A STUDY ON SOURCES AND CONSEQUENCES OF ELEMENTARY STUDENTS' SELF-EFFICACY BELIEFS IN SCIENCE AND TECHNOLOGY COURSE

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Approval of the Graduate School of Social Sciences

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ABSTRACT

A STUDY ON SOURCES AND CONSEQUENCES OF ELEMENTARY STUDENTS' SELF-EFFICACY BELIEFS IN SCIENCE AND TECHNOLOGY COURSE

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The present study aimed at investigating sources and consequences of middle school students' science self-efficacy beliefs. While mastery experience, vicarious experience, verbal persuasion, and emotional arousal were examined as sources of self-efficacy beliefs, students' achievement goals, metacognition, and effort regulation were examined as consequences of self-efficacy beliefs.

Self-report instruments, Sources of Science Self-Efficacy Scale (SSSE), Motivated Strategies for Learning Questionnaire (MSLQ) and Achievement Goal Questionnaire (AGQ), were administered to 1932 middle school students to assess variables of the study.

Results showed that mastery experience, verbal persuasion, and emotional arousal significantly predict students' science self-efficacy which was found to be positively linked to mastery approach goals, performance approach goals, mastery avoidance goals, metacognition, and effort regulation. In addition, a positive relationship was found between verbal persuasion and mastery approach goals.

Moreover, findings revealed that approach goals were positively associated with metacognition and effort regulation while avoidance goals are

negatively linked to effort regulation. Additionally, results indicated a positive association between emotional arousal and effort regulation.

Keywords: Sources of Self-Efficacy, Achievement Goals, Metacognition, Effort Regulation, Path Analysis

ÖZ

İLKÖĞRETİM ÖĞRENCİLERİNİN FEN VE TEKNOLOJİ DERSİNE KARŞI ÖZYETERLİK İNANÇLARININ KAYNAKLARI VE SONUÇLARI ÜZERİNE BİR ÇALIŞMA

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Bu çalışmanın amacı ilköğretim öğrencilerinin fen ve teknoloji dersine karşı özyeterlik inançlarının kaynak ve sonuçlarının incelenmesidir. Özyeterlik kaynakları olarak geçmiş yaşantılar (tecrübeler), dolaylı yaşantılar, sözel ikna ve psikolojik durum incelenirken, başarı hedefleri, üstbiliş ve çaba düzenlemesi de özyeterlik inançlarının sonuçları olarak incelenmiştir.

Çalışmanın değişkenlerini değerlendirmek için, ölçme araçları olarak Fen Özyeterlik Kaynağı Ölçeği (FÖKÖ), Öğrenmede Güdüsel Stratejiler Anketi (ÖGSA) ve Başarı Hedefi Anketi (BHA) 1932 ilköğretim öğrencisine uygulanmıştır.

Çalışma sonucunda, fen ve teknoloji dersine karşı özyeterlik inançlarını geçmiş yaşantı (tecrübe), sözel ikna ve psikolojik durum istatistiksel olarak anlamlı bir şekilde tahmin etmiştir. Çalışma verilerine göre ilköğretim öğrencilerinin özyeterlik inançları, ustalık-yaklaşım hedef yönelimi, başarım-yaklaşım hedef yönelimi, ustalık-kaçınma hedef yönelimi, üstbiliş ve çaba düzenleme ile pozitif ilişkili olarak bulunmuştur. Ayrıca sözel ikna ve ustalık-

yaklaşım hedef yönelimi arasında da pozitif bir ilişki bulunmuştur. Yaklaşım hedef yönelimleri üstbiliş ve çaba düzenlemesiyle pozitif ilişkili iken, kaçınma hedef yönelimleri çaba düzenlemesiyle negatif ilişkili bulunmuştur. Ayrıca çaba düzenlemesi psikolojik durumla pozitif ilişkili olarak bulunmuştur.

Anahtar Sözcükler: Özyeterlik Kaynakları, Başarı Hedef Yönelimi, Üstbiliş, Çaba Düzenlemesi, Yol Analizi

To Us

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TABLE OF CONTENTS

LIST OF TABLES

TABLES

LIST OF FIGURES

FIGURES

LIST OF ABBREVIATIONS

SMES : Sources of Math Self-Efficacy Scale

ACT : American College Testing

SESFA : Self-Efficacy Scale for Future Attainment

MSLQ : Motivated Strategies for Learning Questionnaire

CTBS : Terranova Comprehensive Tests of Basic Skills

PALS : Patterns of Adaptive Learning Survey

GPA : Grade Point Average

SSSE : Sources of Science Self-Efficacy Scale

AGQ : Achievement Goal Questionnaire

CHAPTER 1

INTRODUCTION

Grounded within Bandura's (1977) social cognitive theory, a great deal of research demonstrated that students' judgments of their capabilities to learn and perform effectively in academic settings –*their self-efficacy*- strongly influences their motivation, cognition, and actual performance (Bandura, Barbaranelli, Caprara, & Pastorelli, 1996; Pajares, 1996; Pintrich & DeGroot, 1990; Sungur, 2007; Usher & Pajares, 2006). Students with higher levels of self-efficacy are found to set higher goals, select more challenging tasks, persist in the face of difficulties, put forth greater effort to successfully complete academic tasks, and use different learning strategies (Bandura, 1986; Hoy, 2004). As Bandura (1986) suggested, these students are likely to engage in academic tasks and activities they judge themselves capable of managing. On the other hand, students with lower levels of self-efficacy tend to avoid the tasks and activities they believe beyond their capabilities. These students are likely to give up easily in the face of setbacks and distracters. Since knowledge acquisition and improvement in competence beliefs require sustained effort using a variety of cognitive and metacognitive strategies, lower levels of self-efficacy beliefs tend to limit students' academic performance (Bandura, 1986; Pajares, 1996). Indeed, Buehl and Alexander (2001) reported that students' beliefs about their capabilities to successfully accomplish academic tasks are highly associated with their *metacognitive strategy use* (e.g. planning, monitoring, and evaluating) and their subsequent effort and performance. Similarly, Sungur's (2007) study revealed that self-efficacious students are likely to use strategies that facilitate the control and regulation of their cognition, study for the reasons of learning and mastering the course material, and do not give up easily when faced with difficulties in the learning process (*effort regulation*). Additionally, students with higher levels of

metacognitive strategy use were found to show commitment to accomplishment of the academic tasks. In other study, Pintrich, Smith, Garcia, and McKeachie (1993) also showed that higher levels of self-efficacy were positively related to the cognitive and metacognitive strategy use and effort regulation. All these findings provide a support for Linnenbrink and Pintrich's (2003) assertion that self-efficacy beliefs have an important role in students' behavioral engagement (e.g. effort and persistence), cognitive engagement (e.g. metacognitive strategy use), and motivational engagement (eg. interest) in the learning process which are directly linked to their academic performance. More specifically, according to Linnenbrink and Pintrich (2003), self-efficacious students tend to plan, monitor, and regulate themselves while engaging in an academic task, persist longer, try hard, and show interest in the activities.

In addition, some studies demonstrated that self-efficacy beliefs are related to students' *achievement goals* (Anderman & Midgley, 1992; Pajares, Britner, & Valiante, 2000). Achievement goals concern the reasons why students engage in academic tasks and activities. Early research on achievement motivation distinguished two types of goals namely, mastery goals and performance goals (Ames, 1992; Ames & Archer, 1988), while more recent research has suggested four achievement goals: mastery approach goals, mastery avoidance goals, performance approach goals, and performance avoidance goals. (Elliot & Church, 1997; Elliot & Harackiewicz, 1996; Elliot & McGregor, 2001). Mastery approach goals emphasizes learning, and deep understanding, while mastery avoidance goals focus on avoiding misunderstanding and avoiding not learning. Concerning performance goals, on the other hand, performance approach goals emphasize showing abilities to others and getting the highest grade, whereas performance avoidance goals focus on avoiding looking stupid and getting the worst grades (Elliot & Church, 1997; Elliot & Harackiewicz, 1996; Elliot & McGregor, 2001; Elliot & Reis, 2003; Pintrich & Schunk, 2002). In a study examining the relationship between self-efficacy beliefs and achievement goals, Pajares, Britner, and Valiante (2000) found that self-efficacy beliefs are positively associated with mastery goals but negatively with performance avoidance goals. Results of the

study also revealed a positive relationship between mastery goals and effective strategy use. Similarly, Anderman and Midgley (1992) reported positive relationships between mastery goals, deep processing of information utilizing various metacognitive and regulatory strategies and self-efficacy beliefs. Therefore, it appears that achievement goals are related to both self-efficacy and metacognitive strategy use. Indeed, related literature revealed a positive association between mastery approach goals and student metacognition (Ames & Archer, 1988; Elliot & McGregor, 2001; Pintrich, Roeser, & De Groot, 1994). Concerning performance approach goals, while some studies showed a positive relationship with deep processing of information which involve metacognitive and regulatory strategy use (Wolters, Yu, & Pintrich, 1996), other studies revealed that performance goals were related to surface processing of information which involves the use of strategies like rehearsal (Elliot & McGregor, 2001). On the other hand, performance avoidance goals were, in general, found to be linked to maladaptive strategy use (Elliot & McGregor, 2001; Pintrich & Schunk, 2002). Although, there are only a few studies on mastery avoidance goals, Elliot and McGregor's study (2001) suggested that mastery avoidance goals were not related to strategy use.

In sum, the relevant literature suggests that self-efficacy is positively linked to various adaptive outcomes such as persistence, metacognitive strategy use, achievement goals and actual achievement (Linnenbrink & Pintrich, 2002; Pintrich & Schunk, 2002). Moreover, achievement goals are found to be associated with students' metacognitive strategy use. Therefore, in the present study, it was hypothesized that students' science self-efficacy beliefs are related to their achievement goals metacognitive strategy use and effort regulation. Moreover, based on the literature, relationships were proposed between achievement goals and strategy use and effort regulation.

Though, there is a considerable amount of research on the relationship between students' self-efficacy beliefs and a variety of academic outcomes, there are a few research studies focusing on the antecedents of these beliefs with an attempt to explain how they are developed. According to Bandura (1986), students

create and develop their self-efficacy beliefs by interpreting information from four principle sources: mastery experience, vicarious experience, social persuasion, and physiological state. *Mastery experience* is suggested to be the most powerful source of efficacy beliefs since it involves students' interpretation of their own past performance. In academic settings, students participate in various tasks and activities and they interpret the outcomes of their actions. These interpretations lead to the development of beliefs about their capabilities to accomplish similar or related subsequent tasks. If students successfully complete a task, their efficacy appraisals increase. On the other hand, if they fail, their beliefs about their capabilities to perform well in following activities will diminish (Bandura, 1986; Britner & Pajares, 2006; Usher & Pajares, 2006). However, as noted by Britner and Pajares (2006), mastery experiences alone are not sufficient to form self-efficacy beliefs. Rather, students cognitively evaluate their past performances in company with environmental and personal factors such as the perceived difficulty of the task, effort exerted on the task, and previous self-beliefs. For example, students attributing their failure to inadequate effort or use of poor strategies are likely to be assured of their capabilities compared to the students attributing the failure to inability (Bandura, 1986).

Students can also acquire information about their self-efficacy through *vicarious experience* of observing others perform a task. Students tend to make judgments about their capabilities to succeed at the same or similar task following a model's success or failure. For example, students who observe a similarly perceived classmate accomplish a challenging task are likely to believe that they can as well. Although this source of self-efficacy is weaker than mastery experience, it can lead to considerable, lasting changes in the course and direction that students' life will take (Bandura, 1986; Britner & Pajares, 2006).

Social persuasion which involves the verbal and nonverbal judgments that students receive from others about their capabilities to accomplish tasks serve as a third source of self-efficacy. Students who are encouraged by their parents, teachers, and peers that they have capabilities to master given tasks are likely to try hard and persist when difficulties arise. On the other hand, negative persuasion

tends to cause students to avoid challenging tasks and give up easily in the face of difficulties (Bandura, 1986; Usher & Pajares, 2008).

Finally, students rely in part on information from their *physiological state* such as their anxiety, aches, fatigue, and stress in judging their capabilities. Students who experience an anxiety when participating in particular tasks are likely to interpret their somatic arousal as evidence of lack of skill and abilities to master these tasks. In general, negative physiological states can undermine self-efficacy by hindering performance and increasing the possibility of a poor outcome. On the other hand, positive emotional states are likely to strengthen self-efficacy (Usher & Pajares, 2008).

Review of relevant literature revealed that among these four sources of self-efficacy theorized by Bandura (1986), mastery experience is the most consistent and powerful predictor of self-efficacy (Britner & Pajares, 2006; Klassen, 2004; Lent, Lopez, & Bieschke, 1991). On the other hand, remaining three sources were found to be less consistent as predictors of self-efficacy. For instance, while some studies reported vicarious experience as a significant predictor of self-efficacy (Usher & Pajares, 2006), others revealed no such influence (Britner & Pajares, 2006; Lent et al., 1991). Similarly, predictive power of social persuasion is found to be inconsistent across studies (Britner & Pajares, 2006, Usher, 2009). However, in majority of these studies (Hodges & Murphy, 2009; Klassen, 2004; Lent, et al., 1991; Lopez & Lent, 1992; Usher, 2009), Bandura's four hypothesized sources of self-efficacy were examined in relation to mathematics self-efficacy of students in different educational grade. The studies in the literature examining sources of science self-efficacy beliefs of middle school students are quite rare and findings from the studies investigating the relationship between mathematics self-efficacy and its sources may not be applicable to science self-efficacy since students may use the information from the four sources differently across different academic domains (Usher & Pajares, 2006). Therefore, there is a need for conducting further studies related to academic self-efficacy and its sources in different domains.

One of the few studies on science self-efficacy and its sources was conducted by Britner and Pajares (2006). Participants of the study were 319 public elementary school students. Multiple regression analysis results revealed that, of the four sources, only mastery experience significantly predicted elementary school students' science self-efficacy ($\beta = 0.49$) making the largest unique contribution (24 %) to the explanation of self-efficacy scores. The remaining sources have made only minor contributions to the prediction of science self-efficacy.

In other study, Usher and Pajares (2006) examined sources of academic and self-regulatory efficacy beliefs of entering elementary school students. Participants were 263 sixth school students from a public suburban elementary school. The results indicated that each of the sources predicted self-efficacy for self-regulation for the full sample. Mastery experience, social persuasions, and physiological state predicted academic self-efficacy. Mastery experience was the most influential source of both academic self-efficacy and self-regulatory self-efficacy.

In general, the aforementioned studies, consistent with Bandura's contention, indicated mastery experience as the most prominent source of science self-efficacy. Based on relevant literature and Bandura's contention regarding sources of self-efficacy, the present study aimed at examining sources and consequences of students' science self-efficacy beliefs by proposing a structural model. In the model, as sources of self-efficacy beliefs, mastery experience, vicarious learning, verbal persuasion, and emotional arousal were examined. Therefore, paths were specified from these four hypothesized sources of self-efficacy to science self-efficacy (see *Figure 1.1*). On the other hand, as consequences of self-efficacy beliefs, students' achievement goals, metacognition, and effort regulation were studied. Accordingly, it was hypothesized that self-efficacy was *directly* linked to achievement goals, metacognition, and effort regulation and *indirectly* to effort regulation through its effect on achievement goals and metacognition. In the model, effect of science self-efficacy on metacognition was also mediated through its effect on achievement goals.

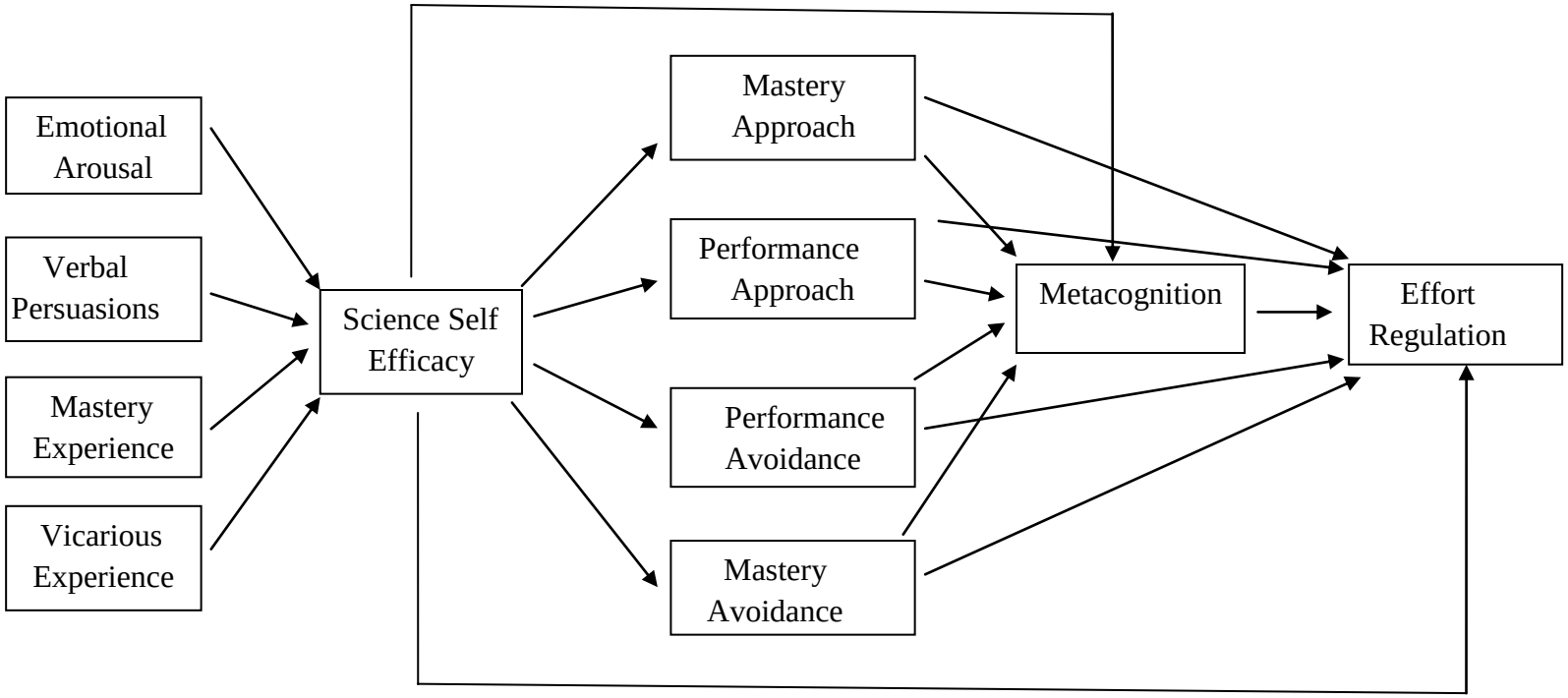


Figure 1.1 The Conceptual Model

1.1 Significance of the Study

Self-efficacy is one of the core elements of social cognitive models of motivation. In educational settings, self-efficacy has been studied by researchers during the past three decades. Researchers report that capability beliefs that students possess in academic tasks or activities considerably affects students' academic performances (Bandura, 1997; Pajares, 1996, 1997), motivation, (Wolters, Yu & Pintrich, 1996), and self-regulation (Zimmerman & Bandura, 1994). Additionally, studies revealed that examination of students' self-efficacy beliefs help educators and researchers predict and interpret students' college major and career preferences (Luzzo, Hasper & Albert, 1999). Hence, since students' self-efficacy beliefs have great importance on their academic motivation, learning and achievement (Pintrich & Schunk, 2002); there is need for conducting studies which provide an in-depth investigation of students' self-efficacy, its antecedents and consequences. Although the level of self-efficacy towards various domains (especially mathematics) was studied, science self-efficacy is studied rarely. Moreover, examination of sources of science self-efficacy is a big gap in the literature (Pajares & Urdan, 2006, as cited in Usher & Pajares, 2009). Researchers generally studied the sources of math self-efficacy and sources of math-science career self-efficacy. What is more, sources of self-efficacy among college students rather than middle or elementary students constituted the majority of the studies. Additionally, studies combining the motivational constructs and strategy use have generally overlooked the sources of self-efficacy beliefs. They have utilized motivational constructs such as achievement goals, self-efficacy, intrinsic motivation etc. and investigated their relationship with students' strategy use such as organization, elaboration, metacognition, rehearsal etc.

This study extends the studies examining the relationship between motivational constructs and strategy use by exploring the sources and consequences of self-efficacy concomitantly in a single structural model. Indeed, structural models have the ability to reveal all the relations among several variables simultaneously, indicating the relative contribution of each variable to

the variance in a result. Therefore, this study has a potential to make a unique contribution to the literature since it is the first time a structural model with various variables including sources of science self-efficacy, achievement goals, science self-efficacy, metacognition, and effort regulation is investigated. Indeed, although there are studies in the literature examining consequences of self-efficacy such as achievement goals and strategy use through regression analyses, the studies examining the sources of self-efficacy, more specifically science self-efficacy, is quite rare.

