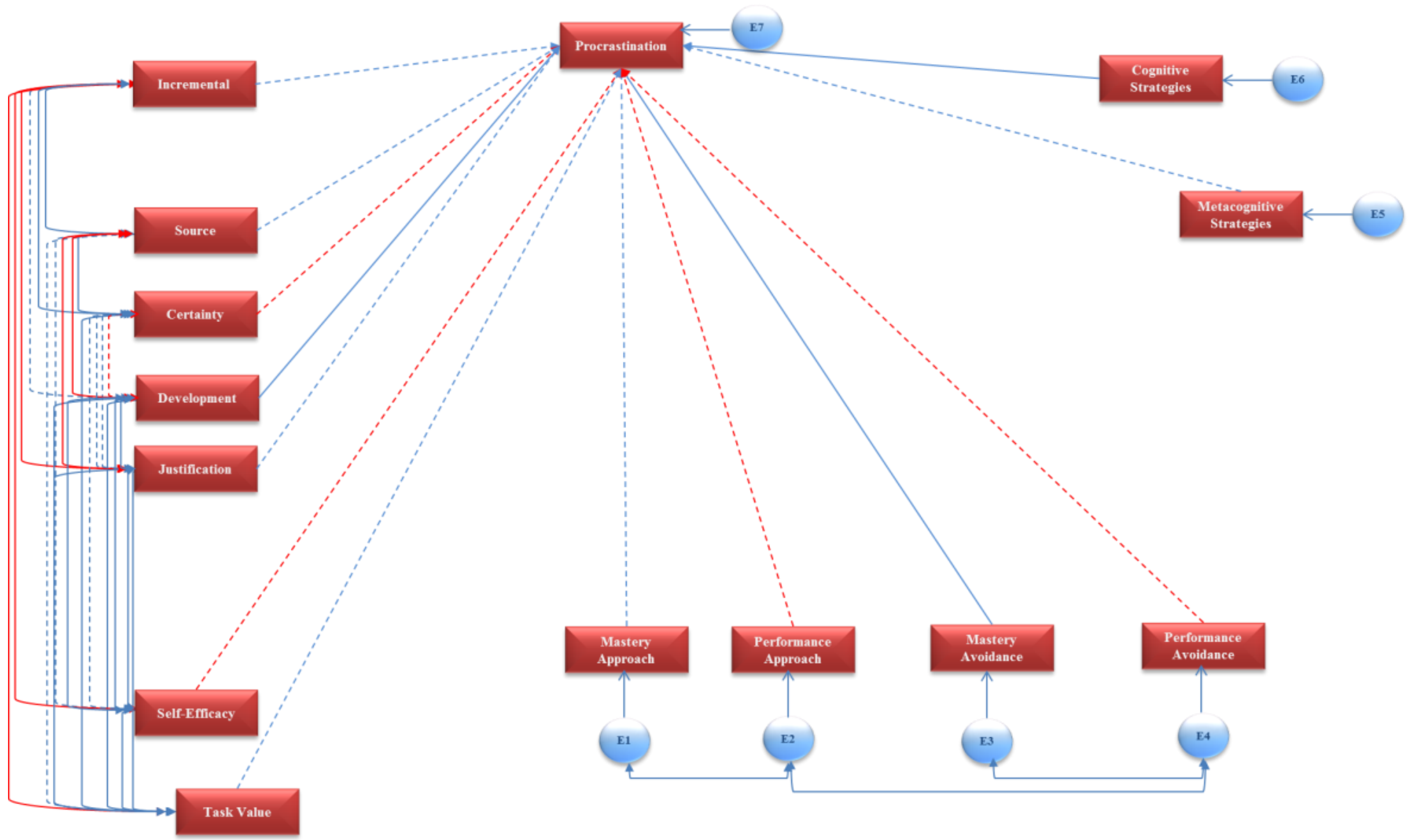


Figure 4.5 Procrastination's Links with Other Variables According to the Path Analysis' Result
*The solid lines indicate positive paths and the dotted lines indicate negative paths.
**The blue lines indicate significant paths and the red lines indicate non-significant path

The path analysis result indicated that incremental theory of ability for science was negatively linked with procrastination. Concerning source of knowing and justification for knowing dimensions of epistemological belief, sophisticated beliefs for the dimensions were negatively related with procrastination. On the other hand, sophisticated beliefs about development of knowledge dimension were positively associated with procrastination. In terms of motivational beliefs, task value was negatively connected with procrastination. Mastery goals were related with procrastination, particularly mastery-approach goal was negatively linked with procrastination but mastery-avoidance goal was positively associated with procrastination. According to result while cognitive learning strategies use positively linked with procrastination, metacognitive learning strategies use was negatively connected with it.

4.4.4 Science Achievement

According to the result of the path analysis, 20 % of variance on science achievement of seventh grade students was explained with the proposed model. The following sub-sections present the result of the path analysis concerning the science achievement in relation to implicit theories of ability, epistemological beliefs, motivational beliefs, learning strategies and procrastination in detail.

4.4.4.1 Science Achievement in Relation to Implicit Theories of Ability

This part addresses the research question 1.14 which is related to the relationship between Turkish elementary school students' science achievement and their implicit theories of ability (i.e., incremental theory of ability) about science were investigated.

Result of the path analysis (see Table 4.50) indicated that students' science achievement was positively related with their incremental theory of ability about science (γ = .06, p < .05). Accordingly students with higher science achievement scores tend to believe that science ability is malleable and changeable.

Table 4.50 Science Achievement in Relation to Incremental Theory of Ability

	Direct Effect		Indirect Effect		Total Effect	
	Stand. Coeff.	t-value	Stand. Coeff.	t-value	Stand. Coeff.	t-value
Incremental Theory of Ability						
Science Achievement	.06	4.15*	.00	2.47	.06	4.40

*Significant path

4.4.4.2 Science Achievement in Relation to Epistemological Beliefs

In this part, the research question 1.15 which addressed the relationship between elementary school students' science achievement and their epistemological beliefs (i.e., source of knowing, certainty of knowledge, development of knowledge and justification for knowing) regarding science was investigated.

Result of the path analysis (see Table 4.51) revealed that students' science achievement was positively related with their sophisticated beliefs about source of knowing dimension (γ = .07, p < .05). It implies that students with higher science achievement scores tend to believe that scientific knowledge can be constructed by oneself.

Table 4.51 Science Achievement in Relation to Source of Knowing Dimension

	Direct Effect		Indirect Effect		Total Effect	
	Stand. Coeff.	t-value	Stand. Coeff.	t-value	Stand. Coeff.	t-value
Source of Knowing						
Science Achievement	.07	3.82*	.00	1.61	.07	3.99

*Significant path

Result of the path analysis (see Table 4.52) showed that students science achievement scores was positively linked with their certainty of knowledge dimension of epistemological belief (γ = .26, p <.05). That is students with higher science achievement scores tend to believe that there could be more than one answer of a scientific question at higher level.

Table 4.52 Science Achievement in Relation to Certainty of Knowledge Dimension

	Direct Effect		Indirect Effect		Total Effect	
	Stand. Coeff.	t-value	Stand. Coeff.	t-value	Stand. Coeff.	t-value
Certainty of Knowledge						
Science Achievement	.26	13.79*	.01	2.90	.26	14.13

*Significant path

Result of the path analysis (see Table 4.53) showed that students' science achievement was insignificantly related with development of knowledge dimension of epistemological belief.

Table 4.53 Science Achievement in Relation to Development of Knowledge Dimension

	Direct Effect		Indirect Effect		Total Effect	
	Stand. Coeff.	t-value	Stand. Coeff.	t-value	Stand. Coeff.	t-value
Development of Knowledge						
Science Achievement	-.02	-1.14	.00	-1.67	-.02	-1.37

*Significant path

In terms of justification for knowing dimension of epistemological beliefs, result of the path analysis (see Table 4.54) demonstrated that students' science achievement positively related with their sophisticated beliefs about justification for knowing scientific knowledge ($\gamma = .19$, $p < .05$) which means that with higher science achievement scores tend to believe on the role of scientific experiments role to support arguments and develop new ideas at higher level.

Table 4.54 Science Achievement in Relation to Justification for Knowing Dimension

	Direct Effect		Indirect Effect		Total Effect	
	Stand. Coeff.	t-value	Stand. Coeff.	t-value	Stand. Coeff.	t-value
Justification for Knowing						
Science Achievement	.19	10.54*	.01	1.81	.19	11.08

*Significant path

4.4.4.3 Science Achievement in Relation to Motivational Beliefs

This part addresses the research question 1.16 which is related to the relationship between Turkish elementary school students' science achievement and their motivational beliefs (i.e., self-efficacy and task value) regarding science course were examined.

As students motivational beliefs their self-efficacy and task value were examined. Result of the path analysis (see Table 4.55) revealed that students' science achievement was positively associated with their self-efficacy in science (γ = .18, p < .05). That means students with higher science achievement scores tend to believe their capabilities to be successful in science class at higher level.

Table 4.55 Science Achievement in Relation Self-Efficacy

	Direct Effect		Indirect Effect		Total Effect	
	Stand. Coeff.	t-value	Stand. Coeff.	t-value	Stand. Coeff.	t-value
Self-Efficacy						
Science Achievement	.18	8.15*	.00	.34	.18	8.83

*Significant path

Result pointed out that students' science achievement was not significantly linked with their task value (see Table 4.56).

Table 4.56 Science Achievement in Relation Task Value

	Direct Effect		Indirect Effect		Total Effect	
	Stand. Coeff.	t-value	Stand. Coeff.	t-value	Stand. Coeff.	t-value
Task Value						
Science Achievement	.00	.06	.01	.69	.01	.32

*Significant path

4.4.4.4 Science Achievement in Relation to Learning Strategies

In this part, the research question 1.17 which addressed the relationship between elementary school students' science achievement and their use of learning strategies (i.e., cognitive learning strategies and metacognitive learning strategies) regarding science course was investigated.

Result of the path analysis (see Table 4.57) showed that students' science achievement was negatively linked with their cognitive learning strategies (β =

-.07, *p* < .05). It implies that students have higher science achievement scores use cognitive strategies at lower levels.

Table 4.57 Science Achievement in Relation Cognitive Learning Strategies

	Direct Effect		Indirect Effect		Total Effect	
	Stand. Coeff.	t-value	Stand. Coeff.	t-value	Stand. Coeff.	t-value
Cognitive Learning Strategies						
Science Achievement	-.07	-2.89*	.00	-.74	-.08	-2.94

*Significant path

Result of the analysis (see Table 4.58) indicated that students' science achievement was positively associated with their metacognitive learning strategies use (β = .08, *p* < .05) which means that students who have higher science achievement scores tend to use more metacognitive learning strategies to regulate their knowledge about their cognitive process, products and everything related with learning process.

Table 4.58 Science Achievement in Relation Metacognitive Learning Strategies

	Direct Effect		Indirect Effect		Total Effect	
	Stand. Coeff.	t-value	Stand. Coeff.	t-value	Stand. Coeff.	t-value
Metacognitive Learning Strategies						
Science Achievement	.08	2.82*	-.04	-2.27	.04	1.82

*Significant path

4.4.4.5 Science Achievement in Relation to Procrastination

This part addresses the research question 1.18 which is related to the relationship between Turkish elementary school students' science achievement and their procrastination in science course was examined.

According to the result (see Table 4.59) students' science achievement was not related with their procrastination in science course.

Table 4.59 Science Achievement in Relation Procrastination

	Direct Effect		Indirect Effect		Total Effect	
	Stand. Coeff.	t-value	Stand. Coeff.	t-value	Stand. Coeff.	t-value
Procrastination						
Science Achievement	-.01	-.76	-	-	-.01	-.76

*Significant path

4.4.4.6 Summary of Findings Concerning Science Achievement

Summary of the findings concerning the science achievement in relation to the implicit theories of ability, epistemological beliefs, motivational beliefs, learning strategies and procrastination regarding science course were presented in the following part as seen in Figure 4.6.

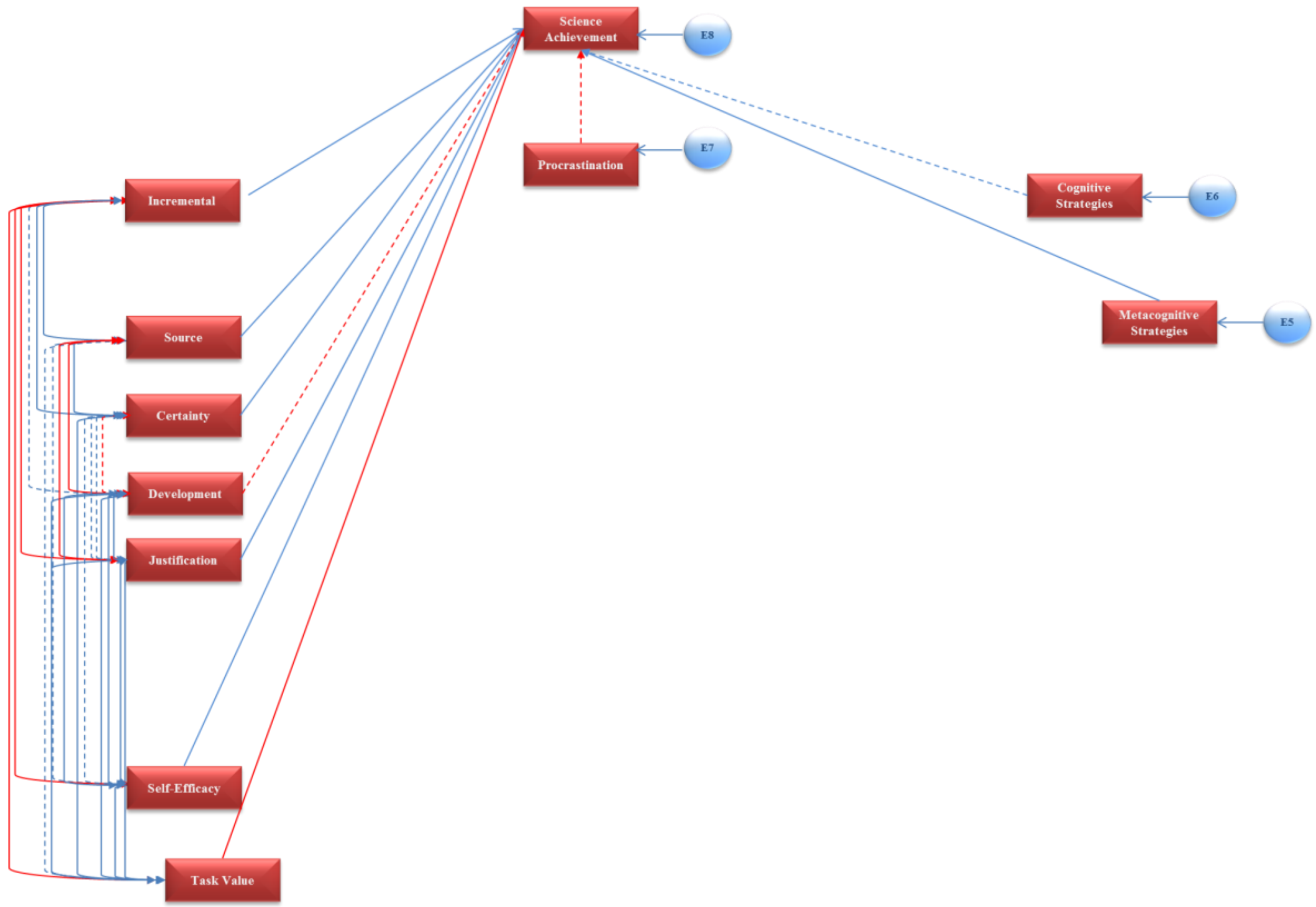


Figure 4.6 Science Achievement's Links with Other Variables According to the Path Analysis' Result
*The solid lines indicate positive paths and the dotted lines indicate negative paths
**The blue lines indicate significant paths and the red lines indicate non-significant path

Result of the analysis indicated that incremental theory of ability positively related with science achievement. Regarding the source of knowing, certainty of knowledge and justification for knowing dimensions of epistemological belief, sophisticated beliefs about the domains were positively associated with science achievement. As motivational beliefs, self-efficacy positively linked to science achievement. While cognitive learning strategies use negatively connected with science achievement, metacognitive learning strategies were positively related with it.

CHAPTER V

DISCUSSION

In this chapter, results of the present study were discussed. Also, conclusion, implications, and limitations and recommendations were presented.

5.1 Discussion of the Results

Specifically for science course, the proposed model tested the interplay among elementary students' implicit theories of ability, epistemological beliefs, motivational beliefs, achievement goals, learning strategies, procrastination and science achievement with a path analysis which is a special type of structural equation modeling.

5.1.1 Achievement Goals in Relation to Implicit Theories of Ability

The association between seventh grade elementary students' achievement goals and their implicit theories of ability was examined within the proposed model by conducting path analysis. Since both achievement goals (Ames & Archer, 1988; Elliot & McGregor, 2001) and implicit theories of ability (Chen & Pajares, 2010; Dweck & Master, 2009; Stipek & Gralinski, 1996) are domain specific, the variables were assessed specifically for science domain. In addition, the current study investigated the achievement goals of the students' in 2x2 frame which includes mastery-approach, performance-approach, mastery-avoidance and performance-avoidance goals. Also, implicit theories of science ability were examined in terms of incremental theory of ability specifically for science ability.

The result of the path analysis in the current study indicated that while seventh grade elementary students' incremental theory of ability for science domain positively linked to their mastery-approach goal, it was negatively linked with their performance-approach goal and avoidance goals (i.e. mastery-avoidance and performance-avoidance goals) for science course. Specifically, these results indicated that elementary students who believe that science ability is malleable and changeable are more likely to set mastery-approach goal in science classes. Accordingly, they tend to study for the reasons of mastering science tasks and activities, and learning science topics deeply. On the other hand, students with incremental theory of science ability were found to hold performance-approach, mastery-avoidance and performance-avoidance goals at lower levels. These findings implied that students believing that science ability is malleable and changeable are less likely focus on being superior, and avoid not learning and inferiority in science classes. Overall, findings of the current study concerning the relationship between achievement goals and implicit theories of science ability were parallel to what was expected before the analysis. Although there is no national or international studies specifically investigating the association between elementary students' achievement goals in science classes in 2x2 framework and their implicit theories of science ability, to the best of our knowledge, relevant literature demonstrated that students' incremental theory of ability is positively linked to their mastery-approach goal (e.g., Cury, Elliot, Da Fonseca & Moller, 2006; Robins & Pals; 2002; Ommundsen, 2001c). On the other hand similar to current findings, students' incremental theory of ability was found to be negatively associated with their performance-approach goal and avoidance goals (e.g., Cury et al., 2006; Elliot & McGregor, 2001). Actually, these results are reasonable because students who believe that science ability can change and be improved are expected to do their best in order to learn and understand science topics, demonstrate less avoidance behaviors and give less emphasis on relative comparisons.

5.1.2 Achievement Goals in Relation to Epistemological Beliefs

The relationship between seventh grade elementary students' achievement goals and epistemological beliefs was examined with the proposed model conducting a path analysis specifically for science course because of domain specific nature of the variables (Ames & Archer, 1988; Elliot & McGregor, 2001; Hofer, 2000, 2006; Jehng, Johnson & Anderson, 1993; Kurt, 2009; Muis, Bendixen, & Haerle, 2006; Paulsen & Wells, 1998). Students' epistemological beliefs of the students were investigated in terms of source of knowing, certainty of knowledge, development of knowledge and justification for knowing dimensions. Students' responses to the self-report instrument were arranged as higher scores represented sophisticated beliefs for each dimension epistemological beliefs.

The results of the path analysis indicated that seventh grade elementary students with sophisticated beliefs about source of knowing, believing that scientific knowledge can be constructed by oneself, are less likely to set avoidance goals (i.e., mastery-avoidance and performance-avoidance goals) for science course. More specifically, these students tend to give less emphasis on avoiding not learning the material, not mastering the task, and being inferior in comparison to others in science classes. On the other hand, source of knowing dimension was not significantly related to neither mastery-approach nor performance-approach goals. Also in terms of for certainty of knowledge dimension, the result of the current study showed that elementary students believing that there could be more than one answer of a scientific question set less performance-approach, mastery-avoidance and performance-avoidance goals for science course. Therefore these students less concentrate on being superior and avoiding inferiority in comparison to others, and avoiding not learning or not mastering task in science class. However, there was not a significant link between certainty of knowledge dimension and mastery-approach goal. In general, findings of the current study were parallel with previous findings in the related the literature demonstrating that naïve beliefs in source of knowing and certainty of knowledge dimensions are positively associated with mastery-avoidance, performance-approach and performance-avoidance (see Muis & Franco, 2009) goals. On the other hand, the expected positive links between sophisticated beliefs about source of knowing and mastery-approach goal, and sophisticated beliefs about certainty of knowledge and mastery-approach goal were not supported in the present study. It was proposed that students believing that textbooks, teachers, or scientists are not the only source of knowledge are expected to access different resources for better learning and understanding (i.e., adopt mastery-approach goal). However, contrary to the expectation the finding consistent with Pamuk’s (2014) study which was conducted in the same grade level and domain with the same instruments of the current study considering mastery-approach and mastery-avoidance goals distinction revealed non-significant relation between source of knowing and mastery-approach goal. In a similar manner, a positive association between certainty of knowledge dimension and mastery-approach goal was expected but it was not supported both in the current study and Pamuk’s (2014) study. Thus, there is a need for conducting future studies to enlighten the reasons behind these non-significant associations. In terms of source of knowing dimension, one speculation concerning its relationship with mastery goals may be arise from nonsupportive learning environments. For example, Turkish educational system is highly competitive and exam oriented. In the nationwide exams multiple-choice items are used. Accordingly students may have tendency to seek for absolute truths to be successful on the exams using their textbooks and teachers as sources of knowledge. As mentioned before, however, this is just a speculation needing further investigation in future studies.

Concerning development of knowledge dimension, the result of the current study showed that seventh grade elementary students who believe that scientific knowledge is evolving are more likely to set mastery-avoidance and performance-avoidance goals for science course. However, development of knowledge dimension was not significantly associated with neither mastery-approach nor performance-approach goals. In addition, for justification for knowing dimension the result of the analysis indicated that seventh grade elementary students, believing the role of scientific experiments as supporter of the arguments and developer of the new ideas, tend to adopt achievement goals at higher levels in all dimensions for science course. In general, these findings were supported by the previously conducted national studies (e.g., Kızılgüneş, Tekkaya & Sungur, 2009; Pamuk, 2014). Considering the fact that epistemological beliefs and achievement goals of learners effected and shaped by educational context (Ames, 1992; Ames & Archer, 1988; Hammer, 1994; Hammer & Elby, 2002; Hofer, 2001; Maehr & Midgley, 1996; Pamuk, 2014; Schunk, & Meece, 1992; Turner, Meyer, Midgley & Patric, 2003), the hypothesized relations in the current study was also guided by the findings from national studies. On the other hand, the findings from other countries revealed that sophisticated beliefs are positively linked to mastery-approach goal and naïve beliefs are positively associated with mastery-avoidance, performance-approach and performance-avoidance goals (see Muis & Franco, 2009). Thus, there is a need for conducting further studies to be able to better understand which contextual factors contribute to these differences in the findings. Apart from the contextual factors, the use of different instruments reflecting different theoretical approaches to assess epistemological beliefs and assessment of achievement goals using different frameworks may also be a reason for these discrepancies.

5.1.3 Achievement Goals in Relation to Motivational Beliefs

The relationship between seventh grade elementary students' achievement goals and motivational beliefs (i.e. self-efficacy and task value) were examined within the proposed model conducting a path analysis specifically for science course because of the domain specific nature of the variables (Ames & Archer, 1988; Bandura, 1997; Bong, 2001; Eccles & Wigfield, 1995; Eccles, Wigfield, Harold & Blumenfeld, 1993; Elliot & McGregor, 2001; Pajares, 1997; Wigfield & Eccles, 2000).

Concerning self-efficacy, the result of the present study demonstrated that seventh grade elementary students believing their capabilities to be successful in science class are more likely to adopt mastery-approach and performance-approach goals in science course, in other words these students give more emphasis on learning the course content and material and being superior in comparison to others in science classes. As mentioned in Dweck and her colleagues' model learners with high perceived ability (i.e. self-efficacy) seek challenge and have high persistence on the task, if not they avoid challenge and demonstrate low persistence. Therefore, the obtained findings are parallel to the common expectations and findings in the related literature (Liem, Lau & Nie, 2008; Sungur, 2007; Wolters, Yu & Pintrich, 1996). On the other hand, in the current study, considering previous findings of the studies conducted in Turkish context with making distinction between mastery-approach and mastery-avoidance goal (e.g., Kıngır, Tas, Gok & Sungur-Vural, 2013; Kıran, 2010), it was proposed that self-efficacy is also positively linked to mastery-avoidance goal. However, the result showed that students with high self-efficacy are less likely to adopt mastery-avoidance goal in science classes. Since Turkish educational system is exam oriented and highly competitive (Sungur & Şenler, 2009) and avoidance goals may be considered to lead to more adaptive outcomes in competitive learning environments (King & McInerney, 2014), students with high self-efficacy may evaluate the mastery-avoidance goal not suitable to be successful in science class. Also a few studies in the literature supported the negative link between mastery avoidance goal and self-efficacy (e.g., Cury et al., 2006; Dweck, 1999).

Regarding task value, the path analysis result of the current study revealed that students who believe that science course materials are interesting, important and useful set more mastery-approach, performance-approach and mastery-avoidance goals for science course. In other words, these students tend to focus on learning and understanding the science course materials, being superior in comparison to others; avoid from misunderstanding and not learning the related materials in science classes. The associations between achievement goals and learners subjective values were mentioned in both Dweck's model (Dweck & Elliott, 1983) and Eccles, Wigfield and colleagues' expectancy-value model (Eccles, Adler, Futterman, Goff, Kaczala, Meece & Midgley, 1983; Wigfield, 1994b). Although a significant association was not detected between task value and performance-avoidance goal in the present study, the rest of the findings are in line with theoretical expectation and supported by previously conducted studies (Kahraman & Sungur, 2013; Senler & Sungur, 2014).

5.1.4 Learning Strategies in Relation to Implicit Theories of Ability

The association between seventh grade elementary students' learning strategies use in science classes and their implicit theories of ability specifically for science ability was examined within the proposed model. Since learning strategies use could be changed according to domain and context (Alexander & Judy, 1988; Bransford & Heldmeyar, 1983; Pintrich, 2004; Somoncuoğlu & Yıldırım, 1999), as implicit theories of ability (Chen & Pajares, 2010; Dweck & Master, 2009; Stipek & Gralinski, 1996), they were assessed specifically for science domain. In addition, the current study investigated learning strategies in terms of cognitive and metacognitive learning strategies.

In the present study, only incremental theory of ability for science domain was used in terms of implicit theories of ability. The result of the analysis showed negative relationship between cognitive learning strategies use of seventh grade elementary students in science course and their incremental theory of science ability, on the other hand a positive association was detected between students' metacognitive learning strategies use in science classes and their beliefs about the malleability of science ability. So according to the findings, students believing that that science ability can change and be improved with time experience and use less cognitive learning strategies to control for their cognitive activities to choose, get and combine the new knowledge with existing knowledge, however, students with higher levels of incremental theory of ability for science are likely to use metacognitive learning strategies at higher levels in science course. According to Dweck and her collegues' model learners with incremental theory of ability display adaptive pattern and use more effective strategies **(**Diener & Dweck, 1978, 1980; Dweck, 1986; Dweck, Chiu & Hong, 1995; Dweck & Leggett, 1988, Elliott & Dweck, 1988). Therefore the positive link between incremental theory of ability and learning strategies was proposed in the current study. This expectation was partly supported with a positive link found between incremental theory of ability and metacognitive learning strategies use. Although, the researcher did not come across any studies on the link between incremental theory of ability and specifically metacognitive learning strategies use, there are some studies which implied a positive association between incremental theory of ability and learning strategies which possess some components of metacognitive learning strategies (e.g., Doron, Stephan, Boiché & Scanff, 2009; Ommundsen, 2003).

On the other hand, the negative relationship found between incremental theory of science ability and cognitive learning strategies use was an unexpected finding. At this point, it is important to note that standardized coefficient for the effect of incremental theory of science ability on cognitive learning strategies use was not large ($\gamma = -.02$).

5.1.5 Learning Strategies in Relation to Epistemological Beliefs

The relationship between seventh grade elementary students' learning strategies use in science classes and their epistemological beliefs was examined within the proposed model conducting the path analysis. Regarding the source of knowing dimension, the result of the current study demonstrated that there was a negative relationship between students' sophisticated beliefs about the source of knowing dimension and their use of cognitive learning strategies. This finding suggested that students believing that scientific knowledge does not reside in external authorities tend to use cognitive learning strategies at lower levels in science course. In addition, the result showed that there was not a significant link between students' beliefs for source of knowing dimension and metacognitive learning strategies use. Concerning the certainty of knowledge dimension, the path analysis indicated a negative association between students' sophisticated beliefs about the dimension and their use of cognitive learning strategies while the link between these beliefs and metacognitive learning strategies was positive. In other words seventh grade elementary students believing that there could be more than one answer of a scientific question are likely to use cognitive learning strategies at lower levels but tend to use metacognitive learning strategies at higher levels in science course. Although, the related literature does not indicate consistent results concerning the relationship between learning strategies and epistemological beliefs of students, the common expectation is that students with more sophisticated beliefs use more strategies than students' who had naïve beliefs (see Kardash & Howell, 2000). Therefore, the positive link found in the current study between sophisticated beliefs for certainty of knowledge dimension and metacognitive learning strategies use was as expected and supported by an previously conducted study (e.g., Alpaslan,Yalvac, Loving & Willson, 2015). However, the result revealing negative relationships between sophisticated beliefs about source of knowing and certainty of knowledge dimensions and cognitive learning strategies use were unexpected. At this point, it is suggested that future studies examine the contextual factors which may lead to these unexpected findings. As a context of study, all science teachers follow the same textbooks suggested by Ministry of Education and the same student-centered curriculum science curriculum implemented countrywide in Turkey. However some studies demonstrated that implemented science curriculum is not the same as the written curriculum (e.g., Genç & Küçük, 2003; Yangın & Dindar, 2007). Science teachers were found to implement the suggested activities in teacher-centered learning environment to transmit the knowledge to students without providing opportunities for active students' participation in knowledge construction (Gökçe, 2006; Kozandağı, 2001; Özmen, 2003).

Accordingly, if the science topics are thought in the classroom as if there is a single right scientific knowledge and textbooks, teachers, and scientists are the sources of knowledge, students with a consistent belief may have a tendency to remember and organize this knowledge using various cognitive learning strategies. On the other hand, students who do not possess beliefs consistent with such a learning environment may lose their motivation to use different strategies to receive this knowledge. Because according to these students knowledge is not received from a source rather it is constructed by the individuals and scientific knowledge is not certain. However, this explanation is speculative and warrants further investigation.

The result of the current study also demonstrated that, seventh grade elementary students' sophisticated beliefs about the development of scientific knowledge were positively linked to their use of cognitive learning strategies in science course. On the other hand, the association between epistemological beliefs on development of knowledge dimension and use of metacognitive learning strategies was non-significant. In addition, the result of the path analysis indicated that, students' sophisticated beliefs about the justification for knowing the scientific knowledge have positive relationship with their metacognitive learning strategies use. However, the link for the sophisticated beliefs about justification for knowing scientific knowledge and cognitive learning strategies use was not significant. Since students with sophisticated epistemological beliefs are generally found to use learning strategies at higher levels in the related literature (see Kardash & Howell, 2000), the obtained positive link of development of knowledge and justification for knowing dimensions of epistemological beliefs with learning strategies in the present study was as expected and supported by previously conducted studies (e.g., Alpaslan et al., 2015; Pamuk, 2014).

5.1.6 Learning Strategies in Relation to Motivational Beliefs

Concerning the relationship between self-efficacy and learning strategies use in science classes, the result of the path analysis indicated that seventh grade elementary students' self-efficacy was positively related with their cognitive and metacognitive learning strategies use. This finding implied that students who believe that they can perform successfully in science classes are likely to control their cognitive activities to choose, get and combine the new knowledge with existing knowledge and have higher levels of awareness, knowledge, and regulation of their cognition. Dweck and her colleagues' model is one of the initiator in the related literature to construct the connection between learners use of learning strategies and their motivational beliefs including self-efficacy (see Dweck & Leggett, 1988; Elliott & Dweck, 1988) and later studies consistently indicated positive association between learners' self-efficacy and their learning strategies, namely; cognitive (e.g., Pintrich & De Groot, 1990; Taş & Çakir, 2014) and metacognitive learning strategies (e.g., Kıran, 2010; Pintrich & De Groot, 1990). Indeed, self-efficacious students have the belief that they have necessary capabilities to be successful in science course. Accordingly, they do not give up easily and persist in the face of difficulties and distracters with using various strategies (Sungur, 2007).