In Turkish context, sources of science self-efficacy of elementary school students have never been studied. Additionally, the combination of sources and consequences of science self-efficacy in a single model is not present in the literature. Therefore, there is a need for research on these issues and this study will fill this gap in the literature.

1.2 Definition of Important Terms

Self-Efficacy

Bandura (1997) defines self-efficacy as "beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments" (p.3). This study involves the sources of self-efficacy which are mastery experiences, vicarious experiences, verbal persuasions and emotional arousal. Their defnitions are presented below.

Mastery Experiences

Authentic, self-committed experiences on a task in which one tries to attain a designated type of performance (Bandura, 1997).

Vicarious Experience

The calibration of capabilities in comparison with others is known as the vicarious experience (Usher & Pajares, 2008).

Verbal Persuaisons

Statements and comments by others about performance of a person on a task (Bandura, 1997). Verbal persuasions and social support encourage individuals to persist on the task at hand and resist to aversive situations (Zeldin & Pajares, 2000).

Emotional Arousal (Physiological States)

Stress, fatigue, mood, tension, emotion, and pain can be addressed as physiological states. They all may be influential when making judgments on self-efficacy.

Achievement Goals

Goal orientation theories for achievement behaviors involve the reasons or purposes individuals possess for approaching, engaging, selecting and persisting in achievement situations (Pintrich, 2000; Meece, Glienke, Burg, 2006; Pajares et al., 2000; Ames, 1992; Linnenbrink & Pintrich, 2002; Elliot, 1999; Was, 2006; Pintrich & Schunk, 2002). In other words, achievement goals deal with why students desire the target outcome.

Mastery Approach Goals

Mastery approach goals represent learning, understanding and focus on mastering the task at hand. Self-improvement, progress and deep understanding of the material constitute the core elements of mastery approach goals (Pintrich & Schunk, 2002).

Mastery Avoidance Goals

Mastery avoidance goals refer to avoiding misunderstanding or avoiding not mastering the task. Not being erroneous and not doing incorrectly are basic components of mastery avoidance goals (Pintrich & Schunk, 2002).

Performance Approach Goals

Performance approach goals represent surpassing and showing the capability to others. Getting the best grades, being top best performer in the class reflects the properties of performance approach goals (Pintrich & Schunk, 2002).

Performance Avoidance Goals

Performance avoidance goals refer to avoiding looking dumb or incompetent relative to others. Use of normative standards of not obtaining the worst grades, refraining from being the lowest performer in the class are characteristics of performance avoidance goals (Pintrich & Schunk, 2002).

Metacognition

Metacognition is defined simply as the arrangement of cognitive processes. In other words it is "thinking about thinking" (Livingston, 1997) and "learning how to learn" (Weinert & Kluwe, 1987). Schraw and Dennison (1994) stated that "Metacognition refers to the ability to reflect upon, understand, and control one's learning" (p. 460).

Effort Regulation

Effort regulation or effort management refers to students' persistence and resilience even though the task is hard and challenging (Pintrich & Johnson, 1990). In other words effort regulation means the act of showing resistance on a compelling task.

1.3 Purpose of the Study

The present study aims to examine the relationships between elementary 8th grade students' sources and consequences of science self-efficacy. As sources of science self-efficacy, mastery experience, vicarious experience, verbal persuasions and emotional arousal; and as consequences of science self-efficacy achievement goals, metacognition and effort regulation are considered. This study explores whether sources of science self-efficacy predict science self-efficacy and

whether science self-efficacy predicts achievement goals, metacognition and effort regulation. For the aims of the present study, following research problems are addressed:

1. What is the relationship between elementary 8th grade students' science self-efficacy and its hypothesized sources?
2. What is the relationship between elementary 8th grade students' science self-efficacy and their achievement goals?
3. What is the relationship between elementary 8th grade students' science self-efficacy and their metacognition?
4. What is the relationship between elementary 8th grade students' science self-efficacy and their effort regulation?

In order to answer these questions, a path model is proposed and path analysis is utilized to examine the relationsips.

CHAPTER 2

REVIEW OF LITERATURE

This review of literature begins with the overview of social cognitive theory and self-efficacy. The review continues with sources and then the consequences of self-efficacy. The review ends with the summary of the findings mentioned in the literature.

2.1 Social Cognitive Theory and the Concept of Self-Efficacy

Bandura's social cognitive theory (1986, 1997) suggests that a great deal of people's learning takes place in a social environment. In the social environment, people observe the actions of others. Observing the consequences of the actions of others provides information to observers regarding the usefulness and appropriateness of the behavior. People process and assess the outcomes of the observed behaviors and act in concert with their beliefs and judgments of their self-appraisals. Overall, they attain knowledge, skills, strategies, rules and attitudes (Schunk, 2000). Indeed, Bandura (1986, 1997) asserts that in social environments people behave under the influence of three factors: personal, behavioral, and environmental. This is known as the "triadic reciprocal determinism". According to Bandura, cognitive processes have great importance on people's ability to form reality, self-regulate, encode information and behavior performance (Pajares, 2002).

Social cognitive theory has key assumptions which are reciprocal determinism, human agency and its capabilities. They are explained in the next section.

2.1.1 Triadic Reciprocal Determinism

In the social cognitive view of human functioning, people do not behave just under the control of internal states nor do they act with the effect and manipulation of external factors. People functioning are defined in terms of a triadic reciprocality, which includes personal factors (cognitive, affective and biological events), behavior and environmental events. These three components act interactively as determinants of each other (Bandura, 1986). Personal (P), behavioral (B) and environmental factors (E) all function bi-directionally, affecting one another interactively.

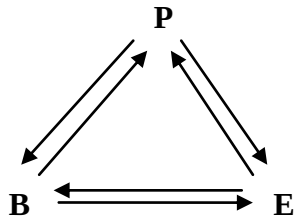


Figure 2.1 Triadic reciprocality model of causation

Note. Adapted from "Self-Efficacy: The Exercise of Control" p. 6 by A. Bandura, 1997 New York: W.H. Freeman.

Bandura (1997) asserts that the degree and influence of each determinant may vary according to the type of activities and circumstances under which they occur and they do not interact equally and simultaneously.

Schunk (2000) exemplifies the bi-directionality between personal factors-behavior, environmental factors-behavior and personal factors-environmental factors within educational settings as follows: Regarding the interaction of *personal factors (self-efficacy) and behavior*, self-efficacy beliefs affect students' achievement behaviors such as persistence and effort expenditure. After students execute actions, the outcome influences their self-efficacy (*behavior-personal*). Personal-environmental factors interaction is found by research conducted on students with learning disabilities by Lich and Kisner (1986) (as cited in Schunk,

2000). The students with learning disabilities have a low sense of efficacy and the individuals in their environments behave them in terms of their disability rather than their actual capabilities (*personal factors - environment*). The reverse is the reaction of the teachers to the disability students as feedbacks. The teachers' praise and encouragements to disabled students help to construct a good sense of efficacy (environment- personality factors). Environmental influence on behavior takes place in classrooms. Teachers demand students to direct their attention to the board. The obedience behavior of students without conscious deliberation causes the occurrence of environmental impact on behavior. The reverse is the wrong response of students to teacher's question. Teacher reteaches some points according to students' answers (behavior-environment).

2.1.2 Human Agency

The concept of human agency constitutes one of the major components of triadic reciprocality. Agency is explained by Bandura (1997) as "the acts done intentionally". Social cognitive theory grounds on such kind of an agency which causes individuals to contribute to their own development and make things happen by their performances (Pajares, 2002). Bandura (1997) states that "If people believe they have no power to produce results, they will not attempt to make things happen" (p. 3). Therefore, beliefs of personal efficacy comprise the key element of human agency (Bandura, 1997).

2.1.3 Fundamental Capabilities of Human Agency

Social cognitive theory asserts that human beings are equipped with certain capabilities (Bandura, 1986; 1989). These capabilities constitute the major aspects of what it is to be a human. They are listed as symbolizing capability, forethought capability, vicarious learning, self-regulation capability, and being self-reflective. Such capabilities enable cognitive processes which makes human beings effective in determining their own destiny.

Human beings have the capability to *symbolize*. With the help of their symbolizing capability, they can pick the useful information in the environment,

form their self-guides for action, solve problems cognitively and develop the capability to anticipate. Bandura considers symbols as the vehicles of thought and human beings symbolize their experiences in order to regulate their course of action in terms of form, meaning and sustainability. Observed actions are instilled into symbols and they are extracted where the observed action is needed. Symbols also provide abstract experiences to test them hypothetically rather than enactively. The following capabilities are fed by symbolizing capability:

Human beings possess *forethought* capability. They can make plans on their future actions, set goals and challenges for themselves and orchestrate their courses of actions. They also can plan alternative strategies which enable them to anticipate the consequences of actions without involving in it and avoid the harmful consequences.

Human beings not only learn by their own experiences but also by observing the actions and consequences of others. This process is known as the "*vicarious learning*" and it keeps people away from making fatal mistakes in many situations rather than applying trial error process. The information gathered from observation (or vicariously) is coded in symbols to be used as a guide for future actions. If the information obtained gives expected and valuable results, people are motivated to employ them in the future again.

Human beings employ *self-regulation* capability to make cumulative self-observation and self-monitoring for the accuracy and consistency of their actions, choices and attributes. They make self-directed changes on their behavior in accordance with their overall self-evaluations.

The capability of *self-reflection* is defined as "distinctly human" by Bandura (1986). Pajares (2002) explains self-reflections as "Through self-reflection, people make sense of their experiences, explore their own cognitions and self-beliefs, engage in self-evaluation, and alter their thinking and behavior accordingly." In view of that, one of the most salient types of self-reflection is considered to be self-efficacy.

2.1.4 The Concept of Self-Efficacy

Social cognitive theory grounds on a view of a human agency which causes individuals to contribute to their own development and make things happen by their performances (Pajares, 2002). Self-beliefs, which are considered as the key elements of human agency, provide human beings to manage their thoughts, emotions, and actions. Among self-beliefs, self-efficacy is stated as the leading factor. Bandura (1997) defines self-efficacy as "beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments" (p. 3). Self-efficacy beliefs establish a ground for motivation, personal attainments and welfare (Pajares, 2002). This is why self-efficacy beliefs stand at the core of social cognitive theory.

Since the concept of self-efficacy is first introduced by Bandura in 1977, it received ample attention from various fields of research in addition to education. Self-efficacy has been the scope of research in psychology, health, athletic performance, medicine, nursing, business administration and career choice (Pajares, 1996).

According to Bandura (1997), self-efficacy is not just "knowing what to do". It is a generative capability and combination of several subskills. Cognitive, social, emotional and behavioral subskills must be arranged accordingly and managed effectively. Even, these facilities are not enough because having these subskills and employing them under congruent circumstances is markedly different processes. It is common to witness the situation that one knows what to do but fails. Real world does not always have the perfect match between belief and reality (Pajares, 2002). Bandura (1997) states that "In short, perceived self-efficacy is concerned not with the number of skills you have, but with what you believe you can do with what you have under a variety of circumstances" (p. 37).

Human functioning is greatly influenced by self-efficacy beliefs. Choices of activities people make, courses of actions they follow, effort expenditure and persistence are the most prominent ones (Pintrich & Schunk, 2002; Pajares, 2002). People generally select and engage in an activity that they believe it would yield desired results. If they do not feel confident and competent, they are inclined to

avoid engaging in such kind of an activity. In educational settings, students holding high self-efficacy are eager to involve in accomplishing a task; those holding low self-efficacy are inclined to avoid it (Pintrich & Schunk, 2002).

Self-efficacy beliefs affect the designation of the amount of the effort people will exert on an activity, their level of perseverance in adverse situations and how fast they recover after being exposed to coercive experiences. Level of self-efficacy determines the level of effort, persistence and resilience. If efficacy is high, then the persistence, resilience and exerted effort are.

Peoples' belief of self-efficacy provides them with a professional notion in approaching tasks. People with high self-efficacy initiate a task in a cool mood; in other words with the sense of serenity. Reversely, people holding low self-efficacy considers the task as it is harder than it really is. As a consequence, low self-efficacy triggers physiological adversities, namely depression, anxiety and stress (Pajares & Miller, 1994).

2.1.5 Self-Efficacy and Other Self-Referent Constructs

Self-referent constructs including self-efficacy, self-concept and self-esteem may be used interchangeably but in essence they refer to markedly different beliefs of personal agency. Pintrich and Schunk (2002) make a clear cut between self-efficacy and self-concept. They assert that self-efficacy is one's perception of own abilities for learning or performing actions at specified tasks. However, self-concept refers to "individuals' beliefs about themselves in terms of their academic, social, athletic, and personal capabilities and characteristics" (p.407). Additionally, self-concept judgments are derived partly from others' courses of actions in comparison to self. However, self-efficacy judgments deal with one's own performance of successfully accomplishing a task, not others' successes (Hoy, 2004). Finally, self-efficacy is a task or context specific judgment of confidence but self-concept is measured in a more general level of specificity including self-worth.

Bandura (1997) asserts that self-esteem and self-efficacy concerns with completely different phenomenon. Self-efficacy is the assessments of one's

capabilities but self-esteem deals with self-worth. Bandura (1997) states that "there is no fixed relationship between beliefs about one's capabilities and whether one likes or dislikes oneself" (p. 11). One may feel competent in a domain but may not have high self-esteem or the reverse is possible. Hoy (2004) exemplifies this as "For example, I have very low self-efficacy for singing, but my self-esteem is not affected, probably because my life does not require singing" (p. 3).

2.2 Sources of Self-Efficacy Beliefs

People's self-knowledge is greatly influenced by their appraisals about their efficacy beliefs (Bandura, 1997). Self-knowledge and efficacy beliefs stand for the salient determinants of behavior. "Self-efficacy beliefs are constructed from four principal sources of information: enactive mastery experiences that serve as indicators of capability; vicarious experiences that alter efficacy beliefs through transmission of competencies and comparison with the attainments of others; verbal persuasions and allied types of social influences that one possesses certain capabilities; and physiological and affective states from which people partly judge their capabilities, strength and vulnerability to dysfunction" (Bandura, 1997, p. 79). These four sources are the antecedents of people's beliefs about their self-efficacy. However, information carried by these sources is not informative enough because that information should be cognitively processed (Bandura, 1997).

Enactive mastery experience or mastery experience is seen as the prominent source of efficacy beliefs (Bandura, 1986, 1997; Hoy, 2004). This is because experience is personal, or in other words authentic, which presents one's all endeavors to attain success. Successes take great part in forming self-efficacy beliefs. Failures on the other hand, have diminishing effects on self-efficacy. As Bandura asserts failures tend to weaken one's beliefs about their capabilities to perform well, especially when failures happen before the establishment of a strong sense of self-efficacy (Bandura, 1997). It is also detrimental for people to get accustomed to obtaining easy successes. Easy successes do not need perseverant

effort and resilient sense of efficacy. Therefore, in the face of difficulty, people who are accustomed to easy successes easily discouraged and disheartened. However, difficulties and obstacles have constructive effects on people. When encountered, aversive situations and setbacks play beneficial roles for people because they help to realize that success usually needs persistence and sustained effort (Bandura, 1997).

People do not judge their level of capabilities just by interpreting personal performance accomplishments. The observed actions of others or the observed performance on a task help individuals to form their efficacy beliefs. The calibration of capabilities in comparison with others is known as the vicarious experience (Usher & Pajares, 2008). The perceived similarities of others, or models, influence the actions of the observers (Zeldin & Pajares, 2000). The failures or successes of models possessing similar characteristics with the observer both undermine or boost the development of efficacy beliefs. Schunk (2000) asserts that "observing similar others succeed raises observers' self-efficacy and motivates them to try the task because they believe that if others can succeed, they can as well" (p. 109). However, respected models' failures have detrimental effects on observers' efficacy beliefs. For example, a mistake of a teacher (considered as respected model for students) may deteriorate efficacy beliefs of students. Vicarious experiences are most influential when observers have limited experiences or are uncertain in their capabilities about a task (Bandura, 1997; Pajares, 1997). Bandura (2004) emphasizes media as a *symbolic model* for individuals in addition to individuals' families, peers, teachers, etc. (as cited in Usher, 2009). Mediatic models (pop singers, politicians, artists and actresses, etc.) may take place as role models in the formation of efficacy beliefs of individuals.

The third hypothesized source of self-efficacy is verbal or social persuasions. Verbal persuasions and social support encourage individuals to persist on the task at hand and resist to aversive situations (Zeldin & Pajares, 2000). Social or verbal persuasions are most influential on individuals who already possess a resilient sense of efficacy (Zeldin, Britner & Pajares, 2008).

Individuals who are lack of self-evaluation of personal performances on various tasks are more tended to the appraisals of others (parents, teachers, parents, etc) (Usher & Pajares, 2006). The trustworthiness of the persuader is also important on forming self-efficacy beliefs. Individuals who are exposed to social persuasions must view the persuader as having adequate qualities to give constructive feedbacks (Hodges & Murphy, 2009). In giving constructive feedback, providers should be careful. They should emphasize on personal growth rather than surpassing others (Usher & Pajares, 2008). Sometimes verbal persuasions have negative effects on individuals' efficacy beliefs because it is easier to undermine self-efficacy beliefs of individuals more than enhancing them (Bandura, 1997). Additionally, verbal persuasions may not have long lasting effects, rather they may increase self-efficacy for short periods (Usher & Pajares, 2009). Finally, social persuasions solely do not yield a positive sense of self-efficacy; rather it functions together with other sources (Britner & Pajares, 2006).

The fourth and last hypothesized source of efficacy beliefs is physiological states or emotional arousal. Stress, fatigue, mood, tension, emotion, and pain can be addressed as physiological states. They all may be influential when making judgments on self-efficacy. For example, one may be well prepared for an examination but hearing of unexpected news may diminish concentration and in turn affect the performance on the examination (Hodges & Murphy, 2009). Bandura (1997) asserts that optimal functioning emerges when emotional arousal is neither too low nor too high. According to Usher and Pajares (2008), enhancing emotional arousal and decreasing negative ones (e.g. depression, despair, and despondency) boost self-efficacy. The sense of anxiety when initiating a new task may cause a false interpretation of competencies. However, individuals holding resilient sense of efficacy may not be affected by the fluctuations in physiological arousals.

The above mentioned sources of self-efficacy have been investigated by many researchers in many areas since the concept of self-efficacy was defined by Bandura. Psychology, health, athletic performance, medicine, nursing, business

administration and career choice are the areas in which self-efficacy has been studied. Considering the scope of current study, the literature review presented in this chapter, on the other hand, just focused on academic and career self-efficacy studies.

Review of relevant literature revealed that sources of self-efficacy were mainly studied by using quantitative research methodologies but there are a few studies that are conducted qualitatively. In academic domain, researchers have generally concentrated on sources of mathematics self-efficacy considering it as the "critical filter" in career aspirations (Lopez & Lent, 1992). Also, Klassen (2004) defines mathematics as "high stakes endeavor" for elementary school students. According to Betz (1992) students refraining from mathematics restrict their future career options to a limited range (as cited in Gainor & Lent, 1998). However, studies examining sources of science self-efficacy beliefs of elementary school students are quite rare.

For example, Lopez and Lent (1992) conducted a research to reveal the four hypothesized sources of mathematics self-efficacy information of high school students. Additionally they intended to explore whether global academic self-concept would explain additional variance in self-efficacy other than the hypothesized sources. Finally, they searched for the relation of self-efficacy beliefs of students to their math/science interest as a contributor to their future career choices. They worked with a sample of 50 (19 males, 31 females) high school students enrolled in two sections of an algebra class. They used Sources of Math Self-Efficacy Scale (SMES) to measure the sources. Past performance and verbal persuasion correlated significantly with self-efficacy but vicarious experience and emotional arousal did not. To deeply reveal the independent contribution made by each source is analyzed by hierarchical multiple regression. They entered the variables in such an order: past performance and grades (SMES's performance items), vicarious experience, verbal persuasion, and emotional arousal. Performance accomplishments, grades and arousal contributed to significant variance. To illustrate whether performance accomplishment made a unique contribution to self-efficacy, the other sources (vicarious experience,

verbal persuasions and emotional arousal) were entered as a set and performance accomplishment alone. The set of predictors accounted for 13 % of the variance in self-efficacy, performance accomplishment accounted for a significant amount of additional variance (R^2 change -.24).

In other study, Lent et al. (1991) also examined students' mathematics self-efficacy. The other dimension of the study was the relations among self-efficacy, outcome expectations, interest in mathematics related college courses, and choice of science based careers. The participants of the study were 138 (53 males, 85 females) introductory psychology students. The authors are the developers of Mathematics Self-Efficacy Scale, which is adapted into different areas in the next two decade. The measure consisted of 10 item- subgroups corresponding to each source. They also used Mathematics Self-Efficacy Index which aims to indicate students' confidence of getting a B or better grade in math-related courses. The last instrument is the Mathematics Course Interest Scale, consisting of 15 items asking students to indicate their degree of interest in math-related courses. They conducted hierarchical regression in order to illustrate the unique influence by each source. Math ACT scores and past performance accounted for the largest variance but other sources did not. Additionally, after entering performance at the first step in hierarchical regression, the other sources did not explain additional significant variance.