Regarding task value, the result of the study revealed positive link between seventh grade elementary students' task value and their both cognitive and metacognitive learning strategies use. This finding suggested that students believing that materials and activities in science classes are interesting, important and have utility are likely to these learning strategies at higher levels. This was an expected finding. Indeed, Dweck and her colleagues mentioned that task characteristic is an important factor influencing their learners' choice of task preference and their strategies use (see Dweck & Leggett, 1988; Elliott & Dweck, 1988), also expectancy-value theory of motivation indicates that learner' value of the activity plays important role on their choice and performance (Wigfield & Eccles, 2000). In line with these theoretical expectations, empirical studies investigating the relationship between task value and learning strategies consistently indicated that students who have high task value use more cognitive learning strategies (e.g., Pintrich & De Groot, 1990; Taş & Çakir, 2014) and also metacognitive learning strategies (e.g., Pintrich & De Groot, 1990; Sungur, 2007).

5.1.7 Learning Strategies in Relation to Achievement Goals

Concerning the relationships between seventh grade elementary students' use of cognitive learning strategies and their achievement goals in science, the result of the current study indicated that while the relationships between cognitive learning strategies and approach goals (i.e. mastery-approach and performance-approach goals) were not significant, cognitive leaning strategies were positively linked to avoidance goals (i.e. mastery-avoidance and performance-avoidance goals). This finding suggested that students focusing on avoiding misunderstanding and not learning of science course material, and avoiding inferiority in comparison to others in science classes are likely to use cognitive learning strategies at higher levels. Although, the related literature indicated a positive associations between cognitive learning strategies and approach goals (e.g., Kadıoglu & Uzuntiryaki-Kondakci, 2014; Muis & Franco, 2009) and negative one between cognitive learning strategies and avoidance goals (e.g., Muis & Franco, 2009), avoidance goals may be considered to lead to more adaptive outcomes in competitive learning environments (King & McInerney, 2014). As a context of current study, Turkish educational system is exam oriented and highly competitive (Sungur & Şenler, 2009). Even at elementary level national examinations are conducted and students are ranked for entrance to high schools. In such a competitive system, normed referenced evaluation may motive the students to use more cognitive learning strategies to avoid misunderstanding and not learning of science course material and to avoid inferiority in science classes. Supporting current findings, Rastegar, Jahromi, Haghighi and Akbari (2010) detected a positive link between cognitive learning strategies use and performance-avoidance goals of Persian students.

In addition, the result of the current study revealed that seventh grade elementary students' metacognitive learning strategies use was positively linked with their mastery-approach and mastery-avoidance goals but the relationships of metacognitive learning strategies use with performance-approach and performance-avoidance goals were non-significant. The positive relationship found between mastery-approach goal and metacognitive learning strategies use is an expected outcome because as Pintrich (2000) stated if students set goals to learn and improve their learning in academic settings, they are likely to monitor their performance to control and regulate it. Previous studies also supported this proposition demonstrating a positive link between mastery-approach goal and metacognitive learning strategies use (e.g., Alpaslan et al., 2015; Kadıoglu & Uzuntiryaki-Kondakci, 2014; Kahraman & Sungur, 2011; Muis & Franco, 2009; Rastegar et al., 2010; Wolters, 2004). On the other hand, the number of studies conducted on mastery-avoidance goal orientation and its association with learning strategies, specifically with metacognitive learning strategies is limited and a significant association between mastery-avoidance goal and metacognitive learning strategies was not detected in the majority of the previously conducted studies (e.g., Muis & Franco, 2009; Kahraman & Sungur, 2011; Kıngır et al., 2013). However, Pintrich (2000) indicated that although students with mastery-avoidance goal give less emphasis on learning compared to the students with mastery-approach goal, the students with mastery-avoidance goal also use metacognitive learning strategies. Additionally, contextual and cultural factors appear to be influential on the observed associations between these variables (Alexander & Judy, 1988; Bransford & Heldmeyar, 1983; King & McInerney, 2014; Pintrich, 2004; Somoncuoğlu & Yıldırım, 1999; Sungur & Senler, 2009), For example, in a study conducted in Turkey Sungur and Şenler (2009) found a positive relationship between mastery-avoidance goal and metacognition. The authors attributed this finding to the competitive educational system prevalent in the country.

5.1.8 Cognitive Learning Strategies in Relation to Metacognitive Learning Strategies

The result of the path analysis indicated that there is positive relationship between cognitive and metacognitive learning strategies use in science. It was an expected result because metacognitive learning strategies, which involve executive processes (Veenman, 2012), are conceptualized as higher-order cognition about cognition. According to this conceptualization metacognitive learning strategies draw on cognitive activities requiring execution of task-related processes (Flavell 1979; Nelson, 1999). Supporting this theoretical link between these two constructs and finding of the current study, numerous empirical studies revealed a positive association between cognitive and metacognitive learning strategies use (e.g., Heikkilä & Lonka, 2006; Kasımi, 2012; Phakiti, 2006; Saçkes, 2010).

5.1.9 Procrastination in Relation to Implicit Theories of Ability

The association between seventh grade elementary students' procrastination and their implicit theories of ability in science course was examined within the proposed model. Because both procrastination (Ferrari & Tice, 2000; Senécal, Lavoie & Koestner, 1997; Solomon & Rothblum, 1984; Steel, 2007) and implicit theories of ability (Chen & Pajares, 2010; Dweck & Master, 2009; Stipek & Gralinski, 1996) are domain specific and the variables were assessed specifically for science domain.

The result of the path analysis indicated negative association between seventh grade elementary students' incremental theory of science ability and their procrastination in science course. In other words, students who believe that science ability is malleable and changeable appeared to be less likely to delay science tasks and activities intentionally. This is an expected finding because it is indicated in the early implicit theories literature that individuals who believe that ability can change and be improved are likely to demonstrate adaptive behavior pattern (e.g., Ames, 1984; Bandura & Dweck, 1985; Leggett & Dweck, 1986). On the other hand, procrastination is evaluated as maladaptive behavior. Thus, the observed negative relation between students' incremental theory of science ability and procrastination was as expected and supported by previous studies (e.g., Howell & Buro, 2009; Ommundsen, 2001c).

5.1.10 Procrastination in Relation to Epistemological Beliefs

The result of path analysis indicated that seventh grade elementary students' sophisticated beliefs about the source of knowing and justification for knowing dimensions of epistemological beliefs were negatively related with their procrastination in science course. That is if students' believe that scientific knowledge can be constructed by oneself, and experiments in science are used to support arguments and develop new ideas, they have a lower tendency to intentionally delay tasks and activities in science course. At this point it is important to note that, according to related literature procrastination may be brought about by general personality or situation. The studies in which procrastination is viewed as part of personality and examined in relation to different traits such as perfectionism, fear of failure, self-handicapping, sensation-seeking and proneness to boredom (Sokolowska, 2009). In other studies, procrastination was taken into the account as related with task and situation (Senécal et. al., 1997; Steel, 2007) and these studies indicated that individuals procrastinate more if they engage with boring tasks (e.g., Ferrari & Tice, 2000; Senécal, Koestner &Vallerand, 1995). Therefore, boring tasks may activate students' procrastination. Accordingly, students believing that they can construct scientific knowledge by themselves and carry out experiments in science course to provide a support for their ideas may help them perceive the task and activities in science course as interesting rather than boring and those students procrastinate less. Actually, supporting current finding, the only study the researcher came across in the relevant literature concerning the relation between epistemological beliefs and procrastination (see Boffeli, 2007), revealed a negative link between students' sophisticated beliefs and procrastination.

On the other hand, the result of the current study revealed a positive link between seventh grade students' beliefs about development of scientific knowledge and their procrastination. This finding suggested that students believing the evolving feature of scientific knowledge procrastinate more. Therefore believing that scientific knowledge evolve continuously may cause students to think that it is difficult to catch up with new developments in science and this thought may promote their fear of failure, which is a trait of procrastinators (Sokolowska, 2009), to procrastinate. Another possible explanation for this finding may be that, there is discrepancy between written and implemented science curriculum in Turkey (Genç & Küçük, 2003; Yangın & Dindar, 2007) and it was found that science teachers tend to be use teacher-centered approach while implementing suggested activities to transmit the knowledge to students without providing opportunities for active students' participation in knowledge construction (Gökçe, 2006; Kozandağı, 2001; Özmen, 2003). Therefore, if science topics in science class presented as absolute, students with beliefs consistent with this educational context may have a tendency to do the task of the course rather than delaying them. On the other hand, students who do not possess beliefs consistent with such a learning environment may experience motivational difficulties so that it may cause delaying initial academic goals and waiting until last minute to create a pressure to start. But this explanation is speculative and warrants further investigation. Also, the obtained non-significant relationships between certainty of knowledge dimension of the epistemological beliefs and procrastination for science course need for further investigations.

5.1.11 Procrastination in Relation to Motivational Beliefs

The result of the present study indicated that there was not a significant association between seventh grade students' self-efficacy and their procrastination for science course. But a negative association was expected between these two variables because self-efficacious students are expected to engage in the activities utilizing various adaptive strategies to perform successfully. Although, the non-significant relation found between self-efficacy and procrastination was not in line with the expectation, there are studies conducted in Turkey supporting this finding (e.g., Aydoğan, 2008; Akbay, 2009). On the other hand, current study's result revealed a negative relation between task value beliefs and procrastination for science course consistent with the expectations. The finding implied that students believing that science course materials are interesting, importat and useful have less tendencies to intentional delay of the course tasks. Since task value influences individuals' achievement-related choices, persistence and performance distinctively in different academic domains (Wigfield & Eccles, 2000) and high level of task-values is associated with high level of task engagement of individuals (Eccles, 2005), it was proposed that there is negative association between students task value and their procrastination. Although conducted in different domains, previous studies (e.g., Corkin, 2012; Hensley, 2013; Taura, Abdullah, Roslan & Omar, 2015) also support the finding.

5.1.12 Procrastination in Relation to Achievement Goals

The result of the present study revealed that seventh grade elementary students adopting mastery-approach goal tend to procrastinate less, while students adopting mastery-avoidance goal tend to procrastinate more in science classes. These findings were parallel to the expectations because procrastinators fail to complete academic tasks which are not enjoying and which require effort, and provoke anxiety, but they tend to complete academic tasks that provide them opportunity to show their skills and creating self-confidence (Scher & Ferrrari, 2000). Students holding mastery-approach goal give more emphasis on learning and understanding. Accordingly, they are likely to engage in science task and activities demonstrating adaptive behavior patterns such as effort and persistence. Thus, it is reasonable that mastery-approach goal oriented students procrastinates less. Indeed, related literature indicated that students who focus on leaning and understanding, have lower levels of procrastination tendencies (e.g., Howell & Buro, 2009; Howell & Watson, 2007; Kandemir, 2010; Scher

& Osterman, 2002) but who focus on studying to avoid misunderstanding are found to procrastinate more (e.g., Howell & Buro, 2009; Howell & Watson, 2007). Therefore, the findings of the current study are parallel to previous studies' results. In addition, the obtained non-significant associations of students' performance goals with their procrastination for science course need for further investigations in future studies.

5.1.13 Procrastination in Relation to Learning Strategies

The path analysis revealed that there was a positive association between seventh grade elementary students' procrastination and cognitive learning strategies use. The positive link found between these two variables was not an unexpected finding because procrastinators have weak skills in systematic and disciplined working (Lay, 1992; Lay & Schouwenburg, 1993) and students with lower levels of learned resourcefulness are more prone to procrastinate (Milgram, Dangour & Raviv, 1992). Accordingly, the common expectation in the literature is that procrastinators are less likely to use learning strategies which help encoding process in integrating and retrieving knowledge (Weinstein, 1988; Weinstein & Mayer, 1986). Although, some of the previously conducted studies in the related literature pointed out negative connection between students' procrastination and their cognitive learning strategies use (e.g., Howell & Watson, 2007; Klingsieck, Fries, Horz & Hofer, 2012; Wolters, 2003), some others indicated positive association between them (e.g., Cao, 2012; Motie, Heidari & Sadeghi, 2012). The difference may arise from the student characteristics since some of the students prefer to work under pressure which is defined as active procrastinators and although active procrastinators procrastinate to the same degree as do passive procrastinators; their outcomes are more similar to the outcomes of non-procrastinators (Chu & Choi, 2005). Therefore the unexpected finding of the current study may arise from the presence of active procrastinators in the sample. In addition, the path analysis result revealed that students who are metacognitively active are likely to procrastinate less. So the reverse relationship between the variables was as expected and supported by the previous studies (e.g., Howell & Watson, 2007; Klingsieck et al., 2012; Motie et al., 2012; Wolters, 2003).

5.1.14 Science Achievement in Relation to Implicit Theories of Ability

The result of the present study demonstrated that seventh grade elementary students' incremental theory of ability specifically for science was positively related with their science achievement. This finding implied that if students believe that science ability is malleable and changeable, they have higher science achievement scores. Actually, individuals' beliefs about ability have pivotal role in the achievement motivation (Dweck, 2006) by affecting their achievement goals, task choice, strategies they use on academic tasks, persistence and performance the tasks and their performance (Dweck, 2002; Dweck et al., 1995; Dweck & Legget, 1988; Hong, Chiu, Dweck, Lin, & Wan, 1999). Supporting this idea, previous studies consistently pointed out a positive association between students' incremental theory of ability and their academic achievement (e.g., Blackwell, Trzesniewski & Dweck, 2007; Cury et al., 2006; Good, Aronson & Inzlich, 2003) in different domains and current study's finding provided a support for this relationship for science domain.

5.1.15 Science Achievement in Relation to Epistemological Beliefs

The path analysis result indicated that seventh grade elementary students having more sophisticated epistemological beliefs about the source of knowing, certainty of knowledge, justification for knowing have higher science achievement scores. Epistemological beliefs of students alter their learning, cognition and motivation (Hofer & Pintrich, 1997; Perry, 1981) and those beliefs contain individuals' choice of comprehension standards and these standards play role on academic performance such as complex topics or complex academic tasks (Ryan, 1984). Therefore positive associations are commonly expected between students' sophisticated epistemological beliefs and their academic achievement in the related literature (e.g., Kızılgüneş, 2007; Schommer, 1993), particularly for source of knowing (e.g., Conley, Pintrich, Vekiri & Harrison, 2004; Özkan, 2008; Pamuk, 2014; Yeşilyurt; 2013), certainty of knowledge (e.g., Conley et al., 2004; Hofer, 2000; Schommer, 1993; Pamuk, 2014), development of knowledge (e.g., Conley et al., 2004) and justification of knowing (e.g., Conley et al., 2004; Pamuk, 2014) dimensions. Moreover, the findings of the current study supported these common results specifically for science domain at elementary education level. Furthermore, a significant association was not detected between development of knowledge dimension of epistemological beliefs and science achievement, so this association needs further investigations in future studies.

5.1.16 Science Achievement in Relation to Motivational Beliefs

Concerning the relationship between seventh grade elementary students’ self-efficacy and their achievement scores for science course, the result showed that students’ self-efficacy was positively related with their science achievement. That is students believing their capabilities to be successful in science class appeared to have higher science achievement scores. Both in Bandura’s (1977a, 1982, 1986) social cognitive theory and Eccles, Wigfield and colleagues’ (Eccles, 1987; 1993, 2005; Eccles et al., 1983; Wigfield & Eccles, 1992, 2000, 2002) expectancy-value model the positive effect of students beliefs about their capabilities on their achievement-related choices and performance was indicated. Also, the results of plenty of studies provided support for the positive relationship between these variables (e.g., Chen & Pajares, 2010; Hıdıroğlu, 2014; Sungur & Güngören, 2009; Yerdelen, 2013). On the other hand, the present study failed to demonstrate a significant link between students’ task value and achievement scores for science course.

5.1.17 Science Achievement in Relation to Learning Strategies

The result of the present study revealed that while there was a positive association between seventh grade students’ metacognitive learning strategies use and their achievement in science, the relationship between their cognitive learning strategies and science achievement was negative. These findings imply that metacognitively active students in science classes with planning, monitoring and regulating activities tend to have higher science achievement scores. On the other hand, students using cognitive learning strategies to memorize, organize, and connect the topics to be learned in science classes at lower levels were found to have higher science achievement scores. It is commonly indicated in the literature that learning strategies could mediate individuals and context, and academic achievement (e.g., Butler & Winne, 1995; Pintrich, 2000; Zimmerman, 2000) and students' strategies use highly correlated with being high or low achievers (Pintrich & De Groot, 1990; Zimmerman & Martinez-Pons, 1986, 1988). Although there were mixed results for the association between learners' achievement and their cognitive learning strategies use, most of the studies signed positive links of both cognitive (e.g., Akyol, Sungur & Tekkaya, 2010; Kaya & Kablan, 2013; Muis & Franco, 2009; Yumuşak, Sungur & Çakıroğlu, 2007) and metacognitive (e.g., Akyol et al., 2010; Kaya & Kablan, 2013; Muis & Franco, 2009; Rastegar et al., 2010) learning strategies with academic achievement. Therefore the positive association found between metacognitive learning strategies use and science achievement was in congruence with the previous findings. Although the negative relationship between students' cognitive learning strategies use and their science achievement was not in line with the expectations and common findings in the literature, Rastegar et al. (2010) reported the same association between Persian university students'cognitive learning strategies use and their mathematics achievement. Also, Yumuşak et al. (2007) reported the negative association between Turkish high school students' rehearsal strategies use, which was assessed as a component of cognitive learning strategies use in the current study, and their achievement in biology course. In addition, in a qualitative study conducted by Romainville (1994), it was found that the high achiever participants could not surely characterize their cognitive learning strategies which means that high achiever students generally could not identify how and where they used the cognitive learning strategies. Although it is not possible to determine whether or not this was the case in the current study, it may be considered as a possible reason for this unexpected finding.

5.1.18 Science Achievement in Relation to Procrastination

The result of the present study indicated that there was not a significant relationship between seventh grade elementary students' science achievement and their procrastination in science course. Although the related literature indicated a negative relationship between procrastination and achievement (e.g., Çakıcı, 2003; Klassen, Krawchuk & Rajani, 2008; Klingsieck et al., 2012; Steel, 2007; van Eerde, 2003), a significant link was not obtained in the current study. Also, there are studies which did not detect significant relation between students' procrastination and academic performance (e.g., Blatt & Quinlan, 1967; Ferrari, 1992; Howell & Watson, 2007; Mendelson, 2007; Solomon & Rothblum, 1984). The structured form of the science course which includes home works, project assignments and exams may be one of the reasons for the non-significant association. Also, not only the product but also the process assessment is emphasized in elementary science curriculum of Turkey (MONE, 2005, 2013). So, both process assessments with exact dates for delivering home works and projects, and exams may help students to arrange their time to study and it may prevent the significant negative association between students' procrastination level and their science achievement. Also, students' characteristics may affect the association because active procrastinators prefer to work under pressure and their outcomes are more similar to the outcomes of non-procrastinators (Chu & Choi, 2005). So the reason for the non-significant result found in the currents study may be the presence of active procrastinator students in the sample. But this explanation is speculative and warrants further investigation.

5.2 Conclusion

The purpose of the current study was test to interrelationships among seventh grade elementary students' implicit theories of science ability, epistemological beliefs, motivational beliefs, achievement goals, learning strategies use, procrastination and science achievement. Overall, findings from path analysis indicated that students' science achievement is significantly related with their incremental theory of ability; sophisticated epistemological beliefs for certainty of knowledge, source of knowing and justification for knowing dimensions; self-efficacy; and metacognitive learning strategies use specifically for science course. On the other hand, contrary to majority of the findings in the related literature, the result of the analysis displayed a negative association between the students' cognitive learning strategies use and their science achievement.

The result also revealed positive associations of students' incremental theory of ability; sophisticated beliefs for certainty of knowledge and justification for knowing; motivational beliefs (i.e. self-efficacy and task value) and cognitive learning strategies use with their metacognitive learning strategies use in science classes. In addition, mastery-approach and mastery-avoidance goals were found to be positively linked to metacognitive learning strategies use.

On the other hand, students' metacognitive learning strategies use appeared to be negatively linked to procrastination for science course. Also, procrastination was also found to be negatively related to sophisticated beliefs on source and justification dimensions of epistemological beliefs. However, sophisticated beliefs about development dimension were positively associated with procrastination. Besides, a negative relationship was found between task value and procrastination. In addition, while the association between mastery-approach goal and procrastination was negative, the association between mastery-avoidance goal and procrastination was positive. Unexpectedly, the result of the analysis revealed that procrastinator students are more likely to use cognitive learning strategies in science course.

Concerning cognitive learning strategies, students using these strategies at higher levels appeared to be less likely to believe that science ability is malleable, scientific knowledge can be constructed by oneself; scientific questions have multiple answers; and scientific knowledge is a fixed body of knowledge. In addition, students using cognitive learning strategies at higher levels were found to be more self-efficacious and adaptive task value beliefs. These students using more cognitive learning strategies also appeared to give more emphasis on avoidance goals.

5.3 Implications

The present study investigated the interplay among seventh grade Turkish elementary students' implicit theories of ability, epistemological beliefs, motivational beliefs, achievement goals, learning strategies, procrastination and their science achievement. Since implicit theories of ability, epistemological beliefs, motivational beliefs, achievement goals, learning strategies, procrastination have domain specific nature (Alexander & Judy, 1988; Ames & Archer, 1988; Bandura, 1997; Bong, 2001; Bransford & Heldmeyar, 1983; Chen & Pajares, 2010; Dweck & Master, 2009; Eccles & Wigfield, 1995; Eccles et al., 1993; Elliot & McGregor, 2001; Ferrari & Tice, 2000; Hofer, 2000; 2006; Jehng, Johnson & Anderson, 1993; Kurt, 2009; Muis et al., 2006; Pajares, 1997; Paulsen & Wells, 1998; Pintrich, 2004; Senécal et. al., 1997; Solomon & Rothblum, 1984; Somoncuoğlu & Yıldırım, 1999; Steel, 2007; Stipek & Gralinski, 1996; Wigfield & Eccles, 2000), they were specifically assessed for science domain in the present study. Therefore, the findings of the study have potential to have important implications for science teachers, science textbook authors, curriculum developers and educational policy makers.

Considering the science achievement of the students, the result of present study indicated that students' science achievement is significantly related to their sophisticated beliefs about source of knowing, certainty of knowledge and justification for knowing. Thus, it is suggested that in order to improve students' science achievement, classroom environments should be arranged to develop sophisticated epistemological beliefs by science teachers. But there is little empirical evidence about how students obtain and change their epistemological beliefs (Hofer, 2001), so suggestions about how to help students to develop sophisticated epistemological beliefs are rare. However, Smith, Maclin, Houghton and Hennessey (2000) asserted that constructivist learning environment facilitates elementary science students development of more sophisticated epistemological beliefs comparing the traditional classrooms because constructivist classrooms facilitate students' understanding and meaning making with asking them deep domain-specific questions and students have responsibility to design experiments to test their ideas, also students developed their ideas through pursuing dialogue with peers, testing their hypothesis and revising their ideas within a community of learners in a constructivist classroom. Although the current elementary science curriculum of Turkey is based on constructivist philosophy, studies demonstrated that implemented science curriculum is not the same as the written curriculum (Genç & Küçük, 2003; Yangın & Dindar, 2007) and science teachers' implementation of the curriculum is criticized regarding its effect on students' epistemological beliefs development (e.g., Boz, Aydemir & Aydemir, 2011). Therefore, in-service trainings should be intensified in Turkey to inform science teachers about the importance and effect of appropriate implementation of the curriculum concerning student related outcomes.

In addition, Qian and Alvermann (2000) summarized four instructional approaches to increase the level of mature (i.e. sophisticated) beliefs of students with reviewing studies on students' beliefs about science. Accordingly, the first one is *criss-crossing the landscape* which suggest that rather than an oversimplified way to introduce the complex topics, teachers should search multiple ways to represent those topics such as multiple demonstrations and refutation text about the topics. So, criss-crossing the landscape of a complex concept provide students to understand complexity of the scientific knowledge. The second approach is *engaging in reflective inquiry* which realized in two phases; in the first one students reflecting on their own inquiry process with thinking about their understanding about a subject and the source of their ideas, in the second phase students discuss their ideas. In that way, students construct deeper-theoretical understanding about natural phenomenon with setting and testing hypotheses, constructing experiments, and considering what they were doing. The third one is *using images of scientists' activities from history* which indicated the use of stories about well-known scientists, in this way students could understand how and why those scientists work on the subjects in their fields. Both engaging in reflective inquiry and using images of scientists' activities from history should be designed to regulate students' nature of science view and they should aim to bring students to explanation level from description level. The last one concerns *teachers' epistemological objectives* which mean that teachers should have three objectives for their classes; the first one is promoting independent thinking and desire to challenge with authoritative beliefs of students, the second one is providing conceptual development rather than formulaic learning and the third one is increasing ability to achieve coherence learning instead of piecemeal learning. Therefore, Qian and Alvermann's (2000) suggestions should be considered by curriculum developers and teachers to sophisticate elementary students' epistemological beliefs and in this way to increase their science achievement. In addition, implementation of argumentation and collaborative debate, in which students work in teams to understand and resolve a problem, in science classes advance students' scientific knowledge, also these implementation methods help students to learn about the process of scientific enterprise and enhance their understanding about nature of scientific knowledge and knowing (Chen & Pajares, 2010). So argumentation and collaborative debates are suggested to be used more often in science classrooms to support the students' epistemological beliefs' development.

The result of the current study indicated that, elementary students' self-efficacy is also positively related with their science achievement. Because students' interpretation of their actual performances provides more reliable information about their capabilities and it is one of the sources of their self-efficacy (Bandura, 1997), teachers should be aware of their students' skills while introducing a task and the task should have at optimal challenge level which allows skill development. Also, to increase the congruence between students' self-efficacy and their performance, teachers can give instruction to students about how to practice self-evaluation giving information about their skills and progress, and providing opportunities to them make self-evaluation (Schunk & Pajares, 2002).

Vicarious experiences is another source of the self-efficacy (Bandura, 1997) giving the message that if others can do, I can do as well but people often seek models with high qualities and competence (Schunk, 1995) and it may cause them to lose their beliefs about their capabilities to achieve (Schunk & Pajares, 2009). Therefore students should be warned about not overestimating others' skills and underestimating their competence. Also, social persuasions can help students to create and developed self-efficacy beliefs (Bandura, 1997). Indeed, teachers' positive feedbacks, considering students' actual skills, may help them to increase their self-efficacy. Also, students can acquire information from physiological and emotional states such as anxiety and stress about their self-efficacy (Bandura, 1997). So, students' self-efficacy can be increase by ensuring their physical and emotional well-being as decreasing their anxiety and stress.

Metacognitive learning strategies use was also found to be positively associated with their science achievement in the current study. In order to facilitate learners' metacognitive learning strategies use, Ley and Young (2001) suggested that students should be provided with instructional activities that favor organizing, monitoring and evaluating their learning. Those instructions should facilitate their metacognitive learning strategies use with presenting students effective ways to learn for a specific domain such as unit glossaries or graphic organizers. Also, the instruction should present feedback on temporary process and product assignments, these feedbacks should be towards learning goals. And the instruction should aim to present how and when learners engages in learning and possible results of their effort. In addition, the instruction should prompt learners to make self-evaluation to make comparison between their accomplishments and their goals. In addition, the result of the present study displayed a positive association between the students' metacognitive learning strategies use and their task value. Therefore, students' metacognitive learning strategies might be enhanced by increasing their task value beliefs through helping them connect the academic knowledge with their daily lives, enhancing their engagement with challenging tasks and meaningful learning activities, using different kinds of tasks, emphasizing the importance of school work, giving opportunities to students for their choice and control in the classroom (Pintrich& Schunk, 2002).

Also, the result of the present study indicated that the students’ mastery goals positively related with their metacognitive learning strategies use. And to foster mastery goals in a classroom Ames and her collegues (Ames, 1990, 1992; Powell, Ames & Maehr, 1990; Tracey, Ames & Maehr, 1990) suggested six classroom structures borrowing an acronym TARGET from Epstein (1989), namely; task, authority, recognition, group, evaluate and time. Accordingly, nature of the academic task is important and teachers should provide challenging task experience to their students but difficulty of those tasks should be in an optimal level and these tasks should be interesting to promote intrinsic motivation. In terms of authority, teachers decide on the distribution of the responsibility in the classroom and they should consider students’ choice and rights over learning activities. For recognition of students, teachers might reward students for different reasons such as individual learning and progress, also each students should have the equal chance to earn the rewards. Also, group refers to students’ working in the groups with their peers rather than emphasizing social comparison. Evaluation is including assessment methods for students’ improvement, progress and mastery, and those evaluations should be private, enhance students’ improvement and encourage students to view of their mistakes. The last one is time to complete the task and it should be adjusted according to task by the teacher. Besides, according to the result of the currents study, students’ mastery-approach goal were positively related with their incremental theory of ability, sophisticated beliefs for justification for knowing dimension of epistemological beliefs, self-efficacy and task value. Thus, classroom environments which provide opportunities to enhance students’ beliefs about malleable nature of science ability, self-efficacy, task value and sophisticated epistemological beliefs are expect to have influence on the development of mastery-approach goal. According to the findings of the currents study, such learning environments can diminish students’ tendency to procrastinate in science classes.

In addition, because a positive link was found between students’ belief that science ability is changeable and science achievement, science teachers are suggested to create learning environments which help students realize that science ability is malleable. Actually, implicit theories of ability could be intervened to desired target beliefs (e.g., Blackwell et al., 2007; Good et al., 2003).

5.4 Limitations and Recommendations

The present study has some limitations and recommendations. The first one is about causality, the present study is a cross sectional study so it provides little information about causal relationships among the variables. So the conducted further experimental and longitudinal studies may supply clear causal associations among the variables of the study.

The second one is about the data collection instruments, in the current study self-reported instruments were used but it might not reflect the actual information. Thus other types of data collection methods may be used in further studies such as observations, interviews and think aloud methods.

The third one is about generalizability of the study; the relationships among the variables of the present study were investigated based on the data gathered from seventh grade elementary students specifically for science course. Therefore, the results of the study was limited for seventh grade students and for science domains and the associations may be investigated in different grade level and for different domains in further studies. Also, replication studies for the unexpected findings of the current studies should be conducted to test the observed the associations.

REFERENCES

Abdullah, M. N. L. Y. (2008). Children’s implicit theories of intelligence: its relationships with self-efficacy, goal orientations, and self-regulated learning. *The International Journal of Learning*, *15*(2), 47-56.

Ackerman, D. S., & Gross, B. L. (2005). My instructor made me do it: Task characteristics of procrastination. *Journal of Marketing Education*, *27*(1), 5–13.

Akbay, S., E. (2009). *Cinsiyete göre üniversite öğrencilerinde akademik erteleme davranışı: Akademik güdülenme, akademik özyeterlik ve akademik yükleme stillerinin rolü*. (Unpublished master’s thesis). Mersin University, Mesin, Turkey.

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

Alexander, P. A., & Judy, J. E. (1988). The interaction of domain-specific and strategic knowledge in academic performance. *Review of Educational Research,58*(4), 375-404.

Alpaslan, M. M., Yalvac, B., Loving, C. C., & Willson, V. (2015). Exploring the Relationship Between High School Students’ Physics-Related Personal Epistemologies and Self-regulated Learning in Turkey. *International Journal of Science and Mathematics Education*, 1-21.

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

Ames, C. (1990). Motivation: What teachers need to know. *The Teachers College Record*, *91*(3), 409-421.

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

Ames, C., & Archer, J. (1987). Mothers' beliefs about the role of ability and effort in school learning. *Journal of Educational Psychology*, *79*(4), 409-414.

Ames, C., & Archer, J. (1988). Achievement goals in the classroom: Students' learning strategies and motivation processes. *Journal of Educational Psychology*, *80*(3), 260-267.

Ames, C., Schunk, D. H., & Meece, J. L. (1992). Achievement goals and the classroom motivational climate. *Student perceptions in the classroom* (pp. 327–348). Mahwah, NJ: Erlbaum.

Atkinson, J. W. (1957). Motivational determinants of risk taking behavior. *Psychological Review*, *64*, 359-372.

Aydoğan, D. (2008). *Akademik erteleme davranışının benlik saygısı, durumluk kaygı ve özyeterlik ile açıklanabilirliği*. (Unpublished master's thesis). Gazi University, Ankara, Turkey.