Recently, Hodges and Murphy (2009) investigated the sources of mathematics self-efficacy in a technology intensive asynchronous college math course. The participants of the study were 99 students (43 male, 56 female). The data were collected through a web-based survey. The instruments of the study were the Self-Efficacy for Learning Mathematics Asynchronously Survey, a demographics survey and Sources of Mathematics Self-Efficacy Scale. A regression analysis was conducted to reveal the relative strength of the sources. The results of the regression analysis indicated that vicarious and affective/physiological components were statistically significant predictors of self-efficacy to learn mathematics asynchronously.

Moreover, Klassen (2004) conducted a cross-cultural study to examine mathematics self-efficacy and other motivation constructs of South Asian immigrant and Anglo Canadian nonimmigrant early adolescents. He also investigated whether the sources of self-efficacy of mathematics are the same or not for both cultural groups. The participants of the study were 270 7^{th} grade students (118 male, 152 female). Of the participants 112 (44 male, 68 female) students were identified as Anglo Canadian, 158 (74 male, 84 female) were identified as Indo Canadian. The instruments of the study were, fathers' level of education, self-efficacy for math, sources of self-efficacy, fear of academic failure, math self-concept, perceived parental value of academics and individualism/collectivism scale. The results showed that all four sources of self-efficacy is related to math self-efficacy for both groups. The standard multiple regression analysis revealed that for Anglo Canadian group past performance and emotional arousal were the only significant contributors to the explanation of math self-efficacy ($R^2 = .26$, $F(4, 107) = 9.46$, $p < .01$). For the Indo Canadian group all of the sources contributed to the equation significantly. Past performance was the strongest predictor of self-efficacy beliefs ($\beta = .306$, $p < .01$). It is followed by vicarious learning ($\beta = .188$, $p < .01$), emotional arousal ($\beta = -.170$, $p < .02$), and social persuasion ($\beta = .152$, $p < .05$). The researcher concluded cultural influences on self-efficacy formation in terms of individualistic/collectivist society structure. He stated that the individualistic structure of western culture influences the sources in self-directedness (e.g. past performance and emotional arousal). However, he stated that the collectivist nature of eastern cultures influence the sources in the direction of being other oriented (the presence of social persuasions and vicarious experience in the regression equation).

In addition, in a recent qualitative study conducted by Usher (2009) sources of mathematics self-efficacy of eight elementary school students was examined. The participants of the study were eight 8^{th} grade students who are enrolled in a suburban school in southern US. A semi structured interview protocol is adapted for elementary school students from Zeldin and Pajares

(2000). The qualitative study showed that students make use of the four hypothesized sources of self-efficacy in forming their efficacy beliefs. Additionally, this study revealed presence of extra self-efficacy source namely, teaching structures, course placement, and students self-regulated learning. Therefore, the study demonstrated that additional sources which were not hypothesized by Bandura can be effective in the formation of elementary school students' self-efficacy beliefs. This finding was in congruence with the finding obtained in Hutchison, Follman, Sumpter, and Bodner (2006) study which revealed understanding / learning course material, drive and motivation, and teaming as the sources of self-efficacy among first year engineering students.

One of the few studies in Turkey regarding sources of self-efficacy was conducted by Özyürek (2005). In the study, the relationships between sources of math related self-efficacy and self-efficacy, interest, and math weighted majors' preferences were investigated. Participants of the study were 590 ninth (109 females, 113 males), tenth (76 females, 115 males) and eleventh (90 females 87 males) grade high school students enrolled in state and private high schools in a southern city of Turkey. The instruments of the study were, "Measurement of Information Sources of Math-Related Self-Efficacy", Math Related Self-Efficacy Measurements, Mathematics Interest Measurement and instruments for measuring math-weighted goals. As a result, all sources but vicarious learning predicted self-efficacy. Also, sources had a significant indirect impact on interest through math-related self-efficacy.

Overall, the above-mentioned literature on mathematics self-efficacy and its sources revealed that mastery experience (past performance) was the prominent source (Lopez & Lent, 1992; Lent, 1991; Klassen, 2004; Usher, 2009) of math self-efficacy. Emotional arousal came as the second most mentioned source (Lopez & Lent, 1992; Hodges & Murphy, 2009; Klassen, 2004). Vicarious experience was also found as a significant contributor (Hodges & Murphy, 2009) to the self-efficacy. A cross cultural investigation by Klassen (2004) revealed that western cultures adopted self-oriented sources (past performance and emotional arousal). However, east originated immigrants used all of the sources, prominently

mastery experience, for developing their self-efficacy. The lack of other oriented sources in Anglo-Canadian students was associated with the cultural structure of the west because western cultures are far more individualistic. Other than hypothesized sources, newly sources were stated in some studies. Klassen, (2004) found that teaching structures, course placement, and students self-regulated learning were considered as sources of self-efficacy by the students. Similarly Hutchison et al., (2006) revealed extra sources as teaching structures, course placement, and students self-regulated learning.

One of the few studies on science self-efficacy and its sources was investigated by Britner and Pajares (2006). Participants were 319 elementary school students (155 boys, 164 girls) from a public elementary school in a small Midwestern city in US. They used Sources of Science Self-Efficacy Scale which was developed by Lent et al. (1991) for measuring the same constructs in mathematics domain. Factor analysis was applied in order to identify the latent constructs. Multiple regression analysis was conducted to reveal the contribution made by each source individually. Of the four sources, only mastery experience significantly predicted science self-efficacy (beta = 0.494) for the full sample, beta = 0.403 for boys and beta = 0.598 for girls. Also mastery experience has made the largest contribution of unique variance in each case (24 % for the full sample, 17 % for boys and 35 % for girls). The remaining sources have made only minor contributions to the prediction of science self-efficacy.

In other study, Usher and Pajares (2006) examined sources of academic and self-regulatory efficacy beliefs of entering elementary school students and explored whether these sources differ as a function of gender, reading ability, and race/ethnicity. Participants were 263 (140 females and 123 boys) 6^{th} grade students from a public suburban elementary school in the Southeastern US. They used adapted version of Sources of Self-Efficacy Scale for academic domain. Also they used The Academic Self-Efficacy scale for academic self-efficacy and Self-Efficacy for self-regulated learning for assessing self-efficacy for self-regulation. They firstly conducted separate ANOVA's to determine gender, race/ethnicity, and reading ability level differences in the four sources, academic self-efficacy,

self-efficacy for self-regulation, and reading scale. Then, they conducted multiple regression analysis to identify the influence of the sources on academic self-efficacy and self-efficacy for self-regulation. The results indicated that each of the sources predicted self-efficacy for self-regulation for the full sample. Mastery experience, social persuasions, and physiological state predicted academic self-efficacy. Mastery experience was the most influent source in both constructs. In addition, for girls, verbal persuasions was the only other source predicting self-efficacy for academic performance (β = .376) and self-efficacy for self-regulation (β = .286). On the other hand boys' mastery experience explained greater unique variance of self-efficacy than the set of other sources. (27 % academic self-efficacy; 18 % self-efficacy for self-regulation).

In addition, Zeldin and Pajares (2000) investigated the sources of self-efficacy beliefs of women in career areas as mathematics, science and technology. Also they examined how their efficacy beliefs influenced their academic and career choices. They used a qualitative methodology in order to get a deep insight on their beliefs. Participants of the study were 15 women who were pursuing careers in mathematics, science or technology. They interviewed with each participant by one by. The results of the study revealed that the sources of self-efficacy of women in such careers are mostly verbal persuasions and vicarious experience. The characteristics of such careers belong mostly to males. So, researchers attribute these sources to this phenomenon because the widely accepted prominent source, mastery experience, was not the first one for women in careers of math, science and technology. The complementary of this study was conducted in following years: Zeldin et al. (2008) investigated the personal stories of men who selected careers in science, technology, engineering, or mathematics in order to know how their self-efficacy were formed and subsequently affected their academic and career choices. The study was qualitative in nature. Semi-structured interviews were conducted. The participants of the study were 10 Caucasian men dealing with science, technology, engineering, or mathematics careers. The results have indicated that mastery experience was the primary source of the men's self-efficacy beliefs.

Moreover, Luzzo et al. (1999) conducted a research on career undecided college students. The aim of the study was to evaluate the effects of performance accomplishments and vicarious learning experiences on math/science self-efficacy and career interests, goals and actions. The participants of the study were 94 freshmen (55 females, 39 males) at a large public university. The instruments of the study were; ACT mathematics score, Math/Science course self-efficacy scale, self-efficacy for technical/scientific fields scale, math/science occupational self-efficacy scale, career interests rating scale. Researchers pre-tested students at first. After pre-test, they randomly assigned students to four experimental conditions: no treatment (n = 24), vicarious learning only treatment (n = 22), performance accomplishment only treatment (n = 22), or the vicarious learning and performance accomplishment combined treatment (n = 26). Immediately after the treatment and again four weeks later, participants completed the same scales again. Results present generally statistically significant relationships between math/science self-efficacy and measures of career choice interests and actions. As expected, performance accomplishments source was superior to vicarious learning source. The only statistically significant effect resulted from performance accomplishment treatment immediately after the experimental condition on students' self-efficacy for math/science related courses. The students who were exposed to vicarious learning treatment showed any significant change in math/science self-efficacy or in any of the career choices, goals, and action measures.

In other study, Chin & Kameoka (2002) investigated psychosocial and contextual factors of self-efficacy beliefs about educational and occupational attainment among Hispanic adolescents living in inner-city. The sample of the study consisted of 107 (44 % female, % 56 male) Hispanic children whose age range lies 10 to 13 (M = 11.28 years). The participants were dwelling in East Los Angeles and City Terrace, 97 % were Mexican American the rest being of Honduran and Guatemalan origin. The researchers developed and utilized the Self-Efficacy Scale for Future Attainment (SESFA) to reveal self-efficacy beliefs about educational and occupational attainment. The sources of self-efficacy scale

is developed by the researchers as well. However, they included previous performance, vicarious experience and social persuasion as sources. They did not include physiological/emotional arousal as a source; instead, they included two contextual factors: perceptions of neighborhood resources and perceptions of neighborhood safety. Standard multiple regression analysis was used to indicate the prediction of each source on SESFA. The sources of self-efficacy significantly explained 50 % ($R^2 = .50$; F (10, 78) = 8.00, $p < .001$) of the variance of educational self-efficacy. The sources also significantly explained the variance in the occupational part of the SESFA. ($R^2 = .32$, F (10, 56) = 2.68, $p < .01$). Regarding the unique contributions, social persuasions were found to be the strongest source for both educational and occupational self-efficacy. Previous performance predicted educational self-efficacy significantly but not occupational self-efficacy. The contextual factors did not contribute to the prediction of educational or occupational beliefs.

Overall, the aforementioned studies revealed that, as hypothesized by Bandura, mastery experience was found as the prominent source of self-efficacy in many studies. Generally, studies revealed that physiological arousal and mastery experience emerged together as the sources while vicarious experience and verbal persuasions did not. This situation is explained as "self-oriented source" phenomenon. It is stated that people generally rely more on their authentic judgments than others comments. These results are valid for mixed samples (male-female) and male samples. However, it is contradictory with the women-sampled studies because women utilize "other oriented" sources more than "self-oriented" sources. Vicarious experiences and verbal persuasions are influential in women's efficacy judgments. Also, similar findings were obtained in cross-cultural studies. While Western cultures adopt self-oriented sources, eastern cultures adopt both self and other-oriented sources. Quantitative based studies generally utilized four factor model for sources and they couldn't detect different sources for efficacy beliefs as expected. On the other hand qualitative studies could broaden the scope and detected different sources. Nevertheless, newly

emphasized sources weren't as significant predictors as the ones hypothesized by Bandura.

2.3 Consequences of Students' Self-Efficacy

In educational settings, self-efficacy beliefs of students have been examined in terms of not only its sources, but also its consequences i.e., its relation with other motivational constructs such as achievement goals, cognitive and metacognitive strategy use, and effort regulation. In the present study, students' achievement goals, their metacognition, and effort regulation are investigated as consequences of their self-efficacy beliefs in science. In the following sections each of these constructs and the relationship among them are described.

2.3.1 Achievement Goals

Goal orientation theories for achievement behaviors were firstly introduced by developmental, motivational and educational psychologists to bring an explanation about students' learning and performance on academic tasks and school works (Pintrich & Schunk, 2002). Accordingly, goal orientation theories for achievement behaviors involve the reasons or purposes individuals possess for approaching, engaging, selecting and persisting in achievement situations (Pintrich, 2000; Meece, Glienke, & Burg, 2006; Pajares et al., 2000; Ames, 1992; Linnenbrink & Pintrich, 2002; Elliot, 1999; Was, 2006; Pintrich & Schunk, 2002). In other words, achievement goals deal with why students desire the target outcome.

There can be a number of reasons why students engage in achievement behaviors leading to different goal orientations, but two of them are targeted in all goal orientation theories with different labels as learning and performance goals (Dweck & Legett, 1988), task-involved and ego-involved goals (Nicholls, 1984), task-focused and ability focused goals (Maehr & Midgley, 1991) and mastery and performance goals (Ames, 1992). Pintrich and Schunk (2002) argue that there is enough evidence for the overlap of these similar constructs. In line with their

suggestion, “mastery and performance goals” labels will be used in this review. Mastery goals focus on learning the material, mastering the task, developing skills and trying to overcome a challenging obstacle. On the other hand performance goals emphasize performance relative to others. Individuals who adopt performance goals try to surpass others, demonstrate a better performance or to attain a normative standard which enables one to best others (Meece et al., 2006; Ames, 1992; Pintrich & Schunk, 2002).

Numerous research examined performance and mastery goals in relation to various outcomes such as cognitive and metacognitive strategy use, effort regulation, self-efficacy, and extrinsic-intrinsic motivation. Findings revealed that, while mastery goals are associated with adaptive behaviors such as perceived ability, use of deep processing strategies, task engagement, effort regulation and persistence in challenging tasks (Anderman & Young, 1994; Dweck & Legett, 1988; Midgley & Urdan, 1995), performance goals are likely to be associated with maladaptive patterns of behavior like lack of persistence, using surface level learning strategies, attributing failure to lack of ability (Anderman & Young, 1994; Nolen, 1988). However, these early studies in achievement goals literature did not make a distinction between approach and avoidance goals. Recently, achievement motivation theorists proposed that motivation has an approach and avoidance dimensions (Elliot & Harackiewicz, 1996; Skaalvik; 1997). It means that individuals may try to gain success or struggle to refrain from failure (Pajares et al., 2000). Accordingly, recent research (Elliot & McGregor, 2001; Elliot & Church, 1997; Elliot & Harackiewicz, 1996) has suggested examination of four achievement goals, namely mastery approach goals, mastery avoidance goals, performance approach goals, and performance avoidance goals. While mastery approach goals represent learning and mastering the task at hand, mastery avoidance goals refer to avoiding misunderstanding or avoiding not mastering the task. Similarly, while performance approach goals represent surpassing others and showing the capability to others, performance avoidance goals refer to avoiding looking dumb or incompetent relative to others (Linnenbrink et al., 2002) (see Table 2.1). The distinction of approach-avoid dimensions revealed that

performance avoidance goals are the ones which cause maladaptive patterns of behavior (Elliot & Harackiewicz 1996; Middleton & Midgley, 1997; Skaalvik; 1997).

Table 2.1 Two Goal Orientations and Their Approach and Avoidance Forms

	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 the 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)

Note. Adapted from "Motivation in education: Theory, research, and applications" p. 219, by P.R. Pintrich, & D. H. Schunk 2002, Columbus, OH: Merrill.

Motivational theorists suggested that self-perceptions of individuals (especially self-efficacy perceptions) are strongly related to achievement goals because individuals, who have high self-efficacy beliefs set challenging goals, persist in the face of difficulty and resist quitting striving on a task (Bandura, 1997; Pintrich & Schunk, 2002). The relevant literature also provides evidence for the relation between students' self-efficacy and achievement goals. For example, the study conducted by Pajares, Britner and Valiante (2000) to examine the

relationship between self-efficacy and achievement goals revealed a positive association between students' self-efficacy and adoption of mastery goals and a negative association with performance avoidance goals. Similarly, Anderman and Midgley' (1992) study indicated a positive relationship between mastery goals and self-efficacy. In sum, relevant theory and literature suggest those students' positive expectations about their performance while accomplishing academic tasks are significantly related to their achievement goals.

2.3.2 Effort Regulation

Effort regulation or effort management refers to students' persistence and resilience even though the task is hard and challenging (Pintrich & Johnson, 1990). In other words effort regulation means the act of showing resistance on a compelling task. Bandura (1993) states that effort is directly affected by self-efficacy and it directly affects skill or performance. Accordingly, students possessing strong efficacy beliefs put forth greater effort on compelling tasks and persevere on the task when they have required skills.

However, students holding low levels of self-efficacy are easily beset by doubts about their abilities and they are more likely to abandon the task even if they possess adequate skills (Linnenbrink & Pintrich, 2003). This is the evidence of positive relation between self-efficacy and effort regulation.

Additionally Bandura (1993) asserted that self-regulatory strategies are meaningless unless students feels themselves motivated to engage in or complete the task. He states clearly that "self-directed learning requires motivation as well as cognitive and metacognitive strategies" (p. 136). Effort regulation is an observable (behavioral) endeavor and a clear indicator of self-efficacy perceptions.

2.3.3 Metacognitive Strategy Use

Metacognition is defined simply as the arrangement of cognitive processes. In other words it is "thinking about thinking" (Livingston, 1997) and "learning how to learn" (Weinert & Kluwe, 1987). Schraw and Dennison (1994)

stated that “Metacognition refers to the ability to reflect upon, understand, and control one’s learning” (p. 460). Metacognition also includes the regular control of whether a learning goal is attained or not and accordingly, to decide on a more suitable strategy to accomplish that goal (O’neil & Abedi, 1996). The intersection of metacognition with academic settings lies in the definition “learning how to learn”. To render the learnt material permanent, metacognitive strategies such as planning, monitoring and evaluating helps students to self-check and regulate their cognition (Sungur, 2007). Additionally, like motivation, metacognition is generally considered as a cornerstone in self-regulated learning (Butler & Winne, 1995; Zimmerman, 1994).

According to Flavell (1979), a well-known scholar in metacognition research, metacognition consists of both metacognitive knowledge and metacognitive experiences or regulation. Metacognitive knowledge refers to gained information about cognitive actions in order to manage cognitive processes. Metacognitive experiences or regulation involves the utilization of metacognitive strategies or metacognitive regulation. These strategies are helpful in arranging and managing learning, and they include planning and monitoring cognitive activities as well as evaluating the outcomes of these activities. A good example of utilizing metacognitive strategy use is when a student completes a chapter or section and starts self-checking what was learned or understood or what was remained remembered about the chapter or section. This self-questioning indicates the monitoring of the understanding. After investigating, the metacognitive readers go back to the problematic parts in which misunderstandings and misconceptions have occurred. They recover the comprehension via re-examining the text (Linnenbrink & Pintrich, 2003).

Metacognitive strategies are partly distinct from cognitive ones. While cognitive processes include task-related strategies like note taking, summarizing, and outlining, metacognitive strategies consists of planning and monitoring learning and deciding which strategy will be used for academic tasks (Hattie, Biggs & Purdie, 1996). In comparison with cognitive strategies, metacognitive ones are more likely a prime trait that enables one to manage and know about

one's cognition. Both cognitive and metacognitive strategies have great importance on student learning but motivation component of human nature plays a prominent role on implementing those strategies. Students, who feel themselves confident in their learning and understanding, struggle to understand schoolwork and approach tasks in a deep processing manner. They also are more metacognitive which is to say that they are more likely to plan, monitor and regulate themselves while they are working on academic tasks (Linnenbrink & Pintrich, 2003). Accordingly, Bandura (1993) asserted that students who perceive themselves as efficacious about their learning and understanding are more inclined to employ various metacognitive strategies which provide them a better look on their comprehension.

2.3.4 The Relationship among Self-Efficacy, Achievement Goals, Effort Regulation and Metacognitive Strategy Use

Preceding sections provided an overview of achievement goals, effort regulation and metacognition. This section presents the studies examining the interplay among these constructs in relation to students' self-efficacy beliefs.

In a recent study, Sungur (2007) investigated the relationships among motivational beliefs, metacognitive strategy use and effort regulation in science courses via a path model. The participants of the study were 391 (222 males, 169 females) high school students. The instrument of the study was MSLQ (Motivated strategies for Learning Questionnaire). The subscales tapping each construct were selected and utilized. The results of the study demonstrated that students holding high levels of efficacy in their learning are likely to participate in a science task or activity to learn or master it (mastery approach goals). Moreover, higher levels of self-efficacy were found to be related to higher levels of metacognitive strategy use and effort regulation.

In another study, Wolters et al. (1996) examined the relations among students' motivational beliefs (i.e. task value, self-efficacy, and test anxiety), goal orientations (i.e. learning, relative ability and extrinsic goal orientations), and their use of self-regulated learning strategies (i.e. self-reported cognitive strategy use

and regulatory strategy use). Additionally, they investigated interactions between these goal orientations and outcomes and examined potential grade level and gender differences. The participants of the study were 434 (225 females and 209 males) 7th and 8th grade students from a junior high school in a Midwestern city in US. The PALS was used to measure students' goal orientations and the MSLQ was used to measure students' motivational beliefs and strategy use. Students' course grades were used as a measure of their academic performances. Data were collected at the beginning (Time 1) and at the end (Time 2) of the academic year. The results showed that learning goal orientation (mastery goal) was positively related to adaptive motivational beliefs and self-regulated learning, while there was no relationship between learning goal orientation and test anxiety. The association between learning goal orientation and academic performance was found to be small. Performance orientation was divided into two dimensions which are relative ability goal orientations and extrinsic goal orientation. Concerning relative ability goal orientation (which mentions social comparisons, competing with other students and desiring not to seem as less competent than others), it was positively related to motivational beliefs (except anxiety) and positively related with self-regulated learning and academic performance. Regarding extrinsic goal orientation which focuses on getting external rewards such as grades and praise from teachers, parents as well as avoiding external sanctions as punishment, it was found to be negatively related to students' self-efficacy, task value, their self-regulated learning and academic performance. As expected, extrinsic goal orientation was positively linked to students' test anxiety. The results of regression analysis in time 1 and time 2 yielded significant results for learning goal orientations: More specifically, learning goals were positive predictors of task value, self-efficacy and both cognitive and self-regulatory strategy use. Learning goal orientation also continued to be the strongest predictor for these outcomes in time 2. Relative ability goal orientation positively predicted students' task value, self-efficacy and cognitive and self-regulatory strategy use. These results were significant both in time 1 and time 2. Extrinsic goal orientation strongly predicted students' level of test anxiety both in time 1 and time 2. The

researchers report that there weren't that many significant interactions across the two times. The gender and grade level differences were found to be small and suggested to be studied in further studies.

In a similar study, Pintrich and De Groot (1990) investigated the relationship between motivational beliefs (i.e. intrinsic value, self-efficacy, and test anxiety), self-regulated learning (i.e. strategy use and self-regulation) and classroom academic performance. As part of their study, the authors firstly examined the relationship between students' motivational beliefs and their self-regulated learning. The second one examined the interactions among three motivational components and their relation to self-regulated learning components. Lastly they investigated the relationship between student performance on classroom academic tasks and motivational and self-regulated learning components. The participants of the study were 173 (100 girls, 73 boys) seventh grade students from a small city school district in southern Michigan. The instrument used was subscales of MSLQ (Motivated Strategies for Learning Questionnaire). The results indicated that higher levels of self-efficacy and intrinsic value were correlated with high levels of cognitive strategy use and higher levels of self-regulation. Test anxiety was not associated with cognitive strategy use and negatively correlated with self-regulation. High achievers reported using self-regulated strategies more than low achievers. However, there were no differences between high and low achievers in terms of cognitive strategy use. Students high in intrinsic value used cognitive strategies more than low in intrinsic value and high in intrinsic value were found to be more self-regulated. And lastly, higher levels of intrinsic value and self-efficacy lead students to higher achievement across all kinds of classroom tasks. Also higher levels of cognitive strategy use and self-regulation were associated with higher levels of achievement on all tasks.

In addition, Kaplan and Midgley (1997) examined whether level of perceived academic competence moderated the relation between performance goals and patterns of adaptive or maladaptive behavior. The sample consisted of 229 seventh grade students from two elementary schools in Southeastern

Michigan. Since the study was two dimensional, the sample was split into two groups. First group consisted of 103 students (57 % female, 43% male); the second group consisted of 126 students (52% female, 48 male). The data were collected through the administration of the PALS (Patterns of adaptive Learning Survey) sub-scales which included learning goal orientation subscale, performance goal orientation subscale, perceived academic competence subscale, adaptive learning strategies subscale and maladaptive (helpless) learning strategies subscale. Additionally, students CTBS scores of math and English were used as the indicators of achievement. The results of the study revealed that regardless of level of perceived competence, performance goals were unrelated to adaptive learning strategies and they were positively related to maladaptive learning strategies. Researchers found evidence that level of perceived competence moderated the relationship between a learning goal orientation and the use of both adaptive and maladaptive learning strategies. High perceived competence group reported using more adaptive and less maladaptive learning strategies.

In other study, Pajares et al. (2000) conducted a two dimensional study concerning the relationship between achievement goals (task, performance approach, and performance avoidance), motivation constructs and gender in elementary schools' writing and science courses. In study 1 they investigated whether three types of writing achievement goals makes an independent contribution to the prediction of writing self-efficacy, writing self-concept, self-efficacy for self-regulation and writing apprehension while controlling for previous writing achievement and gender. In study 2, the same variables were used for science course for the same aim and as expected, previous science achievement, gender and race were controlled. The participants of the study were 497 (250 girls, 247 boys) students from 6^{th} (169), 7^{th} (177) and 8^{th} (151) grades. The instruments of the study were, PALS (Patterns of Adaptive Learning Survey), Academic Self-Description Questionnaire, Writing Apprehension Test and Children's Multidimensional Self-Efficacy Scales. Previous achievement measure was the GPA scores of the students. They conducted hierarchical linear regression

o analyze the data. The results of the study revealed that each of the goals predicted significantly writing self-efficacy and self-concept and added a significant amount of variance for each outcome variable. However, while task and performance approach were positively related, performance avoidance was negatively related. Task goals were related positively to self-regulation and negatively related to writing apprehension. Performance avoidance goals were negatively related to self-regulation and positively related to apprehension. In study 2, again, achievement goals added a significant amount of variance for each outcome variable. Task goals were positively related to self-efficacy, self-concept and self-efficacy for self-regulation and negatively related to science apprehension. Performance avoidance goals were unrelated with self-efficacy, negatively associated with self-concept and self-regulation and positively associated with apprehension.

Moreover, Wolters and Rosenthal (2000) examined the relations between pre-decisional beliefs including students' task value, self-efficacy, learning and performance goal orientations and five post-decisional motivational self-regulative strategies including self-consequating, environmental control, performance self-talk, mastery self-talk and interest enhancement that students use to regulate their effort and persistence on academic tasks. The participants of the study were 114 (n = 60, 53 % females and n = 54, 47 % males) 8^{th} grade students from a small city in southern US. The instruments of the study were PALS (Patterns of Adaptive Learning Survey) and five subscales each tapping self-regulative strategies. They checked for the correlations among variables first and then they utilized multiple regressions. The results of the correlations revealed that while learning goal orientation was associated with all five post-decisional strategies moderate to strong, task value and self-efficacy were significantly related to four of the five post-decisional strategies (self-consequating failed to reach significance). Performance goal orientation, on the other hand, was negatively linked to three of the post-decisional strategies (performance talk and self-consequating failed to reach significance). The results of the regression analysis indicated that task value, learning goal orientation, self-efficacy and

performance goal orientation accounted for a significant portion of the variance in all five post-decisional strategies. The amount of the variance explained ranged from 17 % (self-consequating) to 58 % (mastery talk).

Additionally, Middleton and Midgley (1997) conducted a study examining a number of hypothesized relations between motivational beliefs and self-regulation strategies of students. The participants of the study were 703 sixth grade students (49 % male and 51 % female) enrolled in 21 elementary schools in southeastern Michigan in US. The instruments used were PALS (Patterns of Adaptive Learning Survey), MSLQ (Motivated Strategies for Learning Questionnaire) and other complementary subscales developed by Zimmerman and Martinez-Pons (1988) and Arbreton (1993). Results showed that task goal orientation was positively linked to academic efficacy and self-regulated learning strategies and negatively to avoiding help seeking. Performance avoidance goal orientation, on the other hand, was found to be negatively associated with self-efficacy and positively associated with both avoiding help seeking and test anxiety. Performance approach goals were not significantly related to the avoidance of help seeking, self-efficacy and self-regulated learning. However, it was weakly related to test anxiety.

Recently, Sungur and Senler (2009) investigated Turkish high school students' metacognition and its relation to achievement goals (mastery approach, mastery avoidance, and performance approach and performance avoidance), perceived competence and perceived classroom environment (challenge and threat). The participants of the study were 141 (67 boys, 74 girls) high school students from different schools in urban area. The instruments of the study were MAI (Metacognitive Awareness Inventory), AGQ (The Achievement Goal Questionnaire), The Competence Expectancy Scale and The Challenge and Threat Construals. The results of the study revealed that all types of goal orientations (mastery approach goals, performance approach goals, mastery avoidance goals and mastery avoidance goals) are significantly and positively associated with each other and knowledge and regulation of cognition component of metacognition. Overall, the general results demonstrated that the motivational variables goal

orientations, competence expectations, and perceived classroom environment are found to be positively linked to students' metacognition.

Overall, the aforementioned studies revealed that directly or indirectly self-efficacy influences the goal orientations, effort regulations and metacognitions of students. It is also clear that students holding high efficacy beliefs tend to regulate their effort, approach academic tasks in a positive manner and set challenging goals. They also utilize various metacognitive strategies more than students who possess low efficacy beliefs. Students with high efficacy beliefs tend to adopt learning or mastery goal orientations more than performance approach goals.

2.4 Summary

In this chapter, research studies related to the variables of this study were reviewed. Studies investigating sources of self-efficacy demonstrated mastery experience as the most powerful source of students' self-efficacy across different domains. On the other hand, predictive power of the remaining hypothesized sources of self-efficacy (i.e. verbal persuasions, vicarious experience, and emotional arousal) were found be inconsistent among the studies. Moreover, qualitative studies presented new sources of self-efficacy beliefs such as teaching structures, course placement, and students' self-regulation. On the other hand, studies combining motivational beliefs and learning strategies possess more consistency than the studies conducted in sources of self-efficacy research. The results of the studies combining motivational beliefs (self-efficacy, goal orientations, intrinsic motivation, test anxiety, etc.) and learning strategies (metacognition, rehearsal, elaboration, etc.) generally demonstrated that students holding higher levels of self-efficacy tended to use more self-regulatory strategies, effort regulation, and metacognition.

CHAPTER 3

METHOD

In the previous chapters, significance of the study, definition of terms, review of related literature were presented. In the following chapter, population and sample, instruments of the study, procedure, and data analysis, assumptions and limitations of the study, internal and external validity of the study will be explained briefly.

3.1 Design of the Study

In the present study, the relationship between elementary 8th grade students' sources and consequences of science self-efficacy were investigated. As sources of science self-efficacy, mastery experience, vicarious experience, verbal persuasions and emotional arousal; and as consequences of science self-efficacy achievement goals, metacognition and effort regulation were investigated. The study is a quantitative research which relies on data from students' self-reports. The design of the study could be stated as a correlational study.

3.2 Population and Sample

All 8th grade public elementary school students in Ankara province of Turkey were identified as the target population of the study. Due to the fact that it is so hard to reach the target population, all 8th grade students in public schools of Çankaya district of Ankara was determined as the accessible population. This is the population which the results of the study have been generalized.

To reach the representative sample of this study, cluster random sampling integrated with convenience sampling method was used. Çankaya district of Ankara, from which the sample was chosen, was selected by convenience sampling method. The schools, which were thought as clusters, were randomly

selected from the district. The number of elementary schools in Çankaya district is 103 and the number of participating schools to this study was 21. All of the classrooms of 21 participating schools were included in the present study.

Detailed information about the characteristics of the sample was provided in Table 3.1. As indicated in the table, a total of 1932 eight grade students (52.4 % boys, 46.9 % girls) attending to 21 public elementary schools throughout the Çankaya district were enrolled in the study. The mean age of the students was 14.09, (*SD* = *.386*). Majority of the students had a cGPA of 3 and above.

Table 3.1 General Characteristics of the Sample

	Frequency (f)	Percentage (%)
Gender		
Male	1013	52.4
Female	906	46.9
Missing	13	0.7
Date of Birth		
1994	16	.8
1995	183	9.5
1996	1617	83.7
1997	46	2.4
Missing	70	
Science GPA		
1	161	8.3
2	223	11.5
3	417	21.6
4	558	28.9
5	13	.7
Missing	560	29.0

Table 3.2 presents information concerning participants' socio-economic status (SES). Educational level of the parents, job status, and presence of a computer at home, internet access, buying a daily newspaper, number of books at home, presence of a separate study room and number of siblings were considered

as indicators of SES level. As shown in the table, more than half of the parents were either high school or university graduates. While great majority of the fathers (85.1 %) had a regular job, approximately half of the mothers did not (55.9 %). More than two thirds of the students were either single child or had only one sibling. Great majority of them had a separate room (87.5 %) and a computer at home (89.8 %). However, nearly three fourths of them had internet access. More than one-fourth (31.3 %) had books ranging from 26 to 100. Above half of the participants reported that they sometimes (57.3 %) buy newspaper.

Table 3.2 Socio-economic Status of the Sample

Educational Level	Mother		Father	
	f	%	*f*	%
Illiterate	36	1,9	3	.2
Primary school	444	23.0	235	12.2
Secondary school	304	15.7	295	15.3
High school	586	30.3	594	30.7
University	461	23.9	578	29.9
Master	69	3.6	164	8.5
Doctorate	11	.6	40	2.1
Missing	21	1.1	23	1.2
Occupation				
Yes	679	35.1	1645	85.1
No	1080	55.9	44	2.3
Not a Regular Work	41	2.1	52	2.7
Retired	109	5.6	160	8.3
Missing	23	1.2	31	1.6

Number of Siblings		
1	475	24.6
2	812	42.0
3	384	19.9
4	116	6.0
5 and above	62	3.2
Missing	83	4.3

Table 3.2 Continued

Separate Study Room		
Yes	1691	87.5
No	223	11.5
Missing	18	.9
Computer at Home		
Yes	1735	89.8
No	177	9.2
Missing	20	1.0
Internet Access		
Yes	1477	76.4
No	424	21.9
Missing	31	1.6
Daily Newspaper		
Never	112	5.8
Sometimes	1108	57.3
Always	667	34.5
Missing	45	2.3
Books at Home		
Any or few (0 - 10)	93	4.8
11 – 25	338	17.5
26 – 100	604	31.3
101 – 200	421	21.8
Over 200	455	23.6
Missing	21	1.1

3.3 Data Collection Instruments

In the present study, the data were collected using four instruments namely, Demographical Questionnaire (see Appendix A), Sources of Science Self Efficacy Scale (SSSE) (see Appendix B), Motivated Strategies for Learning Questionnaire (MSLQ) (see Appendix C), and Achievement Goal Questionnaire (AGQ) (see Appendix D).

3.3.1 The Demographical Questionnaire

This questionnaire was used to get information concerning students' gender, age, last semester science grade, and socio-economic status. The SES items investigated number of siblings, mother occupation, father occupation,

mother education level, father education level, buying daily newspaper, presence of a separate study room, presence of a computer at home, internet access, and number of books at home.

3.3.2 The Sources of Science Self-Efficacy Scale (SSSE)

The Sources of Science Self-Efficacy scale, which is a five point Likert scale ranging from "5 = strongly agree" to "1 = strongly disagree", was used to assess eight grade students' sources of science self-efficacy beliefs. The SSSE was originally developed by Lent et al. (1991) to assess college students' sources of mathematics self-efficacy beliefs. The original version of the scale consisted of 40 items assessing four hypothesized sources of self-efficacy, namely, mastery experience (10 items), vicarious experience (10 items), verbal persuasions (10 items) and emotional arousal (10 items). During its development, Lent et al. (1991) pilot tested the instrument with a sample of 27 participants. They explored test–retest correlations of those scales in a two-week interval. After two weeks, the scales demonstrated stable reliability values: personal performance accomplishments .96, vicarious learning .85, social persuasions .91, and emotional arousal .91. After that pilot study, they tested the instrument with a sample of 138 introductory psychology students (53 men and 85 women). Internal consistency reliabilities of this sample were .86 for mastery experience, .56 for vicarious experience, .74 for verbal persuasions and .90 for emotional arousal.

The instrument was translated and adapted into Turkish by the researcher. Since, the instrument was originally developed for college students to assess the sources of their mathematics self-efficacy beliefs, during its adaptation for Turkish elementary students, some of the items which were not compatible with this grade level and Turkish educational system, in general, were deleted. For example, in the verbal persuasion sub-scale, there was an item "My friends have discouraged me from taking math (science and technology) courses". This item was not appropriate for elementary students since in Turkey science and technology is a must course in each elementary grade level. Another item deleted from the instrument belongs to mastery experience sub-scale: "I have received

special awards for my math ability". In Turkey, it is not common for elementary students to get special prizes for their grades or abilities in a specific course domain. Therefore this item was also deleted. After the adaptation and translation of the instrument, it consisted of 35 items: mastery experiences (7 items), vicarious experiences (10 items), verbal persuasions (8 items) and emotional arousal (10 items).

Translated version of the instrument was examined by two instructors from the faculty of education – science education department for its content validity. They also judged the quality of items concerning clarity, sentence structure, and comprehensiveness. In addition, the grammar structure of the translation was examined by one of the instructors from Academic Writing Center of METU. According to the suggestions of instructors from both faculty of education and Academic Writing Center, the instrument was revised. After that, the instrument was read by 5 elementary 8^{th} grade students. Some words were changed with their synonyms. This revision made the items more clear and understandable by 8^{th} grade students. The instrument was pilot tested with 208 8^{th} grade public elementary school students. Administration took approximately one class hour. The data obtained from pilot study were first entered to PASW and then confirmatory factor analysis was conducted using LISREL. Before conducting factor analysis and calculating reliability coefficients, negatively worded emotional arousal items were reverse scored because this subscale included both positively and negatively worded items. Such a reversion enabled higher emotional arousal scores as indicating lower levels of anxiety and stress. Table 3.3 indicates description of the subscales as well as some sample items for each subscale.

Table 3.3 Subscales of SSSE

Subscale	Description	Sample Item	*n* of items
Mastery experience	Authentic experiences which present one's all endeavors to attain success	When I come across a tough science and technology problem, I work at it until I solve it.	5
Vicarious Experience	The calibration of capabilities in comparison with others	My favorite teachers were usually science and technology teachers.	10
Verbal Persuasion	The supporting and encouraging messages that people get from others	Other people generally see me as being poor at science and technology course.	6
Emotional Arousal	Physiological states such as Stress, fatigue, mood, tension, emotion, and pain may influence people's self-efficacy beliefs	I get a sinking feeling when I think of trying hard science and technology problems.	10

Table 3.4 Subscale Reliability Coefficients of SSSE

	Reliability (pilot study)	Reliability Original Version	Number of Items
Mastery Experience	.54	.86	7
Vicarious Experience	.61	.56	10
Verbal Persuasions	.31	.74	8
Emotional Arousal	.85	.90	10

When item-total correlations were examined for each factor, it was found that two of the items from the "mastery experience" and "verbal persuasions" factors did not contribute well to the total variability, resulting in a low reliability coefficient of .54 and .31, respectively. Deletion of these items led to increase of Cronbach alpha coefficient to .68 for "mastery experience" and to .62 for "verbal persuasions" (see Table 3.4).

Then, confirmatory factor analysis was conducted without deleting the problematic items as indicated by reliability analyses. Four indexes, namely Root Mean Square Error of Approximation (RMSEA), Root Mean Square Residuals (SRMR), Goodness of Fit Index (GFI), and Comparative Fit Index (CFI) were presented as fit statistics. The Root Mean Squared Error of Approximation (RMSEA) values below .10 and the Root Mean Square Residuals (SRMR) values below .05 are accepted as regular fit values. Moreover, Goodness of Fit Index (GFI) greater than .90 and Comparative Fit Index (CFI) higher than .90 indicate a good fit to the data (Hu & Bentler, 1999, as cited in Tabachnick & Fidell, 2007).

Table 3.5 CFA Results of Pilot Study

Subscale name	RMSEA	SRMR	GFI	CFI
Mastery Experience	.13	.90	.92	.79
Vicarious Experience	.07	.07	.94	.89
Verbal Persuasions	.13	.09	.91	.78
Emotional Arousal	.10	.06	.91	.93

As shown in Table 3.5, the fit indices revealed that although there was a good model to data fit for vicarious experience and emotional arousal, the model fit for mastery experience and verbal persuasions was not acceptable. Considering reliability analyses and confirmatory factor analyses results, 2 of the items from mastery experience and verbal persuasions sub-scales, which did not contribute well to the total variability and had very low factor loading, were deleted and a second CFA was conducted on the remaining data. Since the second CFA revealed a good model fit for all of the sub-scales (see Table 3.6), in the main study, these problematic items were not included and the number of items per subscale was as follows: mastery experience 5 items, vicarious experience 10 items, verbal persuasions 6 items and emotional arousal 10 items.