Baas, D., Castelijns, J., Vermeulen, M., Martens, R., & Segers, M. (2015). The relation between Assessment for Learning and elementary students' cognitive and metacognitive strategy use. *British Journal of Educational Psychology,85*(1), 33-46.

Balkis, M., & Duru, E. (2015). Procrastination, self-regulation failure, academic life satisfaction, and affective well-being: underregulation or misregulation form. *European Journal of Psychology of Education*, 1-21. doi: 10.1007/s10212-015-0266-5.

Bandura, A. (1977). Self-efficacy: toward a unifying theory of behavioral change. *Psychological Review*, *84*(2), 191-215.

Bandura, A. (1982). Self-efficacy mechanism in personal agency. *American Psychologist, 37*(2), 122-148.

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

Bandura, A. (1997). *Self-efficacy: The exercise of Control.* New York, NY: Freeman.

Bandura, A., & Schunk, D. H. (1981). Cultivating competence, self-efficacy, and intrinsic interest through proximal self-motivation. *Journal of Personality and Social Psychology*, *41*, 586- 598.

Bandura, M., & Dweck, C.S. (1985). *The relationship of conceptions of intelligence and achievement goals to achievement-related cognition, affect, and behavior.* Unpublished manuscript, Harvard University.

Baumeister, R. F., Heatherton, T. F., & Tice, D. M. (1993). When ego threats lead to self-regulation failure: negative consequences of high self-esteem. *Journal of Personality and Social Psychology*, *64*(1), 141-156.

Beardsworth, R. (1999). Practices of procrastination. *Parallax*, *5*(1), 10-12.

Bendixen, L., Schraw, G., & Dunkle, M. (1998). Epistemic beliefs and moral reasoning. *Journal of Psychology*, *132*(2), 187-200.

Bentler, P.M. & Chou, C. (1987). Practical issues in structural modeling. *Sociological Methods and Research*, *16,* 78–117.

Beswick, G., Rothblum, E. D., & Mann, L. (1988). Psychological antecedents of student procrastination. *Australian Psychologist*, *23*(2), 207-217.

Bezci, F., & Sungur-Vural, S. (2013). Academic procrastination and gender as predictors of science achievement. *Journal of Educational and Instructional Studies in the World*, *3*(2), 64-68.

Biggs, J. B. (1987). *Student Approaches to Learning and Studying. Research Monograph*. Hawthorn, Victoria: Australian Council for Educational Research.

Bijou, S., Morris, E., & Parsons, J. (1976). A PSI course in child development with a procedure for reducing student procrastination. *Journal of Personalized Instruction*, *1*, 36-40.

Blackwell, L. S., Trzesniewski, K. H., & Dweck, C. S. (2007). Implicit theories of intelligence predict achievement across an adolescent transition: A longitudinal study and an intervention. *Child Development*, *78*(1), 246-263.

Blatt, S. J., & Quinlan, P. (1967). Punctual and procrastinating students: a study of temporal parameters. *Journal of Consulting Psychology*, *31*(2), 169.

Boffeli, T. J. (2007). *College students' personal epistemological beliefs as factors in academic procrastination*. (Unpublished doctoral dissertation). Capella University, Minnesota, United States of America.

Bong, M. (2001). Role of self-effi cacy and task-value in predicting college students' course performance and future enrollment intentions. *Contemporary Educational Psychology*, *26*, 553–570.

Boz, Y., Aydemir, M., &Aydemir, N. (2011). 4th, 6th, and 8thgrade Turkish elementary students' epistemological beliefs. *Elementary Education Online*, *10*(3), 1191-1201.

Brandt, R. (1988). On learning research: A conversation with Lauren Resnick. *Educational Leadership*, *46*(4), 12-16.

Bransford, J. D., & Heldmeyer, K. (1983). Learning from children learning. In J. Bisanz, G. Bisanz, & R. Kail (Eds.), *Learning in children: Progress in cognitive development research* (pp. 171-190). New York, NY: Springer.

Braten, I., & Olaussen, B. S. (1998). The relationship between motivational beliefs and learning strategy use among Norwegian college students. *Contemporary Educational Psychology*, *23*(2), 182-194.

Bråten, I., & Strømsø, H. I. (2005). The relationship between epistemological beliefs, implicit theories of intelligence, and self-regulated learning among Norwegian postsecondary students. *British Journal of Educational Psychology*,*75*(4), 539-565.

Brown, A. L. (1978). Knowing when, where, and how to remember: A problem of metacognition. In R. Glaser (Ed.), *Advances in instructional psychology* (Vol. 1). Hillsdale, NJ: Lawrence Erlbaum Associates.

Brown, A. L. (1987). Metacognition, executive control, self-regulation, and other more mysterious mechanisms. In F. E. Weinert & R. H. Kluwe (Eds.), *Metacognition, motivation and understanding* (pp. 65-116). Hillsdale, NJ: Erlbaum.

Brown, A. L., Bransford, J. D., Ferrara, R. A., & Campione, J. C. (1983). Learning, remembering, and understanding. In J. H. Flavell & E. M. Markman (Eds.), *Handbook of child psychology,Vol. 3 Cognitive development* (4th Ed., pp. 77-166). New York, NY: Wiley.

Brown, T. A. (2006). *Confirmatory factor analysis for applied research*. New York, NY: Guilford Press.

Buehl, M. M. (2003, April). *At the crossroads: Exploring the intersection of epistemological beliefs, motivation, and culture*. Paper presented at the annual meeting of the American Educational Research Association, Chicago.

Buehl, M. M., & Alexander, P. A. (2001). Beliefs about academic knowledge. *Educational Psychology Review*, *13*(4), 385-418.

Burka, J. B., & Yuen, L. M. (1983). *Procrastination*. Reading, MA: Addison-Wesley.

Butler, D. L., & Winne, P. H. (1995). Feedback and self-regulated learning: A theoretical synthesis. *Review of Educational Research*, *65*(3), 245-281.

Cao, L. (2012). Differences in Procrastination and Motivation between Undergraduate and Graduate Students. *Journal of the Scholarship of Teaching and Learning*, *12*(2), 39-64.

Chandler, M. J., Hallett, D., & Sokol, B. W. (2002). Competing claims about competing knowledge claims. In B. K. Hofer & P. R. Pintrich (Eds.), *Personal epistemology: The psychology of beliefs about knowledge and knowing* (pp. 145–168). Mahwah, NJ: Erlbaum.

Chen, J. A., & Pajares, F. (2010). Implicit theories of ability of Grade 6 science students: Relation to epistemological beliefs and academic motivation and achievement in science. *Contemporary Educational Psychology*, *35*(1), 75-87.

Chiu, C. Y., Hong, Y. Y., & Dweck, C. S. (1997). Lay dispositionism and implicit theories of personality. *Journal of Personality and Social Psychology*, *73*(1), 19-30.

Chun Chu, A. H., & Choi, J. N. (2005). Rethinking procrastination: Positive effects of" active" procrastination behavior on attitudes and performance. *The Journal of Social Psychology*, *145*(3), 245-264.

Cohen, J., Cohen, P., West, S. G., & Aiken, L. S. (2003). *Applied multiple regression/correlation analysis for the behavioral sciences* (3rd Ed.). Mahwah, NJ: Erlbaum.

Conley, A. M., Pintrich, P. R., Vekiri, I., & Harrison, D. (2004). Changes in epistemological beliefs in elementary science students. *Contemporary Educational Psyc*hology, *29*, 186–204.

Coopersmith, S. (1967). *The antecedents of self-esteem*. San Fransico: Freeman.

Corkin, D. (2012). *The Influence of Personal Motivational Beliefs and Classroom Climate Dimensions on Academic Procrastination in College Mathematics Courses*. (Unpublished doctoral dissertation). University of Houston, Houston, United States of America.

Cury, F., Elliot, A. J., Da Fonseca, D., & Moller, A. C. (2006). The social-cognitive model of achievement motivation and the 2× 2 achievement goal framework. *Journal of Personality and Social Psychology*, *90*(4), 666-679.

Cury, F., Elliot, A., Sarrazin, P., Da Fonseca, D., & Rufo, M. (2002). The trichotomous achievement goal model and intrinsic motivation: A sequential mediational analysis. *Journal of Experimental Social Psychology*, *38*(5), 473-481.

Çakıcı, D. Ç., (2003). *Lise ve Üniversite Öğrencilerinde Genel Erteleme ve Akademik Erteleme Davranışının İncelenmesi*. (Unpublished master's thesis). Ankara University, Ankara, Turkey.

Dahl, T. I., Bals, M., & Turi, A. L. (2005). Are students' beliefs about knowledge and learning associated with their reported use of learning strategies?. *British Journal of Educational Psychology*, *75*(2), 257-273.

Davis, J. K. (1999). *The effects of culture on high school academic procrastination*. (Unpublished doctoral dissertation). University of Southern California, Los Angeles, United States of America.

DeBacker, T. K., & Crowson, H. M. (2006). Influences on cognitive engagement: Epistemological beliefs and need for closure. *British Journal of Educational Psychology*, *76*(3), 535-551.

Deryakulu, D., & Büyüköztürk, S. (2002). Validity and reliability study of epistemological beliefs questionnaire. *Eurasian Journal of Educational Research*, *8*, 111-125.

Diener, C. I., & Dweck, C. S. (1978). An analysis of learned helpless: Continuous changes in performance, strategy and achievement cognitions following failure. *Journal of Personality and Social Psychology*, *36*, 451-462.

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

Dindar, H., & Yangın, S. (2007). İlköğretim fen ve teknoloji dersi öğretim programına geçiş sürecinde öğretmenlerin bakış açılarının değerlendirilmesi. *Kastamonu Eğitim Dergisi*, *15*(1), 185-198.

Doerr, C. E., & Baumeister, R. F. (2010). Self-regulatory strength and psychological adjustment: Implications of the limited resource model of self-regulation. In J. Maddux & J. Tangney (Eds.), *Social psychological foundations of clinical psychology* (pp. 71-83). New York: Guilford.

Doron, J., Stephan, Y., Boiché, J., & Scanff, C. L. (2009). Coping with examinations: Exploring relationships between students' coping strategies, implicit theories of ability, and perceived control. *British Journal of Educational Psychology*, *79*(3), 515-528.

Dowson, M., & McInerney, D.M. (1998, April). *Cognitive and motivational determinants of students' academic performance and achievement: Goals, strategies, and academic outcomes in focus.* Paper presented at the annual meeting of the American Educational Research Association, San Diego, CA.

Dunkle, M. F., Schraw, G, J., & Bendixen, L. (1993, April). *The relationship between epistemological beliefs, causal attributions, and reflective judgment.* Paper presented at the annual meeting of the American Educational Research Association, Atlanta.

Dupeyrat, C., & Mariné, C. (2005). Implicit theories of intelligence, goal orientation, cognitive engagement, and achievement: A test of Dweck's model with returning to school adults. *Contemporary Educational Psychology*, *30*(1), 43-59.

Duval, S. & Wicklund. R. A. (1972). *A theory of objective self-avareness*. New York, NY: Academic Press.

Dweck, C. S. (1975). The role of expectations and attributions in the alleviation of learned helplessness. *Journal of Personality and Social Psychology, 31*, 674-685.

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

Dweck, C. S. (1996). Capturing the dynamic nature of personality. *Journal of Research in Personality*, *30*(3), 348–362.

Dweck, C. S. (1999). *Self-theories: Their role in motivation, personality, and development*. Philedelphia, PA: Psychology Press.

Dweck, C. S. (2002). The development of ability conceptions. In A. Wigfield & J. Eccles (Eds.), *The development of achievement motivation*. San Diego, CA: Academic Press.

Dweck, C. S. (2006). Is math a gift? Beliefs that put females at risk. In S. J. Ceci & W. M. Williams (Eds.), *Why aren't more women in science? Top researchers debate the evidence* (pp. 47–55). Washington, DC: American Psychological Association.

Dweck, C. S., Chiu, C., & Hong, Y. (1995). Implicit theories and their role in judgments and reactions: a world from two perspectives. *PsychologicaI lnquiry*, *6*(4), 267-285.

Dweck, C. S., & Elliott, E. S. (1983). Achievement motivation. In P. Mussen & E. M. Hetherington (Eds.), *Handbook of child psychology* (pp. 643-691). New York, NY: Wiley.

Dweck, C. S., & Henderson, V., L. (1988). *Theories of intelligence: Background and measures*. Unpublished manuscript.

Dweck, C. S., & Leggett, E. L. (1988). A social-cognitive approach to motivation and personality. *Psychological Review*, *95*(2), 256-273.

Dweck, C. S., & Master, A. (2009). Self-theories and motivation: Students' beliefs about intelligence. In K.R. Wentzel and A. Wigfield (Eds.), *Handbook of motivation at school* (pp. 123-140). New York, NY: Routledge.

Dweck, C. S., & Repucci, N. (1973). Learned helplessness and reinforcement responsibility in children. *Journal of Personality and Social Psychology*, *25*, 109-116.

Eccles, J. S. (1987). Gender roles and achievement patterns: An expectancy value perspective. In J. M. Reinisch, L. A. Rosenblum, & S. A. Sanders (Eds.), *Masculinity/femininity: Basic perspectives* (pp. 240-280). New York, NY: Oxford University Press.

Eccles, J. S. (1993). School and family eff ects on the ontogeny of children's interests, self-perceptions, and activity choice. In J. Jacobs (Ed.), *Nebraska Symposium on Motivation, 1992: Developmental perspectives on motivation* (pp. 145–208). Lincoln: University of Nebraska Press.

Eccles, J. S. (2005). Subjective task values and the Eccles et al. model of achievement related choices. In A. J. Elliott & C. S. Dweck (Eds.), *Handbook of competence and motivation* (pp. 105–121). New York, NY: Guilford.

Eccles, J. S., Adler, T. F., Futterman, R., Goff , S. B., Kaczala, C. M., Meece, J. L., & Midgley, C. (1983). Expectancies, values, and academic behaviors. In J. T. Spence (Ed.), *Achievement and achievement motivation* (pp. 75–146). San Francisco, CA: W. H. Freeman.

Eccles, J. S., & Midgley, C. (1989). Stage-environment fit: Developmentally appropriate classrooms for young adolescents. *Research on Motivation in Education*, *3*, 139-186.

Eccles, J. S., & Wigfield, A. (1995). In the mind of the actor: The structure of adolescents' achievement tasks values and expectancy-related beliefs. *Personality and Social Psychology Bulletin*, *21*, 215-225.

Eccles, J. S., & Wigfield, A. (2002). Motivational beliefs, values, and goals. *Annual Review of Psychology*, *53*(1), 109-132.

Eccles, J. S., Wigfi eld, A., Harold, R., & Blumenfeld, P. B. (1993). Age and gender diff erences in children's self- and task perceptions during elementary school. *Child Development, 64*, 830–847.

Effert, B. R., & Ferrari, J. R. (1989). Decisional procrastination: Examining personality correlates. *Journal of Social Behavior and Personality, 4*, 151-161.

Elder, A. D. (1999). *An exploration of fifth-grade students' epistemological beliefs in science and an investigation of their relation to science learning*. (Unpublished doctoral dissertation). University of Michigan, Ann Arbor, United States of America.

Elder, A. D. (2002). Characterizing fifth grade students' epistemological beliefs in science. In B. K. Hofer & P. R. Pintrich (Eds.), Personal epistemology: The psychology of beliefs about knowledge and knowing (pp. 347–364). Mahwah, NJ: Lawrence Erlbaum Associates.

Elliot, A. J. (1997). Integrating "classic" and "contemporary" approaches to achievement motivation: A hierarchical model of approach and avoidance achievement motivation. In P. Pintrich & M. Maehr (Eds.), *Advances in motivation and achievement* (pp. 143–179). Green- wich, CT: JAI Press.

Elliot, A.J. (1999). Approach and Avoidance Motivation and Achievement Goals. *Educational Psychologist, 34*(3), 169–89.

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

Elliott, 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 achievement 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 × 2 achievement goal framework. *Journal of Personality and Social Psychology*, *80*, 501–519.

Elliot, A. J., McGregor, H. A., & Gable, S. (1999). Achievement goals, study strategies, and exam performance: A mediational analysis. *Journal of Educational Psychology*, *91*, 549–563.

Ellis, A., & Knaus, W. J. (1977). *Overcoming procrastination*. New York, NY: Signet.

Epstein, S. (1989). Values from the perspective of cognitive-experiential self-theory. In N. Eisenberg, J. Reykowski, & E. Staub (Eds.), *Social and moral values: Individual and social perspectives* (pp. 3-61). Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.

Ferrari, J. R. (1991a). Compulsive procrastination: Some self-reported characteristics. *Psychological Reports*, *68*(2), 455-458.

Ferrari, J. R. (1991b). A preference for a favorable public impression by procrastinators: Selecting among cognitive and social tasks. *Personality and Individual Differences*, *12*(11), 1233-1237.

Ferrari, J. R. (1991c). Procrastination and project creation: Choosing easy, nondiagnostic items to avoid self-relevant information. *Journal of Social Behavior and Personality*, *6*(3), 619-628.

Ferrari. J. R. (1992). Psychometric validation of two measures of procrastination: Arousal and avoidance measures. *Journal of Psychopathology and Beharioural Assessment*, *14*, 97-100.

Ferrari, J. R. (1994). Dysfunctional procrastination and its relationship with self-esteem, interpersonal dependency, and self-defeating behaviors. *Personality and Individual Differences, 17*(5), 673-679.

Ferrari, J. R., & Emmons, R. A. (1995). Methods of procrastination and their relation to self-control and self-rein- forcement. *Journal of Social Behavior and Personality, 10*, 135–142.

Ferrari, J.R., Johnson, J.J., & McCown, W.C. (1995). *Procrastination and task avoidance: Theory, research, and treatment*. New York, NY: Plenum.

Ferrari, J. R., & Olivette, M. J. (1994). Parental authority and the development of female dysfunctional procrastination. *Journal of Research in Personality*,*28*(1), 87-100.

Ferrari, J. R., & Tice, D. M. (2000). Procrastination as a self-handicap for men and women: A task-avoidance strategy in a laboratory setting. *Journal of Research in Personality*, *34*(1), 73-83.

Flavell, J. H. (1976). Metacognitive aspects of problem solving. In L. B. Resnick (Ed.), *The nature of intelligence* (pp. 231-236). Hillsdale, NJ: Erlbaum.

Flavell, J. H. (1979). Metacognition and cognitive monitor- ing: A new area of cognitive-developmental inquiry. *American Psychologist*, *34*, 906-911.

Fraenkel, Jack. R., & Wallen, N. E. (2006). *How to design and evaluate research in education*. New York, NY: McGraw-Hill.

Freud, S. (1953). *Inhibitions, symptoms and anxiety in collected works*. London: Hogards.

Gagné, R.M. (1985). *The conditions of learning and theory of instruction* (4th Ed.). New York, NY: CBS College Publishing.

Ganesan, R., Mamat, N. H. B., Mellor, D., Rizzuto, L., & Kolar, C. (2014). Procrastination and the 2× 2 Achievement Goal Framework in Malaysian Undergraduate Students. *Psychology in the Schools*, *51*(5), 506-516.

Garner, R. (1990). When children and adults do not use learning strategies: Toward a theory of settings. *Review of Educational Research*, *60*(4), 517-529.

Genç, H.&Küçük, M. (2003). *Öğrenci Merkezli Fen Bilgisi Öğretim Programının Uygulanması Üzerine Bir Durum Tespit Çalışması*. . Paper presented at the XII. Eğitim Bilimleri Kongresi, pp. 1555-1572.

Good, C., Aronson, J., & Inzlich, M. (2003). Improving Adolescents' Standardized Test Performance: an intervention to reduce the effects of stereotype threat. *Applied Developmental Psychology*, *24*, 645-662.

Gökçe, İ. (2006). *Fen Ve Teknoloji Dersi Programı İle Öğretmen Kılavuzunun İçsel Olarak Değerlendirilmesi ve Uygulamada Karşılaşılan Sorunlar (Balıkesir Örneği)*. (Unpublished master's thesis). Balıkesir Universitiy, Balıkesir, Turkey.

Hammer, C. A., & Ferrari, J. R. (2002). Differential incidence of procrastination between blue-and white-collar workers. *Current Psychology: Developmental, Learning, Personality, Social*, *21*, 333–338.

Hammer, D. (1994). Epistemological beliefs in introductory physics. *Cognition and Instruction*, *12*(2), 151–183.

Hammer, D., & Elby, A. (2002). On the form of a personal epistemology. In B. Hofer & P. R. Pintrich (Eds.), *Personal epistemology: The psychology of beliefs about knowledge and knowing* (pp. 169–190). Mahwah, NJ: Erlbaum.

Harackiewicz, J. M., Barron, K. E., Tauer, J.M., Carter, S.M., & Elliot, A. J. (2000). Short-term and long-term consequences of achievement goals: Predicting interest and performance over time. *Journal of Educational Psychology*, *92,* 316–330.

Haycock, L. A., McCarthy, P., & Skay, C. L. (1998). Procrastination in college students: The role of self-efficacy and anxiety. *Journal of Counseling & Development*, *76*(3), 317-324.

Heikkila, A., & Lonka, K. (2006). Studying in higher education: Students' approaches to learning, self-regulation, and cognitive strategies. *Studies in Higher Education, 31* (1), 99-117.

Hensley, L. C. (2013). *The Fine Points of Working under Pressure: Active and Passive Procrastination among College Students.* (Unpublished doctoral dissertation). The Ohio State University, Ohio, United States of America.

Hess, B., Sherman, M. F., & Goodman, M. (2000). Eveningness predicts academic procrastination: The mediating role of neuroticism. *Journal of Social Behavior and Personality*, *15*(5), 61-74.

Hıdıroğlu, F. M. (2014). *The role of perceived classroom goal structures, self-efficacy, and the student engagement in seventh grade students' science achievement*. (Unpublished master's thesis). Middle East Technical University, Ankara, Turkey.

Hofer, B. K. (2000). Dimensionality and disciplinary differences in personal epistemology. *Contemporary Educational Psychology*, *25*, 378-405.

Hofer, B. K. (2001). Personal epistemology research: Implications for learning and teaching. *Educational Psychology Review*, *13*(4), 353-383.

Hofer, B. K. (2002). Personal epistemology as a psychological and educational construct: An introduction. In B. Hofer & P. Pintrich (Eds.), *Personal epistemology: The psychology of beliefs about knowledge and knowing*. Mahwah, NJ, US: Lawrence Erlbaum Associates Publishers.

Hofer, B. K. (2006). Personal epistemology and culture. In M. S. Khine (Ed.), *Knowing, knowledge, and beliefs: Epistemological studies across diverse cultures* (pp. 3–22). Berlin: Springer.

Hofer, B. K., & Pintrich, P. R. (1997). The development of epistemological theories: Beliefs about knowledge and knowing and their relation to learning. *Review of Educational Research, 67*, 88-140.

Hofer, B. K., Yu., S., & Pintrich, P. (1998). Teaching college students to be self-regulated learners. In D. Schunk, & B. Zimmerman (Eds.), *Self-regulated learning: From teaching to self-reflective practice* (pp. 57–85). New York, NY: Guilford Press.

Hong, Y. Y., Chiu, C. Y., Dweck, C. S., Lin, D. M. S., & Wan, W. (1999). Implicit theories, attributions, and coping: A meaning system approach. *Journal of Personality and Social Psychology*, *77,* 588–599.

Howell, A. J., & Buro, K. (2009). Implicit beliefs, achievement goals, and procrastination: A mediational analysis. *Learning and Individual Differences*,*19*(1), 151-154.

Howell, A. J., & Watson, D. C. (2007). Procrastination: Associations with achievement goal orientation and learning strategies. *Personality and Individual Differences*, *43*, 167−178.

Jehng, J. J., Johnson, S. D., & Anderson, R. C. (1993). Schooling and students' epistemological beliefs about leaning. *Contemporary Educational Psychology*, *18*, 23-35.

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

Jöreskog, K. G., & Sörbom, D. (2006). *LISREL 8.80 for Windows [Computer software]*. Lincolnwood, IL: Scientific Software International.

Kadıoglu, C., & Kondakçı, E. U. (2014). Relationship between learning strategies and goal orientations: A multilevel analysis. *Eurasian Journal of Educational Research*, *56*, 1-24.

Kahraman, N., & Sungur, S. (2011). The Contribution of Motivational Beliefs to Students' Metacognitive Strategy Use. *Egitim ve Bilim*, *36*(160), 3-10.

Kahraman, N., & Sungur, S. (2013). Antecedents and consequences of middle school students' achievement goals in science. *The Asia-Pacific Education Researcher*, *22*(1), 45-60.

Kandemir, M. (2010). *Akademik Erteleme Davranışını Açıklayıcı Bir Model.* (Unpublished doctoral dissertation). Gazi University, Ankara, Türkiye.

Kaplan, A. (2008). Clarifying metacognition, self-regulation, and self-regulated learning: What's the purpose?. *Educational Psychology Review*, *20*(4), 477-484.

Kaplan, A., & Maehr, M. L. (2007). The contributions and prospects of goal orientation theory. *Educational Psychology Review*, *19*(2), 141-184.

Kardash, C. M., & Howell, K. L. (2000). Effects of epistemological beliefs and topic-specific beliefs on undergraduates' cognitive and strategic processing of dual-positional text. *Journal of Educational Psychology*, *92*(3), 524-535.

Kasımi, Y. (2013). Cognitive and metacognitive strategies employed by Iranian and Turkish EFL readers. *ELT Research Journal*, *1*(3), 159-174.

Kasimatis, M., Miller, M., & Marcussen, L. (1996). The effects of implicit theories on exercise motivation. *Journal of Research in Personality*, *30*(4), 510-516.

Kaya, S., & Kablan, Z. (2013). Assessing the relationship between learning strategies and science achievement at the primary school level. *Journal of Baltic Science Education*, *12*(4), 525–534.

Kelloway, E. K. (1998). *Using LISREL for Structural Equation Modeling*. London New Delhi: Sage Publications.

Kıran, D. (2010). *A Study On Sources and Consequences of Elementary Students' Self-Efficacy Belıefs in Scıence and Technology Course.* (Unpublished master's thesis). Middle East Technical University, Ankara, Turkey.

Kızılgüneş, B. (2007). *Predictive Influence of Students' Achievement Motivation, Meaningful Learning Approach and Epistemological Beliefs on Classification Concept Achievement*. (Unpublished master's thesis). Middle East Technical University, Ankara, Turkey.

Kızılgüneş, B., Tekkaya, C., & Sungur, S. (2009). Modeling the relations among students' epistemological beliefs, motivation, learning approach, and achievement. *The Journal of Educational Research*, *102*(4), 243-256.

King, R. B., & McInerney, D. M. (2014). Culture's consequences on student motivation: Capturing cross-cultural universality and variability through personal investment theory. *Educational Psychologist*, *49*(3), 175-198.

Kingir, S., Tas, Y., Gok, G., & Vural, S. S. (2013). Relationships among constructivist learning environment perceptions, motivational beliefs, self-regulation and science achievement. *Research in Science and Technological Education*, *31*(3), 205-226.

Klassen, R. M., Krawchuk, L. L., & Rajani, S. (2008). Academic procrastination of undergraduates: Low self-efficacy to self-regulate predicts higher levels of procrastination. *Contemporary Educational Psychology*, *33*(4), 915-931.

Klassen, R. M., & Kuzucu, E. (2009). Academic procrastination and motivation of adolescents in Turkey. *Educational Psychology*, *29*(1), 69-81.

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

Klingsieck, K. B., Fries, S., Horz, C., & Hofer, M. (2012). Procrastination in a distance university setting. *Distance Education*, *33*(3), 295-310.

Kozandağı, İ. (2001). *Öğretmen Görüşlerine Göre İlköğretim Okulları 4. ve 5. Sınıf Fen Bilgisi Öğretim Programlarında Karşılaşılan Sorunlar ve Çözüm Önerileri*. (Unpublished master's thesis). Dokuz Eylül University, İzmir, Turkey.

Kurt, F. (2009). *Investigating students' epistemological beliefs through gender, grade level, and fields of the study*. (Unpublished master's thesis). Middle East Technical University, Ankara, Turkey.

Lay, C. H. (1986). At last, my research article on procrastination. *Journal of Research in Personality*, *20*(4), 474-495.

Lay, C. H. (1987). A modal profile analysis of procrastinators: A search types. *Personality & Individual Differences*, *8*, 705-714.

Lay, C. H., & Brokenshire, R. (1997). Conscientiousness, procrastination, and person-task characteristics in job searching by unemployed adults. *Current Psychology*, *16*(1), 83-96.

Lay, C. H., & Schouwenburg, H. C. (1993). Trait procrastination, time management, and academic behavior. *Journal of Social Behavior and Personality*, *8*(4), 647-662.

Leggett, E. L., & Dweck, C. S. (1986). *Goals and inference rules: Sources of causal judgments*. Unpublished manuscript.

Leondari, A., & Gialamas, V. (2002). Implicit theories, goal orientations, and perceived competence: Impact on students' achievement behavior. *Psychology in the Schools*, *39*(3), 279-291.

Ley, K., & Young, D. B. (2001). Instructional principles for self-regulation. *Educational Technology Research and Development*, *49*(2), 93-103.

Liem, A. D., Lau, S., & Nie, Y. (2008). The role of self-efficacy, task value, and achievement goals in predicting learning strategies, task disengagement, peer relationship, and achievement outcome. *Contemporary Educational Psychology*, *33*(4), 486-512.

Linnenbrink, E. A., & Pintrich, P. R. (2002). Motivation as an enabler for academic success. *School Psychology Review*, *31*(3), 313-327.

Linnenbrink, E. A., & Pintrich, P. R. (2003). The Role of Self-Efficacy Beliefs Instudent Engagement and Learning Intheclassroom. *Reading and Writing Quarterly*, *19*(2), 119-137.

Linnenbrink-Garcia, L., Tyson, D. F., & Patall, E. A. (2008). When are achievement goal orientations beneficial for academic achievement? A closer look at main effects and moderating factors. *Revue Internationale de Psychologie Sociale*, *21*(1), 19-70.

Lum, M. K. (1960). A comparison of under-and overachieving female college students. *Journal of Educational Psychology*, *51*(3), 109-115.

Maehr, M. L., & Midgley, C. (1996). *Transforming school cultures*. Boulder, CO: Westview Press.

Maehr, M. L., & Nicholls, J. G. (1980). Culture and achievement motivation: A second look. *Studies in Cross-Cultural Psychology*, *2*, 221-267.

Maehr, M. L., & Zusho, A. (2009). Achievement goal theory: The past, present, and future. In K. R. Wentzel & A. Wigfield (Eds.), *Handbook of motivation in school* (pp. 77–104). New York, NY: Taylor Francis.

McCown, W., & Johnson, J. (1991). Personality and chronic procrastination by university students during an academic examination period. *Personality and Individual Differences*, *12*(5), 413-415.

McGregor, H. A., & Elliot, A. J. (2002). Achievement goals as predictors of achievement-relevant processes prior to task engagement. *Journal of Educational Psychology*, *94*(2), 381-395.

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

Meece, J. L., Wigfield, A., & Eccles, J. S. (1990). Predictors of math anxiety and its influence on young adolescents' course enrollment intentions and performance in mathematics. *Journal of Educational Psychology*, *82*(1), 60-70.

Mendelson, N. (2007). *The functional mediation of flow between achievement anxiety, academic procrastination, and academic performance*. (Unpublished doctoral dissertation). Fordham University, New York, United States of America.

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., Kaplan, A., & Middleton, M. (2001). Performance-approach goals: Good for what, for whom, under what circumstances, and at what cost?. *Journal of Educational Psychology*, *93*(1), 77-86.

Milgram, N. A., Dangour, W., & Ravi, A. (1992). Situational and personal determinants of academic procrastination. *The Journal of General Psychology*,*119*(2), 123-133.

Miller, R. B., Greene, B. A., Montalvo, G. P., Ravindran, B., & Nichols, J. D. (1996). Engagement in academic work: The role of learning goals, future consequences, pleasing others, and perceived ability. *Contemporary Educational Psychology*, *21*(4), 388-422.

Ministry of National Education of Turkey (2005). Science and technology curriculum of elementary schools (6th–8th grades) [in Turkish]. Ankara, Turkey: Board of Education.

Ministry of National Education of Turkey, (2013). Science curriculum of elementary schools (3rd–8th grades) [in Turkish]. Ankara, Turkey: Board of Education.

Missildine, W. H. (1963). *Your inner child of the past*. New York, NY: Simon and Schuster.

Mohammadi, M., Rouhi, A., & Davaribina, M. (2012). Simple and multiple relations between motivational strategies and academic achievement. *International Research Journal of Applied and Basic Sciences, 3*(2), 260-267.

Moller, A. C., & Elliot, A. J. (2006). The 2x2 achievement goal framework: An overview of empirical research. In A. Mittel (Ed.), *Focus on educational psychology* (pp. 307–326). New York, NY: Nova Science.

Moon, S. M., & Illingworth, A. J. (2005). Exploring the dynamic nature of procrastination: A latent growth curve analysis of academic procrastination. *Personality and Individual Differences*, *38*(2), 297-309.

Motie, H., Heidari, M., & Sadeghi, M. A. (2012). Predicting academic procrastination during self-regulated learning in Iranian first grade high school students. *Procedia-Social and Behavioral Sciences*, *69,* 2299-2308.

Muis, K. R. (2007). The role of epistemic beliefs in self-regulated learning. *Educational Psychologist*, *42*(3), 173-190.

Muis, K. R., Bendixen, L. D., & Haerle, F. C. (2006). Domain-generality and domain-specificity in personal epistemology research: Philosophical and empirical reflections in the development of a theoretical framework. *Educational Psychology Review*, *18*(1), 3-54.

Muis, K. R., & Franco, G. M. (2009). Epistemic beliefs: Setting the standards for self-regulated learning. *Contemporary Educational Psychology*, *34*(4), 306-318.

Muis, K. R., Winne, P. H., & Jamieson-Noel, D. (2007). Using a multitrait-multimethod analysis to examine conceptual similarities of three self-regulated learning inventories. *British Journal of Educational Psychology*, *77*(1), 177-195.

Multon, K. D., Brown, S. D., & Lent, R. W. (1991). Relation of self-efficacy beliefs to academic outcomes: A meta-analytic investigation. *Journal of counseling psychology*, *38*(1), 30-38.

Nelson, T. O. (1999). Cognition versus metacognition. In R. J. Sternberg (Ed.), *The nature of cognition* (pp. 625–641). Cambridge: MIT Press.

Nicholls, J. G. (1980, June). *Striving to develop and demonstrate ability: An intentional theory of achievement motivation*. Paper presented at the Conference on Attributional Approaches to Human Motivation, Center for Interdisciplinary Studies, University of Bielefeld, Bielefeld, Germany.

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

Olobatuyi, M. E. (2006). *A user's guide to path analysis*. Lanham: University Press of America, Inc.

Ommundsen, Y. (2001a). Pupilsí Affective Responses in Physical Education Classes: the Association of Implicit Theories of the Nature of Ability and Achievement Goals. *European Physical Education Review*, *7*(3), 219-242.

Ommundsen, Y. (2001b). Self-handicapping strategies in physical education classes: The influence of implicit theories of the nature of ability and achievement goals. *Psychology of Sport and Exercise*, *2*, 139–156.

Ommundsen, Y. (2003). Implicit theories of ability and self-regulation strategies in physical education classes. *Educational Psychology*, *23*(2), 141-157.

Ommundsen, Y., Haugen, R., & Lund, T. (2005). Academic self-concept, implicit theories of ability, and self-regulation strategies. *Scandinavian Journal of Educational Research*, *49*(5), 461-474.

Özer, A., & Altun, E. (2011). Üniversite öğrencilerinin akademik erteleme nedenleri. *Mehmet Akif Ersoy Üniversitesi Eğitim Fakültesi Dergisi*, *1*(21), 45-72.

Özkan, Ş. (2008). *Modeling Elementary Students' Science Achievement: The Interrelationships Among Epistemological Beliefs, Learning Approaches, and Self- Regulated Learning Strategies*. (Unpublished doctoral dissertation). Middle East Technical University, Ankara, Turkey.

Özmen, Ş. G.(2003). *Fen Bilgisi Öğretmenlerinin Yapılandırmacı Öğrenme Yaklaşımına İlişkin Görüşlerinin İncelenmesi.* (Unpublished master's thesis). Hacettepe University, Ankara, Turkey.

Pajares, F. (1995, April). The role of perceived self-efficacy in self-regulation and achievement across domains. In D.H. Schunk (Chair), *Learner perceptions of self-regulatory competence: from self-schemas to self-efficacy.* Symposium conducted at the meeting of the American Educational Research Association. San Francisco.

Pajares, F. (1996). Self-efficacy beliefs in academic settings. *Review of Educational Research, 66*(4), 543-578.

Pajares, F. (1997). Current directions in self-efficacy research. In M. L. Maehr & P. R. Pintrich (Eds.), *Advances in motivation and achievement* (Vol. 10, pp. 1-49). Greenwich, CT: JAI Press.

Pallant, J. (2013). *SPSS survival manual: A step by step guide to data analysis using IBM SPSS* (5th Ed.). New York, NY: McGraw Hill.

Pamuk, S. (2014). *Multilevel analysis of students' science achievement in relation to constructivist learning environment perceptions, episromological beliefs, self-regulation and science teachers characterics*. (Unpublished doctoral dissertation). Middle East Technical University, Ankara, Turkey.

Paulhus, D. L. (1984). Two-component models of socially desirable responding. *Journal of Personality and Social Psychology*, *46*, 598-609.

Paulsen, M. B., & Feldman, K. A. (1999). Student motivation and epistemological beliefs. *New Directions for Teaching and Learnin*g, 78, 17-25.

Paulsen, M. B., & Feldman, K. A. (2005). The conditional and interaction effects of epistemological beliefs on the self-regulated learning of college students: Motivational strategies. *Research in Higher Education*, *46*(7), 731-768.

Paulsen, M. B., & Feldman, K. A. (2007). The conditional and interaction effects of epistemological beliefs on the self-regulated learning of college students: Cognitive and behavioral strategies. *Research in Higher Education*,*48*(3), 353-401.

Paulsen, M. B., & Wells, C. T. (1998). Domain differences in the epistemological beliefs of college students. *Research in Higher Education*,*39*(4), 365-384.

Perry, W. G. (1981). Cognitive and ethical growth: The making of meaning. In A. Chickering (Ed.), *The modern American college* (pp. 76–116). San Francisco: Jossey–Bass.

Phakiti, A. (2006). Modeling cognitive and metacognitive strategies and their relationships to EFL reading test performance. *Melbourne Papers in Language Testing*, *1*, 53-95.

Phan, H. P. (2009). Amalgamation of future time orientation, epistemological beliefs, achievement goals and study strategies: Empirical evidence established. *British Journal of Educational Psychology*, *79*(1), 155-173.

Pintrich, P. R. (1999). The role of motivation in promoting and sustaining self-regulated learning. *International journal of educational research*, *31*(6), 459-470.

Pintrich, P. R. (2000). The role of goal orientation in self-regulated learning. InM. Boekaerts, P. R. Pintrich, & M. Zeidner (Eds.), *Handbook of self-regulation* (pp. 451−502). NewYork: Academic Press.

Pintrich, P. R. (2004). A conceptual framework for assessing motivation and self-regulated learning in college students. *Educational psychology review*,*16*(4), 385-407.

Pintrich, P. R. (2005). The role of goal orientation in self-regulated learning. In M. Boekaerts, P. R. Pintrich, M. Zeidner (Eds.), *Handbook of selfregulation* (pp. 451-502). San Diego: 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., & Schunk, D.H. (2002). *Motivation in education: Theory, research, and applications*. Upper Saddle River, NJ: Merrill Prentice-Hall.

Pintrich, P. R., Smith, D. A., Garcia, T., & McKeachie, W. J. (1991*). A manual for the use of the Motivated Strategies for Learning Questionnaire (MSLQ)*. The University of Michigan, Ann Arbor, MI.

Pintrich, R. R., Smith, D. A. F., Garcia, T., & McKeachie, W. J. (1993). Reliability and predictive validity of the motivated strategies for learning questionnaire (MSLQ). *Educational and Psychological Measurement*, *53,* 801–813.

Powell, B., Ames, C., & Maehr, M. L. (1990, April). *Achievement goals and student motivation in learning disabled and at-risk children*. Paper presented at the annual meeting of the American Educational Research Association, Boston.

Pressley, M., & Ghatala, E. S. (1990). Self-regulated learning: Monitoring learning from text. *Educational Psychologist*, *25*(1), 19-33.

Pressley, M., Goodchild, F., Fleet, J., Zajchowski, R., & Evans, E. D. (1989). The challenges of classroom strategy instruction. *The Elementary School Journal,* 301-342.

Pychyl, T. A., Lee, J. M., Thibodeau, R., & Blunt, A. (2000). Five days of emotion: An experience sampling study of undergraduate student procrastination. *Journal of Social Behavior and Personality, 15*(5), 239-254.

Qian, G., & Alvermann, D. (1995). Role of epistemological beliefs and learned helplessness in secondary school students' learning science concepts from text. *Journal of Educational Psychology*, *87*(2), 282-292.

Qian, G., & Alvermann, D. (2000).Relationship between epistemological beliefs and conceptual change learning. *Reading and Writing Quarterly*, *16*(1), 59-74.

Rastegar, A., Jahromi, R. G., Haghighi, A. S., & Akbari, A. R. (2010). The relation of epistemological beliefs and mathematics achievement: the mediating role of achievement goals, mathematics self-efficacy, and cognitive engagement. *Procedia-Social and Behavioral Sciences*, *5,* 791- 797.

Raykov, T., & Marcoulides, G. A. (2006). On multilevel model reliability estimation from the perspective of structural equation modeling. *Structural Equation Modeling*, *13*(1), 130-141.

Rhodewalt, F. (1994). Conceptions of ability, achievement goals, and individual differences in self-handicapping behavior: On the application of implicit theories. *Journal of Personality*, *62*(1), 67-85.

Robins, R. W., & Pals, J. L. (2002). Implicit self-theories in the academic domain: Implications for goal orientation, attributions, affect, and self-esteem change. *Self and Identity*, *1*(4), 313-336.

Rokeach, M. (1979a). From individual to institutional values: With special reference to the values of science. In M. Rokeach (Ed.), *Understanding human values: Individual and socie*tal (pp. 47–70). New York, NY: Free Press.

Romainville, M. (1994). Awareness of cognitive strategies: The relationship between university students' metacognition and their performance. *Studies in Higher Education*, *19*(3), 359-366.

Rosenbaum, M. (1980). A schedule for assessing self-control behaviors: Preliminary findings. *Behavior Therapy*, *11*(1), 109-121.

Rothblum, E. D., Solomon, L. J., & Murakami, J. (1986). Affective, cognitive, and behavioral differences between high and low procrastinators. *Journal of Counseling Psychology, 33*(4), 387-394.

Ryan, M. P. (1984). Monitoring text comprehension: Individual differences in epistemological standards. *Journal of Educational Psychology, 76,* 248-258.

Saçkes, M. (2010). *The role of cognitive, metacognitive, and motivational variables in conceptual change: Preservice early childhood teachers' conceptual understanding of the cause of lunar phases*. (Unpublished doctoral dissertation). The Ohio State University, Ohio, United States of America.

Scher, S. J., & Ferrari, J. R. (2000). The recall of completed and noncompleted tasks through daily logs to measure procrastination. *Journal of Social Behavior and Personality*, *15*, 255-266.

Scher, S. J., & Osterman, N. M. (2002). Procrastination, conscientiousness, anxiety, and goals: Exploring the measurement and correlates of procrastination among school-aged children. *Psychology in Schools*, *39*, 385-398.

Schommer-Aikins, M. (2002). An evolving theoretical framework for an epistemological belief system. In B. K. Hofer & P. R. Pintrich (Eds.), *Personal epistemology: The psychology of beliefs about knowledge and knowing* (pp. 103-118). Mahwah, NJ: Erlbaum.

Schommer-Aikins, M. (2004). Explaining the epistemological beliefs system: Introducing the embedded systemic model and coordinated research approach. *Educational Psychologist*, *39*(1), 19-29.

Schommer-Aikins, M., & Easter, M. (2006). Ways of knowing and epistemological beliefs: Combined effect on academic performance. *Educational Psychology*, *26*(3), 411-423.

Schommer-Aikins, M., Duell, O. K., & Hutter, R. (2005). Epistemological beliefs, mathematical problem-solving beliefs, and academic performance of middle school students. *The Elementary School Journal*, *105*(3), 289-304.

Schommer-Aikins, M., Mau, W. C., Brookhart, S., & Hutter, R. (2000). Understanding middle students' beliefs about knowledge and learning using a multidimensional paradigm. *The Journal of Educational Research*, *94*(2), 120-127.

Schommer, M. (1990). Effects of beliefs about the nature of knowledge on comprehension. *Journal of Educational Psychology*, *82*(3), 498-504.

Schommer, M. (1993). Epistemological development and academic performance among secondary students. *Journal of Educational Psychology, 85*, 406-411.

Schommer, M. (1994). Synthesizing epistemological belief research: Tentative understandings and provocative confusions. *Educational Psychology Review*,*6*(4), 293-319.

Schommer, M. (1998). The influence of age and schooling on epistemological belief. *The British Journal of Educational Psychology, 68*(4), 551-560.

Schommer, M., Calvert, C., Gariglietti, G., & Bajaj, A. (1997). The development of epistemological beliefs among secondary students: A longitudinal study. *Journal of Educational Psychology*, *89*(1), 37-40.

Schommer, M., Crouse, A., & Rhodes, N. (1992). Epistemological beliefs and mathematical text comprehension: Believing it is simple does not make it so. *Journal of Educational Psychology*, *84*(4), 435-443.

Schouwenburg, H. C. (2004). Academic procrastination: Theoretical notions, measurement, and research. In H. C. Schouwenburg, C. H. Lay, T. A. Pychyl, & J. R.Ferrari (Eds.), *Counseling the procrastinator in academic settings* (pp. 3-17). Washington, DC: American Psychological Association.

Schouwenburg, H. C., & Lay, C. H. (1995). Trait procrastination and the Big Five factors of personality. *Personality and Individual Differences*, *18*, 481-490.

Schraw, G., Dunkle, M. E., & Bendixen, L. D. (1995). Cognitive processes in well-defined and ill-defined problem solving. *Applied Cognitive Psychology*,*9*(6), 523-538.

Schraw, G., Wadkins, T., & Olafson, L. (2007). Doing the things we do: A grounded theory of academic procrastination. *Journal of Educational Psychology*, *99*(1), 12-25.

Schumacker, R. E., & Lomax, R. G. (2004). *A beginner's guide to structural equation modeling* (2nd ed.). Mahwah, NJ: Erlbaum.

Schunk, D. H. (1981). Modeling and attributional effects on children's achievement: A self-efficacy analysis. *Journal of Educational Psychology*,*73*(1), 93-105.

Schunk, D. H. (1995). Self-efficacy, motivation, and performance. *Journal of Applied Sport Psychology*, *7*(2), 112-137.

Schunk, D. H., & Pajares, F. (2005). Competence beliefs in academic functioning. In A. J. Elliot & C. Dweck (Eds.), *Handbook of competence and motivation* (pp. 85–104). New York: Guilford Press.

Schunk, D. H., & Pajares, F. (2009). Self-efficacy theory. In K. R. Wentzel & A. Wigfield (Eds.), *Handbook of motivation in school* (pp. 35–54). New York, NY: Taylor Francis.

Schunk, D. H., & Zimmerman, B. J. (2006). Competence and control beliefs: Distinguishing the means and ends. In P. A. Alexander & P. H. Winne (Eds.), *Handbook of educational psychology* (pp. 349–367). Mahwah, NJ: Lawrence Erlbaum Associates.

Schutz, P. A., Pintrich, P. R., & Young, A. J. (1993, April). *Epistemological beliefs, motivation, and student learning*. Paper presented at the annual meeting of the American Educational Research Association, Atlanta, GA.

Senécal, C., Koestner, R., & Vallerand, R. J. (1995). Self-regulation and academic procrastination. *The Journal of Social Psychology*, *135*(5), 607-619.

Senécal, C., Lavoie, K., & Koestner, R. (1997). Trait and situational factors in procrastination. *Journal of Social Behavior and Personality*, *12*, 889–903.

Senler, B., & Sungur-Vural, S. (2014). Pre-service science teachers' use of self-regulation strategies. *Procedia-Social and Behavioral Sciences*, *152*, 551-556.

Shavelson, R. J., & Bolus, R. (1982). Self concept: The interplay of theory and methods. *Journal of Educational psychology*, *74*(1), 3-17.

Sherer, M., Maddux, J. E., Mercandante, B., Prentice-Dunn, S., Jacobs, B., & Rogers, R. W. (1982). The self-efficacy scale: Construction and validation. *Psychological Reports*, *51*(2), 663-671.

Skinner, B. F. (1953). Some contributions of an experimental analysis of behavior to psychology as a whole. *American Psychologist*, *8*(2), 69-78.

Smith, C. L., Maclin, D., Houghton, C., & Hennessey, M. G. (2000). Sixth-grade students' epistemologies of science: The impact of school science experiences on epistemological development. *Cognition and Instruction*, *18*(3), 349-422.

Snow, R. E. (1996). Aptitude development and education. *Psychology, Public Policy, and Law*, *2*(3-4), 536-560.

Snyder, M. (1974). The self-monitoring of expressive behavior. *Journal of Personality and Social Psychology*, *30*, 526-537.

Sokolowska, J. (2009). *Behavioral, cognitive, affective, and motivational dimensions of academic procrastination among community college students: AQ methodology approach*. (Unpublished doctoral dissertation). Fordham University, New York, United States of America.

Solomon, L. J., & Rothblum, E. D. (1984). Academic procrastination: Frequency and cognitive-behavioral correlates. *Journal of Counseling Psychology*, *31*(4), 503-509.

Somuncuoğlu, Y. & Yıldırım, A. (1999). Relationship Between Achievement Goal Orientations and Use of Learning Strategies. *The Journal of Educational Research*, *92*(5), 267-277.

Spock, B. (1971). Helping the procrastinating child. *Redbook, 36*, 20.

Stead, R., Shanahan, M. J., & Neufeld, R. W. J. (2010). "I'll go to therapy, eventually": Procrastination, stress and mental health. *Personality and Individual Differences, 49*, 175−180.

Steel, P. (2007). The nature of procrastination: a meta-analytic and theoretical review of quintessential self-regulatory failure. *Psychological bulletin*, *133*(1), 65-94.

Stevens, J. P. (2009). *Applied multivariate statistics for the social sciences*. New York, NY: Routledge.

Stipek, D., & Gralinski, J. H. (1996). Children's beliefs about intelligence and school performance. *Journal of Educational Psychology*, *88*(3), 397-407.

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

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., & Gungoren, S. (2009). The role of classroom environment perceptions in self-regulated learning and science achievement. *Elementary Education Online, 8*(3), 883-900.

Sungur, S., & Senler, B. (2009). An analysis of Turkish high school students' metacognition and motivation. *Educational Research and Evaluation*, *15*(1), 45-62.

Tabachnick, B. G., & Fidell, L. S. (2007). *Using multivariate statistics* (5th Ed.). Boston, MA: Pearson.

Taş, Y. & Çakır, B.(2014). An investigation of science active learning strategy use in relation to motivational beliefs. *Mevlana International Journal of Education (MIJE), 4*(1), 55-66.

Taura, A. A., Abdullah, M. C., Roslan, S., & Omar, Z. (2015). Relationship between self-efficacy, task value, self-regulation strategies and active procrastination among pre-service teachers in colleges of education. *International Journal of Psychology and Counselling*, *7*(2), 11-17.

Thomas, J. W., & Rohwer, W. D. (1987). Grade-level and course-specific differences in academic studying: Summary. *Contemporary Educational Psychology*, *12*(4), 381-385.

Tracey, C. B., Ames, C., & Maehr, M. L. (1990, April). *Attiudes and perceptions of competence across regular, at-risk, and learning disabled students*. Paper presented at the annual meeting of the American Educational Research Association, Boston.

Tuckman, B. W. (1991). The development and concurrent validity of the procrastination scale. *Educational and Psychological Measurement*, *51*(2), 473-480.

Tuckman, B. W., & Sexton, T. L. (1992). Self-believers are self-motivated; self-doubters are not. *Personality and Individual Differences*, *13*(4), 425-428.

Turner, J. C., Meyer, D. K., Midgley, C., & Patrick, H. (2003). Teacher discourse and sixth graders' reported affect and achievement behaviors in two high-mastery/high-performance mathematics classrooms. *The Elementary School Journal*, 357-382.

Urdan, T., & Midgley, C. (2001). Academic self-handicapping: What we know, what more there is to learn. *Educational Psychology Review*, *13*(2), 115-138.

Uzun Özer, B. (2010). *A path analytic model of procrastination: testing cognitive, affective, and behavioral components*. (Unpublished doctoral dissertation). Middle East Technical University, Ankara, Turkey.

Uzun Özer, B., Saçkes, M., & Tuckman, W. B. (2009b, August). *Psychometric Properties of the Tuckman Procrastination Scale in a Turkish Sample*. Paper presented at the 6th Biannial Conference on Procrastination, Toronto, Canada.

van Eerde, W. (2003). Procrastination at work and time management training. *The Journal of Psychology*, 137(5), 421-434.

van Eerde, W. (2004). Procrastination in academic settings and the Big Five model of personality: a meta-analysis. In H. C. Schouwenburg, C. H. Lay, T. A. Pychyl, & J. R. Ferrari (Eds.), *Counseling the procrastinator in academic settings* (pp. 29–40). Washington: American Psychological Association.

Veenman, M. V. (2012). Metacognition in Science Education: Defi nitions, Constituents, and Their Intricate Relation with Cognition. In *Metacognition in science education* (pp. 21-36). Springer Netherlands.

Weinstein, C.E. (1988). Assessment and training of student learning strategies. In R.R. Schmeck (Ed.), *Learning strategies and styles* (pp. 291–316). New York, NY: Plenum.

Weinstein, C.E., & Mayer, R.E. (1986). The teaching of learning strategies. In M.C. Wittrock (Ed.), *Handbook of research on teaching* (3rd Ed., pp. 315–327). New York, NY: MacMillan.

Wellman, H. M. (1992). *The child's theory of mind*. Cambridge, MA: The MIT Press.

Wigfield, A. (1994a). The role of children's achievement values in the self-regulation of their learning outcomes. In D. H Schunk & B. Zimmerman (Eds.) *Self-regulation of learning and performance: Issues and educational applications* (pp. 101-124). Hillsdale, NJ: Lawrence Erlbaum Associates.

Wigfield. A. (1994b). Expectancy - value theory of achievement motivation: A developmental perspective. *Educational Psychology Review, 6*, 49-78.

Wigfield, A., & Eccles, J. S. (1992). The development of achievement task values: A theoretical analysis. *Developmental Review, 12*(3), 265-310.

Wigfield, A., & Eccles, J. S. (2000). Expectancy–value theory of achievement motivation. *Contemporary Educational Psychology, 25*(1), 68-81.

Wigfield, A. & Eccles, J. S. (2002). The development of competence beliefs, expectancies for success, and achievement values from childhood through adolescence. In A. Wigfield & J. S. Eccles (Eds.), *Development of achievement motivation* (pp. 91–120). San Diego: Academic Press.

Wigfield, A., Eccles, J. S., & Rodriguez, D. (1998). The development of children's motivation in school contexts. *Review of Research in Education*, *23*, 73-118.

Wigfield, A., Tonks, S., & Klauda, S. L. (2009). Expectancy-value theory. In K. R. Wentzel & A. Wigfield (Eds.), *Handbook of motivation in school* (pp. 55–76). New York, NY: Routledge.

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

Winne, P. H., & Hadwin, A. F. (1998). Studying as self-regulated learning. *Metacognition in Educational Theory and Practice, 93*, 27-30.

Winne, P.H., Jamieson-Noel, D.L., & Muis, K. (2002). Methodological issues and advances in researching tactics, strategies, and self-regulated learning. In P.R. Pintrich & M.L. Maehr (Eds.), *Advances in motivation and achievement: New directions in measures and methods* (Vol. 12, pp. 121–155). Greenwich, CT: JAI Pres.

Wolters, C. A. (2003). Understanding procrastination from a self-regulated learning perspective. *Journal of Educational Psychology*, *95*(1), 179-187.

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., Shirley, L. Y., & Pintrich, P. R. (1996). The relation between goal orientation and students' motivational beliefs and self-regulated learning. *Learning and Individual Differences*, *8*(3), 211-238.

Yerdelen, S. (2013). *Multilevel investigations of students' cognitive and affective learning outcomes and their relationships with perceived classroom learning environment and teacher effectiveness*. (Unpublished doctoral dissertation). Middle East Technical University, Ankara, Turkey.

Yeşilyurt, E. (2013). Scientific epistemological beliefs of primary school students. *The Journal of Academic Social Science Studies*, *6*(1), 1587-1609.

Yılmaz, A., & Şen, S. (2012). Investigation of relationship between university students'epistemological beliefs and motivation. *Hacettepe University Journal of Education*, Special Issue (2),256-263.

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). A social cognitive view of self-regulated academic learning. *Journal of Educational Psychology*, *81*(3), 329-339.

Zimmerman, B. J. (1990). Self-regulated learning and academic achievement: An overview. *Educational Psychologist*, *25*(1), 3-17.

Zimmerman, B. J. (1998). Academic studing and the development of personal skill: A self-regulatory perspective. *Educational Psychologist*, *33*(2-3), 73-86.

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

Zimmerman, B. J., & Bandura, A. (1994). Impact of self-regulatory influences on writing course attainment. *American Educational Research Journal*, *31*, 845–862.

Zimmerman, B. J., & Martinez-Pons, M. (1988). Construct validation of a strategy model of student self-regulated learning. *Journal of Educational Psychology*, *80*(3), 284-290.

Zimmerman, B. J., & Martinez-Pons, M. (1990). Student differences in self-regulated learning. *Journal of Educational Psychology*, *82*, 51–59.

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

APPENDICES

APPENDIX A

Background Characteristics Survey

Lütfen aşağıdaki kişisel bilgi formunu doldurun.

KİŞİSEL BİLGİ FORMU

1.Okul Adı:

2.Şube Adı:

3. Cinsiyetiniz nedir?

① Kız ② Erkek

4.Sınıf Seviyesi:

① 6. sınıf ② 7. sınıf ③ 8. sınıf

5.Doğum tarihiniz(yıl olarak)**:**

① 2001 ② 2002 ③ 2003

④ 2004 ⑤ 2005 ⑥ 2006

6. Kardeş sayısı(sizin dışınızda)**:**

① 0 ② 1 ③ 2

④ 3 ⑤ 4 ⑥ 5 ve üstü

7.Geçen dönemki Fen Bilimleri dersi karne notunuz hangi aralıktadır:

① 1 ② 2

③ 3 ④ 4

⑤ 5

8. Anneniz çalışıyor mu?

① Çalışıyor ② Çalışmıyor

③ Düzenli bir işi yok ④ Emekli

9. Babanız çalışıyor mu?

① Çalışıyor ② Çalışmıyor

③ Düzenli bir işi yok ④ Emekli

Anne ve babanızın eğitim düzeyi nedir?

10.Anne	**11.Baba**
① Hiç okula gitmemiş	① Hiç okula gitmemiş
② İlkokul	② İlkokul
③ Ortaokul	③ Ortaokul
④ Lise	④ Lise
⑤ Üniversite	⑤ Üniversite
⑥ Yüksek lisans	⑥ Yüksek lisans
⑦ Doktora	⑦ Doktora

12. Evinizde kaç tane kitap bulunuyor?
(Magazin dergileri, gazete ve okul kitapları dışında)

① Hiç yok ya da çok az (0 – 10) ② 11 - 25 tane

③ 26 - 100tane ④ 101 - 200 tane

⑤ 200 taneden fazla

13. Evinizde bir çalışma odanız var mı?

① Evet ② Hayır

14. Ne kadar sıklıkta eve gazete alıyorsunuz?

① Hiçbir zaman ② Bazen ③ Her zaman

15. Evinizde bilgisayar var mı?

① Evet ② Hayır

16. Bilgisayarınızın internet bağlantısı var mı?

① Evet ② Hayır

APPENDIX B

Implicit Theories of Science Ability Scale

Lütfen aşağıdaki her bir ifadeyi okuyun ve bu ifadelere ne derecede katılıp ne derecede katılmadığınızı ilgili seçeneği işaretleyerek belirtiniz. (Unutmayınız doğru ya da yanlış cevap yoktur.)

	Kesinlikle Katılmıyorum	Katılmıyorum	Biraz Katılmıyorum	Biraz Katılıyorum	Katılıyorum	Kesinlikle Katılıyorum
1. Kişiler fen ve teknolojiye yönelik belli bir yeteneğe sahiptir ve bunu değiştirmek için pek bir şey yapamazlar	1❑	2❑	3❑	4❑	5❑	6❑
2. Kişilerin fen ve teknolojiye yönelik yetenekleri tamamen kendileriyle ilgili bir şeydir ve onu çok fazla değiştiremezler	1❑	2❑	3❑	4❑	5❑	6❑
3. Kişiler fen ve teknoloji konularında yeni şeyler öğrenebilirler fakat fen ve teknolojiye yönelik temel yeteneklerini değiştiremezler.	1❑	2❑	3❑	4❑	5❑	6❑

APPENDIX C

Epistemological Beliefs Questionnaire

Aşağıda Bilimin Doğası ile ilgili ifadeler yer almaktadır. Bu ifadelere ne derecede katılıp ne derecede katılmadığınızı ilgili seçeneği işaretleyerek belirtiniz. (Unutmayınız doğru ya da yanlış cevap yoktur.)

	Kesinlikle Katılmıyorum	Katılmıyorum	Kararsızım	Katılıyorum	Kesinlikle Katılıyorum
1. Tüm insanlar, bilim insanlarının söylediklerine inanmak zorundadır.	1❑	2❑	3❑	4❑	5❑
2. Bilimde, bütün soruların tek bir doğru yanıtı vardır.	1❑	2❑	3❑	4❑	5❑
3. Bilimsel deneylerdeki fikirler, olayların nasıl meydana geldiğini merak edip düşünerek ortaya çıkar.	1❑	2❑	3❑	4❑	5❑
4. Günümüzde bazı bilimsel düşünceler, bilim insanlarının daha önce düşündüklerinden farklıdır.	1❑	2❑	3❑	4❑	5❑
5. Bir deneye başlamadan önce, deneyle ilgili bir fikrinizin olmasında yarar vardır.	1❑	2❑	3❑	4❑	5❑
6. Bilimsel kitaplarda yazanlara inanmak zorundasınız.	1❑	2❑	3❑	4❑	5❑
7. Bilimsel çalışma yapmanın en önemli kısmı, doğru yanıta ulaşmaktır.	1❑	2❑	3❑	4❑	5❑
8. Bilimsel kitaplardaki bilgiler bazen değişir.	1❑	2❑	3❑	4❑	5❑
9. Bilimsel çalışmalarda düşüncelerin test edilebilmesi için birden fazla yol olabilir.	1❑	2❑	3❑	4❑	5❑
10. Fen ve teknoloji dersinde, öğretmenin söylediği her şey doğrudur.	1❑	2❑	3❑	4❑	5❑
11. Bilimdeki düşünceler, konu ile ilgili kendi kendinize sorduğunuz sorulardan ve deneysel çalışmalarınızdan ortaya çıkabilir.	1❑	2❑	3❑	4❑	5❑
12. Bilim insanları bilim hakkında hemen hemen her şeyi bilir, yani bilinecek daha fazla bir şey kalmamıştır.	1❑	2❑	3❑	4❑	5❑
13. Bilim insanlarının bile yanıtlayamayacağı bazı sorular vardır.	1❑	2❑	3❑	4❑	5❑
14. Olayların nasıl meydana geldiği hakkında yeni fikirler bulmak için deneyler yapmak, bilimsel çalışmanın önemli bir parçasıdır.	1❑	2❑	3❑	4❑	5❑
15. Bilimsel kitaplardan okuduklarınızın doğru olduğundan emin olabilirsiniz.	1❑	2❑	3❑	4❑	5❑
16. Bilimsel bilgi her zaman doğrudur.	1❑	2❑	3❑	4❑	5❑
17. Bilimsel düşünceler bazen değişir.	1❑	2❑	3❑	4❑	5❑

18. Sonuçlardan emin olmak için, deneylerin birden fazla tekrarlanmasında fayda vardır.	1❑	2❑	3❑	4❑	5❑
19. Sadece bilim insanları, bilimde neyin doğru olduğunu kesin olarak bilirler.	1❑	2❑	3❑	4❑	5❑
20. Bilim insanının bir deneyden aldığı sonuç, o deneyin tek yanıtıdır.	1❑	2❑	3❑	4❑	5❑
21. Yeni buluşlar, bilim insanlarının doğru olarak düşündüklerini değiştirir.	1❑	2❑	3❑	4❑	5❑
22. Bilimdeki, parlak fikirler sadece bilim insanlarından değil, herhangi birinden de gelebilir.	1❑	2❑	3❑	4❑	5❑
23. Bilim insanları bilimde neyin doğru olduğu konusunda her zaman hemfikirdirler.	1❑	2❑	3❑	4❑	5❑
24. İyi çıkarımlar, birçok farklı deneyin sonucundan elde edilen kanıtlara dayanır.	1❑	2❑	3❑	4❑	5❑
25. Bilim insanları, bilimde neyin doğru olduğu ile ilgili düşüncelerini bazen değiştirirler.	1❑	2❑	3❑	4❑	5❑
26. Bir şeyin doğru olup olmadığını anlamak için deney yapmak iyi bir yoldur.	1❑	2❑	3❑	4❑	5❑

APPENDIX D

Achievement Goal Questionnaire

Aşağıda Fen ve Teknoloji dersine karşı yaklaşımınızı belirlemeye yönelik ifadeler yer almaktadır. Bu ifadelere ne derecede katılıp ne derecede katılmadığınızı ilgili seçeneği işaretleyerek belirtiniz.(Unutmayınız doğru ya da yanlış cevap yoktur.)