Table 3.6 CFA Results after Item Deletion

Subscale name	RMSEA	SRMR	GFI	CFI
Mastery Experience	.10	.04	.97	.95
Vicarious Experience	.07	.07	.94	.89
Verbal Persuasions	.08	.04	.98	.96
Emotional Arousal	.10	.06	.91	.93

In the main study, the results in the following table were obtained in terms of CFA fit indices and reliability coefficients for SSSE (see Table 3.7).

Table 3.7 CFA Results and Reliability Coefficients of the Main Study

Subscale name	RMSEA	SRMR	GFI	CFI	Reliability
Mastery Experience	.06	.02	.99	.97	.71
Vicarious Experience	08	.06	.95	.73	.54
Verbal Persuasions	.10	.05	.97	.90	.58
Emotional Arousal	.11	.05	.92	.90	.83

3.3.3 Motivated Strategies for Learning Questionnaire (MSLQ)

Motivated Strategies for Learning Questionnaire (MSLQ), a self-report instrument on a seven-point Likert scale, (1 = not at all true of me to 7 = very true of me), developed by Pintrich, Smith, Garcia, and McKeachie (1993) was used to asses students' self-efficacy beliefs, effort regulation and their use of various cognitive and metacognitive strategies.

The MSLQ has two main sections: motivation section and learning strategies section. Motivation section includes 31 items in 6 sub-scales. Learning strategies section consists of 50 items in 9 sub-scales concerning students' use of different cognitive and metacognitive strategies and their management of different resources. Within the scope of the present study, only 3 of the sub-scales namely, self-efficacy for learning and performance, metacognitive strategy use, and effort regulation were used to collect data concerning students' self-efficacy, strategy use, and effort regulation.

The instrument was firstly administered by Pintrich, Smith, Garcia, and McKeachie (1991) to 380 college students. They firstly checked for alpha coefficients for each subscale. They found fairly high values of alphas for motivation section (Self-efficacy for learning and performance .93). Learning strategies section was not as high as motivation section but they also had reasonable alphas. They obtained alpha values of .77 for metacognitive strategy use and .50 for effort regulation (Table 3.7). After calculating reliability statistics, they conducted confirmatory factor analysis. The six factor model for motivation section fit the data obtained from the sample well as indicated by the fit indices of χ^2/df 3.49, GFI .77, AGFI .73 and RMR of .07. The learning strategies section also fit the data well with nine latent variables. The confirmatory Factor analysis generated following indices: χ^2/df 2.26, GFI .78, AGFI .75 and RMR of .08.

The MSLQ was translated and adapted into Turkish by Sungur (2004). During its validation, confirmatory factor analysis was conducted for each section and fit statistics similar to the original instrument were obtained (see Sungur, 2004).

Table 3.8 Subscales and Reliability Coefficients of MSLQ

	Subscales	Description	Sample item	*n* of items	Cronbach alphas (Original Version)	Cronbach alphas (present study)
Motivation	Self-efficacy for learning and performance	One's judgment of capabilities on accomplishing a given task	I believe I will receive an excellent grade in this class	8	.93	.90
Learning strategies	Metacognitive strategy use	Controlling and managing one's own cognition	During class time I often miss important points because I'm thinking of other things.	12	.77	.81
	Effort regulation	The act of showing resilience on a compelling task	I work hard to do well in this class even if I don't like what we are doing.	4	.50	.52

In order to validate factor structure for the present study, CFA was conducted for each section. The CFA results obtained from each section is presented in Table 3.9.

Table 3.9 CFA Results of MSLQ Subscales

Subscale name	RMSEA	SRMR	GFI	CFI
Self-Efficacy for Learning and Performance	.10	.03	.94	.96
Effort regulation	.03	.00	.99	.99

As shown in the table above, fit indices indicated a good model fit for each sub-scale. Also reliability coefficients presented in Table 3.8 were in acceptable ranges.

3.3.4 Achievement Goal Questionnaire (AGQ)

The Achievement Goal Questionnaire, a five point Likert-scale ranging from strongly agree to strongly disagree, developed by Elliot and McGregor (2001) to assess students' achievement goals. It includes 15 items in 4 subscales namely, mastery approach goals (3 items) performance approach goals (3 items), mastery avoidance goals (3 items), performance avoidance goals (6 items). Mastery approach goals emphasizes learning and mastering on a subject (e.g. "It is important for me to understand the content of this course as thoroughly as possible"), and performance approach goals focus on the demonstration of abilities to others (e.g. "It is important for me to do better than other students"). Mastery avoidance goals emphasize the will to refrain from misunderstanding and making mistakes (e.g. "I worry that I may not learn all that I possibly could in this class") while performance avoidance goals focus on expending effort to avoid

failure in comparison to others (e.g "My goal for science and technology class is to avoid performing poorly).

Elliot and McGregor (2001), tested the AGO with a sample of 180 (49 male, 131 female) undergraduate students. Firstly they checked the internal consistency reliabilities of this sample. They found cronbach's alpha coefficients as .87 for mastery approach, .92 for performance approach, .89 for mastery avoidance, and .83 for performance avoidance goals. To check the fit of the proposed factor structure, they applied confirmatory factor analysis. The results revealed that the data fit the model well (RMSEA = .04, TLI = .99, CFI = .99).

The instrument was translated and adapted into Turkish by Senler and Sungur (2007). They tested the adapted version with 616 elementary students through factor analyses. Both exploratory and confirmatory factor analyses results supported four-factor structure (RMSEA = .06, GFI = .92, CFI = .90, SRMR = .07). Forty-five percent of the variance was explained by the four factors. In addition, they found Cronbach's alpha coefficients as .81 for mastery approach goals, .69 for performance approach goals, .65 for mastery avoidance goals, and .64 for performance avoidance goals (see Table 3.10).

The instrument was also factor analyzed via confirmatory factor analysis for this study. While a good model to data fit was found for performance avoidance goals subscale with following fit indices: RMSEA .089, SRMR .04, GFI .97, and CFI .94, a perfect model fit was obtained for mastery approach goals, performance approach goals and mastery avoidance goals subscales (GFI = 1; CFI = 1 RMSEA = 0; SRMR = 0). Also, reliability coefficients were presented in table 3.10.

Table 3.10 Subscales and Reliability Coefficients of AGQ

Subscales	Description	Sample item	*n* of items	Cronbach alphas (Elliot & McGregor, 2001)	Cronbach alphas (Senler & Sungur, 2007)	Cronbach alphas (present study)
Mastery approach	Approaching success for own her/his sake	I want to learn as much as possible from this class.	3	.87	.81	.73
Performance approach	Approaching success for normative standarts	My goal in this class is to get a better grade than most of the other students.	3	.92	.69	.70
Mastery avoidance	Avoiding failure for own her/his sake	I worry that I may not learn all that I possibly could in this class.	3	.99	.65	.62
Performance avoidance	Avoiding failure for normative standarts	My goal in this class is to avoid performing poorly.	6	.83	.64	.75

3.4 Procedure

The current study was started with the identification of the research problem. After that the instrument, SSSE, was obtained. The permission from the authors to use it was granted and the translation and adaptation period began. Academic Writing Center help was also provided by METU. After finishing the translation and adaptation, two faculty members were consulted to check its suitability to science education domain. After their check, the instrument was read by five elementary 8th grade students whether there were ambiguous words causing misunderstandings at their age or not. After these controls, translated versions of MSLQ and AGQ were added to the final form of all scales. The necessary permissions from the Research Center for Applied Ethics of METU and Ministry of Education were granted in order to conduct human subject research. SSSE, MSLQ, and AGQ were pilot tested with 208 elementary 8th grade students in the 2008-2009 spring semester in 2 weeks period. After analysis of reliabilities and factor structures, the scales were revised and prepared for the main study. The final form of the scales were administered to 1932 elementary 8th grade students in the 2009-2010 semester in Çankaya district of Ankara. A total of 21 public elementary schools involved in the study. All data collection process is managed by the researcher. It took one hour for participants to fill out the questionnaires. All the explanations and directions were provided by the researcher in every classroom. Teacher support was needed in order to keep the class concentrated on questionnaires. The students were told that their responses will be kept confidential and they were told to fill out the questionnaires sincerely. It is also stated that this is a voluntary participating study. Any student unwilling to participate was not forced to fill out the questionnaires. No major problem was encountered during the administration of the questionnaires.

3.5 Analysis of Data

The statistical analyses were conducted using PASW and LISREL statistical programs. The gathered data were analyzed by using both descriptive and inferential statistics.

3.5.1 Descriptive Statistics

As part of descriptive statistics mean, standard deviation of the sub-scale scores and demographical information of the students and their families were presented.

3.5.2 Inferential Statistics

As inferential statistics, path analysis was used to examine the link between sources and consequences of elementary students' science self-efficacy beliefs.

3.6 Assumptions and Limitations of the Study

3.6.1 Assumptions of the Study

1. During the instruments' administration, all conditions were standard.
2. Students filled out the questionnaires sincerely.
3. Students did not interact with each other during the instruments' administration
4. The characteristics of sample of the pilot study and the actual sample of the study were assumed to be the similar and representative of the population.

3.6.2 Limitations of the Study

Although the current study provides insights into sources and consequences of elementary school students' science self-efficacy, a few limitations need to be addressed in future studies. First, a cross-sectional design was used in the current study. Future studies can use a longitudinal design in an attempt to validate causal relationships among the constructs. Second the current study examined antecedents and consequences of only elementary school students' science self-efficacy. This study can be extended to different academic domains and to students in other grade levels. Third, the findings of the present study just rely on students' responses to self-report instruments. Future

investigations can utilize qualitative data collection procedures such as interviews to validate and get an in-depth understanding of the observed relationships.

3.7 Internal Validity of the Study

Internal validity of the study refers to the differences on the dependent variable obtained in a research study is due to the independent variable, and not causing from any other unrelated variables (Fraenkel & Wallen, 2006). Possible threats to internal validity and the ways to deal with them were discussed in this section.

Since the present study is correlation in nature and no intervention takes place, some of the threats to internal validity are not applicable. These are implementation, history, maturation, attitude of subjects and regression (Fraenkel & Wallen, 2006).

While investigating the correlation between two or more characteristics of individuals (or groups), the obtained relationship can be explained by any other characteristics. This threat is known as subject characteristics in correlational research (Fraenkel & Wallen, 2006). For the present study, subject characteristic could be a threat since the relationships found might be accounted for by any other characteristics of students such as gender.

Location threat can occur if the data are collected in different locations. In the present study, the data were gathered from 21 different schools and approximately 60 classrooms. However, all the school involved in the study was public schools in the same district with similar resources and physical conditions. Therefore, the instruments were administrated to the participants in their own classroom with similar testing conditions so location was not considered to be a prominent threat to internal validity. Moreover, in the current study, instrument decay and data collector bias, are not considered to be a threat to internal validity. Instrument decay tends to occur mostly in observational studies when a particular instrument is used many times. In the present study, all the instruments were administered just once and at the same time. The instruments contained objective type self-report items and all scorings were done by optical mark reader machine.

Therefore, data collector bias was not a concern for the present study, as well. Data collector bias occurs when the data collector alters the data unconsciously to get certain outcomes. Moreover, since the data for the present study was collected by the researcher himself, data collector characteristics could not be a threat considering the variables of the study.

Additionally, mortality generally is not seen as an internal validity threat for correlational studies because excluding the data of lost subject from the study solves the problem (Fraenkel & Wallen, 2006). However, mortality may be an external validity threat since the firstly specified sample would not be the same with the actual sample. Therefore, the remaining data may be influenced by the ones who refused to participate but specified as a participant of the study by the researcher at the outset. Concerning the present study, some of the school principals refused to participate in the study although the required permissions were granted. Additionally, the instruments were administered to the willing participants; in other words, voluntarily. Therefore, the ones who refused to participate may influence the correlations; mortality could be an external validity threat for the present study.

On the other hand, testing can be threat to internal validity of the present study because in correlation studies students' responses to an instrument can be affected by their responses to previous instruments. The instruments of the present study were administered at the same time; students might have seen connections between items. Therefore, testing could be a threat for this study.

3.8 External Validity of the Study

External validity can be defined as the generalizability of the findings of the research studies (Fraenkel & Wallen, 2006). In this study, the sample was intended to be defined randomly but due to the administrative restrictions, this would not be possible. Therefore, the representativeness of the sample might be influenced by the sample selection. On the other hand, Çankaya district has 103 elementary schools and data were gathered from 21 schools. Although, the

selection of the sample was convenient, the large sample size enables the generalizability of the findings.

CHAPTER 4

RESULTS

This chapter presents the results of the statistical analyses. It consists of two sections. The first section includes descriptive statistics. Second section presents the inferential statistics for the relationship among elementary school students' sources of self-efficacy, metacognition, effort regulation, self-efficacy, and achievement goals in science.

4.1 Descriptive Statistics

As descriptive statistics, means and standard deviations, skewness and kurtosis values for sources of self-efficacy (mastery experience, vicarious experience, verbal persuasions and emotional arousal), self-efficacy, effort regulations, metacognition, and achievement goals (mastery approach, mastery avoidance, performance approach and performance avoidance) are presented in Table 4.1. According to skewness and kurtosis values for all constructs, all the values are in acceptable ranges (between -2, +2). They are all normally distributed.

Table 4.1 Means, Standard Deviations, Skewness and Kurtosis Values for Sources of Self-Efficacy, Self-Efficacy, Metacognition and Achievement Goals

	M	*SD*	*Skewness*	*Kurtosis*
Mastery Experience	3.28	0.82	-.11	-.27
Vicarious Experience	3.08	0.53	-.04	.02
Verbal Persuasions	3.32	0.72	.01	-.26
Emotional Arousal	3.26	0.84	-.02	-.50
Self-Efficacy	4.93	1.41	-.57	-.29
Metacognition	4.69	1.08	-.25	-.22
Effort Regulation	4.63	1.28	-.17	-.17
Mastery Approach	3.89	0.97	-.73	-.15
Performance Approach	3.80	0.96	-.61	-.26
Mastery Avoidance	3.24	0.93	-.22	-.32
Performance Avoidance	3.49	0.84	-.54	.07

4.1.1 Examination of the Sources of Self-Efficacy

Examination of the mean scores for the sources of science self-efficacy revealed that, on a five-point scale, the highest mean score was obtained for verbal persuasion ($M = 3.32$) and the lowest mean score was obtained for vicarious experience ($M = 3.08$). Although, in general, the mean scores for the sources of science self-efficacy appeared to be comparable, the repeated measures ANOVA results indicated statistically significant mean differences in the mean level of sources of science self-efficacy (Wilks' Lambda = .88, $F(3, 1929) = 87.57$, $p = .000$, $\eta^2 = .12$). The multivariate $\eta^2 = 0.12$ demonstrated that the mean difference magnitude was partly large. The pairwise comparisons carried out using Holm's sequential Bonferroni procedure showed that among elementary school students the level of vicarious experience that they experience as a source of science self-efficacy ($M = 3.08$, $SD = .53$) was significantly lower compared to the level of verbal persuasion ($M = 3.32$, $SD = .72$), mastery experience ($M = 3.29$, $SD = .82$), and emotional arousal ($M = 3.27$, $SD = .84$). Magnitudes of the differences were medium (see Table 4.2). In addition, the level of emotional arousal was found to be lower than that of verbal persuasion. The magnitude of the difference as measured by Cohen's d was small. Remaining mean differences

between emotional arousal, verbal persuasion and mastery experience were non-significant (see Table 4.2).

Table 4.2 Pair-Wise Comparisons for Sources of Self-Efficacy

	t	*df*	*p*	*Cohen's d*
Mastery Experience-Vicarious Experience	11.94	1931	.000	.27
Mastery Experience-Verbal Persuasions	-2.13	1931	.034	.05
Mastery Experience-Emotional Arousal	1.27	1931	.205	.03
Vicarious Experience-Verbal Persuasions	-15.77	1931	.000	.36
Vicarious Experience Emotional Arousal	-10.21	1931	.000	.24
Verbal Persuasions-Emotional Arousal	2.94	1931	.003	.07

4.1.2 Examination of the Achievement Goals

Examination of the mean scores for achievement goals suggested that elementary school students tend to hold higher levels of approach goals than avoidance goals in science classes (see Table 4.1). Therefore, they appeared to study for the reasons of learning, understanding, showing their abilities to others, and getting the best grades more than avoiding misunderstanding or getting the worst grades. Overall, the repeated measures ANOVA results revealed that there were statistically significant differences in means among four achievement goals (Wilks' Lambda = .75, F (3, 1929) = 216.85, p = .000, η^2 = .25). The multivariate η^2 = .25 showed that the magnitude of the difference in means is large. All pairwise comparisons were found to be significant with small to medium effect sizes (see Table 4.3). In terms of approach inclinations of 8th grade Turkish students, they were found to be more mastery approach oriented (M = 3.89, SD = 0.97) than performance approach (M = 3.80, SD = 0.96) (t (1931) = 4.46, p = 0.000) with a small effect size (d = .10). It means that students strive to learn

and understand more than getting the best grades or surpassing others. Concerning avoidance tendencies, students were found to be more performance avoidance oriented (M = 3.49, SD = 0.85) than mastery avoidance oriented (M = 3.24, SD = 0.93) (t (1931) = -12.15, p = 0.000) with a medium effect size (d = .28). It is to say that students are worried about looking stupid or getting the worst grades more than not understanding what is taught in class. With respect to approach and avoidance tendencies of students, there is a statistically significant difference in favor of approach goals (see Table 4.3). It is concluded from the approach - avoidance pairs that students are more likely striving to understand and perform better than others rather than refraining to perform poorly and avoid not mastering the task.

The largest difference was obtained between mastery approach (M = 3.89, SD = 0.97) and mastery avoidance goals (M = 3.24, SD = 0.93) (t (1931) = 24.70, p = 0.000) with a large effect size (d = .56). Also a large difference was found between performance approach (M = 3.80, SD = 0.96) and mastery avoidance (M = 3.24, SD = 0.93) (t (1931) = 21.45, p = 0.000). Additionally, the lowest mean score obtained in achievement goals belongs to mastery avoidance (M = 3.24, SD = 0.93).

Table 4.3 Pair-wise Comparisons for Achievement Goals

	t	*df*	*p*	*Cohen's d*
Mastery Approach-Performance Approach	4.46	1931	.000	.10
Mastery Approach-Mastery Avoidance	24.70	1931	.000	.56
Mastery Approach-Performance Avoidance	17.21	1931	.000	.40
Performance Approach-Mastery Avoidance	21.45	1931	.000	.49
Performance Approach-Performance Avoidance	15.55	1931	.000	.35
Mastery Avoidance-Performance Avoidance	-12.15	1931	.000	.28

4.1.3 Examination of the Metacognition, Effort Regulation, and Science Self-Efficacy

Concerning the descriptive statistics for metacognition, effort regulation, science self-efficacy, the mean scores on a seven-point scale showed that elementary school students tend to demonstrate moderate levels of metacognition (M = 4.69) and effort regulation (M = 4.64) in science classes. Additionally, they appeared to have a moderate level of science self-efficacy (M = 4.93).

4.2 Inferential Statistics

4.2.1 Examination of the Relationships between Sources and Consequences of Science Self-Efficacy

The conceptual model presenting the relationship among elementary school students' sources of self-efficacy, metacognition, effort regulation, self-efficacy, and achievement goals in science was tested through path analysis. The analysis was conducted using LISREL 8.30 program in the SIMPLIS programming language. The goodness of fit measures displayed in Table 4.4 revealed that the initial conceptual model did not fit the data very well. Based on these preliminary results, modifications were made and a new model was specified. In re-specified model new paths were specified from performance approach and mastery avoidance goals to performance avoidance goals. A pathway was also hypothesized from mastery approach to performance approach goals. Additionally, two new paths were specified leading from verbal persuasion to mastery approach goals and from emotional arousal to effort regulation (see *Figure 4.1*).

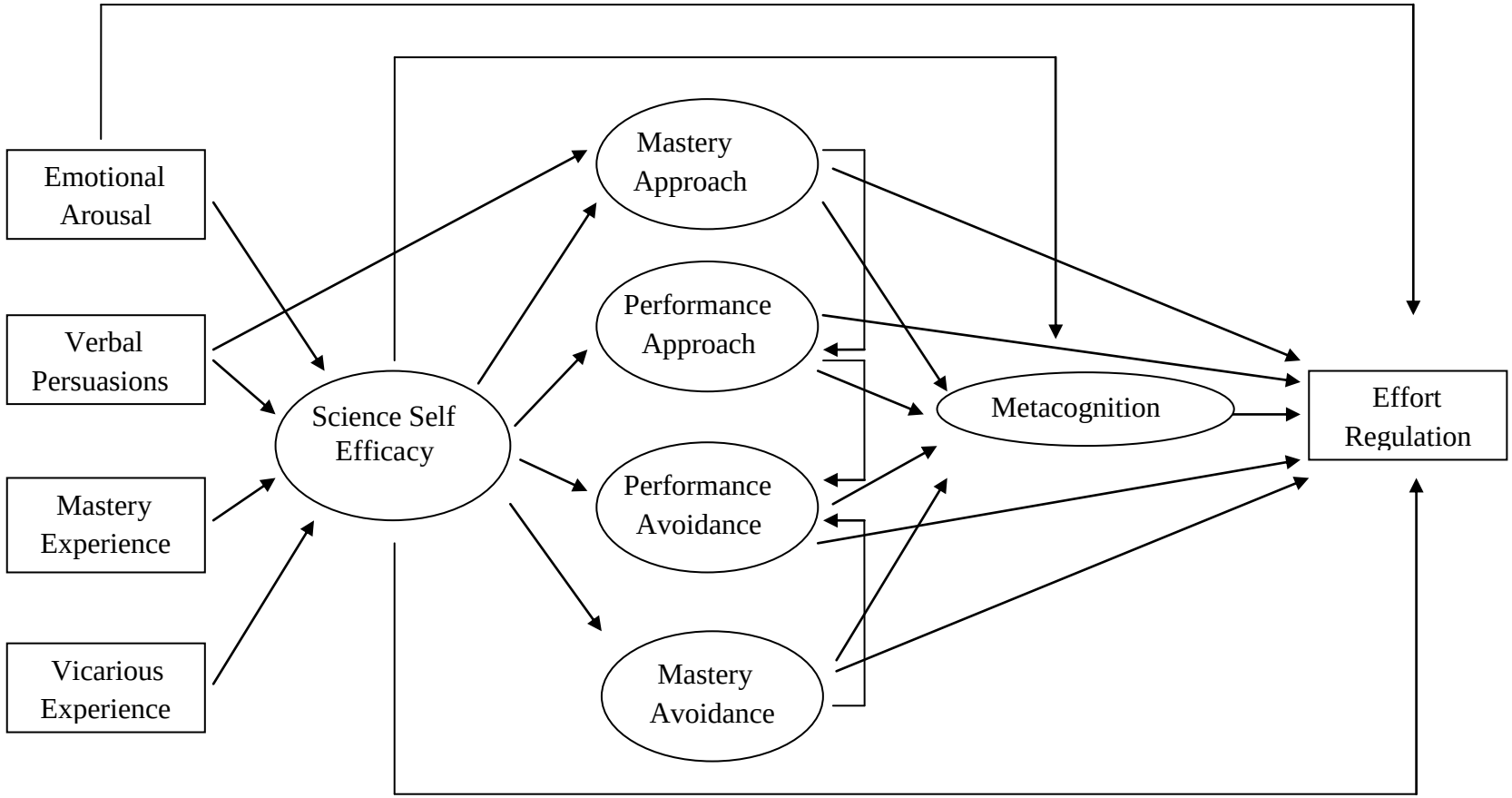


Figure 4.1 Re-specified Model

Table 4.4 Measures of Model Fit For Conceptual, Re-Specified, and Adjusted Model

Model	RMSEA	SRMR	GFI	CFI
Conceptual Model	.20	.12	.82	.79
Re-specified Model	.09	.06	.97	.96
Adjusted Model	.09	.05	.97	.97

As shown in Table 4.4, the re-specified model resulted in an acceptable fit. However, since some of the sub-scale reliabilities were somewhat low which may have a biasing effect (either positive or negative) on the path coefficients (Bollen, 1989; Cohen, Cohen, Teresi, Marchi, & Valez, 1990) sensitivity analysis was also conducted for the re-specified model to examine the effect of non-perfect reliability. In sensitivity analysis, each subscale score was used as an indicator of its latent variable- and for each latent variable, measurement error was adjusted based on the desired alpha coefficient (i.e., $\alpha = .80$). Then, model fit was compared with that of the original re-specified model in which measurement error was not adjusted (see Table 4.4). Although, the fit indices of the adjusted model were found to be slightly better, since the results for the original and adjusted models were basically the same, the original re-specified model was interpreted in the following section.

The fit indices of the study provided evidence for a theoretically sound model which explains the data well. Therefore, the standardized path coefficients for direct, indirect and total effects were analyzed. The conceptual model is presented in *Figure 4.2*. The standardized path coefficients for direct effects are graphically presented in Table 4.5.

In the re-specified model, mastery experience, vicarious experience, verbal persuasion, and emotional arousal accounted for 49 % of the variance in elementary school students' science self-efficacy (see Table 4.5). More specifically, results demonstrated that mastery experience ($\beta = .44$), verbal persuasion ($\beta = .20$), and emotional arousal ($\beta = .14$) were significantly and positively associated with students' science self-efficacy. This finding implied

that, elementary school students who interpret their past performances in science classes as successful receive positive persuasion from others concerning their capabilities to accomplish given science tasks and activities, and experience an anxiety at lower levels while engaging in the tasks are likely to have higher levels of science self-efficacy.

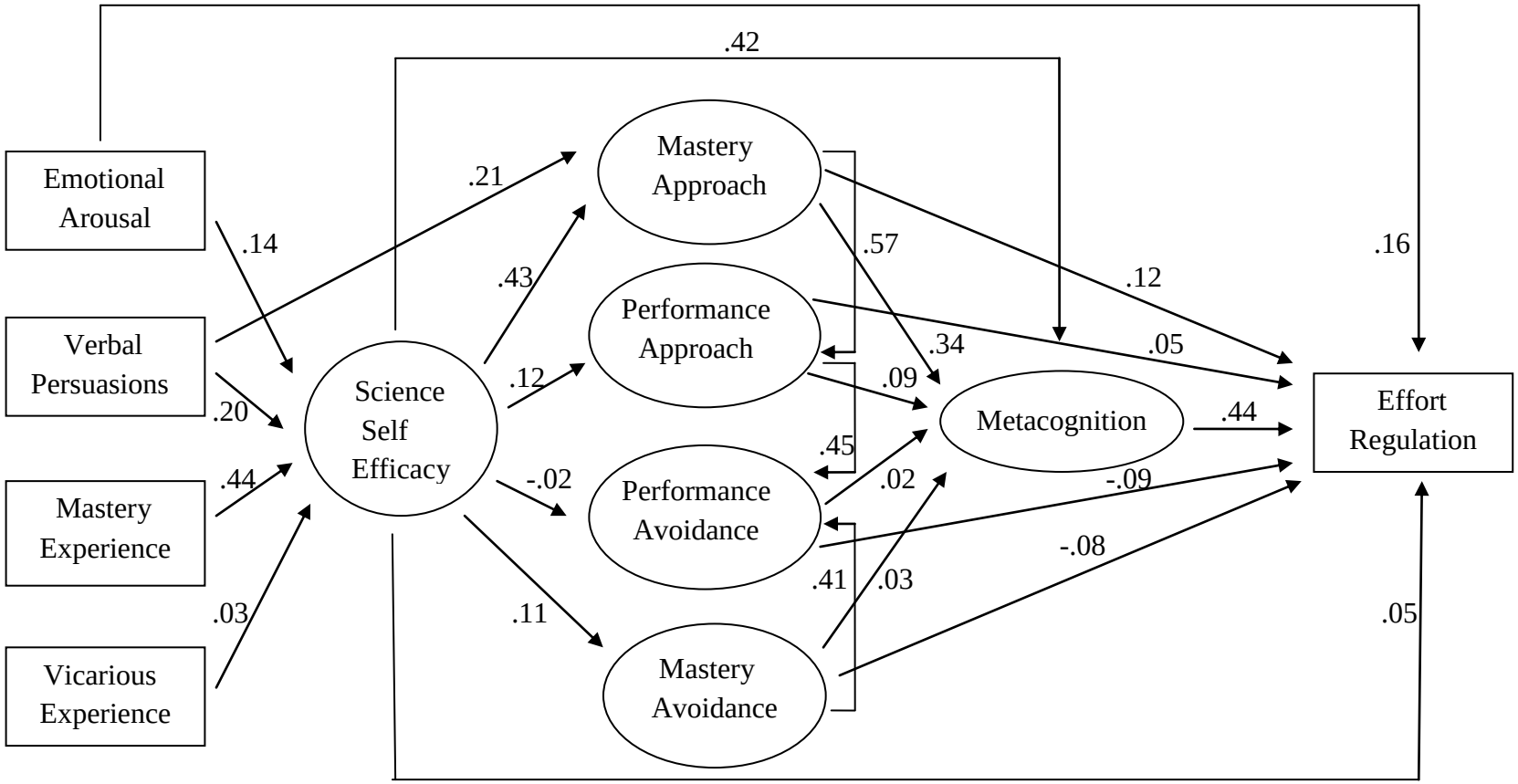


Figure 4.2 Re-specified model with the standardized path coefficients for direct effects.

Table 4.5 Direct, Indirect, and Total Effects on Science Self-Efficacy, Achievement Goals, Metacognition, and Effort Regulation Variables

Effect	*Direct Effects*	*Indirect effects*	*Total effects*	*Standard Errors of the Estimates*	*t*	R^2
On Science Self-Efficacy						
of Mastery Experience	.44	-	.44	.04	17.57*	
of Vicarious Experience	.03	-	.03	.05	1.43	.49
of Verbal Persuasions	.20	-	.20	.04	8.80*	
of Emotional Arousal	.14	-	.14	.04	6.06*	
On Mastery Approach						
of Verbal Persuasions	.21	.09	.30	.03	9.32*	.33
of Science Self-Efficacy	.43	-	.43	.02	18.81*	
On Performance Approach						
of Science Self-Efficacy	.12	.24	.36	.02	5.55*	.41
of Mastery Approach	.57	-	.57	.02	27.51*	
On Mastery Avoidance						
of Science Self-Efficacy	.11	-	.11	.02	18.81*	.01
On Performance Avoidance						
of Science Self-Efficacy	-.02	.21	.19	.01	-1.17	
of Performance Approach	.45	-	.45	.02	22.91*	.38
of Mastery Avoidance	.41	-	.41	.02	22.72*	
On Metacognition						
of Science Self-Efficacy	.42	.18	.60	.01	22.19*	
of Mastery Approach	.34	.06	.40	.02	15.58*	
of Performance Approach	.09	.01	.10	.02	4.12*	.54
of Mastery Avoidance	.03	.01	.04	.02	1.95	
of Performance Avoidance	.02	-	.02	.03	.77	
On Effort Regulation						
of Emotional Arousal	.16	.05	.21	.03	7.54*	
of Science Self-Efficacy	.05	.30	.35	.02	2.03*	.41
of Mastery Approach	.12	.17	.29	.03	4.39*	
of Performance Approach	.05	.00	.05	.03	1.83	
of Mastery Avoidance	-.08	-.02	-.10	.03	-4.25*	
of Performance Avoidance	-.09	.00	-.09	.04	-4.05*	
of Metacognition	.44	-	.44	.03	17.07*	

*Significant paths

Concerning the relationship among science self-efficacy, its sources and approach achievement goals, results demonstrated that verbal persuasion (β = .21) and science self-efficacy (β = .43) explained 33 % of the variance in mastery approach goals. This result suggested that elementary school students receiving positive verbal persuasion regarding their capabilities in science and having the belief that they have abilities to perform well in science classes tend to study for the reasons of learning and mastering the course material (*mastery approach goals*). In addition, positive relationships found between science self-efficacy (β = .12), mastery approach goals (β = .57) and performance approach goals revealed that higher levels science self-efficacy was associated with higher levels of performance approach goals. Moreover, elementary school students studying for the reasons of learning and understanding in science classes appeared to study also for the reasons of showing their abilities to other, looking smart, and obtaining a good grade (*performance approach goals*).

Regarding the relationship between science self-efficacy and avoidance goals, results showed that higher levels of science self-efficacy (β = .11) was associated with higher levels of mastery avoidance goals (R^2 = .41). While the relationship between science self-efficacy and performance avoidance goals was not significant the performance avoidance goals were found to be positively linked to performance approach (β = .45) and mastery avoidance goals (β = . 41).

In addition, path analysis results concerning the relationship between science self-efficacy, achievement goals and metacognition indicated that science self-efficacy, mastery approach goals, performance approach goals, mastery avoidance goals, and performance avoidance goals accounted for 54 % of the variance in metacognition. Among these relationships, only the associations between science self-efficacy (β = .42), mastery approach goals (β = .34), performance approach goals (β = .09) and metacognition were found to be significant. Therefore, students with higher levels of science self-efficacy and approach goals appeared to demonstrate higher levels of metacognition which involves control and regulation of cognition.

The results also revealed that emotional arousal, science self-efficacy, achievement goals, and metacognition explained 41 % of the variance in effort regulation. While the relationships between emotional arousal (β = .16), science self-efficacy (β = .05), mastery approach goals (β = .12), metacognition (β = .44) and effort regulation were found to be positive, negative relationships were observed between mastery avoidance goals (β = -.08), performance avoidance goals (β = -.09) and effort regulation. These findings suggested that elementary school students with the belief that they can accomplish tasks and activates in science classes, study for science to learn and understand, use strategies that facilitate the control and regulation of cognition, and experience anxiety and stress at lower levels while doing a task are likely to persist in the face of difficulties and distracters (*effort regulation*). On the other hand students holding avoidance goals appeared to give up easily when faced with difficulties.

4.3 Summary of the Findings

The present study showed that mastery experience, verbal persuasion, and emotional arousal are significant predictors of elementary school students' science self-efficacy. Additionally, emotional arousal was found to be positively linked to effort regulation. Moreover, the current study demonstrated a positive relationship between science self-efficacy and adaptive outcomes like adoption of approach goals, use of metacognitive strategies at higher levels, and persistence in the face of distracters and difficulties. Verbal persuasions, which are considered to be a source of self-efficacy, also predicted students' mastery approach goals significantly in science and technology course.

CHAPTER 5

CONCLUSIONS, DISCUSSIONS AND IMPLICATIONS

This chapter presents the summary of the study, conclusions, and discussion of the results, and finally addresses the implications of the study and recommendations for further studies.

5.1 Summary of the Study

This study aimed at investigating the sources and consequences of Turkish 8th grade elementary students' science self-efficacy beliefs. In line with the aims of this research study, Sources of Science Self-Efficacy Scale (SSSE), Motivated Strategies for Learning Questionnaire (MSLQ), and Achievement Goal Questionnaire (AGQ) were administered to 1932 8th grade students from the accessible population in Çankaya district of Ankara in 2009-2010 Spring semester. Path analysis was applied to reveal the correlations between sources and consequences of science self-efficacy beliefs of students. Paths were specified from sources to self-efficacy and from self-efficacy to the consequences. As sources of self-efficacy, mastery experience, vicarious experience, verbal persuasions and emotional arousal were identified. On the other hand, as consequences of self-efficacy achievement goals (mastery approach, performance approach, mastery avoidance, performance avoidance) and metacognition and effort regulation were specified.

5.2 Discussion of the Results

The present study examined antecedents and consequences of elementary school students' science self-efficacy beliefs by using a path model. Results revealed that mastery experience (β = .44), verbal persuasion (β = .20), and emotional arousal (β = .14) were significantly related to elementary school

students' science self-efficacy. The largest contribution to the prediction of science self-efficacy was made by mastery experience. This finding, consistent with related literature, implied that elementary school students' self-efficacy beliefs are strongly informed by their mastery experiences. On the other hand, vicarious experience did not significantly predict science self-efficacy (β = .03). This finding implied that, elementary school students who interpret their past performances in science classes as successful receive positive persuasion from others concerning their capabilities to accomplish given science tasks and activities, and experience an anxiety at lower levels while engaging in the tasks are likely to have higher levels of science self-efficacy. Findings of this study regarding mastery experience (past performance) are congruent with the findings in the literature. For example, in a number of studies (Lopez & Lent 1992; Lent et al., 1991; Klassen, 2004; Britner & Pajares, 2006; Usher & Pajares, 2006; Zeldin et al., 2008; Luzzo et al., 1999) mastery experience (past performance) was found as the most powerful source of self-efficacy. At this point it is important to note that, as indicated by the cross-cultural study conducted by Klassen (2004), the culture can play an important role concerning the sources of students' self-efficacy. More specifically, Klassen's study revealed that while Anglo Canadian students use mastery experience and emotional arousal as the leading sources of their math self-efficacy, indo Canadian students use four of the sources. In this study, lower levels of fear, anxiety and fatigue (i.e. emotional arousal) were found to be associated with higher levels self-efficacy. Klassen attributed the findings of the study to the individualistic and collectivistic nature of the western and eastern societies. The cultural dimensions of individualistic/collectivistic society refers to the structure of separateness and connectedness of individuals and groups (Markus & Kitayama, 1991; Triandis, 1995, as cited in Klassen, 2004). According to Kim, Triandis, Kagitcibasi, Choi, & Yoon (1994), individualistic cultures possess the characteristics of "I" consciousness, independence, individual initiative and right to privacy (as cited in Klassen, 2004). On the other hand, collectivist culture structure has an inclination of emphasizing *"*we*"* consciousness, collective identity, group solidarity, and duty (Kim et al., 1994, as

cited in Klassen 2004). Therefore, it can be concluded that, in decision making others' ideas may be more influential in eastern cultures than the western. Accordingly, while western cultures use authentic sources as mastery experience and emotional arousal, eastern cultures use four of the sources. The study conducted by Özyürek (2005) in Turkey presented similar results to Klassen's cross cultural study concerning eastern culture findings. In his study, he investigated sources of math self-efficacy of high school students and he reported that Turkish high school students use mastery experiences, verbal persuasions and emotional arousal as the sources of math self-efficacy. These findings possess similarity to the findings of the present study. In this study, it is found that Turkish elementary 8th grade students use the same sources as their high school counterparts in forming their science self-efficacy. Regardless of the grade level and domain difference, Turkish students reported the same results for math and science domains. In comparison with Klassen's study, Turkish society has similarities and commonalities with eastern cultures and it reflects on these research studies. Unlike findings in western countries, besides mastery experience, other sources are found as the significant contributor to self-efficacy.

Kagitcibasi (1997), a well-known cross-cultural and social psychologist claims that "Since the 1970's there has been a growing concern in American psychology and social sciences with unbridled individualism in western (American) society" (p. 3). The research conducted by Britner & Pajares (2006) concerning sources of science self-efficacy of elementary school students in USA supports this view. The researchers reported that mastery experience was found as the only significant predictor of science self-efficacy. However, in the present study, verbal persuasions and emotional arousals also significantly predicted science self-efficacy for 8th grade students.

At this point, it is worth mentioning that, in the present study, the gathered information about charecteristics of the sample did not include items assessing the cultural structure of the participants in terms of individualism and collectivism. Therefore, contention here presented in an attempt to provide explanation for the findings is just a speculation to orient the attention to cultural differences. In order

to attribute the results completely to cultural structure, in depth investigation regarding structure of the society is highly recommended. Additionally, since self-efficacy is a self-referent construct; individual differences might influence the sources of self-efficacy. This study is a quantitative research in nature. Therefore, it is not possible to reveal sample characteristics in terms of individual differences.

Overall, since mastery experience, social persuasion, and emotional arousal were found to be significantly associated with science self-efficacy, they can be considered as antecedents of Turkish elementary school students' science self-efficacy. However, the observed relationship between vicarious experience and self-efficacy was not significant. Descriptive statistics also revealed that, for elementary school students, the level of vicarious experience as a source of self-efficacy was the lowest compared to other sources. The mean vicarious experience score (M = 3.08) may suggest that elementary school students tend to think that they do not have much opportunity to observe others perform a science activity or have people around them who are good at science. Additionally, it should be noted that although it did not have any biasing effect on path coefficients, vicarious experience had somewhat low reliability coefficient. Similarly, in the literature, vicarious experience scales are found to be problematic with low reliability coefficients (Usher & Pajares, 2006). Accordingly, Lent, Lopez Brown, and Gore (1996) suggested that vicarious influence sub-scale items should be separated into categories so that influence of adults and peers can be assessed separately which may help documentation of the relationship between vicarious experience and self-efficacy more properly. Thus, future studies can examine vicarious influences from peers and adults separately without consolidating them into overall vicarious experience sub-scale.

Concerning the relationship between science self-efficacy and its proposed consequences, results showed that science self-efficacy was positively associated with mastery approach goals (β = .43), performance approach goals (β = .12), mastery avoidance goals (β = .11), metacognition (β = .42), and effort regulation (β = .05). This finding, in general, was consistent with the findings in the relevant

literature demonstrating that self-efficacy is positively linked to approach goals, metacognition, and effort regulation (Pajares, et al., 2000; Pintrich et al., 1993; Sungur, 2007; Wolters et al., 1996). Indeed, as reported by Hoy (2004), self-efficacious students are likely to exert greater effort, persist longer in the face of distracters and problems, and use a variety of learning strategies to accomplish given tasks. Thus, it is suggested that in order to enhance students' science self-efficacy which is found to be positively linked to adaptive outcomes, teachers should provide students with activities and tasks that will encourage students' beliefs that their science skills, knowledge, and abilities can be improved through effort. Students should be able to view the difficulties that they experience as opportunities to utilize different strategies and improve their science learning abilities (Paulsen & Feldman, 2005).