	Hiçbir Zaman	Nadiren	Bazen	Çoğunlukla	Her Zaman
1. Fen ve teknoloji derslerinin içeriğini mümkün olduğunca iyi anlamak benim için önemlidir.	1 ❑	2 ❑	3 ❑	4 ❑	5 ❑
2. Fen ve teknoloji derslerinde amacım sınıftaki diğer öğrencilerden daha kötü performans sergilemekten kaçınmaktır.	1 ❑	2 ❑	3 ❑	4 ❑	5 ❑
3. Fen ve teknoloji derslerinin zorlayıcı noktalarının bana ileride olumlu katkılarının olacağını düşünüyorum.	1 ❑	2 ❑	3 ❑	4 ❑	5 ❑
4. Diğer öğrencilerden daha iyisini yapmak benim için önemlidir.	1 ❑	2 ❑	3 ❑	4 ❑	5 ❑
5. Fen ve teknoloji derslerinden mümkün olduğunca çok şey öğrenmek istiyorum.	1 ❑	2 ❑	3 ❑	4 ❑	5 ❑
6. Fen ve teknoloji derslerinde beni sıklıkla motive eden şey, diğerlerinden daha kötü performans sergileme korkusudur.	1 ❑	2 ❑	3 ❑	4 ❑	5 ❑
7. Fen ve teknoloji derslerinde verilen her şeyi tam olarak öğrenmek arzusundayım.	1 ❑	2 ❑	3 ❑	4 ❑	5 ❑
8. Fen ve teknoloji derslerinin zorlayıcı noktaları benim için olumlu etkiler ifade eder.	1 ❑	2 ❑	3 ❑	4 ❑	5 ❑
9. Fen ve teknoloji derslerinde amacım, diğer pek çok öğrenciden daha iyi bir not almaktır.	1 ❑	2 ❑	3 ❑	4 ❑	5 ❑
10. Fen ve teknoloji derslerinde öğrenebileceğimden daha azını öğrenmekten korkuyorum.	1 ❑	2 ❑	3 ❑	4 ❑	5 ❑

11. Fen ve teknoloji derslerindeki tek amacım diğerlerinden daha başarısız olmanın önüne geçmektir.	1 ❑	2 ❑	3 ❑	4 ❑	5 ❑
12. Fen ve teknoloji derslerinde öğrenilecek her şeyi öğrenemeyebileceğimden sıklıkla endişe duyuyorum.	1 ❑	2 ❑	3 ❑	4 ❑	5 ❑
13. Fen ve teknoloji derslerinde diğerlerine göre daha başarılı olmak benim için önemlidir.	1 ❑	2 ❑	3 ❑	4 ❑	5 ❑
14. Bazen fen ve teknoloji derslerinin içeriğini istediğim kadar iyi anlayamayacağımdan korkuyorum.	1 ❑	2 ❑	3 ❑	4 ❑	5 ❑
15. Fen ve teknoloji derslerinde amacım başarısız olmaktan kaçınmaktır.	1 ❑	2 ❑	3 ❑	4 ❑	5 ❑
16. Fen ve teknoloji derslerinde beni sıklıkla motive eden şey başarısız olma korkusudur.	1 ❑	2 ❑	3 ❑	4 ❑	5 ❑
17. Fen ve teknoloji derslerinde sadece başarısız olmaktan kaçınmak istiyorum.	1 ❑	2 ❑	3 ❑	4 ❑	5 ❑

APPENDIX E

Motivated Strategies for Learning Questionnaire

Motivation Section

Aşağıda Fen ve Teknoloji dersine karşı tutumunuzu belirlemeye yönelik ifadeler yer almaktadır. Bu ifadelere ne derecede katılıp ne derecede katılmadığınızı işaretlerken aşağıda verilen ölçeği göz önüne alınız. Eğer ifadenin sizi tam olarak yansıttığını düşünüyorsanız, 7' yi eğer ifadenin sizi hiç yansıtmadığını düşünüyorsanız, 1' i işaretleyiniz. Bu iki durum dışında ise 1 ve 7 arasında sizi en iyi tanımladığını düşündüğünüz numarayı işaretleyiniz. Unutmayınız doğru ya da yanlış cevap yoktur.

1 --- 2 --- 3 --- 4 --- 5 --- 6 -- 7

beni hiç yansıtmıyor — beni tam olarak yansıtıyor

	beni hiç yansıtmıyor						beni tam olarak yansıtıyor
1.Fen ve teknoloji dersinde öğrendiklerimi başka derslerde de kullanabileceğimi düşünüyorum.	1❑	2❑	3❑	4❑	5❑	6❑	7❑
2. Fen ve teknoloji dersinden çok iyi bir not alacağımı düşünüyorum.	1❑	2❑	3❑	4❑	5❑	6❑	7❑
3. Fen ve teknoloji dersi ile ilgili okumalarda yer alan en zor konuyu bile anlayabileceğimden eminim.	1❑	2❑	3❑	4❑	5❑	6❑	7❑
4. Fen ve teknoloji dersindeki konuları öğrenmek benim için önemlidir.	1❑	2❑	3❑	4❑	5❑	6❑	7❑
5.Fen ve teknoloji dersinde öğretilen temel kavramları öğrenebileceğimden eminim.	1❑	2❑	3❑	4❑	5❑	6❑	7❑
6.Fen ve teknoloji dersinde, öğretmenin anlattığı en karmaşık konuyu anlayabileceğimden eminim.	1❑	2❑	3❑	4❑	5❑	6❑	7❑
7.Fen ve teknoloji dersinin kapsamında yer alan konular çok ilgimi çekiyor.	1❑	2❑	3❑	4❑	5❑	6❑	7❑
8.Fen ve teknoloji dersinde verilen sınav ve ödevleri en iyi şekilde yapabileceğimden eminim.	1❑	2❑	3❑	4❑	5❑	6❑	7❑

9. Fen ve teknoloji dersinde çok başarılı olacağımı umuyorum	1❑	2❑	3❑	4❑	5❑	6❑	7❑
10. Fen ve teknoloji dersinde öğrendiklerimin benim için faydalı olduğunu düşünüyorum.	1❑	2❑	3❑	4❑	5❑	6❑	7❑
11. Fen ve teknoloji dersindeki konulardan hoşlanıyorum.	1❑	2❑	3❑	4❑	5❑	6❑	7❑
12. Fen ve teknoloji dersindeki konuları anlamak benim için önemlidir.	1❑	2❑	3❑	4❑	5❑	6❑	7❑
13. Fen ve teknoloji dersinde öğretilen becerileri iyice öğrenebileceğimden eminim.	1❑	2❑	3❑	4❑	5❑	6❑	7❑
14. Dersin zorluğu, öğretmen ve benim becerilerim göz önüne alındığında, fen ve teknoloji dersinde başarılı olacağımı düşünüyorum	1❑	2❑	3❑	4❑	5❑	6❑	7❑

Learning Strategies Section

Aşağıda Fen ve Teknoloji dersinde kullandığınız öğrenme stratejilerini belirlemeye yönelik ifadeler yer almaktadır. Bu ifadelere ne derecede katılıp ne derecede katılmadığınızı işaretlerken aşağıda verilen ölçeği göz önüne alınız. Eğer ifadenin sizi tam olarak yansıttığını düşünüyorsanız, 7' yi eğer ifadenin sizi hiç yansıtmadığını düşünüyorsanız, 1' i işaretleyiniz. Bu iki durum dışında ise 1 ve 7 arasında sizi en iyi tanımladığını düşündüğünüz numarayı işaretleyiniz. Unutmayınız doğru ya da yanlış cevap yoktur.

1 --- 2 --- 3 --- 4 --- 5 --- 6 -- 7

beni hiç yansıtmıyor — beni tam olarak yansıtıyor

	beni hiç yansıtmıyor					beni tam olarak yansıtıyor	
1. Fen ve teknoloji dersi ile ilgili bir şeyler okurken, düşüncelerimi organize etmek için konuların ana başlıklarını çıkarırım.	1❑	2❑	3❑	4❑	5❑	6❑	7❑
2. Fen ve teknoloji dersi sırasında başka şeyler düşündüğüm için önemli kısımları sıklıkla kaçırırım.	1❑	2❑	3❑	4❑	5❑	6❑	7❑
3. Fen ve teknoloji dersi ile ilgili bir şeyler okurken, okuduklarıma odaklanabilmek için sorular oluştururum.	1❑	2❑	3❑	4❑	5❑	6❑	7❑
4. Fen ve teknoloji dersiyle ilgili duyduklarımı ya da okuduklarımı ne kadar gerçekçi olduklarına karar vermek için sıklıkla sorgularım.	1❑	2❑	3❑	4❑	5❑	6❑	7❑
5. Fen ve teknoloji dersine çalışırken, önemli bilgileri içimden defalarca tekrar ederim	1❑	2❑	3❑	4❑	5❑	6❑	7❑
6. Fen ve teknoloji dersi ile ilgili bir şeyler okurken bir konuda kafam karışırsa, başa döner ve anlamak için çaba gösteririm.	1❑	2❑	3❑	4❑	5❑	6❑	7❑
7. Fen ve teknoloji dersine çalışırken, daha önce okuduklarımı ve aldığım notları gözden geçirir ve en önemli noktaları belirlemeye çalışırım.	1❑	2❑	3❑	4❑	5❑	6❑	7❑
8.Eğer fen ve teknoloji dersi ile ilgili okumam gereken konuları anlamakta zorlanıyorsam, okuma stratejimi değiştiririm.	1❑	2❑	3❑	4❑	5❑	6❑	7❑
9. Fen ve teknoloji dersine çalışırken, dersle ilgili okumaları ve ders sırasında aldığım notları defalarca okurum	1❑	2❑	3❑	4❑	5❑	6❑	7❑

10. Ders sırasında veya ders için okuduğum bir kaynakta bir teori, yorum ya da sonuç ifade edilmiş ise, bunları destekleyen bir bulgunun var olup olmadığını sorgulamaya çalışırım.	1❑	2❑	3❑	4❑	5❑	6❑	7❑
11. Dersle ilgili konuları organize etmek için basit grafik, şema ya da tablolar hazırlarım.	1❑	2❑	3❑	4❑	5❑	6❑	7❑
12. Fen ve teknoloji dersinde işlenen konuları bir başlangıç noktası olarak görür ve ilgili konular üzerinde kendi fikirlerimi oluşturmaya çalışırım.	1❑	2❑	3❑	4❑	5❑	6❑	7❑
13. Fen ve teknoloji dersine çalışırken, dersten, okuduklarımdan, sınıf içi tartışmalardan ve diğer kaynaklardan edindiğim bilgileri bir araya getiririm.	1❑	2❑	3❑	4❑	5❑	6❑	7❑
14. Yeni bir konuyu detaylı bir şekilde çalışmaya başlamadan önce çoğu kez konunun nasıl organize edildiğini anlamak için ilk olarak konuyu hızlıca gözden geçiririm.	1❑	2❑	3❑	4❑	5❑	6❑	7❑
15. Fen ve teknoloji dersinde işlenen konuları anladığımdan emin olabilmek için kendi kendime sorular sorarım.	1❑	2❑	3❑	4❑	5❑	6❑	7❑
16. Çalışma tarzımı, dersin gereklilikleri ve öğretmenin öğretme stiline uygun olacak tarzda değiştirmeye çalışırım.	1❑	2❑	3❑	4❑	5❑	6❑	7❑
17. Genelde derse gelmeden önce konuyla ilgili bir şeyler okurum fakat okuduklarımı çoğunlukla anlamam	1❑	2❑	3❑	4❑	5❑	6❑	7❑
18. Fen ve teknoloji dersindeki önemli kavramları hatırlamak için anahtar kelimeleri ezberlerim.	1❑	2❑	3❑	4❑	5❑	6❑	7❑
19. Fen ve teknoloji dersine çalışırken, konuları sadece okuyup geçmek yerine ne öğrenmem gerektiği konusunda düşünmeye çalışırım.	1❑	2❑	3❑	4❑	5❑	6❑	7❑
20. Mümkün olduğunca fen ve teknoloji dersinde öğrendiklerimle diğer derslerde öğrendiklerim arasında bağlantı kurmaya çalışırım.	1❑	2❑	3❑	4❑	5❑	6❑	7❑
21. Fen ve teknoloji dersine çalışırken notlarımı gözden geçirir ve önemli kavramların bir listesini çıkarırım.	1❑	2❑	3❑	4❑	5❑	6❑	7❑
22. Fen ve teknoloji dersi için bir şeyler okurken, o anda okuduklarımla daha önceki bilgilerim arasında bağlantı kurmaya çalışırım.	1❑	2❑	3❑	4❑	5❑	6❑	7❑
23. Fen ve teknoloji dersinde öğrendiklerimle ilgili ortaya çıkan fikirlerimi sürekli olarak gözden geçiremeye çalışırım.	1❑	2❑	3❑	4❑	5❑	6❑	7❑

24. Fen ve teknoloji dersine çalışırken, dersle ilgili okuduklarımı ve derste aldığım notları inceleyerek önemli noktaların özetini çıkarırım.	1❑	2❑	3❑	4❑	5❑	6❑	7❑
25. Fen ve teknoloji dersiyle ilgili konuları, ders sırasında öğrendiklerim ve okuduklarım arasında bağlantılar kurarak anlamaya çalışırım.	1❑	2❑	3❑	4❑	5❑	6❑	7❑
26. Fen ve teknoloji dersindeki konularla ilgili bir iddia ya da varılan bir sonucu her okuduğumda veya duyduğumda olası alternatifler üzerinde düşünürüm	1❑	2❑	3❑	4❑	5❑	6❑	7❑
27. Fen ve teknoloji dersinde önemli kavramların listesini çıkarır ve bu listeyi ezberlerim.	1❑	2❑	3❑	4❑	5❑	6❑	7❑
28. Fen ve teknoloji dersine çalışırken iyi anlamadığım kavramları belirlemeye çalışırım.	1❑	2❑	3❑	4❑	5❑	6❑	7❑
29. Fen ve teknoloji dersine çalışırken, çalışmalarımı yönlendirebilmek için kendime hedefler belirlerim.	1❑	2❑	3❑	4❑	5❑	6❑	7❑
30. Ders sırasında not alırken kafam karışırsa, notlarımı dersten sonra düzenlerim.	1❑	2❑	3❑	4❑	5❑	6❑	7❑
31. Fen ve teknoloji dersinde, okuduklarımdan edindiğim fikirleri sınıf içi tartışma gibi çeşitli faaliyetlerde kullanmaya çalışırım.	1❑	2❑	3❑	4❑	5❑	6❑	7❑

APPENDIX F

Tuckman Procrastination Scale

Aşağıda Fen ve Teknoloji dersindeki davranışlarınızı belirlemeye yönelik ifadeler yer almaktadır. Lütfen, aşağıda verilen her bir ifadeyi dikkatlice okuduktan sonra, ifadelerin sizin fen ve teknoloji dersindeki davranışlarınızı ne kadar tanımladığını karşısındaki kutucuğu işaretleyerek belirtiniz. (Unutmayınız doğru ya da yanlış cevap yoktur).

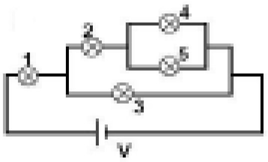
	Kesinlikle Katılıyorum	**Katmıyorum**	**Kararsızım**	**Katılmıyorum**	**Kesinlikle Katılmıyorum**
1. Önemli olsalar bile, fen ve teknoloji dersi ile ilgili işleri (sınavlara hazırlanmak; ödev, proje yapmak, vb.) Bitirmeyi gereksiz yere ertelerim.	1❑	2❑	3❑	4❑	5❑
2. Fen ve teknoloji dersinde yapmaktan hoşlanmadığım işlere başlamayı ertelerim.	1❑	2❑	3❑	4❑	5❑
3. Fen ve teknoloji dersinde, teslim tarihi olan işler (ödev, proje vb.)İçin, son dakikaya kadar beklerim.	1❑	2❑	3❑	4❑	5❑
4. Fen ve teknoloji dersindeki çalışma alışkanlıklarımı geliştirmeyi ertelerim.	1❑	2❑	3❑	4❑	5❑
5. Fen ve teknoloji dersi ile ilgili herhangi bir şey yapmamak için bahaneler bulurum.	1❑	2❑	3❑	4❑	5❑
6. Bana sıkıcı gelse bile, fen ve teknoloji dersine çalışmak için gerekli zamanı ayırırım.	1❑	2❑	3❑	4❑	5❑
7. Ben fen ve teknoloji dersi ile ilgili çalışırken zamanını iyi kullanamayan biriyim	1❑	2❑	3❑	4❑	5❑
8. Ben fen ve teknoloji dersi ile ilgili işleri yaparken zamanımı iyi kullanamıyorum ama bunu düzeltmek için de hiç bir çaba göstermiyorum.	1❑	2❑	3❑	4❑	5❑

9. Fen ve teknoloji dersi ile ilgili yapmam gereken işler üstesinden gelinemeyecek kadar zor olduğunda, onu ertelemek gerektiğine inanırım.	1❑	2❑	3❑	4❑	5❑
10. Fen ve teknoloji dersi için çalışacağıma dair kendime söz veririm ve sonra da bu ders için çalışmayı ağırdan alırım.	1❑	2❑	3❑	4❑	5❑
11. Fen ve teknoloji dersinde çalışma planı yaparsam, yaptığım planı takip ederim.	1❑	2❑	3❑	4❑	5❑
12. Fen ve teknoloji dersi ile ilgili yapmam gereken işlere başlayamadığımda kendimden nefret ederim, ama yine de bu beni harekete geçirmez.	1❑	2❑	3❑	4❑	5❑
13. Fen ve teknoloji dersi ile ilgili önemli işleri her zaman vaktinden önce tamamlarım.	1❑	2❑	3❑	4❑	5❑
14. Fen ve teknoloji dersi ile ilgili yapmam gereken işlere başlamanın ne kadar önemli olduğunu bilmeme rağmen tıkanır kalırım.	1❑	2❑	3❑	4❑	5❑
15. Fen ve teknoloji dersi ile ilgili yapmam gereken işleri bir sonraki güne bırakmak benim tarzım değildir.	1❑	2❑	3❑	4❑	5❑

APPENDIX G

Science Achievement Test

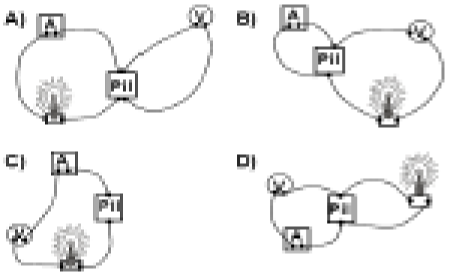
1.



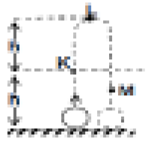
Şekilde verilen elektrik devresindeki eşdeğer ampullerden en az ışık veren iki ampul hangileridir?

A) 1 ve 3　　B) 2 ve 3
C) 3 ve 4　　D) 4 ve 5

2. Aşağıdaki devrelerin hangisinde ampermetre ve voltmetrenin bağlantıları doğru gösterilmiştir?



3.

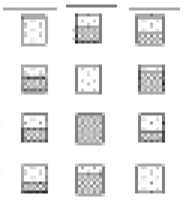


Şekilde düşey doğrultuda yukarı doğru atılan bir topun izlediği yol görülmektedir. Buna göre; topun K, L, M noktalarındaki potansiyel enerji ve kinetik enerji dağılımları hangisindeki gibi olur?

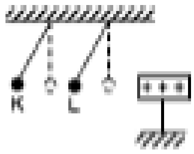
(▩: Potansiyel enerji　　□: Kinetik enerji
Sürtünmeler önemsenmeyecek.)

K　L　M

A)
B)
C)
D)



4.

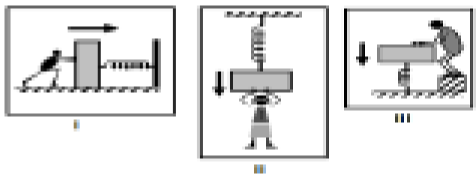


Şekildeki durumun sağlanabilmesi için özdeş K ve L kürelerinin yük durumları hangisinde doğru verilmiştir?

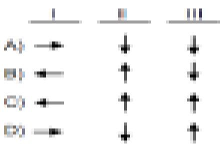
	K	L
A)	+	+
B)	+	Nötr
C)	–	+
D)	–	–

5.

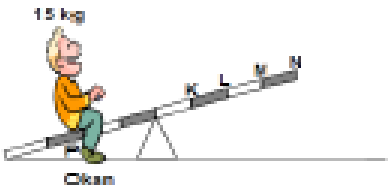
Üç öğrenci I, II, III'teki yaylara oklarla gösterilen yönlerdeki kuvvetleri uyguluyorlar.



Yayların bu kişilere uyguladıkları kuvvetlerin yönleri hangi seçenekte doğru olarak verilmiştir?



6.



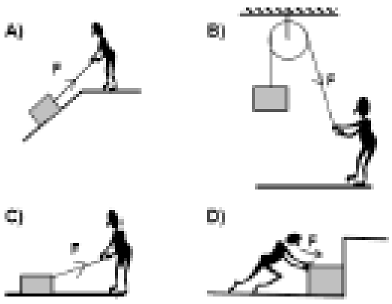
Şekildeki eşit bölmeli tahterevallinin P noktasında oturan 15 kg ağırlığındaki Okan denge konumuna getirilmek istenmektedir. Buna göre aşağıdakilerin hangisinde denge <u>sağlanmaz</u>?

A) K'ye 30 kg ağırlığındaki Ziya oturduğunda
B) L'ye 15 kg ağırlığındaki Göktuğ oturduğunda
C) M'ye 10 kg ağırlığındaki Selim oturduğunda
D) N'ye 20 kg ağırlığındaki Hakan oturduğunda

7. Fiziksel anlamda iş yapılabilmesi için;

- Kuvvet uygulanmalı
- Kuvvet etkisindeki cisim yol almalıdır.

Buna göre aşağıdakilerden hangisinde kesinlikle iş yapılamaz?



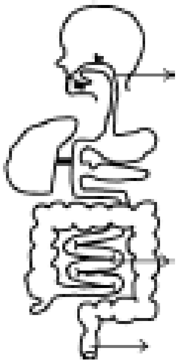
1. **Aşağıdakilerden hangisi diğer iç salgı bezlerinin çalışmasını denetler ve düzenler?**

A) Böbrek üstü bezi B) Hipofiz bezi
C) Tiroit bezi D) Yumurtalık

2. **Aşağıdakilerden hangisi burnumuzun görevi değildir?**

A) Koku alma
B) Alınan havayı süzme
C) Alınan nemli havayı kurutma
D) Alınan soğuk havayı ısıtma

10.



Şekilde sindirim sisteminin bazı organları okla gösterilmiştir.

Aşağıda verilen olaylardan hangisi okla gösterilen organlardan birinin görevi değildir?

A) Atık maddelerin vücuttan uzaklaştırılması
B) Besinlerin ağızdan yemek borusuna iletilmesi
C) Besinlerin bulamaç hâline getirilmesi
D) Besinlerin kana geçirilmesi

11. **Göze gelen ışık ışınları ilk önce aşağıdakilerin hangisinden geçer?**

A) Sarı benekten B) Göz merceğinden
C) İristen D) Korneadan

12. Korku, heyecan, mutluluk ve öfke gibi durumlarda vücutta adrenalin hormonu seviyesi artar.
Buna göre, aşağıdaki durumların hangisinde Hülya'nın adrenalin hormonu seviyesinde artma beklenir?

A) Yemek yerken su içtiğinde
B) Ders çalıştıktan sonra uyuduğunda
C) Her gün, ev işlerinde annesine yardım ettiğinde
D) Sınavda başarılı olunca aşırı sevindiğinde

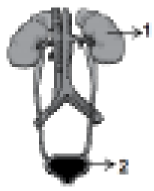
13.

Yağlar, şekilde de görüldüğü gibi sindirim sisteminde sindirilerek yağ asidi ve gliserole ayrılır.
Bu bilgilere göre aşağıdakilerden hangisine ulaşılamaz?

A) Yağların büyük moleküllü olduğuna
B) Yağ asidi ve gliserolün hücre zarından geçebilecek büyüklükte olduğuna
C) Yağların kan yoluyla taşındığına
D) Yağların sindiriminde su kullanıldığına

14.

Öğretmen:
Şekildeki boşaltım sisteminde verilen 1 ve 2 numaralı organların isim ve görevlerini söyler misin?



Öğrenci:
1 numaralı organ böbrektir, idrarı depo eder.
2 numaralı organ idrar kesesidir, kanı süzer.

Bu açıklamalara göre öğrenci ile ilgili olarak aşağıdakilerden hangisi söylenebilir?

A) Boşaltım sistemi organlarını bilmiyor.
B) Boşaltım sistemi organları ile diğer sistemlerin organlarını ayırt edemiyor.
C) Boşaltım sistemi organlarının şeklini biliyor, ancak görevlerini birbirine karıştırıyor.
D) Boşaltım sistemi organlarını ve görevlerini çok iyi biliyor.

APPENDIX H

Permission of Ministry of Education

T.C.
ANKARA VALİLİĞİ
Milli Eğitim Müdürlüğü

BÖLÜM : İstatistik Bölümü
SAYI : B.08.4.MEM.0.06.20.01-60599/ 13589 17/02/2012
KONU : Araştırma İzni
Filiz BEZCİ

.... İLÇE MİLLİ EĞİTİM MÜDÜRLÜĞÜNE

İlgi: a) M.E.B. Bağlı Okul ve Kurumlarda Yap lacak Araştırma ve Araştırma Desteğine Yönelik İzin ve Uygulama Yönergesi.
b) MEB EARGED' in araştırma izinlerine ilişkin 11/04/2007 tarih ve 1950 sayılı yazısı.
c) 09/01/2012 tarih ve 2247 sayılı Valilik Onayı.
d) Orta Doğu Teknik Üniversitesinin 24/01/2012 tarih ve 967 sayılı yazısı.

ODTÜ İlköğretim Anabilim Dalı Bütünleşik Doktora Programı öğrencisi Filiz BEZCİ'nin **"İlköğretim 7. sınıf Fen ve Teknoloji dersindeki başarılarının bilişsel ve güdüsel değişkenlerle incelenmesi"** konulu tezi ile ilgili anket örnekleri, ek listedeki ilçeniz okullarında uygulama yapılması Müdürlüğümüzce uygun görülmüştür.

Mühürlü anket örnekleri (8 sayfadan oluşan) araştırmacıya ulaştırılmış olup, uygulama yapılacak sayıda araştırmacı tarafından çoğaltılarak, araştırmanın ilgi (a) yönerge çerçevesinde gönüllülük esasına göre uygulanmasını rica ederim.

Gülçin UYSAL
Müdür a.
Müdür Yardımcısı

EKLER :
1-Okul Listesi (1 Sayfa)

DAĞITIM :
Yenimahalle, Keçiören,
Etimesgut MEM

İl Milli Eğitim Müdürlüğü-Beşevler Tel : 75 22
İstatistik Bölümü Fax: 75 22
Bilgi İçin: Nermin ÇELENK istat...06@meb.gov.tr

APPENDIX I

Consent Forms

Consent Form for Students

1956

ORTA DOĞU TEKNİK ÜNİVERSİTESİ
MIDDLE EAST TECHNICAL UNIVERSITY
06531 ANKARA-TURKEY

İlköğretim Fen ve Matematik Alanları Eğitimi Bölümü
Department of Elementary Science and Mathematics Education

Tel: 90 (312) 210 40 54
Faks:90 (312) 210 79 84

Bu çalışma, ODTÜ Eğitim Fakültesi doktora öğrencisi Filiz BEZCİ tarafından yürütülen bir çalışmadır. Bu çalışmada yedinci sınıf öğrencilerinin örtülü yetenek inançları, epistemolojik inançları, güdüsel inançları, öğrenme stratejileri, erteleme davranışları ve fen ve teknoloji dersi başarıları arasındaki ilişkilerin incelemesi amaçlamaktadır. Çalışmaya katılım tamamıyla gönüllülük temelinde olmalıdır. Anketlerde ve uygulama esnasında, sizden kimlik belirleyici hiçbir bilgi istenmemektedir. Cevaplarınız tamamıyla gizli tutulacak ve sadece araştırmacılar tarafından değerlendirilecektir; elde edilecek bilgiler bilimsel yayımlarda kullanılacaktır.

Anketler, genel olarak kişisel rahatsızlık verecek uygulamaları ve soruları kesinlikle içermemektedir. Ancak, katılım sırasında uygulamadan, sorulardan ya da herhangi başka bir nedenden ötürü kendinizi rahatsız hissederseniz çalışmadan ayrılmakta veya cevaplama işini yarıda bırakıp çıkmakta serbestsiniz. Böyle bir durumda uygulama yapan kişiye, ayrılmak istediğinizi söylemek yeterli olacaktır. Uygulama sonunda, bu çalışmayla ilgili sorularınız cevaplanacaktır. Bu çalışmaya katıldığınız için şimdiden teşekkür ederiz. Çalışma hakkında daha fazla bilgi almak için doktora öğrencisi Filiz BEZCİ (Tel: 05xx xxx xx xx; E posta:filizbezci@yahoo.com) ile iletişim kurabilirsiniz.

Bu çalışmaya tamamen gönüllü olarak katılıyorum ve istediğim zaman yarıda kesip çıkabileceğimi biliyorum. Verdiğim bilgilerin bilimsel amaçlı yayımlarda kullanılmasını kabul ediyorum. (Formu doldurup imzaladıktan sonra uygulayıcıya geri veriniz).

Ad Soyad	Tarih	İmza	Alınan Ders
	----/----/-----		

Consent Form for Parents

1956

ORTA DOĞU TEKNİK ÜNİVERSİTESİ
MIDDLE EAST TECHNICAL UNIVERSITY
06531 ANKARA-TURKEY

İlköğretim Fen ve Matematik Alanları Eğitimi Bölümü
Department of Elementary Science and Mathematics Education

Tel: 90 (312) 210 40 54
Faks:90 (312) 210 79 84

Sayın Veliler, Sevgili Anne-Babalar,

Orta Doğu Teknik Üniversitesi İlköğretim Fen ve Matematik Alanları Eğitimi Bölümü'nde doktora öğrencisi olarak "İlköğretim 7. Sınıf Fen ve Teknoloji Dersindeki Başarılarının Bilişsel ve Güdüsel Değişkenlerle İncelenmesi " başlıklı doktora tezi çalışmasını yürütmekteyim. Araştırmanın amacı ilköğretim yedinci sınıf öğrencilerinin örtülü yetenek inançları, epistemolojik inançları, güdüsel inançları, öğrenme stratejileri, erteleme davranışları ve fen ve teknoloji dersi başarıları arasındaki ilişkileri incelemektir. Bu amacı gerçekleştirebilmek için Fen ve Teknoloji dersinde çocuklarınızın bazı anketleri doldurmalarına ihtiyaç duyulacaktır.

Katılmasına izin verdiğiniz takdirde uygulama ders saatlerinde olacak ve çocuğunuz anketi okulda ders saatinde dolduracaktır. Çocuğunuzun cevaplayacağı soruların ve uygulamaların onun psikolojik gelişimine olumsuz etkisi olmayacağından emin olabilirsiniz. Çocuğunuzun dolduracağı anketlerde cevaplar kesinlikle gizli tutulacak ve bu cevaplar sadece bilimsel araştırma amacıyla kullanılacaktır. Bu formu imzaladıktan ve onay verdikten sonra dahi çocuğunuz katılımcılıktan ayrılma hakkına her zaman sahiptir. Araştırma sonuçlarının özeti tarafımdan okula ulaştırılacaktır.

Çocuklarınızın anketleri doldurarak bize sağlayacağı bilgiler çocukların duygusal gelişimini ve fen başarısını etkileyen faktörlerin saptanmasına önemli bir katkıda bulunacaktır. Araştırmayla ilgili sorularınızı aşağıdaki e-posta adresini veya telefon numarasını kullanarak bize yöneltebilirsiniz.

Saygılarımla,

Doktora Öğrencisi Filiz BEZCİ
İlköğretim Fen ve Matematik Alanları Eğitimi Bölümü
Orta Doğu Teknik Üniversitesi, Ankara
Tel: 05xx xxx xx xx
e-posta: filizbezci@yahoo.com

Lütfen bu araştırmaya katılmak konusundaki tercihinizi aşağıdaki seçeneklerden size en uygun gelenin altına imzanızı atarak belirtiniz ve bu formu çocuğunuzla okula geri gönderiniz.

A) Bu araştırmaya çocuğum ....'nın katılımcı olmasına izin veriyorum. Çocuğumun çalışmayı istediği zaman yarıda kesip bırakabileceğini biliyorum ve verdiği bilgilerin bilimsel amaçlı olarak kullanılmasını kabul ediyorum.

Baba Adı-Soyadı.................................. Anne Adı Soyadı ....

İmza .... İmza ....

B) Bu çalışmaya çocuğumun ....'nın katılımcı olmasına izin vermiyorum.

Baba Adı-Soyadı.................................. Anne Adı-Soyadı ....

İmza .... İmza..

APPENDIX J

Missing Data Statistics

Subscales	Items	Missing Data Frequency	Missing Data Percentage (%)
Implicit Theories of Ability (Entity Theory of Ability)	Item 1	24	.50
	Item 2	13	.30
	Item 3	21	.40
Epistemological Beliefs (Source of Knowing)	Item 1	13	.30
	Item 6	39	.80
	Item 10	49	1.0
	Item 15	39	.80
	Item 19	65	1.30
Epistemological Beliefs (Certainty of Knowledge)	Item 2	14	.30
	Item 7	32	.70
	Item 12	22	.50
	Item 16	28	.60
	Item 20	44	.90
	Item 23	44	.90
Epistemological Beliefs (Development of Knowledge)	Item 4	33	.70
	Item 8	37	.80
	Item 13	34	.70
	Item 17	75	1.60
	Item 21	72	1.50
	Item 25	24	.50
Epistemological Beliefs (Justification for Knowing)	Item 3	61	1.30
	Item 5	40	.80
	Item 9	49	1.00
	Item 11	65	1.30
	Item 14	76	1.60
	Item 18	32	.70
	Item 22	34	.70
	Item 24	38	.80
	Item 26	27	.60
Achievement Goals (Mastery-Approach Goal)	Item 1	25	.50
	Item 4	137	2.80
	Item 6	20	.40
Achievement Goals (Performance-Approach Goal)	Item 3	26	.50
	Item 7	59	1.20
	Item 11	31	.60
Achievement Goals (Mastery-Avoidance Goal)	Item 8	46	1.00
	Item 10	70	1.50
	Item 12	32	.70

Achievement Goals (Performance-Avoidance Goal)	Item 2	85	1.80
	Item 5	78	1.60
	Item 9	102	2.10
	Item 13	54	1.10
	Item 14	41	.90
	Item 15	39	.80
Motivational Beliefs (Self-Efficacy)	Item 2	29	.60
	Item 3	76	1.60
	Item 5	86	1.80
	Item 6	62	1.30
	Item 8	25	.50
	Item 9	43	.90
	Item 13	31	.60
	Item 14	22	.50
Motivational Beliefs (Task Value)	Item 1	21	.40
	Item 4	20	.40
	Item 7	20	.40
	Item 10	39	.80
	Item 11	33	.70
	Item 12	33	.70
Cognitive Learning Strategies	Item 1	23	.50
	Item 4	38	.80
	Item 5	42	.90
	Item 7	42	.90
	Item 9	33	.70
	Item 10	47	1.00
	Item 11	57	1.20
	Item 12	128	2.70
	Item 13	42	.90
	Item 18	57	1.20
	Item 20	17	.40
	Item 21	37	.80
	Item 22	37	.80
	Item 23	44	.90
	Item 24	33	.70
	Item 25	51	1.10
	Item 26	37	.80
	Item 27	43	.90
	Item 31	35	.70
Metacognitive Learning Strategies	Item 2	33	.70
	Item 3	49	1.00
	Item 6	88	1.80
	Item 8	31	.60
	Item 14	35	.70
	Item 15	45	.90

	Item 16	41	.90
	Item 17	57	1.20
	Item 19	16	.30
	Item 28	66	1.40
	Item 29	73	1.50
	Item 30	22	.50
Procrastination	Item 1	104	2.20
	Item 2	94	2.00
	Item 3	21	.40
	Item 4	18	.40
	Item 5	45	.90
	Item 6	37	.80
	Item 7	82	1.70
	Item 8	51	1.10
	Item 9	38	.80
	Item 10	28	.60
	Item 11	50	1.00
	Item 12	88	1.80
	Item 13	57	1.20
	Item 14	73	1.50
	Item 15	53	1.10
Science Achievement	Item 1	99	2.00
	Item 2	144	2.90
	Item 3	208	4.30
	Item 4	150	3.10
	Item 5	106	2.20
	Item 6	215	4.40
	Item 7	134	2.70
	Item 8	107	2.20
	Item 9	129	2.60
	Item 10	126	2.60
	Item 11	134	2.70
	Item 12	125	2.60
	Item 13	226	4.60
	Item 14	143	2.90

APPENDIX K

Distribution of Univariate Normality

		Skewness		Kurtosis	
		Statistic	Std. Error	Statistic	Std. Error
	Item 1	-.01	.03	-1.27	.07
ITSAS	Item 2	1.0	.03	-1.27	.07
	Item 3	.20	.03	-1.22	.07
	Item 1	-.69	.03	-.43	.07
	Item 2	.22	.03	-1.18	.07
	Item 3	-1.27	.03	1.57	.07
	Item 4	-.64	.03	.08	.07
	Item 5	-2.08	.03	3.10	.07
	Item 6	-.63	.03	-.62	.07
	Item 7	1.20	.03	.75	.07
	Item 8	-.66	.03	.19	.07
	Item 9	-1.10	.03	1.34	.07
	Item 10	-.11	.03	-1.16	.07
	Item 11	-.92	.03	.94	.07
	Item 12	-.53	.03	-.87	.07
EBQ	Item 13	-1.55	.03	2.00	.07
	Item 14	-1.39	.03	2.09	.07
	Item 15	.25	.03	-.43	.07
	Item 16	.06	.03	-.87	.07
	Item 17	-.96	.03	.88	.07
	Item 18	-1.57	.03	2.56	.07
	Item 19	-.30	.03	-.96	.07
	Item 20	-.23	.03	-1.01	.07
	Item 21	-.45	.03	-.11	.07
	Item 22	-1.36	.03	1.71	.07
	Item 23	-.15	.03	-1.04	.07
	Item 24	-.79	.03	.45	.07
	Item 25	-.73	.03	.41	.07
	Item26	-1.74	.03	3.01	.07
	Item 1	-1.51	.03	1.71	.07
	Item 2	-1.68	.03	2.05	.07
	Item 3	-1.87	.03	3.0	.07
	Item 4	-1.67	.03	2.23	.07
	Item 5	-.41	.03	-1.01	.07
	Item 6	-1.23	.03	.84	.07
AGQ	Item 7	-1.52	.03	1.89	.07

	Item 8	-.76	.03	-.45	.07
	Item 9	-.87	.03	-.46	.07
	Item 10	-.37	.03	-.99	.07
	Item 11	-1.57	.03	2.12	.07
	Item 12	-.44	.03	-.78	.07
	Item 13	-1.48	.03	1.39	.07
	Item 14	-.53	.03	-.94	.07
	Item 15	-.59	.03	-1.05	.07
MSLQ (Motivation Section)	Item 1	-.66	.03	-.58	.07
	Item 2	-.75	.03	-.22	.07
	Item 3	-.49	.03	-.63	.07
	Item 4	-1.18	.03	.71	.07
	Item 5	-.88	.03	.20	.07
	Item 6	-.46	.03	-.70	.07
	Item 7	-.71	.03	-.36	.07
	Item 8	-.80	.03	-.06	.07
	Item 9	-.83	.03	-.04	.07
	Item 10	-1.17	.03	.66	.07
	Item 11	-.88	.03	-.09	.07
	Item 12	-1.23	.03	.85	.07
	Item 13	-.90	.03	.09	.07
	Item 14	-1.07	.03	.47	.07
MSLQ (Learning Strategies Section)	Item 1	-.63	.03	-.62	.07
	Item 2	-.60	.03	-.94	.07
	Item 3	-.31	.03	-1.08	.07
	Item 4	-.48	.03	-.70	.07
	Item 5	-.93	.03	-.14	.07
	Item 6	-1.14	.03	.49	.07
	Item 7	-1.10	.03	.38	.07
	Item 8	-.64	.03	-.48	.07
	Item 9	-.62	.03	-.58	.07
	Item 10	-.42	.03	-.72	.07
	Item 11	.05	.03	-1.19	.07
	Item 12	-.48	.03	-.64	.07
	Item 13	-.67	.03	-.47	.07
	Item 14	-.72	.03	-.35	.07
	Item 15	-.66	.03	-.57	.07
	Item 16	-.54	.03	-.61	.07
	Item 17	-.38	.03	-1.14	.07
	Item 18	-.39	.03	-1.11	.07
	Item 19	-.85	.03	-.10	.07
	Item 20	-.50	.03	-.74	.07
	Item 21	-.54	.03	-.79	.07
	Item 22	-.70	.03	-.33	.07
	Item 23	-.55	.03	-.49	.07

	Item 24	-.64	.03	-.63	.07
	Item 25	-.71	.03	-.30	.07
	Item 26	-.52	.03	-.49	.07
	Item 27	-.39	.03	-1.02	.07
	Item 28	-.81	.03	-.11	.07
	Item 29	-.86	.03	-.05	.07
	Item 30	-.64	.03	-.65	.07
	Item 31	-.58	.03	-.69	.07
TPS	Item 1	.85	.03	-.65	.07
	Item 2	.30	.03	-1.32	.07
	Item 3	.67	.03	-.98	.07
	Item 4	.82	.03	-.52	.07
	Item 5	1.10	.03	-.02	.07
	Item 6	1.12	.03	.39	.07
	Item 7	.41	.03	-1.14	.07
	Item 8	.98	.03	-.32	.07
	Item 9	.46	.03	-1.00	.07
	Item 10	.41	.03	-1.09	.07
	Item 11	.96	.03	-.07	.07
	Item 12	.64	.03	-.89	.07
	Item 13	.75	.03	-.42	.07
	Item 14	.31	.03	-1.10	.07
	Item 15	.68	.03	-.73	.07
SAT	Question 1	-1.39	.04	-.06	.07
	Question 2	.11	.04	-1.99	.07
	Question 3	-.19	.04	-1.97	.07
	Question 4	-.21	.04	-1.96	.07
	Question 5	-.26	.04	-1.93	.07
	Question 6	.35	.04	-1.88	.07
	Question 7	-1.31	.04	-.27	.07
	Question 8	-.18	.04	-1.97	.07
	Question 9	-.50	.04	-1.75	.07
	Question 10	-1.8	.04	1.30	.07
	Question 11	.23	.04	-1.95	.07
	Question 12	-.18	.04	-1.97	.07
	Question 13	.25	.04	-1.94	.07
	Question 14	-.38	.04	-1.85	.07

APPENDIX L

Bivariate Correlations

Bivariate Correlations of the ITSAS's Items

	ent1	en2	en3
ent1	1		
en2	.51**	1	
en3	.38**	.43**	1

**Correlation is significant at the 0.01 level (2-tailed).

Bivariate Correlations of the EBQ's Items

	s1	c1	j1	d1	j2	s2	c2	d2	j3	s3	j4	c3	d3	j5	s4	c4	d4	j6	s5	c5	d5	j7	c6	j8	d6	J9
s1	1																									
c1	.29**	1																								
j1	-.01	-.03*	1																							
d1	-.05**	-.07**	.14**	1																						
j2	.02	-.04*	.24**	.12**	1																					
s2	.47**	.26**	.02	-.06**	.07**	1																				
c2	.12**	.20**	-.12**	-.03	-.16**	.13**	1																			
d2	-.01	-.01	.10**	.16**	.09**	-.02	-.03*	1																		
j3	.01	-.02	.29**	.22**	.23**	.02	-.14**	.17**	1																	
s3	.32**	.24**	-.01	-.01	.01	.37**	.16**	-.02	.01	1																
j4	-.04**	-.07**	.27**	.19**	.23**	-.02	-.14**	.11**	.30**	-.05**	1															
c3	.30**	.23**	.09**	.01	.09**	.33**	.13**	.01	.09**	.33**	.07**	1														
d3	.08**	-.01	.14**	.11**	.14**	.10**	-.06**	.14**	.17**	.08**	.12**	.08**	1													
j5	.01	-.05**	.29**	.17**	.26**	.02	-.17**	.11**	.30**	-.01	.33**	.07**	.18**	1												
s4	.29**	.25**	-.06**	-.05**	-.03*	.36**	.18**	.02	-.07**	.37**	-.09**	.32**	.04*	-.10**	1											
c4	.31**	.30**	-.03*	-.03	.00	.36**	.19**	.03*	-.02	.39**	-.08**	.37**	.06**	-.07**	.44**	1										
d4	.05**	.04*	.16**	.15**	.13**	.10**	-.06**	.3**	.20**	.06**	.14**	.07**	.20**	.18**	.03*	.09**	1									
j6	.02	-.04**	.24**	.13**	.21**	.02	-.14**	.11**	.25**	-.01	.23**	.05**	.19**	.32**	-.06**	-.03*	.19**	1								
s5	.33**	.26**	.07**	-.00	.05**	.37**	.15**	-.02	.05**	.39**	.00	.46**	.09**	.06**	.35**	.41**	.07**	.06**	1							
c5	.30**	.33**	.04*	-.00	.01	.34**	.18**	-.01	.04*	.35**	-.01	.42**	.06**	.03*	.32**	.38**	.04**	.05**	.49**	1						
d5	-.06**	-.07**	.16**	.17**	.12**	-.07**	-.12**	.16**	.15**	-.05**	.23**	-.04**	.11**	.20**	-.09**	-.09**	.17**	.18**	-.07**	-.07**	1					
j7	.07**	-.01	.21**	.14**	.19**	.11**	-.06**	.16**	.22**	.06**	.19**	.12**	.20**	.26**	.01	.05**	.20**	.22**	.15**	.08**	.18**	1				
c6	.27**	.25**	.04**	.01	.03*	.29**	.18**	.03	.04**	.37**	.000	.38**	.06**	.03	.35**	.37**	.09**	.04*	.45**	.42**	-.07**	.11**	1			
j8	-.09**	-.08**	.24**	.14**	.18**	-.07**	-.12**	.10**	.25**	-.05**	.28**	.01	.12**	.27**	-.13**	-.11**	.16**	.25**	-.02	-.07**	.22**	.22**	-.02	1		
d6	-.02	-.02	.18**	.17**	.12**	-.01	-.07**	.24**	.19**	-.01	.19**	-.00	.14**	.18**	-.03*	-.00	.31**	.20**	-.03	.01	.25**	.22**	-.01	.18**	1	
j9	.01	-.04**	.22**	.13**	.23**	.01	-.15**	.10**	.23**	.01	.25**	.02	.16**	.29**	-.09**	-.02	.18**	.35**	.01	.02	.16**	.21**	.03	.27**	.20**	1

** Correlation is significant at the 0.01 level (2-tailed).

Bivariate Correlations of the AGQ's Items

	ach_ma1	ach_pv1	ach_pa1	ach_ma2	ach_pv2	ach_ma3	ach_pa2	ach_mv1	ach_pv3	ach_mv2	ach_pa3	ach_mv3	ach_pv4	ach_pv5	ach_pv6
ach_ma1	1														
ach_pv1	.12**	1													
ach_pa1	.24**	.27**	1												
ach_ma2	.32**	.07**	.19**	1											
ach_pv2	.02	.28**	.16**	.04**	1										
ach_ma3	.42**	.12**	.23**	.40**	.04*	1									
ach_pa2	.14**	.32**	.36**	.14**	.29**	.17**	1								
ach_mv1	.14**	.18**	.17**	.18**	.33**	.17**	.16**	1							
ach_pv3	.07**	.28**	.19**	.08**	.34**	.09**	.33**	.20**	1						
ach_mv2	.03*	.15**	.10**	.08**	.35**	.07**	.13**	.44**	.21**	1					
ach_pa3	.22**	.23**	.34**	.20**	.20**	.24**	.41**	.17**	.25**	.13**	1				
ach_mv3	.04*	.16**	.10**	.09**	.34**	.09**	.13**	.43**	.19**	.56**	.14**	1			
ach_pv4	.11**	.27**	.21**	.12**	.27**	.15**	.29**	.21**	.35**	.19**	.28**	.21**	1		
ach_pv5	.01	.21**	.10**	.04**	.49**	.04**	.22**	.36**	.30**	.42**	.18**	.45**	.30**	1	
ach_pv6	-.02	.19**	.09**	.03	.30**	.02	.21**	.19**	.37**	.25*	.20**	.26**	.39**	.38**	1

**Correlation is significant at the 0.01 level (2-tailed).

*.Correlation is significant at the 0.05 level (2-tailed).

Bivariate Correlations of the MSLQ's (Motivation Section) Items

	task_1	effcy_1	effcy_2	task_2	effcy_3	effcy_4	task_3	effcy_5	effcy_6	task_4	task_5	task_6	effcy_7	effcy_8
task_1	1													
effcy_1	.37**	1												
effcy_2	.38**	.52**	1											
task_2	.35**	.44**	.37**	1										
effcy_3	.36**	.46**	.49**	.49**	1									
effcy_4	.35**	.45**	.61**	.36**	.49**	1								
task_3	.38**	.43**	.43**	.41**	.45**	.43**	1							
effcy_5	.35**	.50**	.47**	.47**	.50**	.49**	.47**	1						
effcy_6	.35**	.58**	.50**	.46**	.51**	.47**	.47**	.56**	1					
task_4	.37**	.39**	.36**	.50**	.45**	.36**	.44**	.46**	.49**	1				
task_5	.36**	.41**	.40**	.41**	.41**	.42**	.53**	.41**	.46**	.48**	1			
task_6	.34**	.43**	.36**	.55**	.44**	.37**	.44**	.49**	.47**	.55**	.48**	1		
effcy_7	.34**	.43**	.45**	.42**	.47**	.43**	.42**	.45**	.48**	.41**	.44**	.46**	1	
effcy_8	.36**	.49**	.48**	.43**	.48**	.48**	.46**	.48**	.50**	.45**	.44**	.50**	.50**	1

** Correlation is significant at the 0.01 level (2-tailed).

Bivariate Correlations of the MSLQ's (Learning Strategies Section) Items

	o1	m1	m2	c1	r1	m3	o2	m4	r2	c2	03	c3	e1	m5	m6	m7	m8	r3	m9	e2	o4	e3	c4	e4	e5	c5	r4	m10	m11	m12	e6
o1	1																														
m1	.06**	1																													
m2	.36**	.10**	1																												
c1	.28**	.10**	.40**	1																											
r1	.31**	.17**	.37**	.35**	1																										
m3	.28**	.19**	.29**	.30**	.46**	1																									
o2	.34**	.22**	.33**	.32**	.45**	.44**	1																								
m4	.29**	.08**	.32**	.27**	.32**	.32**	.33**	1																							
r2	.33**	.14**	.37**	.34**	.45**	.38**	.46**	.361**	1																						
c2	.29**	.10**	.36**	.42**	.31**	.31**	.33**	.34**	.35**	1																					
03	.30**	.06**	.38**	.31**	.25**	.22**	.24**	.29**	.36**	.38**	1																				
c3	.30**	.13**	.40**	.38**	.32**	.30**	.32**	.34**	.38**	.44**	.42**	1																			
e1	.33**	.17**	.34**	.35**	.38**	.35**	.41**	.32**	.40**	.41**	.33**	.42**	1																		
m5	.28**	.13**	.27**	.28**	.32**	.33**	.34**	.31**	.34**	.32**	.27**	.37**	.40**	1																	
m6	.30**	.16**	.37**	.33**	.38**	.36**	.39**	.31**	.38**	.35**	.34**	.38**	.43**	.37**	1																
m7	.29**	.07**	.30**	.25**	.29**	.25**	.30**	.33**	.32**	.30**	.29**	.32**	.32**	.33**	.34**	1															
m8	.01	.31**	-.01	.01	.05**	.07**	.07**	-.04**	-.01	-.02	-.09**	-.00	.05**	-.01	.01	-.07**	1														
r3	.25**	.05**	.29**	.24**	.27**	.23**	.25**	.26**	.32**	.31**	.37**	.316**	.29**	.29**	.33**	.32**	-.09**	1													
m9	.35**	.16**	.36**	.33**	.40**	.38**	.40**	.33**	.39**	.37**	.29**	.386**	.44**	.38**	.44**	.36**	.03*	.33**	1												
e2	.27**	.08**	.34**	.31**	.28**	.25**	.27**	.30**	.31**	.36**	.37**	.373**	.36**	.30**	.34**	.30**	-.05**	.32**	.38**	1											
o4	.32**	.12**	.36**	.31**	.35**	.32**	.38**	.31**	.43**	.33**	.39**	.37**	.42**	.33**	.40**	.34**	-.02	.37**	.44**	.38**	1										
e3	.27**	.15**	.32**	.32**	.35**	.35**	.36**	.31**	.36**	.38**	.29**	.38**	.43**	.35**	.42**	.32**	.03*	.30**	.43**	.43**	.42**	1									
c4	.32**	.13**	.37**	.37**	.36**	.34**	.39**	.36**	.41**	.38**	.33**	.40**	.41**	.36**	.42**	.341**	-.00	.32**	.48**	.41**	.46**	.46**	1								
e4	.33**	.15**	.32**	.29**	.37**	.32**	.40**	.28**	.43**	.32**	.34**	.34**	.41**	.33**	.38**	.31**	.03	.33**	.40**	.33**	.52**	.41**	.45**	1							
e5	.27**	.17**	.32**	.33**	.34**	.35**	.36**	.29**	.39**	.36**	.29**	.38**	.42**	.37**	.41**	.32**	.04**	.28**	.45**	.39**	.42**	.49**	.48**	.42**	1						
c5	.25**	.09**	.29**	.33**	.27**	.24**	.30**	.28**	.33**	.39**	.31**	.40**	.38**	.32**	.35**	.30**	-.03*	.30**	.40**	.37**	.36**	.42**	.42**	.37**	.41**	1					
r4	.30**	.09**	.31**	.27**	.31**	.26**	.32**	.27**	.40**	.30**	.39**	.33**	.36**	.32**	.35**	.32**	-.04**	.43**	.36**	.32**	.53**	.34**	.41**	.49**	.38**	.36**	1				
m10	.30**	.14**	.30**	.30**	.37**	.35**	.39**	.31**	.39**	.33**	.28**	.36**	.42**	.35**	.38**	.32**	.03*	.31**	.43**	.32**	.44**	.43**	.46**	.46**	.43**	.40**	.46**	1			
m11	.32**	.15**	.33**	.32**	.37**	.36**	.40**	.29**	.39**	.34**	.31**	.35**	.42**	.38**	.40**	.31**	.04**	.30**	.44**	.35**	.42**	.42**	.43**	.42**	.45**	.37**	.43**	.50**	1		
m12	.31**	.14**	.35**	.32**	.36**	.34**	.37**	.33**	.42**	.36**	.35**	.38**	.37**	.35**	.39**	.36**	-.00	.33**	.43**	.37**	.45**	.41**	.43**	.43**	.40**	.39**	.41**	.44**	.43**	1	
e6	.25**	.08**	.29**	.30**	.27**	.26**	.28**	.26**	.32**	.33**	.31**	.35**	.36**	.30**	.34**	.31**	-.028	.30**	.36**	.36**	.34**	.37**	.37**	.31**	.35**	.38**	.35**	.36**	.39**	.42**	1

Correlation is significant at the 0.01 level (2-tailed).
Correlation is significant at the 0.05 level (2-tailed).

Bivariate Correlations of the TPS's Items

	pro_1	pro_2	pro_3	pro_4	pro_5	pro_6	pro_7	pro_8	pro_9	pro_10	pro_11	pro_12	pro_13	pro_14	pro_15
pro_1	1														
pro_2	.45**	1													
pro_3	.44**	.35**	1												
pro_4	.43**	.37**	.47**	1											
pro_5	.42**	.35**	.44**	.53**	1										
pro_6	.19**	.15**	.15**	.19**	.25**	1									
pro_7	.29**	.26**	.31**	.36**	.38**	.13**	1								
pro_8	.35**	.28**	.37**	.47**	.50**	.20**	.44**	1							
pro_9	.36**	.34**	.36**	.41**	.41**	.17**	.33**	.41**	1						
pro_10	.34**	.30**	.36**	.42**	.42**	.13**	.35**	.43**	.42**	1					
pro_11	.25**	.21**	.19**	.22**	.27**	.30**	.20**	.23**	.20**	.23**	1				
pro_12	.34**	.29**	.35**	.40**	.42**	.16**	.35**	.43**	.39**	.43**	.22**	1			
pro_13	.30**	.23**	.29**	.24**	.26**	.30**	.22**	.23**	.21**	.22**	.45**	.23**	1		
pro_14	.38**	.30**	.36**	.41**	.41**	.19**	.36**	.44**	.43**	.46**	.24**	.48**	.30**	1	
pro_15	.26**	.23**	.25**	.23**	.25**	.27**	.21**	.22**	.22**	.21**	.41**	.21**	.48**	.29**	1

** Correlation is significant at the 0.01 level (2-tailed).

APPENDIX M

Syntax of the Path Analysis

```
Raw Data from File path.psf
Asymptotic Covariance Matrix From File path.asc
Relationships:
sc_ach = pro mcog  cog ebq_s ebq_c ebq_j ebq_d effcy task imp_inc
pro = imp_inc ach_ma ach_mv ach_pa ach_pv ebq_s ebq_c ebq_j ebq_d effcy task
cog mcog
mcog = imp_inc ach_ma ach_mv ach_pa ach_pv ebq_s ebq_c ebq_j ebq_d effcy
task
cog = imp_inc ach_ma ach_mv ach_pa ach_pv ebq_s ebq_c ebq_j ebq_d  effcy
task mcog
ach_ma ach_mv ach_pa ach_pv = ebq_s ebq_c ebq_j ebq_d effcy task imp_inc
set the error covariance of ach_pv and ach_mv free
set the error covariance of ach_pa and ach_pv free
set the error covariance of ach_pa and ach_ma free
Path Diagram
Wide Print
Print Residuals
Lisrel Output: ND= 3 ME=ML SS SC EF RS
End of Problem
```

APPENDIX N

Goodness of Fit Statistics

Degrees of Freedom = 7
Minimum Fit Function Chi-Square = 287.809 (P = 0.0)
Normal Theory Weighted Least Squares Chi-Square = 282.273 (P = 0.0)
Satorra-Bentler Scaled Chi-Square = 280.809 (P = 0.0)
Chi-Square Corrected for Non-Normality = 271.683 (P = 0.0)
Estimated Non-centrality Parameter (NCP) = 273.809
90 Percent Confidence Interval for NCP = (222.684 ; 332.352)
Minimum Fit Function Value = 0.0638
Population Discrepancy Function Value (F0) = 0.0608
90 Percent Confidence Interval for F0 = (0.0495 ; 0.0738)
Root Mean Square Error of Approximation (RMSEA) = 0.0932
90 Percent Confidence Interval for RMSEA = (0.0841 ; 0.103)
P-Value for Test of Close Fit (RMSEA < 0.05) = 0.000
Expected Cross-Validation Index (ECVI) = 0.113
90 Percent Confidence Interval for ECVI = (0.101 ; 0.126)
ECVI for Saturated Model = 0.0533
ECVI for Independence Model = 9.368
Chi-Square for Independence Model with 105 Degrees of Freedom = 42145.827
Independence AIC = 42175.827
Model AIC = 506.809
Saturated AIC = 240.000
Independence CAIC = 42287.038
Model CAIC = 1344.597
Saturated CAIC = 1129.686
Normed Fit Index (NFI) = 0.993
Non-Normed Fit Index (NNFI) = 0.902
Parsimony Normed Fit Index (PNFI) = 0.0662
Comparative Fit Index (CFI) = 0.993
Incremental Fit Index (IFI) = 0.994
Relative Fit Index (RFI) = 0.900
Critical N (CN) = 297.668
Root Mean Square Residual (RMR) = 0.0220
Standardized RMR = 0.0244
Goodness of Fit Index (GFI) = 0.992
Adjusted Goodness of Fit Index (AGFI) = 0.858
Parsimony Goodness of Fit Index (PGFI) = 0.0579

APPENDIX O

Extended Turkısh Summary
(Genişletilmiş Türkçe Özet)

İLKÖĞRETİM ÖĞRENCİLERİNİN YETENEĞE YÖNELİK ÖRTÜLÜ TEORİLERİ, EPİSTEMOLOJİK İNANÇLARI, GÜDÜSEL İNANÇLARI, BAŞARI HEDEF YÖNELİMLERİ, ÖĞRENME STRATEJİLERİ, ERTELEME DAVRANIŞLARI VE FEN BAŞARILARI ARASINDAKİ İLİŞKİ

Giriş ve İlgili Alan Yazını

Bireyler sahip oldukları inançlarını geliştirirler ve geliştirmiş oldukları bu inançlar onların yaşamlarında ki etkisini kendi kişisel dünyalarını düzenlerken ve deneyimlerini yorumlarken önemli roller oynayarak gösterir (Dweck, 1999). Özellikle, bu inançlar bireylerin psikolojik dünyalarını, düşüncelerini, duygularını ve davranışlarını etkiler. Akademik ortamlarda ise bireylerin inançları bir filtre gibi davranarak, onların öğrenme süreçlerini ve bu sürecin bileşenlerinin yorumlanmasına yardım ederler (Thomas ve Rohwer, 1987). Bundan dolayı önemli pek çok eğitim kuramı ve modeli bireylerin inanç ve değerlerine odaklanmıştır (ör., Bandura, 1986, 1997; Dweck, 2002, 2006; Dweck, Chiu ve Hong, 1995; Dweck ve Legget, 1988; Eccles, 1987, 1993, 2005; Eccles, Adler, Futterman, Goff, Kaczala, Meece ve Midgley, 1983; Eccles ve Wigfield, 1995;

Hofer ve Pintrich, 1997; Schommer, 1990; Wigfield, 1994a; Wigfield ve Eccles, 1992, 2000, 2002).

Dweck ve meslektaşları bireylerin inanç ve değerlerine vurgu yaparak başarı güdülenmesinin sosyal-bilişsel bir modelini geliştirmişlerdir (Bandura ve Dweck, 1985; Diener ve Dweck, 1978, 1980; Dweck, 1975, 1999; Dweck ve diğerleri, 1995; Dweck ve Legget, 1986, 1988; Elliott ve Dweck, 1988; Dweck ve Reppucci 1973; Leggett ve Dweck, 1986). Bu modele göre, bireylerin inanç ve değerleri farklı alanlardaki örtülü teorilerinde; zeka, kişilik ve ahlak gibi kişisel farklar yaratırlar (ör., Bandura ve Dweck, 1985; Dweck ve diğerleri, 1995; Dweck ve Legget, 1988). Örtülü zekâ teorisi bireylerin entelektüel yetenekler hakkındaki inançlarına ilişkindir (Dweck, 2002, 2006; Dweck ve diğerleri, 1995; Dweck ve Legget, 1988; Hong, Chiu, Dweck, Lin, ve Wan, 1999). Bireylerin zekânın doğası hakkındaki inançlarına bağlı olarak varolan zekâ teorisi (yani zekânın sabitliği gibi) ve artan zekâ teorisi (yani zekânın geliştirilebilirliği gibi) şeklinde iki öz-teorisi tanımlanmıştır (Dweck ve Legget, 1988). Varolan zekâ teorisinde, artan zekâ teorisindeki işlenebilen ve değişen zekânın aksine değişmeyen ve işlenemeyen bir zekânın varlığı düşünülür. Yetenek ve zekânın anlamı aynı olmamasına rağmen, ima edilen olgu örtülü yetenek teorisinde ve örtülü zeka teorisinde aynı olduğu varsayılmıştır ve şimdiye kadar yapılmış olan pek çok çalışmada ve bu çalışmada da bu iki terim birbirinin alternatifi olarak kullanılmıştır (ör., Chen ve Pajares, 2010; Cury, Da Fonseca, Rufo ve Sarrazin, 2002; Cury, Elliot, Da Fonseca ve Moller, 2006; Dweck, 2002; Ommundsen, 2003). Bireylerin örtülü zekâ teorilerine benzer şekilde, öğrencilerin örtülü yetenek teorileri hakkındaki inançları da alana özgüdür (Chen ve Pajares, 2010; Dweck, 2002). Bunun sonucu olarak, öğrencilerin akademik görevlerinde hedef koyma, strateji kullanımı, efor, süreklilik ve performans ile ilgili bulunan örtülü yetenek teorileri değerlendirilirken, fen ve matematik gibi özel akademik alanlara odaklanmak önemlidir (Dweck, 1999, 2002; Dweck ve diğerleri, 1995; Dweck ve Legget, 1988; Elliott ve Dweck, 1988; Hong ve diğerleri, 1999; Leggett ve Dweck, 1986). Buna uygun olarak, mevcut çalışmada, öğrencilerin örtülü fen yetenek teorilerinin hedef koyma, öğrenme stratejileri kullanımı, erteleme eğilimleri ve fen başarılarıyla olan ilgisi incelenmiştir.