In addition, the present study revealed a positive relationship between verbal persuasion and mastery approach goals. This finding implied that students receiving positive messages from significant others concerning their abilities to accomplish science task and activities tend to study for the reasons of learning and understanding the course material. The students holding approach goals also appeared to use metacognitive strategies at higher levels and persist in the face of setbacks longer. Indeed, relevant literature demonstrated that students' achievement goals, i.e. the reasons for why they engage in academic tasks are associated with various metacognitive activities (Pintrich, 2000). More specifically, results indicated a positive association between mastery approach goals and metacognitive awareness and self-monitoring of cognition (Elliot & McGregor, 2001; Kaplan & Midgley, 1997; Pintrich, Roeser, & DeGroot, 1994). On the other hand, avoidance goals were generally found to be linked to maladaptive strategy use (Elliot & McGregor, 2001; Pintrich & Schunk, 2002). Although, there is not much research on mastery avoidance goals, the study conducted by Elliot and McGregor (2001) showed that mastery avoidance goals were related neither to deep processing nor to surface processing. In the present study, avoidance goals were found to be negatively linked to effort regulation.

Overall, the present study showed that mastery experience, verbal persuasion, and emotional arousal are significant predictors of elementary school students' science self-efficacy. Moreover, the current study demonstrated a positive relationship between science self-efficacy and adaptive outcomes like adoption of approach goals, use of metacognitive strategies at higher levels, and persistence in the face of distracters and difficulties.

5.3 Implications of the Study

The present study aimed at demonstrating the relationship between sources and consequences of science self-efficacy of Turkish elementary 8th grade students. In light of the results of the present study, it can be inferred that elementary 8th grade students primarily utilize mastery experience as the source of their science self-efficacy as well as verbal persuasion and emotional arousal. Therefore, it is suggested that science teachers help students interpret their performances in science activities and tasks in ways that strengthen their self-efficacy beliefs. In order to achieve this end, science teachers should provide students with learning environments in which the link between students' effort and accomplishments rather than normative comparisons is emphasized (Pintrich & Schunk, 2002). As suggested by Britner and Pajares (2006), teachers should scaffold authentic inquiry-based science activities so that student success can be maximized leading to higher levels of self-efficacy. Moreover, since environmental and personal factors such as perceived task difficulty, effort put forth on the task influence the students' judgments of their past performances (Bandura, 1986), science teachers should also help students make realistic and adaptive attributions on the outcomes of their performances. Additionally, teachers, parents, and significant others should convey the message that the student has a capability to successfully engage in science tasks and activities. However, the message received by the student should be realistic and appropriate. Students should not be persuaded to engage in activities considerably beyond their current knowledge and capabilities (Brtiner & Pajares, 2006; Usher & Pajares, 2006).

Additionally, since self-efficacy is directly and positively linked to mastery and performance approach goals, metacognition and effort regulation, it is recommended that regarding the aforementioned sources, teachers and parents help students to bolster their efficacy beliefs to improve their motivation and cognition. In order to achieve this end, science teachers should create learning environments which support students' beliefs that their skills and knowledge in science can be improved through their own effort. Students should be able to view the difficulties that they experience during science learning as opportunities to use different strategies and improve their abilities (Paulsen & Feldman, 2005).

5.4 Recommendations for Further Research

The present study shed light on students' sources and consequences of self-efficacy beliefs regarding science and technology course. Since the sources of self-efficacy is studied rarely both in Turkey and other countries, researchers may orient their interest to sources of self-efficacy in different domains. The available literature is mainly related to sources of math self-efficacy. Other domains still remain untouched. Future studies should focus on these domains. Moreover, this study is quantitative in nature. There are also qualitative studies in the literature. Therefore, to gain a deep insight and extend the number of significant sources of self-efficacy, there is a need for more qualitative studies. The data analyzed in this study were gathered from Çankaya district of Ankara province. Since, the cultural and contextual factors might influence the sources of self-efficacy beliefs, it is recommended to future researchers to collect data from the different regions of Turkey to make more accurate inferences regarding sources of self-efficacy. Also, cross-cultural studies may be extended to make comparisons between sources of self-efficacy. In addition, present study included metacognition and effort regulation as cognitive and behavioral consequences of students' self-efficacy. Future studies can integrate other variables such as students' use of various learning strategies like organization, rehearsal, elaboration strategy use to the model to get a more comprehensive picture of the antecedents and consequences of students' self-efficacy.

REFERENCES

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

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

Anderman, E. M. & Midgley, C. (1992). *Student self-efficacy as a function of classroom goal orientation.* Paper presented at the annual meeting of the American Educational Psychological Association, Washington, DC.

Anderman, E. R., & Young, A. J. (1994). Motivation and strategy use in science: Individual differences and classroom effects. *Journal of Research in Science Teaching, 31,* 811-831.

Arbreton A. (1993*). When getting help is helpful: Developmental, cognitive, and motivational influences on students' academic help-seeking*, Unpublished doctoral dissertation, University of Michigan.

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

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

Bandura, A. (1989). Regulation of cognitive processes through perceived self-efficacy. *Developmental Psychology, 25,* 729-735.

Bandura, A. (1993). Perceived self-efficacy in cognitive development and functioning. *Educational Psychologist, 28,* 117-48.

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

Bandura, A., Barbaranelli, C., Caprara, G. V., & Pastorelli, C. (1996). Multifaceted impact of self-efficacy beliefs on academic functioning. *Child Development, 67,* 1206-1222.

Bollen, K. A. (1989). *Structural equations with latent variables*. New York: Wiley.

Britner, S. L., & Pajares, F. (2006). Sources of science self-efficacy beliefs of middle school students. *Journal of Research in Science Teaching, 43,* 485-499.

Buehl, M. M., & Alexander, P. A. (2001). Beliefs about academic knowledge. *Educational Psychology Review, 13,* 385-418.

Butler, D. L., & Winne, P. H. (1995). Feedback and self-regulated learning: A theoretical synthesis. *Review of Educational Research, 65,* 245-281.

Chin, D., & Kameoka, V. A. (2002). Psychosocial and Contextual Predictors of Educational and Occupational Self-Efficacy among Hispanic Inner-City Adolescents. *Hispanic Journal of Behavioral Sciences, 24,* 448-464.

Cohen, P., Cohen, J., Teresi, J., Marchi, M., & Valez, C. N. (1990). Problems in the measurement of latent variables in structural equations causal models. *Applied Psychological Measurement, 14,* 183-196.

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

Elliot, A. J. (1999). Approach and avoidance motivation and achievement goals. *Educational Psychologist, 34,* 149-169.

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.

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

Elliot, A. J., & McGregor, H. A. (2001). A 2X2 achievement goal framework. *Journal of Personality and Social Psychology, 80,* 501-519.

Elliot, A. J., & Reis, H. T. (2003). Attachment and exploration in adulthood. *Journal of Personality and Social Psychology, 85,* 317-331.

Flavell, J. H. (1979). Metacognition and cognitive monitoring: A new area of cognitive-developmental inquiry. *American Psychologist, 34,* 906-911.

Fraenkel, J. R., & Wallen, N. E. (2006). *How to design and evaluate research in education.* New York, USA: McGrawhill, Inc.

Gainor, K. A., & Lent, R. W. (1998). Social cognitive expectations and racial identity attitudes in predicting the math choice intentions of black college students. *Journal of Counseling Psychology, 45,* 403-413.

Hatcher, L., & Stepanski, E. J. (1994). *A step-by-step approach to using the SAS system for univariate and multivariate statistics*. Cary, NC: SAS Institute.

Hattie, J., Biggs, J., & Purdie, N. (1996). Effects of learning skills interventions on student learning: A meta-analysis. *Review of Educational Research, 66,* 99-136.

Hodges, C. B. & Murphy, P. F. (2009). Sources of self-efficacy beliefs of students in a technology-intensive asynchronous college algebra course. *The Internet and Higher Education, 12,* 93-97.

Hoy, A. W. (2004). *What do teachers know about self-efficacy?* Paper presented at the annual meeting of the American Educational Research Association, San Diego, CA.

Hutchison, M. A., Follman, D. K., Sumpter, M., & Bodner, G. M. (2006). Factors influencing the self-efficacy beliefs of first-year engineering students. *Journal of Engineering Education, 95*, 39-47.

Kagitcibasi, C. (1997). Individualism and collectivism. In J. F. Berry, M. H. Segall, & C. Kagitcibasi (Eds.), Handbook of cross-cultural psychology vol. 3 (pp. 1-49). London: Allyn & Bacon.

Kaplan, A., & Midgley, C. (1997). The effect of achievement goals: Does level of academic efficacy make a difference? *Contemporary Educational Psychology*, *22*, 415-435.

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

Klassen, R. (2004). A cross-cultural investigation of the efficacy beliefs of South Asian immigrant and Anglo non-immigrant early adolescents, *Journal of Educational Psychology, 96,* 731-742.

Lent, R. W., Lopez F. G., & Bieschke, K. J. (1991). Mathematics self-efficacy: Sources and relation to science-based career choice. *Journal of Counseling Psychology, 38,* 424-430.

Lent, R. W., Lopez F. G., Brown, S. D., & Gore, P. A. (1996). Latent structure of the sources of mathematics self-efficacy. *Journal of Vocational Behavior, 49,* 292-308.

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

Linnenbrink, E. A. & Pintrich, P. R. (2002). Motivation as an enabler for academic success. *School Psychology Review, 31,* 313-327.

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

Livingston, J. A. (1997). *Metacognition: An overview.* Retrieved March 22, 2010, from http://gse.buffalo.edu/fas/shuell/cep564/metacog.htm

Lopez, F. G. & Lent, R.W. (1992). Sources of mathematics self-efficacy in high school students, *The Career Development Quarterly, 41,* pp. 3-12.

Luzzo, D. A., Hasper, P., Albert, K.A., Bibby, M. A. & Martinelli,E. A. Jr. (1999). Effects of self-efficacy-enhancing interventions on the math/science self-efficacy and career interests, goals, and actions of career undecided college students. *Journal of Counseling Psychology, 46,* 233-243.

Maehr, M. L., & Midgley, C. (1991). Enhancing student motivation: a schoolwide approach. *Educational Psychologist, 26,* 399-427.

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

Middleton, M., & Midgley, C. (1997). Avoiding the demonstration of lack of ability: An underexplored aspect of goal orientation. *Journal Educational Psychology, 89,* 70-718.

Midgley, C., & Urdan,T. (1995). Predictors of middle school students' use of self-handicapping strategies. *Journal of Early Adolescence, 15,* 389-411.

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

Nolen, S. B. (1988). Reasons for studying: Motivational orientations and study strategies. *Cognition and Instruction, 5,* 269-287.

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

Özyürek, R. (2005). Informative sources of math-related self-efficacy expectations and their relationship with math-related self-efficacy, interest, and preference. *International Journal of Psychology, 40,* 145-156.

Pajares, F. (1996). Self-efficacy beliefs in academic settings. *Review of Educational Research,* 66, 543-578.

Pajares, F. (1997). Current directions in self-efficacy research. In M. Maehr & P. R. Pintrich (Eds.), *Advances in motivation and achievement* (Vol. 10, pp. 1-49). Greenwich, CT: JAI Press.

Pajares (2002). *Overview of social cognitive theory and of self-efficacy*. Retreived March 23, 2010, from http: //www.emory.edu/EDUCATION/mfp/eff. html

Pajares, F., Britner, S. & Valiante, G. (2000). Writing and science achievement goals of middle school students, *Contemporary Educational Psychology, 25,* 406-422.

Pajares, F., & Miller, M. D. (1994). Role of self-efficacy and self-concept beliefs in mathematical problem solving: A path analysis. *Journal of Educational Psychology, 86,* 193-203.

Pajares, F., & Urdan, T. (Eds.). (2006). *Adolescence and education: Vol. 5. Self-efficacy beliefs of adolescents.* Greenwich, CT: Information Age.

Paulsen, M. B., & Feldman, , K.A. (2005). The conditional andinteraction effects of epistemological beliefs on the self-regulated learning of college students: Motivational strategies. *Research in Higher Education, 46,* 731-768.

Pintrich, P. R. (2000). An achievement goal theory perspective on issues in motivation terminology, theory, and research. *Contemporary Educational Psychology, 25,* 92-104.

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

Pintrich, P. R, & Johnson, G. R, (1990). *Assessing and improving students learning strategies.* In new directions for teaching and learning (no.42). San Francisco, CA: Jossey-Bass.

Pintrich, P. R., Roeser, R. W., & De Groot, E. A. M. (1994). Classroom and individual differences in early adolescents' motivation and self-regulated learning. *Journal of Early Adolescence, 14*, 139-161.

Pintrich, P. R., & Schunk, D.H. (2002). *Motivation in education: Theory, research, and applications.* Columbus, OH: Merrill.

Pintrich, P. R., Smith, D.A.F., Garcia, T., & Mckeachie, W.J. (1993) Reliability and predictive validity of the motivated strategies for learning questionnaire. *Educational and Psychological Measurement* 53, 810-813.

Schraw, G., & Dennison, R. S. (1994). Assessing metacognitive awareness. *Contemporary Educational Psychology, 19*, 460-475.

Senler, B. & Sungur, S. (2007). Parental influences on students' self-concept, task value beliefs, and achievement in science. *The Spanish Journal of Psychology*, *12,* 106-117.

Schunk, D. H. (2000). *Learning Theories: An Educational Perspective*. Prentice Hall: New Jersey.

Skaalvik, E. M. (1997). Self-enhancing and self-defeating ego orientation: relations with task and avoidance orientation, achievement, self-perceptions, and anxiety. *Journal of Educational Psychology, 89,* 71-81.

Sungur, S. (2004). *An implementation of problem based learning in high school biology courses*. Unpublished doctoral dissertation, Middle East Technical University, Turkey.

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

Sungur, S., & Senler, B. (2009). An analysis of Turkish high school students' metacognition and motivation. *Educational Research and Evaluation, 15,* 45-62.

Usher, E. L. (2009). Sources of middle school students' self-efficacy in mathematics: A qualitative investigation of student, teacher, and parent perspectives. *American Educational Research Journal, 46,* 275-314.

Usher, E. L., & Pajares, F. (2006). Sources of academic and self-regulatory efficacy beliefs of entering middle school students. *Contemporary Educational Psychology, 31,* 125-141.

Usher, E. L., & Pajares, F. (2008). Sources of self-efficacy in school: Critical review of the literature and future directions. *Review of Educational Research, 78,* 751-796.

Usher, E. L., & Pajares, F. (2009). Sources of self-efficacy in mathematics: A validation study. *Contemporary Educational Psychology, 34,* 89-101.

Tabachnick, B. G., & Fidell, L. S. (1996). *Using multivariate statistics* (5th edition). New York: HarperCollins.

Was, C. (2006). Academic achievement goal orientation: Taking another look. Electronic Journal of Research in Educational Psychology, 4, 529-550.

Weinert, F. E., & Kluwe, R. H. (1987). *Metacognition. motivation, and understanding.* Hillsdale, NJ: Lawrence Erlbaum Associates.

Wolters, C., & Rosenthal, H. (2000). The relation between students' motivational beliefs and their use of motivational regulation strategies. *International Journal of Educational Research, 33,* 801-820.

Wolters, C. A., Yu, S. Y., & Pintrich, P. R. (1996). The relation between goal orientation and students' motivational beliefs and self-regulated learning. *Learning and Individual Differences, 8,* 211-238.

Zeldin, A., Britner, S. L., & Pajares, F. (2008). A comparative study of the self-efficacy beliefs of successful men and women in mathematics, science, and technology careers. *Journal for Research on Science Teaching,45,* 1036-1058.

Zeldin, A. L., & Pajares, F. (2000). Against the odds: Self-efficacy beliefs of women in mathematical, scientific, and technological careers. *American Educational Research Journal, 37,* 215-246.

Zimmerman, B. (1994). Dimensions of academic self-regulation: A conceptual framework for education. In D. Schunk & B. Zimmerman (Eds.), *Self-regulation of learning and performance: Issues and educational applications* (pp.2-21). Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.

Zimmerman, B. J., & Bandura, A. (1994). Impact of self-regulatory influences on writing course attainment. *American Educational Research Journal, 31,* 845-862.

Zimmerman, B., & Martinez-Pons, M. (1988).Construct validation of a Strategy model of student self-regulated learning. *Journal of Educational Psychology, 80,* 284-290.

APPENDICES

APPENDIX A

Değerli öğrenciler,

Bu çalışmada, sizlerin Fen ve Teknoloji dersine karşı genel yaklaşım ve tutumunuzu etkileyen faktörleri belirlemek için "Özyeterlik Algısı Kaynakları Anketi", Fen ve Teknoloji dersinde kullandığınız öğrenme stratejilerinizi ve çalışma becerilerinizi belirlemek için "Öğrenmede Güdüsel Stratejiler Anketi" ve Fen ve Teknoloji dersine yönelik hedeflerinizi belirlemek için "Hedef Yönelimi Anketi" uygulanacaktır.
Lütfen her cümleyi okuduktan sonra, size uygun olan seçeneği <u>mutlaka</u> işaretleyiniz.
Katkılarınızdan dolayı teşekkür ederim.

Arş. Gör. Dekant KIRAN
ODTÜ Eğitim Fakültesi
İlköğretim Bölümü

1.Cinsiyetiniz nedir? 1 Kız 2 Erkek 2. Kardeş sayısı:…… 3. Doğum tarihiniz (Yıl olarak belirtiniz): ……. 4. Geçen dönemki fen ve teknoloji karne notunuz: ……. 5. Anneniz çalışıyor mu? 1 Çalışıyor 2 Çalışmıyor 3 Düzenli bir işi yok 4 Emekli 6.Babanız çalışıyor mu? 1 Çalışıyor 2 Çalışmıyor 3 Düzenli bir işi yok 4 Emekli 7 Ne kadar sıklıkla eve gazete alıyorsunuz? 1 Hiçbir zaman 2 Bazen 3 Her zaman	Anne ve babanızın eğitim düzeyi nedir? 8. Anne 9. Baba 1 Hiç okula gitmemiş 1 Hiç okula gitmemiş 2 ilkokul 2 ilkokul 3 Ortaokul 3 Ortaokul 4 Lise 4 Lise 5 Üniversite 5 Üniversite 6 Yüksek Lisans 6 Yüksek Lisans 7 Doktora 7 Doktora 10 Evinizde bir çalışma odanız var mı? 1 Evet 2 Hayır 11 Evinizde bilgisayarınız var mı? 1 Evet 2 Hayır 12 Bilgisayarınızın internet bağlantısı var mı? 1 Evet 2 Hayır 13. 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 – 100 tane 4. 101 – 200 tane 5. 200 taneden fazla

APPENDIX B

ÖZYETERLİK ALGISI KAYNAKLARI ANKETİ

Anket 35 maddeden oluşmaktadır. Anketin güvenirlik ve geçerliği için soruları ilgi ve samimiyetle dolduracağınıza inanıyoruz. **Her maddeyi dikkatli bir şekilde okuduktan sonra, sizi en iyi ifade ettiğini düşündüğünüz rakamı aşağıdaki ölçeği göz önüne alarak işaretleyiniz.**

Kesinlikle Katılmıyorum **Katılmıyorum** **Kararsızım** **Katılıyorum** **Kesinlikle Katılıyorum**

1 **2** **3** **4** **5**

	Kesinlikle Katılmıyorum	Katılmıyorum	Kararsızım	Katılıyorum	Kesinlikle Katılıyorum
1)Fen ve teknoloji dersinden yüksek notlar alırım.	1	2	3	4	5
2)En sevdiğim öğretmenlerim genellikle fen ve teknoloji dersine giren öğretmenlerimdir.	1	2	3	4	5
3)Kendimi zorlandığım fen ve teknoloji konularıyla uğraşırken düşündüğümde umutsuzluğa kapılırım.	1	2	3	4	5
4) Şu ana kadar en çok hayran olduğum büyüklerim fen ve teknoloji alanında başarılı olmuş kişilerdir.	1	2	3	4	5
5)Çevremdeki insanlar genellikle benim fen ve teknoloji dersinde yetersiz olduğumu düşünürler.	1	2	3	4	5
6) Okulda fen ve teknoloji derslerine ayrılan ders saati arttırılırsa buna üzülürüm.	1	2	3	4	5
7) Fen ve teknoloji derslerinde sorulan soruların cevabını nadiren sınıf arkadaşlarımdan önce bulurum.	1	2	3	4	5
8) Arkadaşlarımın çoğu fen ve teknoloji dersinden zayıf not alır.	1	2	3	4	5
9) Fen ve teknoloji sınavı olurken kendimi oldukça gergin hissederim.	1	2	3	4	5
10)Öğretmenlerim fen ve teknoloji dersinde başarılı olduğum için lisede sayısal alan seçmem konusunda beni cesaretlendiriyor.	1	2	3	4	5
11) Arkadaşlarım arasında fen ve teknolojiyle ilgili problemleri çözen genelde benimdir. (örnek: bir yükün daha kolay nasıl taşınabileceği)	1	2	3	4	5
12) Ailem, fen ve teknoloji dersindeki yeteneğimle gurur duymam için beni yüreklendirir.	1	2	3	4	5
13)Fen ve teknoloji dersine çalışırken aklım karışır ve iyi **düşünemem.**	1	2	3	4	5
14) Mesleki yönden örnek aldığım insanlar (onlar gibi olmak istediğim kişiler) genellikle fen ve teknolojiyle ilgili **olmayan** alanlardadırlar.	1	2	3	4	5
15) Fen ve teknoloji benim için her zaman çok zor bir ders olmuştur.	1	2	3	4	5