Fen yetenek inançları yanında epistemolojik inançlar öğrencilerin başarısıyla ilgili süreçleri ve sonuçları etkileyen önemli bir yapı olarak ortaya çıkar (Ryan, 1984; Schommer, 1993). Öğrencilerin bilgi ve bilmek hakkında olan inançları onların kişisel epistemolojisini (epistemolojik inançlarını) meydana getirir. Bireylerin epistemolojik inançları üzerine yapılan ilk çalışmalarda bu inançlar genellikle tek boyutlu ele alınmasına karşın daha sonradan yapılan çalışmalarda bu inançlar çok boyutlu olarak ele alınmıştır. Örneğin; Schommer (1990) kişilerin epistemolojik inançlarının bağımsız, çok boyutlu inançlar sistemi olduğunu ileri sürmüştür. Bu iddia alanda yapılan çalışmalarda gelişimsel yaklaşımdan, daha kapsamlı bir yaklaşıma yönlendirmiştir ve buna göre epistemolojik inançlar biliş ve performans ile ilişkilendirilmiştir. Schommer (1990) kolaylık, kesinlik, bilginin kaynağı ayrıca bilgi edinme hızı ile kontrolü hakkındaki epistemolojik inançlar kavramsallaştırmıştır. Kişisel epistemoloji alan yazınında genel olarak açıklanan ilk üç boyuttan, özellikle kolaylık ve kesinlik boyutları bilginin doğası başlığı altında olmasına karşın kaynak boyutu bilmenin doğası başlığı altındadır. Bununla birlikte, son iki bilgi kazanım boyutu olan kontrol (zekânın sabitlik veya geliştirilebilirliği özelliğini ifade eder) ve hız (çabuk ya da kademeli bilgi kazanımını ifade eder) bireylerin örtülü zekâ teorileri hakkındaki araştırmalara dayanır ve Dweck ile meslektaşları tarafından geliştirilen sosyal-bilişsel modelinden kaynaklanmaktadır (Schommer, 1990). Schommer'ın modeline öne sürdüğü boyutlardan dolayı eleştirile gelmiştir çünkü farklı çalışmalar benzer faktör yapısını ortaya koyamamıştır (ör., Qian ve Alvermann, 1995). Aynı zamanda, alan yazının da yapılan diğer çalışmalar (ör., Hofer ve Pintrich, 1997) Schomer'ın modelindeki boyutlardan kontrol ve hız boyutunun ne bilgiye ne de bilmeye odaklanmadığını göstermişlerdir, ayrıca kişisel epistemolojinin saf bir formda ve bilme ile bilginin doğası hakkındaki inançlar tarafından sınırlandırılması gerektiğini iddia etmişlerdir. Bundan dolayı, Hofer ve Pintrich (1997) Schomer'ın modeline yapılan eleştirileri dikkate alarak yeni bir kişisel epistemoloji teorik yapısı önermişlerdir. Araştırmacılar bilginin kesinliği ile bilginin kolaylığı boyutlarının bilginin doğasını temsil ettiği ve bilginin kaynağı ile bilginin gerekçelendirilmesi boyutlarının ise bilmenin doğasını kastettiği dört boyutlu bir kişisel epistemoloji inanç yapısı önermişlerdir. Hofer ve Pintrich'in (1997) çalışmasını temel alarak, Conley, Pintrich, Vekiri ve Harrison (2004) ilköğretim seviyesindeki öğrencilerin fene yönelik epistemolojik inançlarını dört boyutlu olarak belirlemişlerdir; bilginin kaynağı (bilimsel bilginin kaynağının dış bir otoriteye mi yoksa bireylerin kendi gözlem ve düşünmelerine mi bağlı olduğu hakkındaki inançlarını ifade eder), bilginin kesinliği (bilimsel soruların tek bir doğru cevabının olduğunu ya da birden fazla doğru cevabın olabileceğine ilişkin inançları ifade eder), bilginin gelişimi (bilimsel bilginin değişmez olduğunu mu yoksa değişken bir doğaya mı sahip olduğunu kasteder) ve bilginin gerekçelendirilmesi (bilimsel deneylerin bilimsel kanunları doğrulamadaki, bilimsel tartışmaların çözümündeki ve yeni fikirlerin geliştirilmesindeki rollerine dair inançları ifade eder). Mevcut çalışmada, çalışmanın ilköğretim seviyesindeki öğrencilerle ve fen dersinde yapılacak olduğu gerçeği dikkate alınarak Conley ve meslektaşları (2004) tarafından önerilen yapı kullanılmıştır. Öğrencilerin kişisel epistemolojik inançlarını araştıran çalışmalar incelendiğinde, bu inançlara dair çalışmaların genellikle üniversite ve lise düzeyindeki öğrencilerle gerçekleştirildiği fark edilir. Fakat yapılan araştırmaların sonuçları çocuklarda epistemolojik inançların gelişiminin erken yaşlarda başladığını (Wellman, 1992) ve geliştiğini göstermiştir (Chandler, Hallett, ve Sokol, 2002). Ayrıca, alan yazınında genellikle rapor edilen başka bir bulgu ise üst sınıflardaki öğrencilerin alt sınıftakilere göre daha karmaşık inançları olduğudur (Schommer, Calvert, Gariglietti, ve Bajaj, 1997; Schommer, Mau, Brookhart, ve Hutter, 2000; Kurt, 2009). Bunlardan dolayı, alt sınıflarda bulunan öğrencilerin epistemolojik inançlarını araştıracak çalışmalara ihtiyaç vardır ve öğrencilerin epistemolojik inançlarının incelenmesi önemlidir. Çünkü epistemolojik inançlar öğrencilerin öğrenmelerinde önemli role sahiptir (Buehl, 2003; Schommer, 1990; Schommer, Crouse ve Rhodes, 1992). Bunun yanında, pek çok çalışma epistemolojik inançlar ile başarı hedef yönelimleri (Chen ve Pajares, 2010; DeBacker ve Crowson; 2006; Hofer ve Pintrich, 1997; Kızılgüneş, Tekkaya ve Sungur, 2009; Muis ve Franco, 2009; Pamuk, 2014; Paulsen ve Feldman, 1999; Phan, 2009; Yılmaz ve Şen, 2012), öğrenme stratejileri (Alpaslan,Yalvac, Loving ve Willson, 2015; Bråten ve Strømsø, 2005; Dahl, Bals ve Turi, 2005; Kardash ve Howell, 2000; Özkan, 2008; Pamuk, 2014; Paulsen ve Feldman, 2007; Ryan, 1984), erteleme davranışı gibi akademik problemler (Boffeli, 2007) ve akademik başarı (Conley ve diğerleri, 2004; Hofer, 2000; Kızılgüneş, 2007; Özkan, 2008; Pamuk, 2014; Ryan, 1984; Schommer-Aikins ve Easter, 2006; Schommer, 1993; Yeşilyurt, 2013) arasında ilişki ortaya koymuştur. Mevcut çalışmada bu ilişkilerin özellikle fen alanındaki incelemesine yer verilmiştir.

Öğrencilerin fen yeteneklerine dair inançları ve epistemolojik inançlarının yanı sıra, güdüsel inançlarının da öğrenmelerinde ve performanslarında önemli role sahip olduğu görülmektedir (Bandura, 1977a, 1982, 1986; Bandura ve Schunk, 1981; Eccles, 1987; 1993, 2005; Eccles ve diğerleri, 1983; Linnenbrink ve Pintrich, 2002, 2003; Multon, Brown ve Lent, 1991; Wigfield ve Eccles, 1992, 2000, 2002). İlgili alan yazınında, öğrencilerin öğrenmesindeki en etkili güdüsel inançların öz-yeterlilik inançlarını ve görev değer inançlarını kapsadığı görülür. Öz-yeterlilik kavramı bireylerin bir görevle ilgi olarak kendi kapasiteleri hakkındaki yargılarıyla ilgilidir (Bandura, 1986, 1997). Ayrıca, öz-yeterlilik inançları bireylerin etkinlik seçimini, gayretlerini, sürekliliklerini, ilgilerini ve başarılarını etkileyebilir (Bandura, 1977a, 1997; Pajares, 1996, 1997; Schunk, 1981, 1995). Bundan dolayı, yüksek öz-yeterlilik öğrencilerde üst düzey başarıyı ve daha fazla öz-düzenlemeyi sağlayabilir (Schunk ve Pajares, 2009). Bunun yanında, görev değer öğrencilerin bir akademik görevin önemi, ilginçliği ve faydalılığı gibi nitelikleri hakkındaki inançlarını kapsar (Eccles, 2005; Eccles ve diğerleri, 1983; Wigfield ve Eccles, 1992; Wigfield, Tonks ve Klauda, 2009). Eğer bireyler bir performansın önemli olduğuna; zevkli olduğuna; faydalı olduğuna; ayrıca düşük maliyeti olduğuna inanıyorlar ise yüksek ihtimalle bu görevi gerçekleştireceklerdir (Eccles ve diğerleri, 1983). Görev değer inançları bireylerin akademik performansları, süreklilikleri ve akademik ortamlardaki seçimleriyle direkt olarak ilişkilidir (Eccles, 1987, 1993, 2005; Eccles ve diğerleri, 1983; Eccles ve Wigfield, 1995; Meece, Wigfield, ve Eccles, 1990; Wigfeld, 1994; Wigfield ve Eccles, 1992, 2000, 2002). Genel olarak, uyarlanabilir güdüsel inançları olan öğrencilerin üst düzeyde öğrenme stratejileri kullandıkları görünmektedir (Ames ve Archer, 1988; Bråten ve Olaussen, 1998; Kıran, 2010; Pintrich ve De Groot, 1990; Sungur, 2007; Tas ve Cakir, 2014; Yumuşak, Sungur ve Çakıroğlu, 2007). Ayrıca bu öğrenciler daha düşük düzeylerde erteleme davranışı gibi akademik problemler sergilemekte (Akbay, 2009; Corkin, 2012; Haycock, McCarthy ve Skay, 1998; Hensley, 2013; Klassen, Krawchuk ve Rajani, 2008; Özer ve Altun, 2011; Taura, Abdullah, Roslan ve Omar, 2015; Tuckman, 1991; Uzun Özer, 2010; Wolters, 2003, 2004) ve daha üst düzey başarılara sahip olmaktadırlar (Chen ve Pajares, 2010; Hıdıroğlu, 2014; Senler ve Sungur, 2014; Sungur ve Güngören, 2009; Yerdelen, 2013; Yumuşak ve diğerleri, 2007). Bunların yanında, uyarlanabilir güdüsel inançlar öğrencilerin konuları anlamlı bir şekilde öğrenme ve anlama arzularıyla ilişkili bulunmuştur (Bandura, 1986, 1997; Dweck ve Leggett, 1988; Elliott ve Dweck, 1988; Schunk ve Pajares, 2009). İlgili alan yazınında rapor edilen bu ilişkiler mevcut çalışmada ilköğretim öğrencileriyle özellikle fen alanı gözetilerek incelenmiştir. Öğrencilerin güdüsel inançları alanlara göre değişim gösterebileceğinden dolayı farklı alanlarda çalışmaların sürdürülmesi önemlidir (Bandura, 1997; Bong, 2001; Eccles ve Wigfield, 1995; Eccles, Wigfield, Harold ve Blumenfeld, 1993).

İlgili alan yazınına göre, güdüsel inançların yanında, başarı hedef yönelimlerin de akademik ortamlarda önemli bir güdülenme yapısı olarak ortaya çıkmaktadır. Başarı hedef yönelimleri öğrencilerin akademik etkinliklerdeki amaçlarını ya da niyetlerini kasteder (Kaplan ve Maehr, 2007; Maehr ve Nicholls, 1980; Midgley, Kaplan ve Middleton, 2001). Başarı hedef yönelimleri farklı teorik çerçevelerde ikili (Ames ve Archer, 1987, 1988; Dweck ve Elliott, 1983; Nicholls, 1980, 1989) ve üçlü (Elliot, 1997; Elliot ve Church, 1997; Elliot ve Harackiewicz, 1996; Middleton ve Midgley, 1997) olarak değerlendirilmesinin yanında, öğrenme-yaklaşma, performans-yaklaşma, öğrenme-kaçınma ve performans-kaçınma hedeflerini içeren 2x2 hedef yönelimi çerçevesi de (Elliot, 1999; Elliot ve McGregor, 2001; Pintrich, 2000) ileri sürülmüştür. Buna göre öğrenme-yaklaşma hedefi olan öğrenciler "görevde, öğrenmede, anlamada ustalaşmaya odaklanır", performans-yaklaşma hedefine sahip olan öğrenciler "diğerlerine göre üstün, en iyi, en zeki olmaya odaklanır", öğrenme-kaçınma hedefi olan öğrenciler "yanlış anlama ile öğrenememe veya bir görevde ustalaşamamaktan kaçınmaya odaklanır" ve performans kaçınma hedefleri olanlar "diğer bireylere kıyasla aşağı ve aptal görünmeden kaçınmaya odaklanırlar" (Pintrich, 2000, p.477). Mevcut çalışmada başarı hedef yönelimleri 2x2 çerçevesin de dikkate alınmıştır. Ayrıca, ilgili alan yazını öğrencilerin başarı hedef yönelimlerinin kullanmış oldukları öğrenme stratejileri üzerinde (Alpaslan ve diğerleri, 2015; Ames, 1984; Ames ve Archer, 1988; Bandura ve Dweck, 1985; Dupeyrat ve Mariné, 2005; Dweck ve Leggett, 1988; Elliot ve McGregor, 2001; Elliot, McGregor, ve Gable, 1999; Harackiewicz, Barron, Tauer, Carter ve Elliot, 2000; Kadıoglu ve Uzuntiryaki-Kondakci, 2014; Kahraman ve Sungur, 2011; Kıngır, Tas, Gok ve Sungur-Vural, 2013; Kıran, 2010; Leggett ve Dweck, 1986; Muis ve Franco, 2009; Rastegar, Jahromi, Haghighi ve Akbari, 2010; Somoncuoğlu ve Yıldırım, 1999; Tas ve Cakir, 2014; Wolters 2004), ve biliçli olarak akademik aktivitelerin ertelenmesi eğilimi üzerinde etkili olduğunu göstermiştir (Cao, 2012; Ferrari, 1991a, 1991b, 1991c; Ganesan, Mamat, Mellor, Rizzuto ve Kolar, 2014; Howell ve Buro, 2009; Howell ve Watson, 2007; Kandemir, 2010; McGregor ve Elliot, 2002, Study 2; Özer ve Altun, 2011; Scher ve Ferrrari, 2000; Scher ve Osterman, 2002; Wolters, 2003, 2004). Mevcut çalışma fen alanındaki bu ilişkileri ilköğretim düzeyinde incelemeyi hedeflemiştir.

Önceki paragraflarda da belirtildiği gibi öğrencilerin epistemolojik inançlarının, güdüsel inançlarının ve başarı hedef yönelimlerinin kullandıkları öğrenme stratejileriyle dikkate değer ilişkileri vardır. Öğrenme stratejileri öğrenme aktiviteleri esnasında bilinçli olarak sürdürülen zihinsel etkinlikleri kasteder (Brandt, 1988). Öğrenme stratejilerinin kullanımının önemi bazı sosyal-bilişsel modellerde (ör., Diener ve Dweck, 1978, 1980; Dweck, 1986; Dweck ve diğerleri, 1995; Dweck ve Leggett, 1988, Elliott ve Dweck, 1988) ve öz-düzenleme modellerinde (ör., Boekaerts ve Niemivirta, 2005; Muis, 2007; Pintrich, 2000;

Winne ve Hadwin, 1998; Zimmerman, 1989, 1990, 1998) vurgulanmıştır. Öğrenme stratejileri ilgili alan yazınında farklı şekillerde sınıflandırılmıştır. Örneğin, Dweck ve meslektaşlarının sosyal-bilişsel modelinde; etkin ve pasif stratejiler olarak kategorize edilmişlerdir. Ayrıca, bazı kaynaklarda öğrenme stratejileri derin ve yüzeysel stratejiler olarak sınıflandırılmıştır (Biggs, 1987; Meece, Blumenfeld, ve Hoyle, 1988; Miller, Greene, Montalvo, Ravindran, ve Nichols, 1996). Bunlarla birlikte, öğrenme stratejilerinin genel olarak kullanılan sınıflandırılması, Pintrich, Smith, Garcia and McKeachie (1991) tarafından da yapılmıştır. Bu sınıflandırma da öğrenme stratejilerini bilişsel ve bilişötesi stratejiler olmak üzere kategorilere ayrılmıştır. Mevcut çalışmada bu sınıflandırma yöntemi kullanılmıştır. Bilişsel öğrenme stratejileri; katılım, öğrenme, hatırlama ve düşünme kontrolü için kullanılan öğrenci becerilerini (Gagné, 1985) ve yeni bilgileri arasından seçim yapılmasını, anlaşılmasını ve zihinde var olan bilgilerle bütünleştirmesini ifade eder (Dowson ve McInerney, 1998). Bilişsel öğrenme stratejileri tekrarlama, detaylandırma, organizasyon ve eleştirel düşünme gibi yöntemleri kapsar (Pintrich ve diğerleri, 1991). Bilişötesi öğrenme stratejileri ise öğrencinin bilişsel süreçleri, bilişsel ürünleri ve öğrenme süreciyle ilgi olan her şeyi kendi kendine düzenlemesini ifade eder(Brown, 1978, 1987; Flavell, 1976, 1979). Bilişötesi stratejiler planlama, gözlemleme ve düzenleme gibi öğrenme stratejilerini içerir (Pintrich ve diğerleri, 1991). Öğrenme aşamaları esnasında bilişötesi öğrenme stratejileri bilişsel süreçleriden faydalanır (Flavell 1979; Nelson

1999). Bilişsel aktiviteler herhangi bir performansın gerçekleştirilebilmesi için gerekli olan yöntemlerin düzenlenmesini kapsamasına karşın bilişötesi aktiviteler kullanılan bu yöntemlerin değerlendirilmesi sürecidir (Veenman, 2012). Budan dolayı öğrencilerin bilişötesi öğrenme strateji kullanımı, bilişsel strateji kullanımlarıyla ilişkilidir (Heikkilä ve Lonka, 2006; Kasımi, 2012; Phakiki, 2006; Saçkes, 2010). Ayrıca öğrenme stratejilerini az kullanan öğrencilerin bilinçli olarak akademik aktiviteleri erteme gibi davranışları sergileme eğilimleri daha yüksektir (Cao, 2012; Howell ve Watson, 2007; Klingsieck, Fries, Horz ve Hofer, 2012; Motie, Heidari ve Sadeghi, 2012; Wolters, 2003). Bunanla birlikte, bu stratejilerin daha fazla kullanımı öğrencilerin daha yüksek akademik başarı göstermelerine aracılık eder (Butler ve Winne, 1995; Pintrich, 2000; Pintrich ve De Groot, 1990; Zimmerman, 2000; Zimmerman ve Martinez-Pons, 1986). Mevcut çalışmada, ilköğretim öğrencilerin fen dersinde kullandıkları öğrenme stratejileri kullanımının erteleme davranışları ve fen başarısındaki rolünün incelenmesine yer verilmiştir.

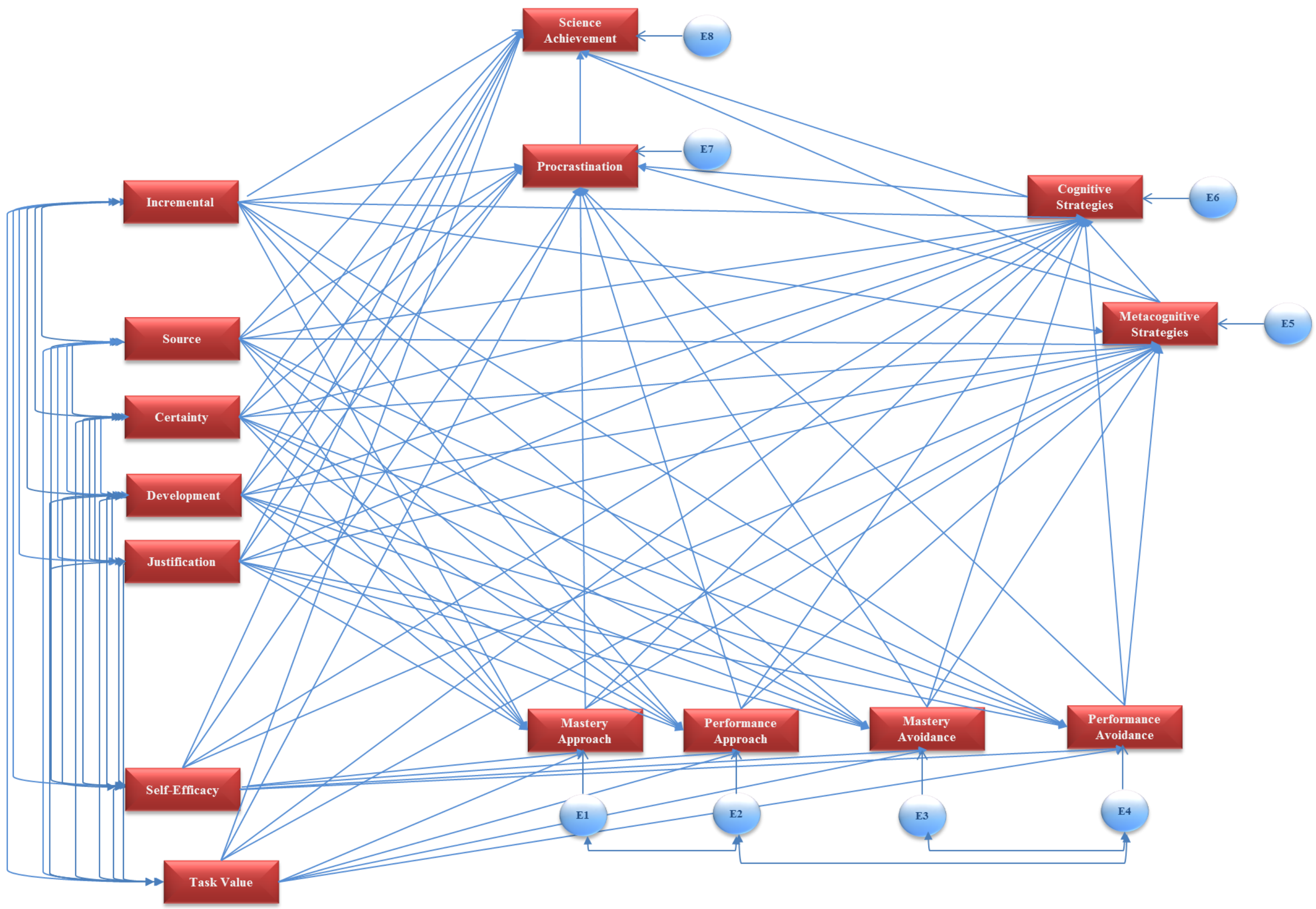
Akademik erteleme davranışının yol açtığı olumsuz akademik sonuçlarına rağmen, öğrenciler okuma ödevleri, ev ödevleri ve sınav için hazırlık gibi akademik görevleri bilinçli olarak erteleme eğilimindedirler (Howell ve Watson, 2007; Senecal, Koestner, ve Vallerand, 1995; Steel, 2007). İlgili alan yazınında, erteleme davranışı "görevlerin gereksizce sıkıntı oluşturabilecek bir zamana ötelenmesi eylemidir" (Solomon ve Rothblum, 1984, p. 503) tanımı sıklıkla kullanılmasına karşın, bunun dışında erteleme davranışı için pek çok tanım bulunmaktadır. Bu durum ilgili alan yazınında konunun kişisel özellikler, mevcut durum, öz-koruma yöntemi, pekiştirilmiş davranış, kendi yeteneği hakkında şüphe duyma, öz-düzenleme yetersizliği, uyarlanamayan davranışlar gibi değişik açılardan çalışılmasından. Ayrıca erteleme davranışı eğitim psikolojisinde düşük akademik başarının açıklaması olarak görülmüştür (Scher ve Osterman, 2002; van Eerde, 2003; Wolters, 2004).

İlgili alan yazını örtülü yetenek teorisinin (Chen ve Pajares, 2010; Cury, ve diğerleri, 2006; Good, Aronson ve Inzlich, 2003; Robins ve Pals, 2002; Blackwell, Trzesniewski ve Dweck, 2007), epistomolojik inançların (Conley ve diğerleri, 2004; Hofer, 2000; Kızılgüneş, 2007; Özkan, 2008; Pamuk, 2014; Schommer-Aikins ve Easter, 2006; Schommer, 1993; Schommer, Brookhart, Hutter ve Mau, 2000; Yeşilyurt, 2013), güdüsel inançların (Bandura, 1977a, 1982, 1986; Bandura ve Schunk, 1981; Chen ve Pajares, 2010; Eccles, 1987; 1993, 2005; Eccles ve diğerleri, 1983; Hensley, 2013; Hıdıroğlu, 2014; Kıngır ve diğerleri, 2013; Linnenbrink ve Pintrich, 2002, 2003; Mohammadi, Rouhi ve Davaribina, 2012; Multon ve diğerleri, 1991; Pamuk, 2014; Senler ve Sungur, 2014; Sungur ve Güngören, 2009; Wigfield ve Eccles, 1992, 2000, 2002; Yerdelen, 2013; Yumuşak ve diğerleri, 2007), öğrenme stratejilerinin (Akyol, Sungur ve Tekkaya, 2010;

Butler ve Winne, 1995; Dupeyrat ve Mariné, 2005; Kaya ve Kablan, 2013; Kıngır ve diğerleri, 2013; Muis ve Franco, 2009; Özkan, 2008; Pintrich, 2000; Pintrich ve De Groot, 1990; Rastegar ve diğerleri, 2010; Yerdelen, 2013; Yumuşak ve diğerleri, 2007; Zimmerman, 2000; Zimmerman ve Martinez-Pons; 1986, 1988), ve erteleme davranışının (Bezci ve Sungur, 2013; Çakıcı, 2003; Howell ve Watson, 2007; Klassen ve diğerleri, 2008; Klingsieck ve diğerleri, 2012; McGregor ve Elliot, 2002, Study 2; Mendelson, 2007; Scher ve Osterman, 2002; Steel, 2007; van Eerde, 2003; Wolters, 2004) öğrencilerin akademik başarılarındaki direkt rolünü göstermiştir. Yukarı bölümlerde açıklanan tüm değişkenler alana özgü doğaya sahiptirler. Bu nedenle mevcut çalışmada fen alanına odaklanılmış ve bu değişkenlerin fen başarısına olan etkileri incelenmiştir.

Çalışmanın Amacı

Mevcut çalışma da ilköğretim öğrencilerinin örtülü yetenek teorileri, epistemolojik inançları, güdüsel inançları, başarı hedef yönelimleri, öğrenme stratejileri, erteleme davranışları ve fen başarıları arasındaki ilişkiler yol analizini kullanılarak incelenmiştir (bk. Şekil 1.).



Şekil 1. Önerilen Yol Modeli

Araştırma Soruları

Mevcut çalışmada aşağıda ki araştırma sorularına cevap aranmıştır;

1. Türk yedinci sınıf ilköğretim öğrencilerinin fen dersindeki örtülü yetenek teorileri, epistemolojik inançları, güdüsel inançları, başarı hedef yönelimleri, erteleme davranışları ve fen başarıları arasındaki ilişki nedir?
    1.1. Türk yedinci sınıf ilköğretim öğrencilerinin fen dersindeki başarı hedef yönelimleri (öğrenme-yaklaşma hedefi, performans-yaklaşma hedefi, öğrenme-kaçınma hedefi ve performans-kaçınma hedefi) ve örtülü teorileri (artan yetenek teorisi) arasında bir ilişki var mıdır?
    1.2. Türk yedinci sınıf ilköğretim öğrencilerinin fen dersindeki başarı hedef yönelimleri (öğrenme-yaklaşma hedefi, performans-yaklaşma hedefi, öğrenme-kaçınma hedefi ve performans-kaçınma hedefi) ve epistemolojik inançları (bilginin kaynağı, bilginin kesinliği, bilginin gelişimi ve bilginin gerekçelendirilmesi) arasında bir ilişki var mıdır?
    1.3. Türk yedinci sınıf ilköğretim öğrencilerinin fen dersindeki başarı hedef yönelimleri (öğrenme-yaklaşma hedefi, performans-yaklaşma hedefi, öğrenme-kaçınma hedefi ve performans-kaçınma hedefi) ve güdüsel inançları (öz-yeterlilik ve görev değer) arasında bir ilişki var mıdır?

1.4. Türk yedinci sınıf ilköğretim öğrencilerinin fen dersindeki öğrenme stratejileri kullanımları (biliş ve bilişötesi öğrenme stratejileri) ve örtülü yetenek teorileri (artan yetenek teorisi) arasında bir ilişki var mıdır?

1.5. Türk yedinci sınıf ilköğretim öğrencilerinin fen dersindeki öğrenme stratejileri kullanımları (biliş ve bilişötesi öğrenme stratejileri) ve epistemolojik inançları (bilginin kaynağı, bilginin kesinliği, bilginin gelişimi ve bilginin gerekçelendirilmesi) arasında bir ilişki var mıdır?

1.6. Türk yedinci sınıf ilköğretim öğrencilerinin fen dersindeki öğrenme stratejileri kullanımları (bilişsel ve bilişötesi stratejiler) ve güdüsel inançları (öz-yeterlilik ve görev değer) arasında bir ilişki var mıdır?

1.7. Türk yedinci sınıf ilköğretim öğrencilerinin fen dersindeki öğrenme stratejileri kullanımları (bilişsel ve bilişötesi stratejiler) ve başarı hedef yönelimleri (öğrenme-yaklaşma hedefi, performans-yaklaşma hedefi, öğrenme-kaçınma hedefi ve performans-kaçınma hedefi) arasında bir ilişki var mıdır?

1.8. Türk yedinci sınıf ilköğretim öğrencilerinin fen dersindeki bilişsel ve bilişötesi öğrenme stratejileri kullanımları arasında bir ilişki var mıdır?

1.9. Türk yedinci sınıf ilköğretim öğrencilerinin fen dersindeki erteleme davranışı ve örtülü yetenek teorileri (artan yetenek teorisi) arasında bir ilişki var mıdır?

1.10. Türk yedinci sınıf ilköğretim öğrencilerinin fen dersindeki erteleme davranışları ve örtülü inançları (bilginin kaynağı, bilginin kesinliği, bilginin gelişimi ve bilginin gerekçelendirilmesi) arasında bir ilişki var mıdır?

1.11. Türk yedinci sınıf ilköğretim öğrencilerinin fen dersindeki erteleme davranışları ve güdüsel inançları (öz-yeterlilik ve görev değer) arasında bir ilişki var mıdır?

1.12. Türk yedinci sınıf ilköğretim öğrencilerinin fen dersindeki erteleme davranışları ve başarı hedef yönelimleri (öğrenme-yaklaşma hedefi, performans-yaklaşma hedefi, öğrenme-kaçınma hedefi ve performans-kaçınma hedefi) arasında bir ilişki var mıdır?

1.13. Türk yedinci sınıf ilköğretim öğrencilerinin fen dersindeki erteleme davranışları ve öğrenme stratejileri kullanımları (bilişsel ve bilişötesi öğrenme stratejileri) arasında bir ilişki var mıdır?

1.14. Türk yedinci sınıf ilköğretim öğrencilerinin fen dersindeki başarıları ve örtülü yetenek teorileri (artan yetenek teorisi) arasında bir ilişki var mıdır?