16) Fen ve teknoloji sınavı olurken hemen hemen hiçbir zaman kendimi gergin **hissetmem.**	**1**	**2**	**3**	**4**	**5**
17) Arkadaşlarım fen ve teknoloji dersine isteksiz girerler.	**1**	**2**	**3**	**4**	**5**
18) Annem ve babam fen ve teknoloji konularında çok başarılı **değildirler**.	**1**	**2**	**3**	**4**	**5**
19) Öğretmenlerim beni çok iyi fen ve teknoloji bilgisine sahip olmayı gerektiren mesleklere yönelmekten vazgeçirmeye çalışırlar.	**1**	**2**	**3**	**4**	**5**
20) Arkadaşlarıma, zor olan fen ve teknoloji konularında nadiren yardım edebilirim.	**1**	**2**	**3**	**4**	**5**
21*)* Önemsediğim kişiler (anne - baba, arkadaşlar ya da öğretmenler gibi) fen ve teknoloji konularında başarılıdırlar.	**1**	**2**	**3**	**4**	**5**
22) Fen ve teknolojiyle ilgili problemleri çözme yeteneğim hakkında genellikle endişe **etmem.**	**1**	**2**	**3**	**4**	**5**
23) Fen ve teknolojiyle ilgili kulüplere (bilim-teknoloji kulübü, bilgisayar kulübü) katılmam konusunda genellikle cesaretlendirilirim.	**1**	**2**	**3**	**4**	**5**
24) En yakın arkadaşlarımdan bazıları, fen ve teknoloji sınavlarında çok başarılıdırlar.	**1**	**2**	**3**	**4**	**5**
25) Fen ve teknoloji dersleri kafamı karıştırır ve beni tedirgin eder.	**1**	**2**	**3**	**4**	**5**
26) Önemsediğim kişiler (anne - baba, arkadaşlar ya da öğretmenler gibi), gelecekte fen ve teknolojiyle ilgili bölümleri /alanları/meslekleri **seçmememi** öneriyorlar.	**1**	**2**	**3**	**4**	**5**
27) Zor bir fen ve teknoloji problemiyle karşılaştığımda, çözene kadar uğraşırım.	**1**	**2**	**3**	**4**	**5**
28) Tanıdığım yetişkinlerin çoğu iyi fen ve teknoloji bilgisi gerektiren işlerde çalışıyorlar.	**1**	**2**	**3**	**4**	**5**
29) Fen ve teknoloji sınavlarında genellikle rahat olurum.	**1**	**2**	**3**	**4**	**5**
30) Fen ve teknolojiye karşı doğal bir yeteneğim vardır.	**1**	**2**	**3**	**4**	**5**
31) Öğretmenlerim gelecekte sayısal alanı seçmem konusunda beni nadiren cesaretlendirirler.	**1**	**2**	**3**	**4**	**5**
32) Fen ve teknoloji dersleri beni rahatsız ve gergin hissettirir.	**1**	**2**	**3**	**4**	**5**
33) Pek çok arkadaşım gelecekte üst düzey fen ve teknoloji bilgisi **gerektirmeyen** meslekleri seçmeyi istiyorlar.	**1**	**2**	**3**	**4**	**5**
34) Annem ve babam beni fen ve teknoloji dersinde başarılı olmam konusunda cesaretlendirir.	**1**	**2**	**3**	**4**	**5**
35) Fen ve teknoloji derslerinde genellikle kendimi rahat hissederim.	**1**	**2**	**3**	**4**	**5**

APPENDIX C

ÖĞRENMEDE GÜDÜSEL STRATEJİLER ANKETİ

Değerli öğrenciler,

Bu anket iki kısımdan oluşmaktadır. İlk kısımda Fen ve Teknoloji dersine karşı tutumunuzu, motivasyonunuzu, ikinci kısımda ise Fen ve Teknoloji dersinde kullandığınız öğrenme stratejileri ve çalışma becerilerini belirlemeye yönelik ifadeler yer almaktadır. Cevap verirken aşağıda verilen ölçeği göz önüne alınız. **Eğer ifadenin sizi tam olarak yansıttığını düşünüyorsanız, 7'yi yuvarlak içine alınız. Eğer ifadenin sizi hiç yansıtmadığını düşünüyorsanız, 1'i yuvarlak içine alınız. Bu iki durum dışında ise 1 ve 7 arasında sizi en iyi tanımladığını düşündüğünüz rakamı yuvarlak içine alınız.**

1 --- 2 --- 3 --- 4 --- 5 --- 6 -- 7

Beni hiç yansıtmıyor — **Beni tam olarak yansıtıyor**

BİRİNCİ BÖLÜM

A.Motivasyon

Anketin 8 maddeden oluşan bu kısmı, sizin Fen ve Teknoloji dersine karşı tutumunuza ve motivasyonunuza yönelik maddelerdir. Maddeleri yukarıda belirtilen yönergeler doğrultusunda doldurunuz.

	Beni hiç yansıtmıyor						Beni tam olarak yansıtıyor
1)Fen ve teknoloji dersinden çok iyi bir not alacağımı düşünüyorum.	1	2	3	4	5	6	7
2)Fen ve teknoloji dersi ile ilgili okumalarda yer alan en zor konuyu bile anlayabileceğimden eminim.	1	2	3	4	5	6	7
3)Fen ve teknoloji dersinde öğretilen temel kavramları öğrenebileceğimden eminim.	1	2	3	4	5	6	7
4)Fen ve teknoloji dersinde, öğretmenin anlattığı en karmaşık konuyu anlayabileceğimden eminim.	1	2	3	4	5	6	7
5) Fen ve teknoloji dersinde verilen sınav ve ödevleri en iyi şekilde yapabileceğimden eminim.	1	2	3	4	5	6	7
6)Fen ve teknoloji dersinde çok başarılı olacağımı umuyorum.	1	2	3	4	5	6	7
7 Fen ve teknoloji dersinde öğretilen becerileri iyice öğrenebileceğimden eminim.	1	2	3	4	5	6	7
8)Dersin zorluğu, öğretmen ve benim becerilerim göz önüne alındığında, fen ve teknoloji dersinde başarılı olacağımı düşünüyorum.	1	2	3	4	5	6	7

İKİNCİ BÖLÜM

B. Öğrenme Stratejileri

Anketin bu kısmındaki maddeler sizin Fen ve Teknoloji dersinde kullandığınız öğrenme stratejilerinizi ve çalışma becerilerinizi belirlemeye yöneliktir. Maddeleri yukarıda belirtilen yönergeler doğrultusunda doldurunuz.

	Beni hiç yansıtmıyor						Beni tam olarak yansıtıyor
1) Fen ve teknoloji dersi sırasında başka şeyler düşündüğüm için önemli kısımları sıklıkla kaçırırım.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
2) Fen ve teknoloji dersi ile ilgili bir şeyler okurken, okuduklarıma odaklanabilmek için sorular oluştururum.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
3) Fen ve teknoloji dersine çalışırken kendimi çoğu zaman o kadar isteksiz ya da o kadar sıkılmış hissederim ki, planladıklarımı tamamlamadan çalışmaktan vazgeçerim.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
4) Fen ve teknoloji ile ilgili bir şeyler okurken bir konuda kafam karışırsa, başa döner ve anlamak için çaba gösteririm.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
5) Eğer fen ve teknoloji dersi ile ilgili okumam gereken konuları anlamakta zorlanıyorsam, okuma stratejimi değiştiririm.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
6) Fen ve teknoloji dersinde yaptıklarımızdan hoşlanmasam bile başarılı olabilmek için sıkı çalışırım.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
7) 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**
8) Fen ve teknoloji dersinde işlenen konuları anladığımdan emin olabilmek için kendi kendime sorular sorarım.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
9) Çalışma tarzımı, dersin gereklilikleri ve öğretmenin öğretme tarzına uygun olacak şekilde değiştirmeye çalışırım.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
10) Genelde derse gelmeden önce konuyla ilgili bir şeyler okurum fakat okuduklarımı çoğunlukla anlamam.	**1**	**2**	**3**	**4**	**5**	**6**	**7**

	Beni hiç yansıtmıyor						Beni tam olarak yansıtıyor
11)Eğer bir konu zorsa ya çalışmaktan vazgeçerim ya da yalnızca kolay kısımlarını çalışırım.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
12)Fen ve teknoloji dersine çalışırken, konuları sadece okuyup geçmek yerine ne öğrenmem gerektiği konusunda düşünmeye çalışırım.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
13) Konu çok sıkıcı olsa da, ilgimi çekmese de konuyu bitirene kadar çalışmaya devam ederim.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
14) Fen ve teknoloji dersine çalışırken iyi anlamadığım kavramları belirlemeye çalışırım.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
15) Fen ve teknoloji dersine çalışırken, çalışmalarımı yönlendirebilmek için kendime hedefler belirlerim.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
16) Ders sırasında not alırken kafam karışırsa, notlarımı dersten sonra düzenlerim.	**1**	**2**	**3**	**4**	**5**	**6**	**7**

APPENDIX D

HEDEF YÖNELİMİ ANKETİ

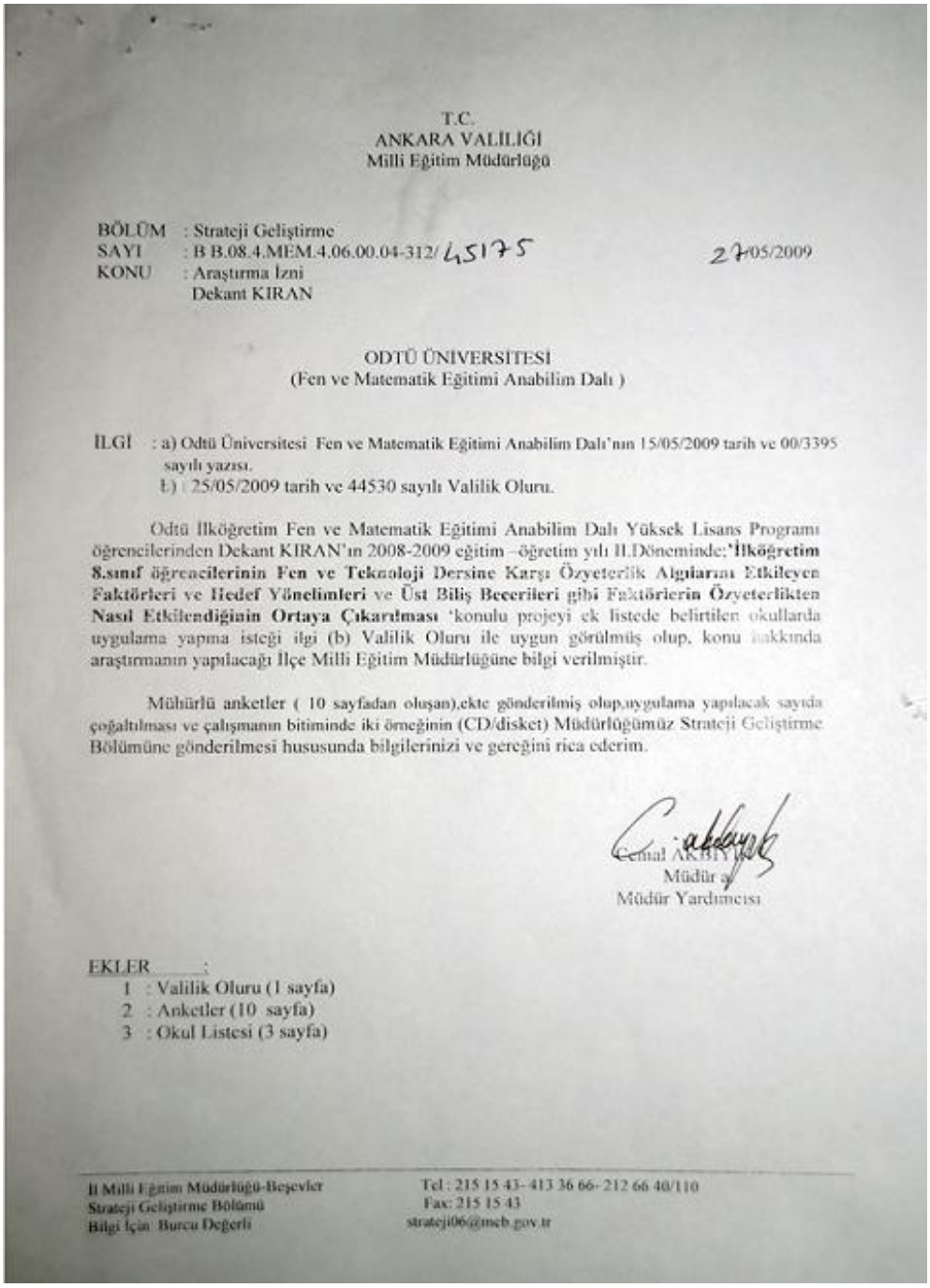
Değerli öğrenciler,
Hedef Yönelimi Anketi, sizin Fen ve Teknoloji dersindeki hedeflerinizi belirlemek amacıyla hazırlanmıştır. Anket 15 maddeden oluşmaktadır. Her maddeyi dikkatli bir şekilde okuduktan sonra, sizi en iyi ifade ettiğini düşündüğünüz rakamı aşağıdaki ölçeği göz önüne alarak yuvarlak içine alınız. Unutmayın, doğru ya da yanlış cevap yoktur. Yapmanız gereken sizi en iyi tanımlayacak rakamı yuvarlak içine almanızdır.

Hiçbir Zaman	Nadiren	Bazen	Çoğunlukla	Her Zaman
1	2	3	4	5

	Kesinlikle Katılmıyorum	Katılmıyorum	Kararsızım	Katılıyorum	Kesinlikle Katılıyorum
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. Diğer öğrencilerden daha iyisini yapmak benim için önemlidir.	1	2	3	4	5
4. Fen ve teknoloji derslerinden mümkün olduğunca çok şey öğrenmek istiyorum.	1	2	3	4	5
5. Fen ve teknoloji derslerinde beni sıklıkla motive eden şey, diğerlerinden daha kötü performans sergileme korkusudur.	1	2	3	4	5
6. Fen ve teknoloji derslerinde verilen her şeyi tam olarak öğrenmek arzusundayım.	1	2	3	4	5
7. Fen ve teknoloji derslerinde amacım, diğer pek çok öğrenciden daha iyi bir not almaktır.	1	2	3	4	5
8. Fen ve teknoloji derslerinde öğrenebileceğimden daha azını öğrenmekten korkuyorum.	1	2	3	4	5
9. Fen ve teknoloji derslerindeki tek amacım diğerlerinden daha başarısız olmanın önüne geçmektir.	1	2	3	4	5

	Kesinlikle Katılmıyorum	Katılmıyorum	Kararsızım	Katılıyorum	Kesinlikle Katılıyorum
10. Fen ve teknoloji derslerinde öğrenilecek her şeyi öğrenemeyebileceğimden sıklıkla endişe duyuyorum.	**1**	**2**	**3**	**4**	**5**
11. Fen ve teknoloji derslerinde diğerlerine göre daha başarılı olmak benim için önemlidir.	**1**	**2**	**3**	**4**	**5**
12. Bazen fen ve teknoloji derslerinin içeriğini istediğim kadar iyi anlayamayacağımdan korkuyorum.	**1**	**2**	**3**	**4**	**5**
13. Fen ve teknoloji derslerinde amacım başarısız olmaktan kaçınmaktır.	**1**	**2**	**3**	**4**	**5**
14. Fen ve teknoloji derslerinde beni sıklıkla motive eden şey başarısız olma korkusudur.	**1**	**2**	**3**	**4**	**5**
15. Fen ve teknoloji derslerinde sadece başarısız olmaktan kaçınmak istiyorum.	**1**	**2**	**3**	**4**	**5**

APPENDIX E



T.C.
ANKARA VALİLİĞİ
Milli Eğitim Müdürlüğü

BÖLÜM : Strateji Geliştirme
SAYI : B B.08.4.MEM.4.06.00.04-312/ 45175 27/05/2009
KONU : Araştırma İzni
Dekant KIRAN

ODTÜ ÜNİVERSİTESİ
(Fen ve Matematik Eğitimi Anabilim Dalı)

İLGİ : a) Odtü Üniversitesi Fen ve Matematik Eğitimi Anabilim Dalı'nın 15/05/2009 tarih ve 00/3395 sayılı yazısı.
b) 25/05/2009 tarih ve 44530 sayılı Valilik Oluru.

Odtü İlköğretim Fen ve Matematik Eğitimi Anabilim Dalı Yüksek Lisans Programı öğrencilerinden Dekant KIRAN'ın 2008-2009 eğitim –öğretim yılı II.Döneminde;**'İlköğretim 8.sınıf öğrencilerinin Fen ve Teknoloji Dersine Karşı Özyeterlik Algılarını Etkileyen Faktörleri ve Hedef Yönelimleri** ve **Üst Biliş Becerileri** gibi Faktörlerin **Özyeterlikten Nasıl Etkilendiğinin Ortaya Çıkarılması** 'konulu projeyi ek listede belirtilen okullarda uygulama yapma isteği ilgi (b) Valilik Oluru ile uygun görülmüş olup, konu hakkında araştırmanın yapılacağı İlçe Milli Eğitim Müdürlüğüne bilgi verilmiştir.

Mühürlü anketler (10 sayfadan oluşan),ekte gönderilmiş olup,uygulama yapılacak sayıda çoğaltılması ve çalışmanın bitiminde iki örneğinin (CD/disket) Müdürlüğümüz Strateji Geliştirme Bölümüne gönderilmesi hususunda bilgilerinizi ve gereğini rica ederim.

Cemal AKBAYIR
Müdür a.
Müdür Yardımcısı

EKLER :
1 : Valilik Oluru (1 sayfa)
2 : Anketler (10 sayfa)
3 : Okul Listesi (3 sayfa)

İl Milli Eğitim Müdürlüğü-Beşevler
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BÖLÜM : Strateji Geliştirme
SAYI : B B.08.4.MEM.4.06.00.04-312/ 44530 25../5./2009
KONU : Araştırma İzni
Dekant KİRAN

VALİLİK MAKAMINA
ANKARA

İLGİ a) M.E.B. Bağlı Okul ve Kurumlarda Yapılacak Araştırma ve Araştırma Desteğine Yönelik İzin ve Uygulama Yönergesi.
b)Odtü Fen ve Matematik Eğitimi Anabilim Dalı'nın 15/05/2009 tarih ve 00/3395 sayılı yazısı.

Odtü İlköğretim Fen ve Matematik Eğitimi Anabilim Dalı Yüksek Lisans Programı öğrencilerinden Dekant KİRAN'ın 2008-2009 eğitim-öğretim yılı II. Döneminde'**İlköğretim 8.sınıf öğrencilerinin Fen ve Teknoloji Dersine Karşı Özyeterlik Algılarını Etkileyen Faktörleri ve Hedef Yönelimleri ve Üst Biliş Becerileri gibi Faktörlerin Özyeterlikten Nasıl Etkilendiğinin Ortaya Çıkarılması'**konulu araştırması ile ilgili olarak,ilgi (a) yönerge doğrultusunda Müdürlüğümüz Değerlendirme Komisyonu tarafından incelenmiş olup,(10 sayfadan oluşan) anketin,gönüllülük esasına dayalı olarak uygulanması Müdürlüğümüzce uygun görülmüştür.

Makamlarınızca da uygun görüldüğü takdirde Olurlarınıza arz ederim.

Kamil AYDOĞAN
Milli Eğitim Müdürü

OLUR
22/05/2009
Ufuk SEÇİLMİŞ
Vali a.
Vali Yardımcısı

EKLER :
1-Öz Yeterlik Algısı Kaynakları Anketi(4 sayfa)
2-Öğrenme Güdüsel Stratejiler Anketi(4 sayfa)
3-Hedef Yönelimi Anketi(2 sayfa)

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