1.15. Türk yedinci sınıf ilköğretim öğrencilerinin fen dersindeki başarıları ve epistemolojik inançları (bilginin kaynağı, bilginin kesinliği, bilginin gelişimi ve bilginin gerekçelendirilmesi) arasında bir ilişki var mıdır?

1.16. Türk yedinci sınıf ilköğretim öğrencilerinin fen dersindeki başarıları ve güdüsel inançları (öz-yeterlilik ve görev değer) arasında bir ilişki var mıdır?

1.17. Türk yedinci sınıf ilköğretim öğrencilerinin fen dersindeki başarıları ve öğrenme stratejileri kullanımı (bilişsel ve bilişötesi öğrenme stratejileri) arasında bir ilişki var mıdır?

1.18. Türk yedinci sınıf ilköğretim öğrencilerinin fen dersindeki başarıları ve erteleme davranışları arasında bir ilişki var mıdır?

Yöntem

Bu çalışmada ilköğretim yedinci sınıf öğrencilerinin örtülü yetenek teorileri, epistemolojik inançları, başarı hedef yönelimleri, öğrenme stratejileri, erteleme davranışı ve fen başarısı arasındaki ilişkiyi incelemek için çeşitli anketler ve testler ile elde edilen veriler LISREL 8.80 programı kullanılarak yol analizi ile incelenmiştir.

Evren ve Örneklem

Bu çalışmanın hedef evrenini Ankara ilinde ki devlet okullarında okuyan bütün yedinci sınıf öğrencileri oluşturmaktadır. Bu evrene ulaşmak kolay olmadığından, erişilebilir evren belirlenmesi uygun görülmüştür ve bu doğrultuda erişilebilen evren Etimesgut, Keçiören ve Yenimahalle ilçelerinin devlet okullarında öğrenim gören bütün yedinci sınıf öğrencileri olarak belirlenmiştir. Bu durumda mevcut çalışmanın sonuçları bu evrene genelleştirilebilir.

Küme örneklemesi ve kolayda örnekleme yöntemleri bu çalışmanın örneklemi oluşturulurken kullanılan yöntemlerdir. Örneklem oluştururken Etimesgut, Keçiören ve Yenimahalle ilçeleri kolaylık örneklem yöntemine göre belirlenmiş. Ardından her bir ilçedeki okul sayısının toplam okul sayısına oranı gözetilerek küme örneklemesi yöntemiyle rastgele olarak 46 ilköğretim okulu belirlenmiştir. Çalışmanın verisi bu okullarda bulunan toplam 4510 öğrenciden toplanmıştır.

Veri toplama araçları

Bu çalışmada kullanılan veri toplama araçları ile öğrencilerin demografik bilgileri, ilgili değişkenler açısından öz-değerlendirmeleri ve fen başarıları ile ilgili veriler toplanmıştır. Tablo 1. çalışmada kullanılan veri toplama araçlarını, geliştiren ve Türkçeye adapte edenleri, kullanılan alt boyutlarını ve mevcut çalışmada elde edilen güvenirlik katsayıları ve doğrulayıcı faktör analizi sonuçlarını içermektedir.

Tablo 1. Veri toplama araçları

Veri Toplama Aracı	Değişkenler	Cronbach Alfa	Doğrulayıcı Faktör Analizi Uyum Katsayıları
Demografik Bilgi Ölçeği	Cinsiyet Yaş Kardeş Sayısı Fen Dersi Notu Annenin Eğitim Düzeyi Babanın Eğitim Düzeyi Annenin Çalışma Durumu Babanın Çalışma Durumu Evdeki Kitap Sayısı Çalışma Odası Gazete Alma Sıklığı Bilgisayar Internet Bağlantısı		
Örtülü Yetenek Teorisi Ölçeği Geliştiren: Dweck (1999) Türkçe'ye Adaptasyon: Mevcut Çalışmada Yapılmıştır	Varolan Yetenek Teorisi	.71	RMSEA = .00 SRMR =.00 NFI = 1.00 CFI = 1.00 GFI = 1.00

Tablo 1. Veri toplama araçları (devam ediyor)

Veri Toplama Aracı	Değişkenler	Cronbach Alfa	Doğrulayıcı Faktör Analizi Uyum Katsayıları
Epistemolojik İnançlar Ölçeği	Bilginin Kaynağı	.74	RMSEA = .04
Geliştiren: Conley, Pintrich, Vekiri ve	Bilginin Değişmezliği	.71	SRMR =.05
Harrison (2004)	Bilginin Gelişimi	.57	NFI = .95
Türkçe'ye Adaptasyon: Özkan (2008)	Bilginin Gerekçelendirilmesi	.75	CFI = .96
			GFI = .95
Başarı Hedef Yönelimleri Ölçeği	Öğrenme-Yaklaşma	.65	RMSEA = .06
Geliştiren: Elliot ve Mcgregor (2001)	Performans-Yaklaşma	.64	SRMR =.05
Türkçe'ye Adaptasyon: Senler ve Sungur	Öğrenme-Kaçınma	.73	NFI = .94
(2007)	Performans-Kaçınma	.73	CFI = .95
			GFI = .95
Öğrenmede Güdüsel Stratejiler Ölçeği	*Öğrenme Stratejileri Bölümü:*		RMSEA = .05
(MSLQ)	Bilişsel Öğrenme Stratejileri	.91	SRMR =.04
Geliştiren: Pintrich, Simith, Garcia, ve	Bilişötesi Öğrenme Stratejileri	.80	NFI = .98
Mckeachie (1991)			CFI = .98
Türkçe'ye Adaptasyon: Sungur (2004)			GFI = .92
	Güdülenme Bölümü:		
	Öz-Yeterlilik	.88	RMSEA = .05
	Görev Değer	.82	SRMR =.03
			NFI = .99
			CFI = .99
			GFI = .95

Tablo 1. Veri toplama araçları (devam ediyor)

Veri Toplama Aracı	Değişkenler	Cronbach Alfa	Doğrulayıcı Faktör Analizi Uyum Katsayıları
Tuckman Erteleme Davranışı Ölçeği Geliştiren: Tuckman (1991) Türkçe'ye Adaptasyon: Uzun-Özer, Saçkes ve Tuckman (2009)	Erteleme Davranışı	.87	RMSEA = .08 SRMR =.06 NFI = .95 CFI = .95 GFI = .91
Fen Başarı Testi Geliştiren: Yerdelen (2013)	Fen Başarısı	KR20 =.75	

Bulgular ve Tartışma

Mevcut çalışmada yedinci sınıf öğrencilerinden toplanan veriler doğrultusunda oluşturulan model çalışmanın değişkenleri arasındaki on sekiz ilişkinin incelemesini içermektedir.

Araştırma Sorusu 1: Başarı hedef yönelimlerinin örtülü yetenek teorileri ile ilişkisi

Bu çalışmada öğrencilerin örtülü yetenek teorilerini belirlemek için artan yetenek teorisi kullanılmıştır. Yol analizi sonuçları öğrencilerin fene yönelik artan yetenek teorisi ile fen dersindeki öğrenme-yaklaşma hedefi ile pozitif, diğer başarı hedef yönelimleriyle yani performans-yaklaşma, öğrenme-kaçınma, performans-kaçınma hedefleriyle negatif ilişkili olduğunu göstermiştir. Diğer bir deyişle, fen yeteneğinin değişebileceğine ve artabileceğine inan öğrenciler fen dersinde daha çok öğrenme ve ustalaşmaya yönelirken daha az diğer öğrencilerden üstün olmaya, öğrenememekten kaçınmaya ve diğerinden daha kötü olmaktan kaçınmaya yönelirler. Bu sonuçlar Dweck ve meslektaşları (Dweck ve diğerleri, 1995) tarafında önerilen temel sosyal-bilişsel modeli desteklemektedir.

Araştırma Sorusu 2: Başarı hedef yönelimlerinin epistemolojik inançlar ile ilişkisi

Yapılan analiz sonucunda, öğrencilerin bilginin kaynağına dair sofistike inançlarının öğrenme-kaçınma ve performans-kaçınma hedef yönelimleri ile negatif ilişkili olduğu belirlenmiştir. Yani bilimsel bilginin dış otoriteler örneğin kitaplar ve öğretmenler haricinde kişiler tarafından da oluşturulabileceğine inan öğrenciler fen dersinde daha az öğrenememekten ve diğerlerinden geri kalmaktan kaçınmaktadır. Bilginin kesinliği açısından sonuçlar şunu göstermektedir; bilimsel bir sorunun birden fazla cevabı olabileceğine inanan öğrenciler fen dersinde daha az performans-yaklaşma, öğrenme-kaçınma ve performans-kaçınma hedefleri belirlemektedirler. Bilginin kaynağı ve bilginin kesinliğine yönelik sonuçlar alan yazınındaki beklentiler ile örtüşmektedir (bk., Muis ve Franco, 2009).

Öte yandan mevcut çalışmanın sonuçlarına göre yedinci sınıf ilköğretim öğrencilerinin bilimsel bilginin gelişen bir doğası olduğuna dair inançları onların fen dersindeki öğrenme-kaçınma ve performans-kaçınma hedefleri ile pozitif yönde ilişkili bulunmuştur. Ayrıca sonuçlar şunu göstermiştir bilimsel deneylerin argümanları destekleme ve yeni fikirler üretmede katkısı olduğuna inanan öğrencilerin fen dersinde başarı hedef yönelimleri bütün boyutlarda daha fazladır. Bu sonuçlar genel olarak ulusal alan yazınındaki bulguları desteklemektedir (ör., Kızılgüneş, Tekkaya ve Sungur, 2009; Pamuk, 2014). Başarı hedef yönelimleri ve epistemolojik inançlar öğrenme ortamı tarafından etkilenir (Ames, 1992; Ames ve Archer, 1988; Hammer ve Elby, 2002; Hammer, 1994; Hofer, 2001; Maehr ve Midgley, 1996; Pamuk, 2014; Schunk, ve Meece, 1992; Turner, Meyer, Midgley ve Patric, 2003) ve bu durum göz önüne alındığında ulaşılan sonuçlar anlam kazanabilir. Fakat ortam değişkenlerinin bu bulgulara etkisinin daha iyi anlaşılması için ileri çalışmalara ihtiyaç vardır.

Araştırma Sorusu 3: Başarı hedef yönelimlerinin güdüsel inançlar ile ilişkisi

Mevcut çalışmanın sonuçları öz-yeterlilik inançları yüksek öğrencilerin daha çok öğrenme-yaklaşma ve performansa-yaklaşma hedefleri belirleme eğiliminde olduğunu göstermiştir. Başka bir deyişle, sahip oldukları becerilerin fen dersi gereksinimlerini karşılayacağına inan öğrenciler daha çok öğrenmeye ve diğerlerinden daha iyi olmaya odaklanmaktadır. Bu sonuçlar Dweck ve meslektaşlarını oluşturduğu modeli ve alan yazınını (ör., Liem, Lau ve Nie, 2008; Sungur, 2007; Wolters, Yu ve Pintrich, 1996) desteklemektedir ve beklendik sonuçlardır. Öte yandan, ulusal çalışmalar göz önünde bulundurularak öğrencilerin öz-yeterlilik inançları ve öğrenme-kaçınma davranışları arasında pozitif ilişki beklenmekteydi çünkü Türk eğitim sistemi sınav odaklı ve rekabete dayalı (Sungur ve Şenler, 2009) ve böyle ortamlarda kaçınmaya yönelik hedefler daha olumlu sonuçlar vermektedir (King ve McInerney, 2014). Fakat beklenilenin aksine analiz sonuçları öz-yeterliliği yüksek öğrencilerin daha az öğrenme-kaçınma hedefi belirlediğini göstermiştir. Bu durumda, fen dersi öğrencileri öğrenememekten kaçınmanın fen dersinde başarıya erişmek için uygun olacağını düşünmemiş olabilirler.

Öğrencilerin güdüsel inançları, öz-yeterlilik inançlarına ilaveten görev değer inançlarını da içermektedir. Yapılan yol analizi sonuçları beklendik sonuçlar göstermiştir buna göre fen dersini ilginç, önemli ve işlevsel bulan öğrenciler daha çok öğrenmeye, diğerlerinden daha iyi olmaya ve öğrenememekten kaçınmaya odaklanmaktadırlar.

Araştırma Sorusu 4: Öğrenme stratejilerinin örtülü yetenek teorileri ile ilişkisi

Yapılan yol analizi fen yeteneğinin değişebileceğine ve zamanla arttırılabileceğine inan öğrencilerin fen dersinde daha az bilişsel öğrenme stratejileri kullandıklarını ama daha çok bilişötesi öğrenme stratejileri kullandıklarını göstermiştir. Dweck ve meslektaşlarının oluşturdukları sosyal-bilişsel model **(**Diener ve Dweck, 1978, 1980; Dweck, 1986; Dweck ve diğerleri, 1995; Dweck ve Leggett, 1988, Elliott ve Dweck, 1988) artan yetenek teorisine sahip bireylerin daha uygun yollar izlediği ve daha etkili stratejiler kullandıklarını ileri sürmüşlerdir. Bu durumda çalışmanın sonuçları bunu kısmen desteklemektedir. Diğer yandan artan yetenek teorisi ve bilişsel öğrenme stratejiler arasında ki ilişki büyük değildir (γ = -.02).

Araştırma Sorusu 5: Öğrenme stratejilerinin epistemolojik inançlar ile ilişkisi

Yapılan analiz sonuçları yedinci sınıf ilköğretim öğrencilerinin bilimsel bilginin kaynağına dair sofistike inançlarının fen dersinde bilişsel öğrenme stratejileri ile negatif ilişkili olduğunu göstermiştir. Ayrıca epistemolojik inançların bilimsel bilginin kesinliği boyutu için sonuçlar öğrencilerin sofistike inançlarının bilişsel öğrenme stratejileri kullanma ile negatif, bilişötesi öğrenme stratejileri kullanma ile pozitif ilişkili olduğunu göstermiştir. İlaveten öğrencilerin bilginin gelişimine yönelik sofistike inançları bilişsel öğrenme stratejileri ile, bilginin gerekçelendirilmesine yönelik sofistike inançları ise bilişötesi öğrenme stratejileri ile pozitif yönde ilişkili bulunmuştur. İlgili literatür genel olarak sofistike epistemolojik inançlara sahip öğrencilerin naif inançlara sahip öğrencilere göre daha fazla strateji kullandıklarını göstermiştir (bk., Kardash ve Howell, 2000). Buna göre sonuçlarda elde edilen pozitif ilişkiler bu beklentiyi karşılarken negatif ilişkiler beklenmedik ilişkilerdir. Fakat yapılan çalışmalar göstermektedir ki Türkiye'de yazılı olan fen dersi müfredatı ile uygulanan birbirinden farklıdır (Genç ve Küçük, 2003; Yangın ve Dindar, 2007), fen dersi öğretmenleri müfredatta önerilen öğrenci merkezli aktiviteleri öğretmen merkezli olarak uygulamaktadır (Gökçe, 2006; Kozandağı, 2001; Özmen, 2003). Bu durumda eğer fen öğretmenleri sınıflarında tek bir doğru bilgi olduğunu ve buna kitaplar ve öğretmenler aracılığı ile ulaşılabileceğini öğretirlerse, naif inançlara sahip öğrenciler bu bilgileri öğrenmek ve hatırlamak için bilişsel aktivitelerini daha çok kontrol ederler yani daha çok bilişsel öğrenme stratejileri kullanırlar. Diğer taraftan bu tarz öğrenme ortamları daha sofistike inançlara sahip öğrencilerin bilişsel öğrenme stratejilerini kullanmak için motivasyonlarını kaybetmesine neden olabilir.

Araştırma Sorusu 6: Öğrenme stratejilerinin güdüsel inançlar ile ilişkisi

Yapılan analizi sonuçları yedinci sınıf ilköğretim öğrencilerinin güdüsel inançlarının yani öz-yeterlilik ve görev değer inançlarının fen dersinde kullandıkları hem bilişsel hem de bilişötesi öğrenme stratejileri ile pozitif yönde ilişkili olduğunu göstermiştir. Başka bir deyişle fen dersini ilgi çekici, önemli ve işlevsel bulan öğrenciler ve sahip oldukları yeteneklerin bu dersin gerekliliklerini yerine getirmeye yeteceğine inanan öğrenciler öğrenmek, hatırlamak ve düşünmek için bilişsel aktivitelerini daha çok kontrol ederler ve daha çok düzenlerler. Bu sonuç ulusal ve uluslararası alan yazını ile uyumludur (ör., Kıran, 2010; Pintrich ve De Groot, 1990; Sungur, 2007; Tas ve Cakir, 2014).

Araştırma Sorusu 7: Öğrenme stratejilerinin başarı hedef yönelimleri ile ilişkisi

Bu çalışmanın sonuçları yedinci sınıf ilköğretim öğrencilerinden öğrenme-kaçınma ve performans-kaçınma hedef yönelimleri fazla olan öğrencilerin fen dersinde daha çok bilişsel öğrenme stratejileri kullandıklarını göstermektedir. İlgili alan yazını kaçınma hedeflerinin strateji kullanımı ile ters ilişkili olduğunu gösterse de (bk. Muis ve Franco, 2009), kaçınmaya yönelik hedefler rekabete dayalı öğrenme ortamlarında daha olumlu sonuçlar vermektedir (King ve McInerney, 2014). Dolayısı ile sınav odaklı ve rekabete dayalı Türk eğitim sistemi (Sungur ve Şenler, 2009) elde edilen bu ilişkiyi etkilemiş olabilir. Ayrıca, yol analizi sonuçları öğrenme-yaklaşma ve öğrenme-kaçınma hedeflerine sahip öğrencilerin daha çok bilişötesi öğrenme stratejileri kullandığını göstermiştir. Elde edilen sonuçlarla uyumlu olarak, Pintrich (2000) öğrenme odaklı öğrencilerin, öğrenmelerini iyileştirmek için daha çok bilişötesi stratejileri kullandıklarını belirtmiştir.

Araştırma Sorusu 8: Bilişsel öğrenme stratejilerinin bilişötesi öğrenme stratejileri ile ilişkisi

Mevcut çalışmanın sonuçları yedinci sınıf ilköğretim öğrencilerinin fen dersinde kullandıkları bilişsel öğrenme stratejileri ile bilişötesi öğrenme stratejilerinin pozitif yönde ilişkili olduğunu göstermiştir. Bu sonuç literatürü destekler niteliktedir (ör., Heikkilä ve Lonka, 2006; Kasımi, 2012; Phakiki, 2006; Saçkes, 2010).

Araştırma Sorusu 9: Erteleme davranışının örtülü yetenek teorileri ile ilişkisi

Yapılan analiz sonucuna göre fen yeteneğinin değişebileceğine ve arttırılabileceğine inanan yedinci sınıf öğrencileri fen dersin gerekliliklerini yerine getirirken daha az erteleme davranışı göstermektedir. Örtülü yetenek teorileri ile ilgili ilk yapılan çalışmalar da mevcut çalışmanın sonucu ile uyumlu olarak, artan yetenek teorisine sahip kişilerin daha uyarlanabilir davranışlar gösterdikleri belirtilmiştir (ör., Ames, 1984; Bandura ve Dweck, 1985; Leggett ve Dweck, 1986).

Araştırma Sorusu 10: Erteleme davranışının epistemolojik inançlar ile ilişkisi

Bu çalışmanın sonuçları bilginin kaynağı ve bilginin gerekçelendirilmesi boyutlarında sofistike inançlara sahip olan yedinci sınıf ilköğretim öğrencilerin fen dersin gerekliliklerini yerine getirirken daha az erteleme davranışı gösterdikleri açığa çıkarmıştır. Öğrencilerin sofistike epistemolojik inançları ve erteleme davranışları arasında negatif ilişki beklenmektedir (bk. Boffeli, 2007) ve çalışmanın bilginin kaynağı ve bilginin gerekçelendirilmesine yönelik sonuçları bu beklentiye paraleldir. Fakat yapılan yol analizi göstermiştir ki öğrencilerin bilginin gelişimine yönelik sofistike inançları erteleme davranışları ile pozitif yönde ilişkilidir. Bu sonuç öğrenme ortamlarından etkilenmiş olabilir, eğer fen sınıflarında bilginin değişmez olduğu vurgulanıyorsa, bu durum benzer inanca sahip olan öğrencilerin motivasyonunu arttırırken ve daha az ertelemelerine neden olurken, daha sofistike inanca sahip öğrencilerin motivasyon güçlüğü yaşamasına neden olup erteleme davranışlarını arttırabilir. Fakat bu açıklama gelecekte yapılacak olan çalışmalarda araştırılmalı ve aydınlatılmalıdır.

Araştırma Sorusu 11: Erteleme davranışının güdüsel inançlar ile ilişkisi

Çalışmanın sonuçlarına göre yedinci sınıf ilköğretim öğrencilerinde görev değer inançları yüksek olanlar fen dersinin gerekliliklerini yerine getirirken daha az erteleme davranışı göstermektedirler. Bu sonuç beklenti-değer teorisi (ör., Eccles, 2005; Wigfield ve Eccles, 2000) ve daha önce yapılan çalışmalarla (ör., Corkin, 2012; Hensley, 2013; Taura ve diğerleri, 2015) uyumludur.

Araştırma Sorusu 12: Erteleme davranışının hedef yönelimi ile ilişkisi

Mevcut çalışmanın sonuçları göstermiştir ki öğrenme-yaklaşma hedeflerine sahip yedinci sınıf ilköğretim öğrencileri fen dersin gerekliliklerini yerine getirirken daha az erteleme davranışı gösterirken, öğrenme-kaçınma hedefine sahip öğrenciler daha çok erteleme davranışı göstermektedir. Yani fen dersinde öğrenmeye odaklanan öğrenciler görevlerini daha az ertelerken, öğrenememekten kaçınanlar daha çok ertelemektedirler. Elde edilen sonuçlar ilgili alan yazınını destekler niteliktedir (ör., Howell ve Buro, 2009; Howell ve Watson, 2007; Kandemir, 2010; Scher ve Osterman, 2002).

Araştırma Sorusu 14: Erteleme davranışının öğrenme stratejileri ile ilişkisi

Yapılan yol analizi sonuçları fen dersinde bilişsel öğrenme stratejileri kullanan öğrencilerin dersinin gerekliklerini yerine getirirken daha çok erteleme davranışı gösterdiklerini fakat bilişötesi öğrenme stratejileri kullanan öğrencilerin daha az erteleme davranışı gösterdiklerini ortaya çıkarmıştır. Erteleme davranışı gösteren öğrenciler zayıf sistemli ve disiplinli çalışma yeteneğine sahiptir (Lay, 1992; Lay ve Schouwenburg, 1993). Bu nedenle bu öğrencilerin daha az öğrenme stratejisi kullanması beklenmektedir. Fakat bazı öğrenciler baskı altında çalışmayı tercih ederler ve bu aktif erteleyen öğrenciler pasif erteleyenler ile aynı seviyede erteleme davranışı göstersede, ortaya çıkardıkları ürünler ertelemeyen öğrenciler ile benzerlik gösterir (Chu ve Choi, 2005). Dolayısı ile sonuçların ortaya koyduğu bilişsel öğrenme stratejileri ve erteleme davranışı arasındaki pozitif ilişki öğrencilerin aktif erteleyen olmalarından kaynaklanabilir.

Araştırma Sorusu 15: Fen başarısını örtük yetenek teorileri ile ilişkisi

Çalışmanın sonuçları yedinci sınıf ilköğretim öğrencilerinden fen yeteneğinin değişebileceğine ve zamanla arttırabileceğine inan öğrencilerin fen dersinde daha başarılı olduklarını göstermiştir. Bu sonuç Dweck ve meslektaşlarının modelini (Dweck, 2002; Dweck, ve diğerleri, 1995; Dweck ve Legget, 1988; Hong ve diğerleri, 1999) ve daha önce yapılan çalışmaları (ör., Blackwell, Trzesniewski ve Dweck, 2007; Cury ve diğerleri, 2006; Good ve diğerleri, 2003) destekler niteliktedir.

Araştırma Sorusu 15: Fen başarısını epistemolojik inançlar ile ilişkisi

Yol analizi sonuçlarına göre bilginin kaynağı, bilginin kesinliği ve bilginin gerekçelendirilmesi boyutlarında daha sofistike epistemolojik inançlara sahip olan yedinci sınıf ilköğretim öğrencileri daha yüksek fen başarısına sahiptir. Beklenen bu ilişkiler literatürü destekler niteliktedir (ör., Conley et.al., 2004; Hofer, 2000; Özkan, 2008; Pamuk, 2014; Schommer, 1993; Yeşilyurt, 2013).

Araştırma Sorusu 16: Fen başarısını güdüsel inançlar ile ilişkisi

Mevcut çalışmanın sonucu göstermektedir ki yüksek öz-yeterliliğe sahip yedinci sınıf öğrencileri daha yüksek fen başarısına sahiptirler. Bu sonuç Bandura'nın (1977a, 1982, 1986) sosyal–bilişsel modeli, Eccles, Wigfield ve meslektaşlarının beklenti-değer teorisi (Eccles, 1987; 1993, 2005; Eccles ve diğerleri, 1983; Wigfield ve Eccles, 1992, 2000, 2002) ve daha önce yapılan çalışmalar ile uyum göstermektedir (ör., Chen ve Pajares, 2010; Hıdıroğlu, 2014; Sungur ve Güngören, 2009; Yerdelen, 2013).

Araştırma Sorusu 17: Fen başarısını öğrenme stratejileri ile ilişkisi

Mevcut çalışmanın sonuçlarına göre yedinci sınıf fen dersi öğrencilerinin bilişsel öğrenme stratejileri kullanmaları fen başarıları ile negatif yönde ilişkili iken, bilişötesi öğrenme stratejileri kullanmaları fen başarıları ile pozitif yönde ilişkilidir. Bu durumda daha çok bilişötesi öğrenme stratejileri kullanan öğrencilerin daha başarılı olması beklenen ve ilgili literatür ile uyumlu bir sonuçtur (ör., Akyol ve diğerleri, 2010; Kaya ve Kablan, 2013; Muis ve Franco, 2009; Rastegar ve diğerleri, 2010). Fakat öğrencilerin bilişsel öğrenme stratejileri kullanmaları fen başarıları arasındaki negatif yöndeki ilişkili öngörülmemiş olmasına rağmen Romainville (1994) yaptığı nitel çalışmada şunu gözlemlemiştir yüksek başarı seviyesine sahip öğrenciler, kullandıkları bilişsel stratejileri tanımlamakta, ne zaman ve nasıl kullandıklarını belirmekte zayıftır. Ayrıca, bu negatif ilişki alan yazınında ki bazı çalışmalarla kısmen desteklenmektedir (ör. Rastegar ve diğerleri, 2010; Yumuşak ve diğerleri, 2007).

Araştırma Sorusu 18: Fen başarısını erteleme davranışı ile ilişkisi

Yapılan çalışmanın sonucu göstermiştir ki yedinci sınıf fen öğrencilerinin gösterdikleri erteleme davranışları fen başarıları ile önemli ölçüde ilişkili değildir. Bu durum bazı öğrencilerin aktif erteleme özelliğine sahip olmasından ve dersin iyi planlanmış olmasından kaynaklanabilir.

Çıkarımlar

Bütün değişkenleri fen alanına özgü olarak ölçülen bu çalışmanın fen öğretmenleri, fen kitabı yazarları, eğitim planlayıcıları ve eğitim politikası geliştirenler için önemli olduğu düşünülmektedir. Fen başarısı göz önüne alındığında, mevcut çalışmanın sonuçları öğrencilerin sofistike epistemolojik inançlarının başarıları ile önemli ölçüde ilişkili olduğunu göstermektedir. Dolayısı ile öğrencilerin fen başarısını arttırmak için sofistike epistemolojik inançlarını arttırmak önemlidir, Smith, Maclin, Houghton ve Hennessey (2000) bunun yapılandırmacı öğrenme ortamları ile mümkün olduğunu ileri sürmüştür. Türkiye'de uygulanmakta olan fen dersi müfredatı yapılandırmacı temelli olsa da uygulamada sorunlar olduğu görülmüştür (Genç ve Küçük, 2003; Yangın ve Dindar, 2007) ve bu durumun öğrencilerin epistemolojik inançları üzerine etkisi bazı araştırmacılar tarafından eleştirilmektedir (ör., Boz, Aydemir ve Aydemir, 2011). Bu sorunun güçlendirilen hizmet içi eğitimler ile çözülebileceği düşünülmektedir. Ayrıca, Qian ve Alvermann (2000) öğrencilerin sofistike inançlarını arttırmak için fen derslerine yönelik bazı eğitimsel yaklaşımlar önermiştir, bu yaklaşımları temel almanın öğrencilerin sofistike inançlarını arttırmada etkin olacağı düşünülmektedir. Epistemolojik inançlara ilaveten, çalışma sonuçları göstermiştir ki öğrencilerin öz-yeterlilikleri de başarıları ile ilişkilidir. Öğrencilerin öz-yeterliliklerini arttırmak için Bandura (1997) tarafından belirlenen kaynaklara odaklanılabilir. Bunların dışında, bilişötesi öğrenme stratejilerini daha çok kullanan öğrencilerin daha başarılı olduğu sonucuna ulaşılmıştır ve öğrencilerin bu stratejileri nasıl ve nerede kullanacakları eğitimsel aktiviteler ile desteklenebilir (Ley ve Young, 2001). Genel olarak, Ames ve meslektaşları (Ames, 1990,1992; Ames ve Maehr, 1988; Powell, Ames ve Maehr, 1990; Tracey, Ames ve Maehr, 1990) tarafından önerilen sınıf ortamı yapıları incelenerek sınıf ortamlarının güçlendirilebileceği düşünülmektedir.

APPENDIX P

Curriculum Vitae

PERSONAL INFORMATION

Surname, Name: Bezci-Bircan, Filiz
Nationality: Turkish (TC)
Date and Place of Birth: 16 January 1983, Ankara
Marital Status: Married
Phone: +90 312 210 7382
Fax: +90 312 210 7984
email: filizbezci@gmail.com

EDUCATION

Degree	Institution	Year of Graduation
BS	METU, Elementary Science Education Department, Ankara	2007
High School	Aydınlıkevler Lisesi(YDA), Ankara	2001

WORK EXPERIENCE

Year	Place	Enrollment
2013- Present	METU	Reseach Assistant
2013-2013	Çankırı Karatekin University	Reseach Assistant
2008-2009	The Project of "Küçük Öğretmenler Bilime Dokunuyor"	Trainer
2007-2007	Hamdullah Suphi Elementary School	Intern Student
2006-2007	Bilim College	Intern Student
2003-2004	Ankara Özel Tevfik Fikret Schools	Intern Student

FOREIGN LANGUAGES

Advance English, Beginner German

PUBLICATIONS

- Bezci, F., & Sungur Vural, S. (2013). Academıc procrastınatıon and gender as predıctors of scıence achıevement. *Journal of Educational and Instructional Studies in the World, 3*(2), 64-68.

- Bezci, F. & Sungur, S. (2013, September). *Elementary Students' Procrastination in Science in Relation to Self-Efficacy and Gender*. Paper presented at the European Conference on Educational Research (ECER). Abstract retrieved from http://www.eera-ecer.de/ecer-programmes/conference/8/contribution/21090/

- Bezci, F. and Sungur, S. (2013, October). *Elementary Students' Procrastination in Science in Relation to Implicit Beliefs about Abilities and Self-Efficacy*. Paper presented at the International Perspectives on New Aspects of Learning in Teacher Education, p.40.

APPENDIX Q

Tez Fotokopisi İzin Formu

ENSTİTÜ

Fen Bilimleri Enstitüsü ☐

Sosyal Bilimler Enstitüsü ■

Uygulamalı Matematik Enstitüsü ☐

Enformatik Enstitüsü ☐

Deniz Bilimleri Enstitüsü ☐

YAZARIN

Soyadı : BEZCİ-BİRCAN
Adı : Filiz
Bölümü : İlköğretim

TEZİN ADI (İngilizce) : The Interplay Among Elementary Students' Implicit Theories of Ability, Epistemological Beliefs, Motivational Beliefs, Achievement Goals, Learning Strategies, Procrastination and Science Achievement

TEZİN TÜRÜ : Yüksek Lisans ☐ Doktora ■

1. Tezimin tamamından kaynak gösterilmek şartıyla fotokopi alınabilir. ☐
2. Tezimin içindekiler sayfası, özet, indeks sayfalarından ve/veya bir bölümünden kaynak gösterilmek şartıyla fotokopi alınabilir. ☐
3. Tezimden bir bir (1) yıl süreyle fotokopi alınamaz. ■

TEZİN KÜTÜPHANEYE TESLİM TARİHİ: