INVESTIGATING ELEMENTARY STUDENTS' MOTIVATION TOWARDS SCIENCE LEARNING: A CROSS AGE STUDY

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ABSTRACT

INVESTIGATING ELEMENTARY STUDENTS' MOTIVATION TOWARDS SCIENCE LEARNING: A CROSS AGE STUDY

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This study investigated the effects of grade level and gender on elementary school students' motivation towards science learning. This study was carried out during 2007-2008 fall semester at 12 public elementary schools in Yenimahalle districts of Ankara. A total of 2231 students (1121 boys, 1093 girls, 17 did not report their gender) participated in the study. In terms of grade level, 1164 were enrolled in 6^{th} grade level and 1055 in 8^{th} grade (12 did not report their grade level). Data were collected through Students' Motivation Towards Science Learning Questionnaire (SMTSL). Two-way Multivariate Analysis of Variance (MANOVA) was conducted in order to identify the effects of grade level and gender on six dimensions of motivation (i.e. self efficacy, active learning strategies, learning environment stimulation, science learning value, achievement goal and performance goal) towards science learning. Two-way MANOVA results showed that grade level and gender had a significant effect on the collective dependent variables. Follow-up univariate analysis indicated that there was a significant difference between 6^{th} and 8^{th} grade students' motivation towards science learning regarding mean scores on each motivational variable. In addition, mean scores on each motivational variable, except leaning environment stimulation, were significantly different for boys and girls, in favors of girls. Result demonstrated that students' motivation towards science learning declined as the grade level increased and girls had a higher motivation towards science learning than boys.

Keywords: Science Learning Motivation, Grade Level, Gender, Self Efficacy, Learning Environment Stimulation, Achievement Goal, Performance Goal, Science Learning Value, Active Learning Strategies

ÖZ

ÖĞRENCİLERİN FEN ÖĞRENİMİNE YÖNELİK MOTİVASYONLARININ İNCELENMESİ: KARŞILAŞTIRMALI BİR ÇALIŞMA

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Bu çalışmada sınıf düzeyi ve cinsiyetin ilköğretim öğrencilerinin fen öğrenimine yönelik motivasyonlarına (öz yeterlik, fen öğrenimine değer verme, başarı hedefleri, performans hedefleri, aktif öğrenme stratejileri, öğrenme ortamı etkisi) etkisi incelenmiştir. Araştırma 2007-2008 öğretim yılı sonbahar döneminde Ankara ili Yenimahalle ilçesinde bulunan 12 devlet ilköğretim okulunda okuyan toplam 2231 (1121 erkek, 1093 kız) öğrencinin katılımı ile gerçekleştirilmiştir (1164 altıncı sınıf ve 1055 sekizinci sınıf). Veriler, Öğrencilerin Fen Öğrenimine Yönelik Motivasyonu Anketi ile toplanmıştır. Sınıf düzeyi ve cinsiyetin motivasyon değişkenleri üzerindeki etkisi iki-yönlü MANOVA analizi kullanılarak test edilmiştir. Analiz sonucunda, sınıf düzeyinin ve cinsiyetin öğrencilerin fen öğrenimine yönelik motivasyonları üzerinde anlamlı düzeyde etkisi belirlenmiştir. Altıncı sınıf ve sekizinci sınıf öğrencilerinin fen öğrenimine yönelik motivasyonlarının anlamlı düzeyde farklılık gösterdiği saptanmıştır. Ayrıca, kız ve erkek öğrencilerin fen öğrenimine yönelik motivasyonları öğrenme ortamı etkisi dışındaki bütün değişkenler açısından anlamlı düzeyde farklılık göstermiştir. Bu çalışmada öğrencilerin fen öğrenimine yönelik motivasyonlarının sınıf düzeyi artıkça azaldığı ve kız öğrencilerin fen öğrenmeye yönelik motivasyonlarının erkek öğrencilerden daha yüksek olduğu belirlenmiştir.

Anahtar sözcükler: Fen öğrenme motivasyonu, sınıf düzeyi, cinsiyet, öz yeterlik, fen öğrenimine değer verme, başarı hedefleri, performans hedefleri, öğrenme ortamı etkisi, aktif öğrenme stratejileri

To my fiancé İsmail

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ALS	: Active Learning Strategies
SLV	: Science Learning Value
LES	: Learning Environment Stimulation
AG	: Achievement Goal
PG	: Performance Goal
SE	: Self Efficacy
MANOVA	: Multivariate Analysis of Variance
SMTSL	: Students' Motivation Towards Science Learning
SES	: Socio-Economic Status
SPSS	: Statistical Package for Social Sciences

CHAPTER 1

INTRODUCTION

In order to raise students who are capable of adjusting themselves to the dynamic nature of world and consequently science, countries, being aware of the importance of affective factors in education, investigate the way of educating scientifically literate students.

From this point of view, motivation towards learning continue to be an active field of education research with a growing interest and attention because of its relation to positive educational outcomes. Research in this area particularly underlines the fact that education should involve motivational aspects as well as cognitive aspects since students' cognitive processing is not isolated from the motivational factors (Anderman & Young, 1994; Lee & Brophy, 1996; Pintrich, 2003; Pintrich, Marx & Boyle, 1993; Tuan, Chin & Shieh, 2005). From a constructivist perspective, learning is an active process that each student is required to construct own knowledge in response to environmental stimulation. However, construction of knowledge requires effort of learners, which in turn, requires motivation in order to initiate the effort and conserve it during the learning process (Palmer, 2005). The research stressing the importance of integrating learning and cognition with motivation found that motivation has an important role in students' achievement, cognitive engagements and conceptual change process (Brophy, 1998; Lee & Brophy, 1996; Pintrich et al, 1993; Singh, Granville, & Dika, 2002, Wigfield & Wentzel, 2007).

Concerning the positive relation of motivation with cognition and learning, it can be well understood that the motivational factors have a critical role in determining students' future trajectories since students' earlier success and attitudes towards science are thought to have an influence on choices and decisions related with their future plans (Singh et al. 2002). However, in general, students experience a decrease in their motivation towards learning that directly or indirectly affect their achievement related outcomes across the grade levels (Anderman & Midgley, 1997; George 2006; Urdan & Midgley, 2003; Wigfield & Wentzel, 2007). Research evidence indicated that students' task goal orientation (Anderman & Anderman, 1999), self efficacy beliefs (Anderman & Migdley, 1997; Urdan & Midgley, 2003), and value beliefs (Eccles & Wigfield, 1994) gradually decline across the school years. Therefore, a serious investigation of changes in motivation towards learning in early ages can have a crucial role in order to alter the situation in favor of students, because students' negative beliefs and attitudes towards learning can be more difficult to be changed in older ages (Patrick, Mantzicopoulos, Samarapungavan, & French, 2008).

The other issue that attracted attentions for a long time in many motivation research is gender. Its role in the formation of motivational beliefs continues to be investigated. Boys and girls were found to differ in many motivational beliefs such as self efficacy beliefs (Anderman & Young, 1994; Britney & Pajares, 2001, 2006; Pajares 1996), attributional beliefs (Meece, Glienke, & Burg, 2006), value beliefs (DeBacker & Nelson, 1999), goal orientation beliefs (Anderman & Young 1994; Britner & Pajares 2001; DeBacker & Nelson, 1999, 2000), use of learning strategies (Meece & Jones, 1996) each of them have crucial role in achievement. Also, in Turkey, some studies found gender differences in favor of girls in science learning (Arisoy, 2007; Yaman & Dede, 2007; Yavuz, 2006). Concerning stereotypical images, girls and boys develop different attitudes and interests within science domains; girls are relatively more interested in biological sciences and social sciences whereas boys are relatively more interested in physical sciences (Jones, Howe & Rua 2000). Therefore, the examination of gender effect on motivation towards learning can be enlightening to construct a clear understanding in order to cope with this issue.

1.1 Significance of the Study

The present study aimed to investigate the elementary school students' motivation towards science learning with respect to grade level and gender differences. In recent years, Turkish Education System has changed its educational philosophy based on more Constructivist perspective and accordingly the elementary school curricula have redesigned. Thereby, there is a transition from teacher-centered instruction to the student-centered instruction which students are required to construct their own knowledge (Board of Education, [Talim ve Terbiye Kurulu Başkanlığı] 2006). However, in order to raise active learner students who have the ability to construct own knowledge and in order to enhance science education, the variables that can be thought to have an effect on student science learning should be investigated more deeply. Although the motivational factors as well as cognitive factors become an important field of research in Turkey, there is a need for more research to completely understand the associations between motivation and science learning. As in the present study, examinations of group differences such as grade level and gender differences in motivation towards science learning are also important to give insight into the motivation research in Turkey as well as abroad.

More specifically, elementary school years are considered to be a critical period for students in their formation of motivational beliefs towards science learning and revealing their interest in science. In these years, students become more realistic about evaluating their attitudes and abilities (Eccles & Wigfield, 2000). So, in case of negative belief formation in earlier years of schooling, it can be more difficult to change these beliefs in a positive way in upper grades (Patrick et al., 2008). Thus, investigation of changes, particularly a decline, in motivation in these years has a critical importance to deal with this situation not to be too late since, after completion of elementary schools, students enter high schools with some decision about choosing or not choosing science domain as a first step to their career. Furthermore, Turkish society in which the gender stereotypic image in science can have an influence on the thoughts of parents, teachers, and, consequently, students towards science and science careers, the investigation of gender role in motivation towards science learning can contribute to the clear understanding of the pattern in

Turkey and if exist, it can be encouraging to deal with the issue by taking preventive strategies.

1.2 Purpose of the Study

The present study investigated the effect of grade level and gender on elementary school students' motivation towards science learning. The motivational variable on which the grade level and gender effect were investigated are self efficacy, active learning strategies, science learning value, achievement goal, performance goal and learning environment stimulation.

1.2.1 Research Questions and Hypothesis

Research question 1: Is there a significant difference between the mean scores of students in 6^{th} and 8^{th} grade level with respect to self efficacy, active learning strategies, science learning value, achievement goal, performance goal and learning environment stimulation?

Research question 2: Is there a significant difference between the mean scores of girls and boys regarding self efficacy, active learning strategies, and science learning value, achievement goal, and performance goal and learning environment stimulation?

Research question 3: Is there a significant interaction between grade level and gender on the motivational variables?

Null Hypothesis 1: There is no significant difference between the mean scores of students in 6^{th} and 8^{th} grades with respect to self efficacy, active learning strategies, and science learning value, achievement goal, and performance goal and learning environment stimulation.

Null Hypothesis 2: There is no significant difference between the mean scores of boys and girls regarding self efficacy, active learning strategies, science learning value, achievement goal, and performance goal and learning environment stimulation.

Null Hypothesis 3: There is no significant interaction between grade level and gender on the motivational variables.

1.3 Definitions of Important Terms

Motivation

"It is a process whereby goal-directed activity is instigated and sustained" (Pintrich & Schunk, 2002, p.5). "It is a theoretical construct used to explain the initiation, direction, intensity, and persistence of behavior, especially goal-directed behavior" (Brophy, 1998, p.3).

Self Efficacy

It is defined as judgments of one's capabilities to do well in specific academic tasks (Pintrich & Shunk, 2002).

Active Learning Strategies

It refers to students' use of learning strategies in order to make connections between the previous and new understanding during the construction of knowledge (Tuan, Chin & Shieh, 2005). Individuals using deep learning approach in specific learning task focus on meaningful understanding and attempt to establish relationships between newly learned things and prior knowledge, prior experience and everyday life (Chin & Brown, 2000).

Science Learning Value

It refers to whether or not student perceive the value of science learning during the engagement of science activities through the important features of science learning value such as problem solving ability, relevancy of science knowledge with daily life, thinking, and science inquiry (Tuan, Chin & Shieh, 2005).

Performance Goal

It focuses on the desire to compete for good grades, to perform better than others and to please the teacher and parent and to avoid being appeared to have low ability (Pintrich & Schunk, 2002).

Achievement Goal

It focuses on the desire to learn the task for self improvement, to increase competency and achievement during learning (Pintrich & Schunk, 2002).

Learning Environment Stimulation

It refers to features such that teacher-student interaction, student-student interaction, instructional strategies, class activities and curriculum content having an impact on students' motivation towards learning (Tuan, Chin & Shieh, 2005).

CHAPTER 2

REVIEW OF RELATED LITERATURE

This chapter includes research regarding the motivational constructs used in the present study which are self-efficacy, achievement goal, performance goal, science learning value, learning environment stimulation, and active learning strategies. Additionally, research concerning grade-level and gender differences in motivation are presented.

2.1 Related Research with Self Efficacy

Self-efficacy is emerged from Bandura's (1986) Social Cognitive Theory. Bandura (1986) defines the self efficacy as

> People's judgments of their capabilities to organize and execute courses of action required to attain designated types of performances. It is concerned not with the skills one has but with the judgments of what one can do with whatever skills one possesses (p.391).

Bandura theorized that self-efficacy beliefs are obtained by students' interpretation of information from four sources: mastery experiences, vicarious experiences, social persuasion and psychological state. *Mastery experience* is the most important source of self-efficacy generated after the interpretation of previous experiences. When students attribute their success to their own efforts, efficacy beliefs raise whereas failed efforts lower efficacy beliefs. Besides own experiences, students also construct their efficacy beliefs through *vicarious experiences*. In vicarious experiences, students observe the experiences of someone else called as a model. Model's success increases student's self-efficacy beliefs while model's failure decreases self efficacy beliefs. The third source of self-efficacy; *social persuasion* is a feedback about the student's performance. The encouraging feedback enhances self efficacy beliefs in a given academic area. Self-efficacy beliefs are also altered by *emotional and psychological state* which is the feelings of students about an academic task. Positive feelings improve self efficacy beliefs, but negative feelings lower self efficacy beliefs. (Bandura, 1986, 1997; Pajares, 1996; Pintrich & Shunk, 2002; Usher & Pajares, 2006).

Researchers expressed that self efficacy beliefs affects the choices and the courses of actions. Individuals having strong efficacy beliefs are expected to engage in a task, show greater effort and persistence when confronted with obstacles. Individuals who have lower efficacy beliefs avoid engaging in a task and they are expected to give up easily when encountered with difficulties, even if they have the competence to accomplish the task (Bandura, 1993, 1997; Pajares, 1996; Pintrich & Schunk, 2002; Linnenbrink & Pintrich, 2003). Bandura (1993) stated that "perceived self-efficacy influences four major processes which are cognitive, motivational, and affective and selection processes". In parallel with the Bandura's statement, several research related with self efficacy were presented in detail to understand why self efficacy is highly important in educational researches and educational implementation. Pintrich and Linnenbrink (2003) underlined that self-efficacy is one of the most important motivational construct in promoting students' behavioral and cognitive engagement and learning. Moreover, researchers suggested that because of being a situation specific and sensitive to contextual factors students' self-efficacy beliefs can be increased by providing students with a challenging environment in order for them to engage in the task and experience successful outcomes (Pajares, 1996; Pintrich & Shunk, 2002; Pintrich & Linnenbrink, 2003; Margolis & McCabe, 2006).

There are many research which investigated the relationship between self-efficacy and science achievement. In one of these studies, Pajares and Britner (2001) explored the predictors of science achievement by using science self-efficacy, science self-concept, self-efficacy for self-regulated learning, science anxiety, value of science, achievement goal orientation as the motivational variable. Participants (N=262) were 7th grade students in one of the middle school in Southeast United States. They reported that among the motivational variables used in the study, science self efficacy was the only motivational variable to predict the science achievement of students. They also pointed out that the girls (β= .602) had higher self efficacy than the boys (β=. 542).

In another study, Britner and Pajares (2006) investigated the extent to which the sources of self- efficacy (Bandura, 1997) predict the science self-efficacy beliefs of middle school students and how each of the sources predicts science achievement and how self-efficacy beliefs and its sources differ as a function of gender. The participants of the study were 319 students in grades 5 to 8 in public middle school in Midwestern city. The variables of the study were; sources of self efficacy (mastery experiences, vicarious experiences, social persuasion, psychological state), science grade self-efficacy, science self-concept, science anxiety, self-efficacy for self- regulated learning, and science achievement (students' grade at the end of grading period). The results show that each of the sources of self efficacy significantly correlated with each other, with science self-efficacy and with science achievement. Of the four sources, only mastery experiences significantly predicted the science self-efficacy (β=.494 for the full sample, β=.403 for boys, β=.598 for girls). Moreover, boys reported stronger mastery experiences than did girls (boys M=4.2 girls M= 3.9) and girls reported stronger psychological state and anxiety than did boys (M=2.6 to M=2.2). Also, girls' self-efficacy for self-regulated learning was higher than did boys (M= 4.7 to M= 4.3). Finally, science self-efficacy predicted students' science grade (β=.480). The authors suggested that science teachers create a student centered environment in order for students to enhance their self efficacy beliefs through mastery experiences which was the stronger predictor of the self-efficacy beliefs. Also, the author pointed out the importance of teacher role in the development of other sources of self efficacy.

In a separate study, Singh, Chang and Dika (2006) examined the effects of science attitude and science self-efficacy on psychological and behavioral engagement in science learning and science grades through path analysis. The participants were 1589 high school students in grades 9 through 12 in Virgina. Data were collected by School and Social Experiences Questionnaire. The items included in the questionnaire were related with school and classroom factors, science courses taken, science interest, science motivation, science attitude and background characteristics and science achievement. The researcher found that science self efficacy had a direct effects on task engagement (.49) and science grades (.52). Furthermore, the study revealed that there was a strong relationship between science self- efficacy and science attitude. The direct effect of science attitude on science self efficacy was . 49. The authors stated that the positive attitude towards science learning enhances feelings of science self-efficacy and self-efficacy feelings enhance positive attitudes reciprocally. The authors emphasized the importance of affective factors and attitudinal factors in improvement of learning and achievement in their study.

Recently, Kang et al. (2005) investigated the relationship among students' cognitive and motivational variables, cognitive conflict and conceptual change in a specific science concept “density”. Subjects of the study were 159 seventh grade Korean students. Motivational variable in the study were self-efficacy, mastery goal orientation and failure tolerance. Regarding with self-efficacy, the result showed that self-efficacy was significantly correlated with conceptual change.

With regard to self efficacy and self-regulated learning, Pintrich (1999) reported a review of previous research made with his colleagues (Pintrich, 1989; Pintrich & De Groot, 1990; Pintrich & Garcia, 1991). The studies investigated the relationship between motivation and self regulatory learning in middle school context. Data on approximately 1000 middle school students collected over the years through Motivated Strategies for Learning Questionnaire (MSLQ, Pintrich et al., 1993). The relations between self regulation and motivation were investigated using correlation and regression analysis. Pintrich (1999) reported that self-efficacy had positive relations with self-regulated learning and self-regulated strategies; monitoring strategies such as tracking of attention, listening to a lecture; planning strategies such as setting goals, generating questions before reading a text, activating prior knowledge and regulating strategies such as rereading a text, reviewing course materials. Furthermore, the result revealed that there was a strong relationship between self-efficacy and academic performance which included examinations, lab reports, and overall final grades of students (Pintrich, 1999). With regard to performance and self efficacy association, similar result was found in the study of Tuan, Chin, and Shieh (2005) which investigated the students' motivation towards science learning. In this study, participants (N= 1407) were 7th, 8th and 9th grade students randomly selected from fifteen junior high schools in central Taiwan. Data were collected through Students Motivation Towards Science Learning Questionnaire. Regarding self efficacy, the results showed that self efficacy had the highest correlations with (r=.44) science achievement among the other motivational variable which were active learning strategies, science learning value, performance goal, achievement goal, and learning environment stimulation. Likewise, Zusho, Pintrich, Arbor, and Coppola (2003) also found that self efficacy was the better predictors of course performance (β= .40) of the students attending college chemistry course.

More recently, Usher and Pajares (2006) investigated the effects of Bandura's (1997) hypothesized sources of self efficacy on the academic self-efficacy and self-regulatory efficacy beliefs of middle school students. They also examined whether these sources of self-efficacy vary by gender. Participants were 263 sixth grade students in public middle schools in the Southeastern United States. The results indicated that each of the sources predicted self-efficacy for self-regulation. Mastery experience, social persuasion and psychological state predicted academic self- efficacy. In these two results, mastery experience had the strongest effects (β=.343 for academic self-efficacy; β=.354 for self-efficacy for self-regulation). Furthermore, girls and boys differ in their sources of self-efficacy beliefs. For girls, mastery experience and social persuasion predicted the academic self-efficacy and self-efficacy for self regulation. Girls' social persuasion accounted for the greater unique variance in academic self-efficacy (17 %) whereas mastery experience accounted for only 4 %. For boys, mastery experiences and vicarious experiences predicted academic self-efficacy and self-efficacy for self regulation. Boys' mastery experiences accounted for greater unique variance in academic self-efficacy (27 %) and self-efficacy for self-regulation (18 %). Unlike girls, social persuasion did not predict the self-efficacy of boys. With regard to gender differences, the research revealed that girls are more likely to depend on the judgments of others about their abilities to perform a specific task.

In brief, studies on the self efficacy underlined that self efficacy beliefs influence students' behavioral and cognitive and metacognitive engagement in learning situations which in turn affect their performance and achievement. The researchers suggested that because of being situation specific and changeable according to features of classroom environment, teachers should aid students to enhance their self efficacy beliefs by creating challenging environment in which students can experience success with effort and by providing them accurate and effort-related feedback.

2.2 Related Research with Achievement Goal and Performance Goal

"Goal orientation concerns the purposes for engaging in achievement behavior" (Pinrtich & Shunk, 2002, p.213). Goal orientation emphasizes the person's reasons for choosing, performing and persisting at various learning activities. Students who approach the same task with different achievement goals may engage in the task in a different manner and produce different outcomes (Brophy, 1998, p.27).

In achievement goal theory research, it is possible to see goals different in terminology, but quite similar in meanings. Regarding different use of term, Pintrich (2000) stated that "learning", "task", "task-involved", and "mastery goals" refer to focus on understanding, mastering and learning the tasks whereas labels like "performance", "relative ability" and "ego-involved goals" refer to focus on the self, ability, or performance relative to the others. In their review, Eccles and Wigfield (2002) mentioned the similarities between the goals; learning versus performance goal (Dweck, 1999), mastery versus performance goal (Ames, 1992), and task-involved versus ego-involved goals (Nichols et al., 1990). Furthermore, they mentioned the need to differentiate the performance goal orientations into performance approach goal and performance avoidance goal (Elliot, 1999; Midgley et al. 1998) because of inconsistent findings about the effects of performance goals on educational outcomes. Performance approach goals refer to participating in the task for performance reason such as getting good grades whereas performance-avoidance goals refer to disengagement in order not to appear incompetent (Eccles & Wigfield, 2002). Mastery and performance goal orientations are the most commonly used terms in research (Pintrich, 2003).

> A *mastery goal* orientation refers to focus on learning, mastering the task according to self improvement, developing new skills, improving and developing competence, trying to accomplish something challenging and trying to gain understanding. A *performance goal* orientation, in contrast to mastery orientation, is concerned with demonstrating competence or ability relative to others, competing for grades, attempting to best others, striving to be the best in the group, how ability will be judged relative to others, using social comparative standards, avoiding judgments of low ability (Pintrich & Schunk, 2002, p. 214).

Regarding terminology of achievement goal orientations, Tuan et al. (2005) used the term “achievement goal” instead of mastery goal in their questionnaire Students’ Motivation Towards Science Learning and they described it as students feel satisfied as they increase their competence and achievement during science learning. Thus, in the present study, the achievement goal refers to mastery goal or learning goal.

Reviewing the previous studies, Pintrich (1999) examined the role of goal orientations in self-regulated learning. Goal orientations mentioned in the study were namely mastery orientation, extrinsic orientation and relative ability orientation. In mastery goal orientation focus is on learning and mastering the task using self improvement. In extrinsic orientation focus is on obtaining good grades, pleasing teacher and parent. In relative ability orientation focus is on comparing one’s ability or performance to others, performing better than others. The relations between self regulation and motivation were investigated using correlation and regression analysis. The results indicated that mastery goal orientations were strongly positively related with the use of cognitive strategies and self regulatory strategies. Mastery goal orientation was found to be the most adaptive goal for self-regulated learning. Extrinsic orientation associated negatively with the use of cognitive strategies (from -.15 to -.20), self regulatory strategies (from -.31 to -.41) and performance (from -.05 to -.21). Additionally, relative ability orientation had positive relations with the use of cognitive and self regulatory strategies and performance in middle school context.

Similarly, Shih (2005) also carried out a study to explore relations between achievement goals, use of cognitive strategies and motivational process of Taiwanese students. Achievement goals included in the study were; mastery goals, performance-approach goals and performance-avoidance goals. The participants were 198 sixth grade students in one of the elementary school in Taiwan. Students completed questionnaires including achievement goal questionnaire (Elliot & Church, 1997) and subscales for cognitive and metacognitive study strategies, intrinsic value scale, and test anxiety scale from the Motivational Strategies for Learning Questionnaire (Pintrich & DeGroot, 1990). Mastery goal was found to be positive predictors of cognitive and metacognitive strategy use and intrinsic value (respectively $\beta=.70$, $p<.001$; $\beta=.63$, $p<.001$, $\beta=.77$, $p<.001$) whereas negative predictors of test anxiety (β=.–36, $p<.001$). Likewise, performance approach goals were positive predictors of cognitive and metacognitive strategy use and intrinsic value (respectively $\beta=.28$, $p<.001$; $\beta=.29$, $p<.001$, $\beta=.19$, $p<.01$) whereas negative predictors of test anxiety (β=.-24, $p<.05$). On the contrary, performance-avoidance predicted students' cognitive and metacognitive strategy use and intrinsic value negatively (respectively β=.-14, $p<.01$; β=.-20 $p<.01$, β=.-18, $p<.001$) while it predicted test anxiety positively ($\beta=.54$, $p<.001$). Consistent with the finding of Pintrich (1999), mastery goal was the most adaptive goal for strategy use.

Another study that examined relations between achievement goals and self-regulation was conducted by Pajares, Britner and Valiante (2000). The study aimed to investigate the relationship between achievement goals, motivation constructs and gender in science. Participants were 281 students attending to 7th grade in one of the middle schools in the South in United States. Achievement goals included in the study were task goals, performance approach goals and performance avoidance goals. Motivational variable were science self-efficacy, science self concept, science apprehension, self efficacy for self regulated learning. The results revealed that task goals were positively related with self-efficacy, self-concept and self-efficacy for self-regulation, but negatively related with science apprehension. Furthermore, performance avoidance goals were found to be unrelated with self-efficacy, negatively related with self-concept and self-regulation and positively related with science apprehension. In addition to these findings, performance approach goals did not have an effect on self-efficacy and self-regulation. However, its influence on self concept was modest. Moreover, there was a significant correlation between task goals and performance approach goals (.30). The results also indicated that students with a lower prior achievement in science tend to be performance avoidance goal oriented. There were no gender differences with respect to achievement goals in science.

As reviewed research has underlined, mastery goals are strongly positively related to the use of cognitive strategies as well as self-regulatory strategies. In general, if students approach the task for self-improvement and learning, they tend to focus on various cognitive and metacognitive strategies in order to improve their learning. In other words, students' use of deeper cognitive strategies such as the use of elaboration strategies (i.e., paraphrasing, summarizing) and organizational strategies (i.e., networking, outlining) and metacognitive strategies (planning, monitoring, regulating) have a positive relationship with mastery learning (Pintrich, 1999). However, when students are performance oriented such as studying for just getting good grades, outperform others, pleasing teacher, they may reach this goal without much in-depth cognition or self-regulation. (Kaplan & Midgley, 1997; Pintrich, 1999; Somuncuoglu & Yıldırm, 2001). With regard to performance goal orientation, Elliot and Moller (2003), based on their empirical review of related literature, argued that performance approach goals were not necessarily viewed negatively. They expressed that performance approach goals are related with several positive variables and outcomes and are not related consistently with many negative variables. Findings of Barron and Harackiewicz (2003) in their study supported this view. They found that performance approach goals were positively related with students' final grades whereas mastery orientation had no effect on the final grades of college students. Moreover, the results showed that mastery goals positively predicted student interest in the course whereas performance approaches goals had no effect on interest. Barron and Harackiewicz (2003) also emphasized that students may develop multiple goals. They stated that mastery and performance approach goals could contribute independently for achieving a particular educational outcome and different achievement goals may be more suitable for different situations. Likewise, Dowson and McInerney (2003) found that students' goals are not isolated from each other and students can hold multiple goals.

The other important research area in goal orientation is influence of learning environment on personal goals. Several goal orientations studies investigated how classroom goal structures related with individual's own goal orientation. In one of these studies, Wolter (2004) investigated whether classroom goal structure related with students' goal orientation. Participants were 525 students in two junior high schools in United States. Students' perceptions of mastery goal structures and performance goal structures were assessed items adapted from Midgley et al. (1998). Results showed that students who perceived the classroom context more mastery structured tended to be more mastery oriented. However, students tended to be more performance-approach oriented when they perceive that their classroom environment more emphasize getting extrinsic rewards, performing better than other and showing high ability. Furthermore, findings revealed that students reported more performance-avoidance orientation when they perceive the instructional practices more performance approach structured whereas they less focused on performance avoidance orientation when they perceived the classroom environment more mastery structured.

In line with the findings of Wolter (2004), previous studies also revealed similar patterns. Anderman and Young (1994) pointed out that learning environment can influence the development of students' goal orientations. Similar results were found by Kaplan and Maehr (1999), Anderman and Midgley (1997) and Anderman and Anderman (1999). Their findings also indicated that there is a positive relation between students' perceived goal structure and their personal goal orientation. Moreover, in Turkey, Tas (2008) recently investigated the relationship among personal goal orientations and classroom goal structures specific to science domain in a sample of 7^{th} grade students. She found that learning environments emphasizing students' abilities supported students to pursue performance goals while learning environments emphasizing learning the material supported students to adopt mastery goals.

2.3 Related Research with Science Learning Value (Subjective Task Value)

Tuan et al. (2005) pointed out that during the engagement in science learning in a suitably created environment, if students can gain problem-solving competency, perform inquiry activities, arouse their own thinking and grasp the relevance of science with daily life, they perceive the science learning as valuable. However, the description is only related with science learning. In order to better understand this construct, value beliefs are further explained by mentioning Expectancy-Value Theory (Wigfield, 1994; Eccles & Wigfield, 2000, 2002).

Achievement task value (subjective task value) is defined in terms of four components: attainment value (importance), intrinsic value, utility value (usefulness of the task), and cost. *Attainment value* is defined as the importance of performing well in a given task. *Intrinsic value* is the pleasure individual gets from doing a task. The third component of a task value is *utility value* defined as whether the task is suitable for individuals regarding their future goals, including career goals. Finally, *cost* refers to how the decision to participate in one activity reduces doing other activities (Wigfield, 1994; Eccles & Wigfield, 2000, 2002).

According to expectancy value model, the researchers suggested that expectancy and value beliefs can have effects on individuals' achievement related choices, effort, persistence, and performance. Furthermore, they emphasized that expectancies and values can be influenced by task-specific beliefs such as ability beliefs, the perceived difficulty of different tasks, and individuals' goals (Wigfield & Eccles, 2000, 2002).

Based on previous studies, Pintrich (1999) emphasized that task value beliefs were positively related to cognitive strategy use and self-regulated learning. Students tended to report the use of self regulatory strategies when they grasped interesting, important and useful features of course activities they engaged. The findings also revealed that task value was correlated to performance although these relations were not as strong as those for self-efficacy for both middle school and college students. Regarding performance and task value relations, similar result was found by Zusho et al. (2003). Their findings indicated that task value beliefs were the second significant predictor of the chemistry performance of college students (β =.22) after the self efficacy beliefs (β=.40). They suggested that teachers should focus on task values in their lessons by emphasizing the relevance and usefulness of subjects for everyday life. Likewise, Bong (2001) investigated the role of task value beliefs in predicting college students' course performance and future enrollment intentions. The findings of this study also showed that task value beliefs predicted the students' performance and their intention to future course selection. More specifically, overall, utility value (perceived usefulness) predicted performance stronger than interest value while interest value predicted enrollment intentions stronger than utility value.

A recent study that examined the role of task value beliefs in predicting achievement and strategy use was conducted by Yumusak, Sungur and Cakiroglu (2007). The study investigated how students' motivational beliefs, cognitive and metacognitive strategy use contribute to the biology achievement of Turkish high school students. Participants were 519 students attending 10^{th} grade. The instruments used in the study were Motivated Strategies for Learning Questionnaire (Pintrich et al., 1991) and Biology Achievement Test developed by the researchers. Results of the study showed that the motivational variables explained 10 % of the variation in students' biology achievement. Regarding task value beliefs, results indicated that task value beliefs (β=.16) significantly predicted the students' biology achievement. Higher levels of task value were found to be related with higher levels of achievement. Furthermore, the findings of the study by canonical correlations revealed a positive relation between higher levels of task value beliefs and higher levels of learning strategy use.

Relevance of knowledge with daily life is an important feature strengthens the value beliefs of students. With regard to relevancy of science with daily life, Barmby, Kind, and Jones (2008) carried out a study to investigate students' attitudes about science. Qualitative part of the study was conducted with a mobile science laboratory "Lab in a Lorry" which visited schools. The students involved in the Lab in a Lorry study were included in the semi-structured interview after two weeks. A total of 44 students varying academic abilities and having an age between 7 to 9 years were interviewed. The questions asked to students were related with their experience in Lab in a Lorry and their thoughts about school science. The analysis of interview data revealed that students did not enjoy in school science and did not perceive the school science as relevant. Students' responses pointed out that they could not make a links between school science and daily life. However, they expressed their pleasure while engaging in activities in Lab in a Lorry and stated that Lab in a Lorry made them to realize the importance of science in every day life. Therefore, as Tuan et al. (2005) said, teachers should create an opportunities in order for students to understand the relevance of science with daily life by designing supportive learning environments.

Regarding utility of science, George (2003) conducted a study to investigate the trend in students' beliefs among the middle and high school students. Also, the study examined which factors have an influence on the utility of science beliefs. The study was a longitudinal study and included information through grades 7^{th} to 11^{th}. The findings of the study revealed that both middle and high school students, in general, hold fairly positive attitudes about the usefulness of science. Additionally, the results showed that science self-concept had the strongest effects on students' attitudes about usefulness of science. The second strongest predictor of students' attitudes about the usefulness of science was the encouragement they received from their science teacher. Moreover, participation in science activities such as science fairs, science clubs related with higher attitudes about the usefulness of science but its effect was smaller when compared to science self concept or teacher encouragement. As the study pointed out, teachers can play an important role in development of students' attitudes about the usefulness of the science. Furthermore, Brophy (1998, 1999) highlighted the importance of teacher role in the formation of students' value beliefs and recommended that teachers support students to make a connection between classroom learning and life out of school. By this way, students can perceive the academic activities being applicable in real life.

2.4 Related Researches with Learning Environment Stimulation

Learning environments includes teacher-student interaction, student-student interaction, instructional strategies, class activities and curriculum content. These factors thought to have a significant influence on the formation of motivational beliefs of students (Brophy, 1998; Pintrich & Shunk, 2002; Tuan et al., 2005). Wolters and Pintrich (1998) explained that motivational processes such as formation of self-efficacy beliefs can be sensitive to the features of classroom environment. In line with this statement, Urdan and Schoenfelder (2006) emphasized that motivation does not only related with individual or only with context; it is resulted by the interaction between individual and features of classroom environment.

Students' goal orientations can be influenced by the learning environment they engage. With regard to goal orientation, many researches on this issue showed that there is positive relation between classroom goal structure and personal goal structure. The students tend to be more mastery oriented when the learning environment more emphasize the learning the task and self-improvement whereas students are more likely to be performance-oriented when they perceive their classroom environment as performance-focused such as giving more importance to the grades, competition (Anderman & Young, 1994; Anderman & Midgley, 1997; Kaplan & Maehr, 1999; Urdan & Schoenfelder, 2006; Wolter, 2004).

In one of these classroom goal structure research, Ames and Archer (1988) examined how perception of classroom goal structure relates to the development of motivational processing. Participants were 176 students from junior high school and high school. Students completed a questionnaire related with their perceptions of classroom goal structure, use of effective learning strategies, task choices, attitudes, and causal attributions. Findings of the study revealed that students perceiving their classroom environment as mastery-focused in which more emphasizes are given to learning and self-improvement, reported more effective cognitive strategy use and preference for more challenging tasks. Moreover, they developed more positive attitudes towards class and developed stronger attributional beliefs that success is because of individuals' effort. On the contrary, students perceiving the classroom environment as performance-oriented was more likely to put emphasizes on their abilities. Also, they tended to produce attributional beliefs in such a way that failure is because of lack of ability.

In another study, Hanrahan (1998) conducted a qualitative study to investigate the effect of learning environment on students' motivation and learning. Data were collected through observation of participants over six weeks, interviews with the students and the biology teacher and self- report survey (CES, Tobin, 1993). Twelve girls and three boys attending to 11^{th} grade in biology class in a local Brisbane high school were participated in the study. Findings of the study showed that although students' motivations (both extrinsic and intrinsic) were quite high, they were confronted with instructional problems. Results revealed that teacher centered-instructions and high autonomy of the teacher prevented students from engaging in learning activities deeply. She emphasized the implementation of suitable teaching methods in order to create a meaningful environment in which students can enhance their learning and strengthen their motivational beliefs.

Another research related with learning environment was performed by Black and Deci (2000). The study explored the effects of students' perceptions of autonomy supportive learning environment on their adjustment and academic performance in a university level. From the perspective of self-determination theory, autonomy supportive environment in which the student-centered instruction takes place concerns the preservation and improvement of intrinsic motivation. The findings indicated that student' perceptions of their teachers' as an autonomy supportive predicted increases in their self-regulation, perceived competence, interests and enjoyments and predicted decreases in anxiety over semester. Additionally, teacher autonomy support predicted performance in the course.

Studying with 377 ninth grade students and eleven teachers from seven high schools in Washington, Nolen (2003) investigated relationship between students' perception of science learning environment and motivation, learning strategies and achievement. In fall, students completed an achievement test and questionnaires related with motivational orientations and strategy-value beliefs. In spring, they completed the same questionnaires and additionally satisfaction with learning survey and learning environment survey. Teachers, however, completed a questionnaire related with their classroom features such as class level, classrooms tests, and textbook. Hierarchical Linear Modeling was used to examine the effects of classroom climate, measured as shared perception of students within classes, on the students' outcomes. The results indicated that shared perception (high intraclass agreement) of classroom learning environment were significant predictors of achievement in science and satisfaction with learning. Learning-focused classrooms in which teachers encourage students' understanding and independent thinking predicted positively students' satisfaction with learning. Shared perceptions of classroom environment in which only most clever can be successful in science classrooms, in which instruction progress rapidly and in which focus is on correct answers were predicted science achievement negatively.

A recent study that examined the association between the aspects of classroom climate and motivated behavior of students was carried out by Anderson, Hamilton and Hattie (2004). Participants were 12th grade students from four classes in each three separate secondary school in New Zealand. Data were collected by Classroom Environment Scale (CES, Trickett & Moos, 1974). The scales selected for the purpose of this study were competition scale, order and organization scale, rule clarity scale, teacher control scale, affiliation scale (degree of friendship students feel for each other such as enjoying working together, helping each other in their homework). Motivational scales used in the study were; involvement scale which measures students' level of interest and attentiveness in class activities and participation in class discussion obtained by students' self-report; participation scale which measures students' active and relevant participation or disengagement and disinterest completed by the teachers; and task completion scale measures number of assignments completed by students obtained from school records. The findings of the study revealed that social environment of classroom have a significant impact on the students' motivated behaviors. Among the dimensions of classroom climate, affiliation was the only variable that strongly distinguished 12 classrooms from three different schools. Classrooms were clustered according to level of affiliation. The findings indicated that higher levels of affiliation were related with higher levels of motivated behavior in the classroom.

Ryan and Patrick (2001) conducted a study to investigate how students' perceptions of social environment of classroom associate with changes in their motivation and engagement. Students, a total of 233, were administered a questionnaires in spring of 7th grade and again in fall of 8th grade. They came from 30 different math classes from three middle schools in Midwestern. Dimensions of classroom social environment included in the study were; teacher support, promoting interaction, promoting mutual respect, promoting performance goal. Teacher support refers to teachers' friendliness, caring and valuing students, establishing relationship with students. Promoting interaction refers to teacher's encouragement of students to interact with each other during class activities such as working together in group activities, informal help-giving and help-seeking in their seatwork. Promoting mutual respect refers to teacher encouragement to create an environment in which students communicate positively with each other. Promoting performance goal refers to emphasizing competition and relative ability comparison among students. Motivational variable were; academic efficacy, social efficacy with the teacher and social efficacy with peers. Social efficacy concerns the students' judgments of their capability to establish satisfactory and effective relationship with their teacher and peers. Students' engagement variables were self-regulated learning which concerns the students' planning, monitoring and regulating their cognition and disruptive behavior which refers to students' own disruptive behavior and negative manner in class. The findings of the study showed that in general students' perception of classroom social environment variables were correlated positively with motivation and self-regulated learning and negatively associated with disruptive behaviors. In particular, among the classroom social environment variables, teacher support, promoting interaction and promoting mutual respect were associated positively with social efficacy with teachers and with peers, academic efficacy, self regulated learning and related negatively to disruptive behavior. Promoting performance goals was negatively related with social efficacy with teachers and with peers, academic efficacy, self regulated learning and related positively to disruptive behavior. Furthermore, students' perceptions of classroom social environment were related to changes in motivation and engagement variables when they passed from 7^{th} to 8^{th} grade. More specifically, students' perceptions of classroom social environment were related to changes in students' social efficacy with their teacher (β=.38, p<.001), academic efficacy (β=.21, p<.01), self regulated learning (β=.15, p<.05), disruptive behavior (β=-.34, p<.001). However, classroom social environment did not related to changes in students' social efficacy with peer.

2.5 Related Research with Active Learning Strategies

Students become an active learner while using learning strategies to construct new knowledge based on their previous understanding. In constructivist learning, students actively engage in learning process, interact with their environment and apply active learning strategies to link newly learned things to previous knowledge for the construction of knowledge (Tuan et al., 2005).

With regard to learning strategies, deep learning and surface learning strategies mentioned in several research. Deep learning approach is related with intrinsic motivation and interest. Individuals using deep learning approach in specific learning task focus on meaningful understanding and attempt to establish relationships between newly learned things and prior knowledge, prior experience and everyday life. Surface learning approach is associated with extrinsic motivation. Individuals using surface learning approach in specific task perceive it as a requirement to be met. They tend to use rote learning and are more likely not to make connections with newly learned things and prior knowledge and experience (Chin & Brown, 2000).

Lee and Brophy (1996) pointed out that students' goal choices and learning strategy use during a task engagement can be a sign of their motivation to learn. Students who are motivated to learn pursue the goal of improving their understanding and tend to use cognitive and metacognitive learning strategies to attain specific tasks. In contrast, students who are not motivated to learn are more likely to complete the task with the minimal possible effort without gaining much understanding. Previous researches' findings supported these views in terms of the relationship between learning strategy use and learning goals (Kaplan & Midgley, 1997; Pajares et al., 2000; Pintrich, 1999; Shih, 2005; Somuncuoglu & Yıldırım, 2001). Therefore, in general, students' mastery goal orientation is positively related with the use of cognitive and self-regulatory strategies whereas students' performance goal orientation is positively related to use of much surface learning approaches. Moreover, Zimmerman (2000) stated that self efficacy beliefs encourage students to use learning strategies. In line with this statements, researchers found a positive association between self efficacy belies and self regulatory strategies (Pintrich, 1999; Usher & Pajares, 2006).

In general, researches investigating the association between use of active learning strategies and students' motivation focus on achievement goals (mastery and performance goals), self efficacy, intrinsic and extrinsic motivation and their relation with the learning strategy use. In one of these studies, Meece et al. (1988)

investigated how students' achievement goals influence their learning strategy use. Participants were 5^{th} and 6^{th} grade students, a total of 275 from 10 classrooms. The questionnaires were administered to students in order to assess their learning strategies and achievement goals science. The findings of the study revealed that students who pursue mastery goals reported more deep cognitive strategy use in their learning. In contrast, students pursuing performance goals reported more use of surface learning strategies.

The study by Greene, Miller, Crowson, Duke and Akey (2004) investigated the effects of students' self-efficacy, achievement goals and instrumentality on their cognitive engagement. Students (N=220) from one of the high schools in Midwest participated in the study completed a series of questionnaires over three months period. The findings through path analysis indicated that self efficacy (β=.14, t= 2.39), mastery goal (β=.40, t=5.62) and perceived instrumentality (β=.27, t=3.85) were predictors of strategy use. These variables were accounted for 48 % of the variance in meaningful cognitive strategy use. However, performance-approach goal did not predict meaningful cognitive strategy use. Additionally, meaningful cognitive strategy use directly predicted students' achievement (β=.15, t=2.08). It was the second variable after self efficacy having a direct effect on achievement. Therefore, the results revealed that meaningful cognitive strategy use which was influenced by self efficacy, mastery goal and perceived instrumentality, in turn, influenced achievement directly. In contrast to finding of Greene et al (2004), Meece, Herman and McCombs (2003) found a positive relationship between active learning strategy use and both mastery and performance goals.

More recently, Liem, Lau and Nie (in press) investigated the role of self-efficacy, task value and achievement goals in predicting students' learning strategies. Participants were 1475 9-year Singaporean students chosen from 147 classes in 39 secondary schools. Data were collected through Motivated Strategies for Learning Questionnaire (MSLQ; Pintrich et al., 1993) from which self-efficacy, the two types of cognitive engagement were taken and the Patterns of Adaptive Learning Survey (PALS, Midgley et al., 1998) from which three achievement goals scales were taken. Achievement goals included in the study were mastery goal, performance approach goals and performance-avoidance goals. Cognitive strategies mentioned in the study were surface learning strategies such as memorization, rote learning and deep learning strategies (deep cognitive engagement) such as understanding, questioning. The findings through path analysis revealed that cognitive learning strategies were predicted by achievement goals and self-efficacy. More specifically, mastery goal (β=.32, p<.01), performance-approach goal (β= .16, p<.01) and self-efficacy (β=.22, p<.01) had a direct effect on the adoption of deep learning strategies. Mastery goal also had a direct effect on use of surface learning strategies (β=.55, p<.01). Moreover, performance-avoidance goal had a direct effect on surface learning strategy (β=.15, p<.01). Although performance approach goal was found to be positive predictor of deep learning strategies, its affect on surface learning strategy was not significant (β=.01, p<.85). The results showed that the students pursing mastery goal can use both deep and surface learning strategies at the same time. The researchers explained this situation regarding cultural reasons and Singaporean students' unique learning approach by giving such a statement "memorization with understanding". Furthermore based on the finding that performance goal was a positive predictor of deep learning strategies, they emphasized that performance approach goals may produce adaptive learning outcomes in learning situations.

In another recent study, Walker, Greene and Mansell (2006) examined how identifications with academics, self efficacy, and intrinsic and extrinsic motivation play a role in predicting cognitive engagement. "Identification with academics" refers to the degree to which individuals establish their self-esteem depending on academic outcomes, value academic achievement and belong in the academic environment. In this study, two types of cognitive engagement were mentioned; meaningful cognitive engagement and shallow cognitive engagement. Meaningful cognitive engagement concerns using strategies that merge the meaningful processing (connecting new information with existing knowledge) and self-regulatory strategies. Shallow learning strategies include applying rote memorization and cannot link the new information to the previous knowledge.

Participants were 191 college students in Southwestern University. Data were collected through Academic Motivation Scale (AMS, Vallerand & Bissonnette, 1992) to measure extrinsic and intrinsic motivation, Self Efficacy Scale (Greene & Miller, 1996), Identification with Academics Scale (based on Osborne, 1997), Cognitive Engagement Scale (Greene & Miller, 1996). Intercorrelations among the variables showed that meaningful cognitive engagement was positively correlated with self efficacy, intrinsic motivation and identifications with academics. Path model was used in order to assess predicted relationship between cognitive engagement variables and motivational variables. The findings indicated that meaningful cognitive engagement was predicted positively by self-efficacy (β= .32, t=5.32), intrinsic motivation (β=.24, t=3.62), and identifications with academics (β=.34, t= 5.20). Moreover, extrinsic motivation was the only variable that predicted shallow cognitive engagement (β=.39, t= 5.43).

2.6 Related Research with Grade Level-Related Changes in Motivation

Most of the children begin to school with more positive attitudes, enthusiasm and motivation. Students' beliefs about their abilities towards learning are more optimistic in early ages. However, students tend to be more doubtful and negative about their ability-related beliefs in proceeding years of schooling (Freedman-Doan et al., 2000; Wigfield & Eccles, 2000). Students' confidence in their ability, curiosity and excitement about learning begin to decrease over the course of school years and they start to develop such a feeling that school is place in which they are forced to do many activities not having a lot of meaning for them (Wigfield & Wentzel, 2007). Children form beliefs about themselves and academic domains starting even from the first year of schooling. Their beliefs about themselves and academic domains at this early ages tend to be stable especially if their beliefs are negative and maladaptive (Patrick et al., 2008).

There is a growing concern about decline in motivation, perceptions of ability, and interest of students towards academic domains in educational research. Motivational researchers deal with this issue by conducting cross-sectional and longitudinal studies. With regard to motivational decline, Pintrich (2003) stated that "students' understandings and beliefs about motivation become more differentiated over time with more complex meanings and understanding of ability, effort, intelligence, interest, and value emerging with age". Similar to this view, Eccles and Wigfield (2000) stated that students start to shape beliefs about their abilities and values more accurately as they get older via the evaluative feedback. Also, they underlined that since the nature of school environment becomes more competitive and more evaluative, these factors influence some students in a negative manner during their formation of ability related beliefs.

Earlier, Wigfield and Eccles (1994) investigated the changes in students' competence beliefs, values and general self esteem during the transition from elementary school to junior high school in some academic domains (mathematics, English, social activities and sport activities). Approximately 1850 students making transition from 6th grade in elementary school to 7th grade in junior high school were participated in the study. Students completed the questionnaire fourth times; twice in the 6th grade and twice in the 7th grade. The results showed that students' self esteem decreased after the transition from the 6th to 7th grade and increased during 7th grade. However, students' overall self esteem in seventh grade was lower than the self esteem in sixth grade. Furthermore, students' competence beliefs and valuing (usefulness and importance) the tasks also decreased after the transition from 6th to 7th grade. Wigfield and Ecless underlined that the decline in competence beliefs and task value beliefs across the transition from 6th to 7th grade can be explained by the changes in students' interpretation of evaluative feedback and changes in learning environments. They also argued that younger children are more optimistic and older children are more realistic for their evaluation of competence beliefs.

In another study of Eccles, Wigfield, Harold and Blumenfeld (1993), students self perceptions and task value perceptions were examined during the elementary school years. The participants were 865 students in 1st, 2nd, and 4th grades from ten elementary schools in Michigan. Their ages were 7 to 10 years. A questionnaire was administered to assess their self perceptions of competence in several activity domains (math, reading, sport, experimental music) and valuing of these activities. The results revealed that students' perceptions of competence beliefs decreased across the grades. In general, younger children reported higher competence beliefs than older children. Furthermore, task value beliefs showed different patterns in several activity domains. Valuing the tasks showed a decrease in reading and music, showed an increase in sport and remained almost same in math.

In a longitudinal study, Jacobs, Lanza, Osgood, Eccles, and Wigfield (2002) investigated the changes in students' perception of self competence and task value beliefs in mathematics, language arts and sports. Data were collected between the years 1989-1999. Participants were 761 students in grades 1 through 12. The results of the study showed changes in students' perception of self competence and task value beliefs across the grades. Competence beliefs of students' in all domains decreased across the school years. Similar to results for competence beliefs, task value perceptions also declined across the grade levels. Moreover, it was found that changes in competence beliefs accounted for much of the changes in task value beliefs over time explaining 40 % decreases in values in each domain studied.

In another study related with changes in students' motivation, Otis, Grouzet, and Pelletier (2005) examined the changes in intrinsic and extrinsic motivation during the transition from junior high school to senior high school. It was a longitudinal study that took place three consecutive years in Canada. A total of 646 students participated in the study with mean ages of 13, 14, and 15 years. The Academic Motivation Scale (AMS; Valerand et al., 1989, 1992, 1993) assessing intrinsic and extrinsic motivation was administered to the students when they were in 8th, 9th and 10th grade. Results of the study indicated that students' intrinsic and extrinsic motivation gradually declined from the 8th to the 10th grade. The authors suggested that teachers should be particularly helpful to the students experiencing the motivational decline and maintaining the same low level of motivation by adjusting educational environment in a positive way.

Recently, Neber, He, Liu, Schofield (2008) examined whether the Chinese students are self-regulated learner by investigating this issue from three aspects; motivational, cognitive and environmental. Participants were 8th and 10th grade students in Beijing. A questionnaire was administered to the students. Motivational variable used in the study were self-efficacy for learning physics, intrinsic values of learning physic and task goal orientations. The findings revealed that although tenth grade students perceived the classroom environment as less teacher-controlled, and more open to investigation, they had a lower level of motivation than eight graders. There was a decline in intrinsic value, self-efficacy beliefs, task goal orientation, and self-regulatory strategy use among tenth graders as compared to eight graders and there was an increase in work-avoidance goal orientation across the grades. The authors emphasized the grade-related motivational decline even though students in tenth grade reported more supportive and investigative classroom environment. They suggested that teachers should provide the learning environment in a complementary way that students can both experience individual decision-making and take teachers' help and support in order to enhance their motivation.

In one of the studies concerning a change in motivation towards learning, Anderman and Migdley (1997) investigated the students' motivation during the transition from elementary school to middle school in math and English. Patterns of Adaptive Learning Survey (PALS; Midgley et al., 1996) was administered to 341 students in 5th grade in elementary school and re-administered to same students in their 6th grade in middle school in Midwestern city. Personal achievement goals, perceptions of classroom goal structure (task oriented or performance oriented) and perceived academic competence were the motivational variable of the study. Results showed that students' personal task goals decreased after the transition from 5th to 6th grade. The study also revealed differences in classroom goal structures. 6th grade students perceived their classrooms as more performance oriented and less tasks oriented than 5th grade classrooms. Moreover, there was a decline in perceived academic competence from 5th to 6th grade, especially in high ability students. In this study, features of the classroom environment were found to influence students' motivation negatively. The authors stressed the role of changes in the features of learning environment and also changes in the type of academic task, evaluation process and peer group relations during the formation of these beliefs. They suggested that educators and teachers should create an environment that supports students learning and development positively.

Anderman and Anderman (1999) investigated the role of environmental factors in changes in students' achievement goal orientations from 5^{th} to 6^{th} grade. The environmental factors included in the study were classroom goal structure, school belonging ("students feeling of being respected and of comfort in their particular middle school"), and social relationship with peers. The data collected from 660 students in a longitudinal study. The findings pointed out a shift from personal task goal orientation to personal ability goal orientation from 5^{th} to 6^{th} grade. More specifically, ANOVAs results revealed that students were reported lower levels of personal task goals in 6^{th} grade (M=3.52) than in 5^{th} grade (M=3.66). On the contrary, students reported higher levels of personal ability goals in 6^{th} grade (M=2.84) than in 5^{th} grade (M=2.68). The authors emphasized that the changes in motivational orientations caused by inappropriate instructional practices and social aspects of school and classroom environment. They advised to teachers for the use of more socially oriented instructional practices such as cooperative learning strategies in their classrooms.

Similarly, Urdan and Midgley (2003) explored that whether changes in students' perceptions of classroom goal structure have an effect on motivation as students proceed from one grade level to another. This study was a longitudinal study including three consecutive years. Data collection started with 555 students attending in 5^{th} grades and continued in their 6^{th} and 7^{th} grades. Findings revealed that students who perceived a decline in mastery goal structures of classroom from 5^{th} to 6^{th} grade reported significantly lower level of self-efficacy and personal mastery goal. Moreover, similar decline was observed in students' self efficacy and personal mastery goals from 6^{th} to 7^{th} grade when they again perceived a decrease in classroom mastery goal structure.

In Turkey, Yavuz (2006) conducted a study to find out whether or not students' motivation in science changes regarding grade-level. Participants (N=3685) were 6th, 7th, and 8th grade students. Findings of the study revealed a decline in students' motivation in science as students proceed from one grade to upper one. Sixth grade level students reported highest level of motivational traits whereas 8th grade level students reported lowest level of motivational traits in science.

Earlier, Harter, Whitesell, and Kowalski (1992) examined changes in students' motivational orientation and academic self-concepts during the educational transitions. The researcher conducted their studies in two parts; Study 1 and Study 2. Study 1 was a longitudinal study conducted with the four groups of students; 5th to 6th grade for both same school and different school and 6th to 7th grade for both same school and different school. The results of study 1 revealed three groups of students whose perceived competence decreased, increased and remained same across the transition. Students who initially had lower perceived competence reported more increase in their perception of competence than the students having initially higher perceived competence. Moreover, there was a significant relationship between the changes in perceived competence and changes in motivational orientations. Students showing increases in perceived competence across the transition also showed increases in intrinsic motivation whereas students showing decreases in perceived competence showed decreases in intrinsic motivation. Students who reported stability in their perception of competence showed a slight increase in their intrinsic motivation. In study 2, participants were 338 middle school students attending 6th, 7th and 8th grade. A questionnaire was administered. The results of second study revealed that majority of the students focused more on extrinsic motivation and they perceived the school environment more performance oriented giving more emphasize to the competition, grades and performance evaluation.

Greenfield (1997) investigated how students' attitude towards science changes by grade-level. The study included students in three types of schools which grades were clustered to ease the analysis; lower elementary (grade K-3), upper elementary (grade 4-6), intermediate (grade 7-8) and high schools (grade 9-12). With regard to motivation, the variables included in the attitude scale were science self concept, science anxiety, relevance of science. The results showed that overall younger students' attitudes towards science were more positive than the older students' attitudes towards science. However, intermediate school students' expressed lower science self-concept than either elementary or high school students.

In a recent study, George (2006) explored changes in students' attitudes towards science and changes in attitudes towards utility of science over the middle school and high school years. It was a longitudinal study. There were 444 participants attending 7^{th} through 11^{th} grades. Science self-concept, science anxiety, utility of science were the motivational variables included in the study. The results of the study indicated general decline in the attitudes of students over the middle school and high school years. Moreover, students' overall attitudes towards utility of science showed increasing trends, however declined after the 10^{th} grade. Also, the results indicated that science self-concept was the strongest predictor of the attitudes towards science and attitudes towards utility of science.

More recently, Barmby et al. (2008) conducted a research to investigate the changes in students' attitude towards science over the first three years of secondary school in England. Mean ages of students participated in the study were 7, 8, 9 years. The attitude construct included six variables which were learning science in school, practical work in science, importance of science, self-concept in science, future participation in science, and science outside of school. The data were both quantitative and qualitative. A questionnaire was administered to the 932 students. Also, 44 students were interviewed about their views on science generally. The results indicated a steady decline in students' attitude towards science while students progress through the school. The largest decline in students' attitude towards science was observed in attitudes towards learning science in school whereas students' attitudes towards practical work in science and importance of science showed small decreases through the years 7 to 9 years.

In another study, Zusho, Pintrich, Arbor, and Coppola (2003) made a study to investigate the changes in motivation of students over time. Participants were 458 students enrolled in introductory college chemistry classes in Midwestern. Participants' motivation was assessed at three time points over time. Motivational variables included in the study were self-efficacy, task value (importance and utility of the course), mastery goal orientation, performance goal orientation, interest and anxiety. The result indicated that in general, students' motivation decreased over time. Specifically, there was a decline in students' self efficacy and task value whereas students' performance goal increased. There were not significant differences detected in students' mastery goal, interests and anxiety over time.

2.7 Related Research with Gender Differences in Motivation

Although gender issue has maintained its importance in the field of motivation for many years, research findings failed to demonstrate a consistent pattern. In this part, gender differences in motivation were examined based on goal orientation theory (Ames, 1992; Dweck, 1999; Elliot, 1999; Midgley et al., 1998; Nichols et al., 1990), self-efficacy of social cognitive theory (Bandura, 1997), expectancy-value theory (Wigfield, 1994; Eccles & Wigfield, 2000) and attribution theory (Weiner, 1985). Furthermore, gender differences in active learning strategy use, attitude toward science and stereotypic view of science were presented.

Concerning gender differences in achievement goal orientations, research findings have produced mixed results. While some studies found boys to be more mastery oriented and less performance oriented, others found reverse patterns. Moreover, some studies revealed no gender differences. Therefore, there is not a clear pattern in achievement goal research with respect to gender. For example, Anderman and Young (1994) reported that girls were more learning focused and less ability focused in science than boys. Likewise, girls were found to be more learning focused than boys in study of Martin (2004). Similarly, Middleton and Midgley (1997) reported that African American girls showed higher task goal orientation than African American boys in math. Also, they pointed out that boys adopted stronger performance-approach goals than girls in math. Moreover, Anderman and Anderman (1999) and Britner and Pajares (2001) found that boys had stronger performance approach goal orientations in science. Additionally, Meece et al. (2003) reported that boys were more performance-oriented and work-avoidant than girls. In contrast to these findings, DeBacker and Nelson (1999, 2000) reported that females were somewhat more influenced by extrinsic motivators (i.e., pleasing the teacher, perceived instrumentality and outperforming others) than the males. Pajares, Britner and Valiante (2000) and Meece and Jones (1996) reported no gender differences in students' learning and performance goals.

Regarding self-efficacy beliefs, some research indicated that boys tend to report higher self-efficacy than girls about their performance in math and science (Anderman & Young, 1994; Pajares, 1996). Moreover, Meece and Jones (1996) found that boys had a greater science confidence than girls. Recently, Neber et al. (2008) reported that girls had a lower self efficacy than boys in physics and Hassan (2008) reported that boys had a stronger self-concept of ability in science than girls. Also, Beghetto (2007) showed that boys had more positive perceptions of competence in science than did girls. Additionally, DeBacker and Nelson (2000) found that boys had higher perceived ability than girls in science subjects. Contrary to these findings, Britney and Pajares (2001, 2006) found that girls had higher science self efficacy than boys. In the study investigating the sources of self-efficacy beliefs, Usher and Pajares (2006) found different results for girls and boys. They reported that social persuasion accounted for greater unique variance in the prediction of girl's academic self-efficacy than did mastery experience whereas boys' mastery experience accounted for greater unique variance in self-efficacy than did the other sources combined. Based on above findings, it can be said that girls may rely more on others' judgments of their capabilities than on their previous mastery experience.

Concerning learning strategy use, Meece and Jones (1996) found that average achieving girls reported greater use of meaningful learning strategies than average achieving boys and boys reported greater use of superficial learning strategies than girls. Similarly, Neber et al. (2008) reported that boys more tended to use superficial learning strategies than girls during physic learning. In addition, Baser (2007) found out that Turkish boys less focused on the use of active learning strategies than girls during biology learning.

As far as gender differences in causal attribution patterns are considered, review of research explained that men attribute their success to internal stable causes such as ability and attribute their failure to external factors such as low effort. In contrast, women are more likely to attribute their success to external causes such as luck, ease of task or unstable causes such as effort, trying hard whereas attribute their failures to internal and stable causes such as lack of ability (Pintrich & Shunk, 2002; Meece, Glienke, & Burg, 2006). However, they pointed out that these patterns are not consistently found across all studies. Meece et al. (2006) also underlined that gender differences in causal attribution pattern depend on academic domain and these differences may be more obvious for achievement areas that were sex-typed as masculine and feminine domains such as science and math, English, and writing.

Concerning the research on gender differences in value beliefs, Debacker and Nelson (1999) found gender differences in the contribution of motivational variables (values, beliefs and goals) to persistence and effort in science. With regard to effort, goals accounted 36 % of variance for females, whereas goals and values made approximately equal contributions for males (25%, 20% respectively). Moreover, goals were the strongest predictor of persistence scores for males explaining 44% of variance whereas goals accounted for 36% of variance and values accounted for 16 % of variance in explaining persistence scores in females. Furthermore, it is found that beliefs especially perceived ability were more strongly associated with persistence and effort for females than males. Meece et al. (2006) stated that gender differences in students' competency beliefs and the value beliefs in different academic domains follow gender stereotypes. In line with this view, Debacker and Nelson (2000) pointed out that stereotyped views of science, perceiving science as a male domain, were more strongly negatively related to perceived instrumentality, importance of science and perceived ability in females than males. In order to understand the gender differences related with this subject, the stereotypic beliefs of girls and boys about science are given in below part.

When gender stereotyped beliefs about science and science learning motivation are examined, it was reported that students who have high perception of value and ability in science and who do not possess gender stereotyped views of science tend to follow learning goals in science class whereas students who possess more stereotyped views of science are less likely to pursue learning goals in science class and to chose science careers as a future goal (DeBacker & Nelson, 2000). Furthermore, Jones, Howe and Rua (2000) conducted a study in order to investigate whether students' attitudes, interest and experiences in science vary as a function of gender. Participants were 437 sixth grade students from five schools in southeastern United States. The findings of the study indicated that males were interested in physical sciences more than females whereas females were interested in science aesthetics and biological sciences more than males. Males reported more interests in lights, electricity, planes, and new sources of energy, atomic bombs, atoms, cars, computer, x-ray, and technology while females reported more interests in animal communication, healthy eating, colors, and rainbows. Also, their extracurricular activities showed differences such as boys being more interested in batteries, electric toys, pulleys and girls being more interested in planting seeds and bread making. Furthermore, students' perception of science also followed gender differences. More males than females perceived science as better suitable for boys. More females than males perceived science as difficult to understand. The study of Greenfield (1997) supported the study of Jones et al. (2000) in some aspects. Greenfield also found that males more than females were more likely to perceive science as a masculine domain. Boys more than girls expressed more interests in extracurricular activities related with physical sciences, but gender differences were not found in life sciences. Moreover, the study revealed that girls were actively participated in science class, carried out science experiments like boys; however, they did not receive much attention from their teachers. Furthermore, Kahle, Parker, Rennie, and Riley (1993) expressed that gender effect has an influence on students' attitudes towards science, their self-confidence in performing science activities, their achievement levels in science and motivation to follow science course and careers. They pointed out that both males and females have stereotypic images of science as a masculine domain particularly physical science. They emphasized that girls undervalue their competence in science and were less confident in science. Moreover, they drew attention to the issue that teachers also influence students' formation of stereotyped images of science as a masculine domain. Additionally, DeBacker and Nelson (2000) found that boys reported higher scores on stereotyped views of science as a male domain than girls. Meece and Jones (1996) found out that although there was not gender differences in students' science grades, girls were found to be less confident in their ability to perform science tasks successfully in the classroom. With regard to this result, they concluded that this can be resulted by the girls' perception of science as a masculine domain. In Turkey, Yavuz (2006) found that girls were more motivated than boys in science among the grades 6^{th}, 7^{th} and 8^{th}. In line with this finding, Yaman and Dede (2007) and Arısoy (2007) also reported that girls possess higher motivation than boys in science learning.

Meece et al. (2006) emphasized that teachers and parents play a significant role in the formation of gender differences in competence beliefs, value beliefs, interest and overall motivation by modeling sex-type behavior, expressing different expectations and goals for boys and girls, encouraging different activities and skills. Cultural stereotypes (such as science as a masculine domain) influence parents' perceptions of their children abilities, in turn, influence students' perceptions of their own ability.

2.8 Summary

The reviewed research pointed out that self-efficacy; goal orientations, learning environment, active learning strategies, and task value have considerable effects on the quality of learning, engagement in learning task, educational outcomes and future goals. Also, these motivational variables reciprocally affect each other in learning situations. Furthermore, the research identified changes in learning motivation of students regarding grade level and gender. In general, longitudinal and cross-age studies drew attention to the grade-level related motivational change and decline as proceeding one grade to upper one. However, research on gender differences in motivation outlined mixed patterns. Some studies found boy to be more motivated towards learning, some studies identified reverse situation and some studies revealed no gender differences. Moreover, it was emphasized that perceptions of stereotypic images of domains especially science a masculine domain can arouse negative consequences during the formation of motivational beliefs particularly for girls.

CHAPTER 3

METHOD

3.1 Introduction

This chapter consists of information presented in nine parts respectively; the design of the study, population and sampling, variables and the instrument of the study, data collection, data analysis, assumptions and limitations of the study, threats to internal validity and ethical issues in the study.

3.2 Design of the Study

In this study, students' motivations towards science learning were investigated. A cross-sectional survey design was used since the information was collected at just one point in time (Fraenkel & Wallen, 2005). The nature of the present study was a cross-age including 6^{th} and 8^{th} grade students in order to reveal motivational patterns with regard to grade level and gender. Data were analyzed using two-way multivariate analysis of variance (2-way MANOVA) to determine the effect of gender and grade level on the six dimensions of motivation towards science learning.

3.3 Population and Sampling

The target population of this study was all 6^{th} and 8^{th} grade students in elementary schools in Ankara. The accessible population of the study was 6^{th} and 8^{th} grade students in the public elementary schools in Yenimahalle district of Ankara. Twelve elementary schools were randomly selected from 83 public elementary schools in Yenimahalle district. Almost all 6^{th} and 8^{th} grade students of the representative schools (12 schools) were participated in the study. The frequencies and the percentages of students with respect to gender and grade level are given in the Table 3.1.

Table 3.1 Distribution of Sample with respect to Gender and Grade Level

Grade Level (N)	**Gender (N)**			
	Girls	**Boys**	**Missing**	**Total**
6th grade	557	599	8	1164
8th grade	532	514	9	1055
Missing	4	8		12
Total	1093	1121	17	2231

As seen in Table 3.1, a total of 2231 students (1093 (49 %) girls; 1121 (50.2 %) boys; 17 students did not provide their gender) across the grade level participated in the study. Of 2231, 1164 (52.2 %) were attending 6th grade and 1055 (47.3 %). students were attending 8th grade level. Twelve students did not report their grade level.

Furthermore, information regarding socio-economic status of sample (SES) presented in Table 3.2. Majority of the students reported that they have a separate study room (78.3 %) and have a computer at their home (61.8 %). Also, students had books varying in numbers mostly reported between 26-100 books at their home. More than half of the students (62.4 %) reported that they sometimes find daily newspapers at their home. When students' family income examined, it can be inferred that majority of students come from middle class family. When the fathers' educational level (FEL) considered, the table indicated that most of the fathers (30.8%) graduated from high school. The percent of fathers graduated from university is only 14.8. Moreover, mothers' educational level (MEL) showed that majority of them (41.5%) graduated from primary school and only 7.9% graduated from university. Also, concerning Fathers Working Status (FWS) and Mothers Working Status (MWS), most of the fathers were employed (90%) whereas most of the mothers were unemployed (81.2 %).

Table 3.2 Socio-economic status of the sample (SES)

	%	%
Educational level of parents	**FEL**	**MEL**
Illiterate	0.5	3.4
Primary School	24.7	41.5
Secondary School	22.3	20.4
High School	30.8	24.2
University	14.8	7.9
MS & Ph.D	8.4	1.0
Employment	**FWS**	**MWS**
Unemployed	7.9	81.2
Employed	90.0	18
Family income		
0-500 YTL	18.7	
500-1000 YTL	32	
1000-1500 YTL	24.1	
1500-2000 YTL	12.8	
More than 2000 YTL	8.1	
Number of books in the home		
0-10 books	8.3	
11-25 books	29.8	
26-100 books	32.9	
101-200 books	15.1	
More than 200 books	11.7	
Study room		
Have room	78.3	
No room	20.6	
Computer		
Present	61.8	
Absent	37.6	
Newspaper		
Never	6.8	
Sometimes	62.4	
Always	30.1	
Sibling		
0	7.2	
1	45.0	
2	30.2	
3	10.7	
4 and above	5.9	

3.4 Variables

This study included six dependent variables and two independent variables.

3.4.1 Dependent Variables

The dependent variables of this study were; self efficacy (SE), active learning strategies (ALS), science learning value (SLV), performance goal (PG), achievement goal (AG) and learning environment stimulation (LES). These variables were considered as continuous variables and measured on interval scale.

3.4.2 Independent Variables

The independent variables of this study were gender (girls and boys) and grade level (6^{th} grade level and 8^{th} grade level). These variables were considered as discrete variables and measured on nominal scale.

3.5 Instruments

The instruments used in this study were Demographic Characteristic Questionnaire and Students' Motivation Towards Science Learning Questionnaire (SMTSL).

3.5.1 Demographic Characteristics Questionnaire

Demographic Characteristics Questionnaire revealed data about socio-economic status (SES) of the sample. The items on the questionnaire were related with parents' educational level, parents' working status, family income, number of siblings, and number of books at home, daily newspaper, having a study room and computer in the home.

3.5.2 Students' Motivation Towards Science Learning Questionnaire (SMTSL)

In this study, SMTSL questionnaire, developed by Tuan, Chin and Shieh (2005), was used in order to assess students' motivation towards science learning. The questionnaire was translated and adapted into Turkish by Baser (2007). It is a self-reported questionnaire and a five-point Likert-type scale consisting of six motivational subscales. These subscales and their reliability coefficients obtained from present study were; Self-Efficacy (SE, 6 items, α=0.66), Active Learning Strategies (ALS, 8 items, α=0.87), Science Learning Value (SLV, 5 items, α=0.70), Performance Goal (PG, 3 items, α=0.67), Achievement Goal (AG, 5 items, α=0.70), and Learning Environment Stimulation (LES, 6 items, α=0.78). Items on the scales are ranging from "1=strongly disagree" to "5= strongly agree". Tuan et al. (2005) reported that Cronbach alpha for the original questionnaire is .89; for each scale, alpha ranged from .70 to .87 and discriminative validity ranged from .09 to. 51 indicating that each scale measured different dimension from another in their study.

In SMTSL questionnaire, Self Efficacy (SE) refers to students' beliefs about their capabilities to perform science learning tasks well (e.g., "Whether the science content is difficult or easy, I am sure that I can understand it"). Active Learning Strategies (ALS) refers to students' motivation for active engagement during science learning by using a variety of strategies to construct new knowledge based on their prior understanding (e.g., "When learning new science concepts, I connect them to my previous experiences"). Science Learning Value (SLV) assess students' motivation created as students perceive the value of science learning by gaining problem solving ability, understanding the relevance of science with daily life and practicing inquiry activities (e.g., "I think that learning science is important because I can use it in my daily life"). Performance Goal (PG) refers to students' willingness to be seen as competent in science learning to other students and the teacher (e.g., "I participate in science course to perform better than other students"). Achievement Goal (AG) refers to students' satisfaction as they increase their capability and success during science learning (e.g., "During a science course, I feel most fulfilled when I attain a good score in a test"). Learning Environment Stimulation (LES) assess students' motivation for learning science influenced by student-student interaction, student-teacher interaction, teacher instruction and curriculum (e.g., "I am willing to participate in this science course because the content is exciting and changeable").

The developers of SMTSL questionnaires expressed that this questionnaire was created specifically to investigate students' learning motivation in science (Tuan, Chin & Shieh 2005). The items in the questionnaire entirely focus on motivation for learning science rather than understanding students' general motivation in learning. Some of the other researchers have highlighted the importance of being specific for questionnaires while investigating students' learning motivation in specific content areas because students may express their motivational beliefs in different manner in these areas (Lee & Brophy 1996).

Table 3.3 Items of Subscales of SMTSL Questionnaire

Subscales	**Item No**
Self Efficacy (SE)	1, 13, 18, 21, 26, 33
Active Learning Strategies (ALS)	2, 8, 14, 19, 25, 29, 30, 32
Learning Environment Stimulation (LES)	6, 12, 17, 24, 28, 31
Science Learning Value (SLV)	3, 9, 15, 20, 23
Achievement Goal (AG)	5, 7, 11, 22, 27
Performance Goal (PG)	4, 10, 16

Note. The SMTSL Questionnaire was presented in Appendix B.

3.6 Procedure

This study was conducted in the randomly selected public schools in Yenimahalle district of Ankara during 2007-2008 fall semester. Twelve schools and 2231 students were participated in the study. With the formal permissions from the Ministry of Education and the administration of each selected school, the study was implemented.

As all scientific research, this study was also conducted within the voluntary basis. The questionnaire was administered to volunteer students in the classrooms during their science and technology lesson. Students were informed about the purpose of the study and the procedure. Almost all students in the classrooms were willing to participate in the study. The students were told that their answers were not used for their assessment in science and technology lesson. Students were also informed about not to write their name on the questionnaire. They were especially warned about that there was no true answer in the questionnaire and they were requested to reflect their opinion sincerely. Approximately twenty five minutes were needed to fill the questionnaire. Since the sample size was large and students were enrolled in different schools, the data were collected by the researcher and also the science teachers of the schools. In order to prevent the data collector bias, all the necessary explanations were made beforehand.

3.7 Data Analysis

Data were analyzed through descriptive and inferential statistics. Descriptive analysis of each scales were performed. Means, standard deviations, skewness and kurtosis values were provided in the analysis. Cronbach's Alpha coefficients for each motivation scale were calculated.

There were six dependent variables namely self-efficacy (SE), active learning strategies (ALS), science learning value (SLV), performance goal (PG), achievement goal (AG), and learning environment stimulation (LES) measured by the SMTSL and two independent variables in the study. Two-way multivariate analysis of variance (MANOVA) was conducted to investigate the effect of gender and grade level (6^{th} and 8^{th}) on these motivational variables. Statistical Package for Social Sciences (SPSS) program was used to analyze the data.

3.8 Assumptions and Limitations

3.8.1 Assumptions

- The SMTSL questionnaire was administered under standard conditions.
- Because the study was relied on students' responses in the questionnaire, it is assumed that students responded to the items honestly.
- The researcher and the science teachers who administered the questionnaire were not biased.

3.8.2 Limitations

- The questionnaire used in this study is a self- reported questionnaire and the results of the study entirely relied on students' answers.

- This study was limited to the 12 public schools in Yenimahalle district of Ankara. This sample may not be representative concerning other public schools and private schools in Ankara and Turkey.

- 6^{th} and 8^{th} grade students were included in the study to investigate whether or not the motivation of students towards science learning differ as a function of grade level. It can be more effective to reveal the motivational tendency when the 7^{th} grade students would also be included in the study. Yet, the more time and financial support would be needed to make this wish further.

- Teachers who administered the questionnaire may influence the students for the quick completion of the questionnaire in order to save the time and continue their lessons.

3.9 Threats to Internal Validity of the Study

Mortality might be a threat in this study. Some of the subjects might be absent from the class on the day of testing or fail to complete the questionnaire. If the percentage of the lost subjects is somehow problematic such as introduce some bias, limit the generalizability of the result, then mortality threat can arise (Fraenkel & Wallen, 2005). To control mortality threat in this study, the sample size was held as large as possible. Also, questionnaire was administered in a typical school days. So, the number of absent students did not arise any problem. The other mortality threat is that some students cannot complete the questionnaire in a given time and do not return the questionnaire. This was controlled by arranging an optimum time for the completion of the questionnaire.

Instrument decay resulted from scoring procedures such as different interpretations of results or fatigue of scorers is an instrumentation threat to internal validity (Fraenkel & Wallen, 2005). In this study, the questionnaire was printed in optical format in order to prevent any problem related with scoring procedures. Another instrumentation threat to internal validity is a data collector bias which the data may be unconsciously distorted in the favor of expected results (Fraenkel & Wallen, 2005). In this study, the questionnaire was administered by mainly the same researcher, but also other science and technology teachers administered the instrument. To prevent this threat, necessary explanations were made previously to the data collectors. So, instrumentation was not considered as a threat in this study.

The places where the data are collected may produce alternative explanations for results. This threat is known as a location threat (Fraenkel & Wallen, 2005). This study was carried out in typical classrooms in which there were not any extraordinary things. So, location could not be a threat in this study.

3.10 Ethical Issues in the Study

Confidentiality was ensured by informing students not to write their identity on the questionnaires. In this study, it was not necessary to identify individual subjects.

Deception was not an issue in this study because of the nature of the study. All students participated in the study were informed explicitly about the all aspects of study; the purpose of the study, directions and completion of the questionnaire.

This study did not arouse any psychological or physical harm for the subjects. The study was performed in the classrooms, usual places for students. Also, there were not any items that may influence students' psychological conditions in the questionnaire. Therefore, the subjects were not exposed to any harm.

CHAPTER 4

RESULT

This chapter includes descriptive statistics for the variables, assumption of multivariate analysis of variance and two-way MANOVA in order to explore any differences of grade level by gender (and vice versa) on the dependent variables of motivation. Additionally, main effect by grade level and by gender on the dependent variables examined in detail.

4.1 Descriptive Statistics

Means and standard deviations for gender and grade level with respect to six motivational variables were presented in Table 4.1. In general, mean scores for the whole sample were above the scales' midpoints indicating quite high levels of motivation towards science learning. Also, girls had higher mean scores than boys on each motivational variable for each grade level.

Table 4.1 Descriptive statistics for measures by grade level and by gender

Measure	6^{th} grade level				8^{th} grade level			
	Boys (N=593)		Girls (N=551)		Boys (N=510)		Girls (N=525)	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
SE[1]	3.58	0.84	3.85	0.83	3.44	0.76	3.61	0.76
ALS[1]	4.00	0.80	4.18	0.75	3.64	0.74	3.85	0.69
LES[1]	4.01	0.82	4.06	0.75	3.50	0.82	3.60	0.74
SLV[1]	3.98	0.82	4.02	0.77	3.66	0.84	3.88	0.68
AG[1]	3.93	0.85	4.00	0.86	3.77	0.79	3.95	0.77
PG[1]	2.62	0.17	2.76	1.18	2.75	0.93	2.96	0.94

Note. Motivational variables ranged from 1 to 5.
[1]SE= self efficacy, ALS= active learning strategies, LES= learning environment stimulation, SLV= science learning value, AG= achievement goal, PG= performance goal.

4.2 Assumptions of Multivariate Analysis of Variance

The assumptions required before conducting 2-way MANOVA were, namely, independence of observation, normality and outliers, linearity, multicollinearity and singularity, homogeneity of variance-covariance matrices (Stevens, 2002; Tabachnick & Fidell, 1996). Each was tested before the analysis.

Before the explanations of MANOVA assumptions, it can be informative to mention the sample size of the present study. When using MANOVA, it is necessary to have more cases than the number of dependent variables. Otherwise, the power of the analysis is lowered because of reduced degrees of freedom for error. Also, the reason for having more cases than the number of dependent variables in each cell is associated with the assumptions of homogeneity of variance-covariance matrices (Tabachnick & Fidell, 1996). There were a total of 24 cells (two levels for each independent variable: boys/girls; 6^{th} grade/ 8^{th} grade; and six dependent variables for each). The numbers of cases in cells were 593, 551, 525, and 510. So, the number of cases in each cell was many more than the number of the dependent variables of 6. Therefore, there was no problem with the sample size of the study.

Independence Observation

MANOVA requires that the observations are independent. The violation of this assumption is very serious (Stevens, 2002). In the present study, each student completed the questionnaire individually, that is, there was no interaction among the students in the classroom during the implementation of the questionnaire. If necessary, the researcher and their science teacher aided students in case of unclear statements in students' mind.

Normality and Outliers

Univariate normality was checked by examining histograms, skewness and kurtosis values for each dependent variable in each group. Histograms, in general, were not appeared to be normally distributed. Skewness and kurtosis values were in acceptable range of -2, +2 for each group with a few exceptions. Although there seemed to be some violations in normality, according to Tabachnick and Fidell (1996, p. 381), a sample size of about 20 in the smallest cell should ensure robustness. Since the sample size in the smallest cell (N=510) was higher than 20, the violation of normality did not seem to create a serious problem.

Table 4.2 Skewness and kurtosis values for the dependent variables in each group

		SE	AG	LES	PG	ALS	SLV
8th grade girls	Skewness	-0.29	-0.96	-0.82	0.08	-0.85	-0.75
	Kurtosis	-0.31	0.87	1.24	-0.49	1.20	0.43
8th grade boys	Skewness	0.08	-0.70	-0.60	0.29	-0.64	-0.75
	Kurtosis	-0.51	0.29	0.05	-0.23	0.44	0.24
6th grade girls	Skewness	-0.56	-1.14	-1.19	0.43	-1.60	-1.27
	Kurtosis	-0.32	1.19	2.22	-0.82	3.20	2.42
6th grade boys	Skewness	-0.06	-1.07	-1.19	0.47	-1.03	-1.19
	Kurtosis	-0.83	0.99	1.40	-0.75	0.99	1.46

Multivariate normality and outliers were checked by examining Mahalanobis distance. Its value was 49.52. The Mahalanobis distance value of 49.52 was evaluated by comparing it with the critical value from Chi-square table (Pallant, 2001). The critical value for six dependent variables was 22.46. The Mahalanobis distance of 49.52 was larger than the critical value of 22.46 indicating multivariate outliers in the data file. Twenty five cases exceeding the critical value of 22.46 eliminated from the study. So, there was no threat of multivariate outliers any more.

Linearity

In order to examine the linearity (straight-line relationship) between each pair of dependent variables, scatter plots were generated separately for each group (6th grade male, 6th grade female, 8th grade male and 8th grade female). Because of having four groups and six dependent variables, 60 scatterplots were generated. So, the interpretation of scatterplots was made according to general view. There seemed to be no serious violation of linearity assumption.

Homogeneity of Variance-Covariance Matrices

Results of the Box's M Test of Equality of Covariance Matrices showed a violation of the assumption, because the significance value (p=0.000) was smaller than 0.001. Luckily, the violation of the assumption has minimal effect if the group sizes are equal or approximately equal (largest/smallest<1.5) (Stevens, 2002). In the present study, the ratio of the largest group size to smallest group size was smaller than 1.5. Therefore, the violation did not appear to be a serious problem. While evaluating multivariate significance, the Pillai's Trace will be used instead of Wilks' Lamda as it is more robust to the violation of assumptions (Tabachnick & Fidell, 1996). Furthermore, regarding Levene's Test of Equality of Error Variances, as presented in Table 4.3, all significance values were less than 0.05 indicating the violation of the assumption of equality of variance for each variable. However, as explained in the situation of Box' Test, the violation has minimal effect, if the group sizes are equal or approximately equal (largest/smallest<1.5) (Stevens, 2002). In the present study, the ratio of the largest group size to smallest group size was smaller than 1.5. So, it can be assumed that the violations of homogeneity of variance do not produce a big problem. Regarding the violations of homogeneity of variance assumptions based on both Box's M Test of Equality of Covariance Matrices and Levene's Test of Equality of Error Variances, it was concluded that the reason for the violations of the assumption was having large sample sizes (N= 2206) in the present study.

Table 4.3 Levene's Test of Equality of Error Variances

	F	df1	df2	Sig. (*p*)
SE	5.99	3	2175	0.000
AG	3.02	3	2175	0.029
PG	26.12	3	2175	0.000
ALS	4.46	3	2175	0.004
SLV	5.86	3	2175	0.001
LES	3.04	3	2175	0.028

Multicollinearity and Singularity

Pallant (2001) stated that correlations up around 0.8 or 0.9 were not appropriate for MANOVA. In the present study, correlations between dependent variables did not exceed the value of 0.8 (Table 4.4). So, there was no violation of the assumption.

Table 4.4 Correlations coefficients for the dependent variables

		SE	AG	ALS	LES	PG
	SE	1	-	-	-	-
Whole sample	AG	.249**	1	-	-	-
	ALS	.503**	.565**	1	-	-
	LES	.445**	.565**	.765**	1	-
	PG	.070**	-.398**	-.220**	-.305**	1
	SLV	.376**	.609**	.729**	.748**	-.380**
	SE	1	-	-	-	-
8th grade boys	AG	.289**	1	-	-	-
	ALS	.486**	.571**	1	-	-
	LES	.410**	.546**	.728**	1	-
	PG	-.061	-.393**	-.304**	-.365**	1
	SLV	.376**	.561**	.706**	.729**	-.384**
	SE	1	-	-	-	-
8th grade girls	AG	.258**	1	-	-	-
	ALS	.588**	.436**	1	-	-
	LES	.513**	.472**	.680**	1	-
	PG	.030	-.283**	.-102*	-.194**	1
	SLV	.393**	.506**	.653**	.678**	-.281**
	SE	1	-	-	-	-
6th grade boys	AG	.156**	1	-	-	-
	ALS	.389**	.589**	1	-	-
	LES	.361**	.618**	.814**	1	-
	PG	.183**	-.462**	-.229**	-.286**	1
	SLV	.257**	.651**	.768**	.780**	-.405**
	SE	1	-	-	-	-
6th grade girls	AG	.277**	1	-	-	-
	ALS	.521**	.627**	1	-	-
	LES	.479**	.623**	.759**	1	-
	PG	.065	-.435**	-.223**	-.343**	1
	SLV	.420**	.666**	.730**	.775**	-.425**

**Correlation is significant at the 0.01 level
*Correlation is significant at the 0.05 level.

4.3 Multivariate Analysis of Variance (MANOVA)

A two-way multivariate analysis of variance was conducted to examine the effects of gender and grade level on students' motivation towards science learning. As it mentioned in assumptions part, Pillai's Trace was used instead of Wilks' Lambda in order to evaluate multivariate significance, because Tabachnick and Fidell (1996, p.382) recommended use of Pillai's Trace if some assumptions are not meet. The results revealed a statistically significant grade level effect on the combined dependent variables as indicated in Table 4.5, Pillai's Trace=0.11, $F(6, 2170)=45.43$, $p=0.000$. The multivariate partial η^2 value based on Pillai's Trace was 0.11 indicating that 11% of multivariate variance of the dependent variables was explained by grade level.

Furthermore, the results showed statistically significant gender effect on the combined dependent variables as seen in Table 4.5, Pillai's Trace=0.04, $F(6, 2170)=14.85$, $p=0.000$. The multivariate partial η^2 value based on Pillai's Trace was 0.039 indicating that 3.9 % of multivariate variance of the dependent variables was explained by gender.

It was also found that there was a statistically significant interaction effect between grade level and gender on the combined dependent variables as shown in the Table 4.5, Pillai's Trace=0.01, $F(6, 2170)=4.00$, $p=0.001$. The multivariate partial η^2 value based on Pillai's Trace was 0.011 indicating 1.1 % of multivariate variance of the collective dependent variables was explained by grade level and gender together.

Table 4.5 MANOVA Results on Collective Dependent Variables by Gender and Grade level

Source	Pillai's Trace	*F*	Sig. (*p*)	Partial eta squared
Grade level	0.11	45.43	0.000*	0.11
Gender	0.04	14.85	0.000*	0.039
Grade level X Gender	0.01	4.00	0.001*	0.011

*Analysis was performed with the significance level of $\alpha = 0.05$

After reaching statistically significant main effects for both grade level and gender and also interaction effect, follow-up univariate analysis were conducted in order to determine on which dependent variables girls and boys differed, on which dependent variables 6^{th} and 8^{th} grade level students differed, and also on which dependent variables there was an interaction effect. Significant differences were assessed at the 0.008 level of significance by using Bonferroni adjustment to reduce the change of a Type 1 one error. The significance level of 0.008 was obtained by dividing the original alpha level of 0.05 by the number of dependent variables in the study (0.05/6=0.008) (Pallant, 2001). Therefore, interpretation of main effects and interaction effects on the dependent variables were made based on Bonferroni adjusted alpha level of 0.008. As presented in the Table 4.6, univariate statistics revealed statistically significant mean difference on the dependent variables by grade level and by gender separately. Furthermore, there was an interaction between grade level and gender only for science learning value (SLV), $F(1, 2175)=7.19$, $p<0.008$. This interaction effect indicated that grade level effect depended on the gender (and vice versa) with respect to students' SLV. However, the value of partial eta squared was 0.003 referring to too small effect size, only 0.3 % variance of science learning value explained by this interaction effect. For the other motivational variables except SLV, no interaction effect between grade level and gender was found.

Table 4.6 Follow-Up Univariate Results

Sources	Dependent Variable	*df*	*F*	Significance (*p*)	Partial eta squared
Grade level	SE	1	30.06	0.000*	0.014
	AG	1	9.12	0.003*	0.004
	PG	1	11.90	0.001*	0.005
	ALS	1	115.9	0.000*	0.051
	SLV	1	47.48	0.000*	0.021
	LES	1	204.8	0.000*	0.086
Gender	SE	1	39.71	0.000*	0.018
	AG	1	12.51	0.000*	0.006
	PG	1	14.66	0.000*	0.007
	ALS	1	36.48	0.000*	0.016
	SLV	1	13.75	0.000*	0.006
	LES	1	5.52	0.019	0.003
Grade level X Gender	SE	1	2.39	0.122	
	AG	1	2.32	0.128	
	PG	1	0.57	0.448	
	ALS	1	0.22	0.643	
	SLV	1	7.19	0.007*	
	LES	1	0.62	0.432	
Error	SE	2175			
	AG	2175			
	PG	2175			
	ALS	2175			
	SLV	2175			
	LES	2175			

*Analysis was performed with the significance level of $\alpha = 0.05$.

4.3.1 Follow-up ANOVA Results for Self Efficacy (SE)

Regarding self efficacy, statistically significant mean difference was found between 6th grade students and 8th grade students by using a Bonferroni adjusted alpha level of 0.008, $F(1, 2175)=30.06$, $p=0.000$, partial eta squared=0.014 (Table 4.6). This partial η^2 value indicated that 1.4 % of the variance of self efficacy explained by grade level. However, this effect size was considered to be small according to Cohen (1988). An inspection of the mean scores indicated that students in 6th grade reported slightly higher levels of self efficacy (M= 3.71, SD=0.84) than students in 8th grade level (M= 3.53, SD=0.76). That is, compared to 8th grades, 6th grade students were more likely to develop stronger beliefs about their ability to perform science learning tasks successfully. Also, there was statistically significant mean difference between girls and boys on their self efficacy, $F(1, 2175)=39.71$, $p<0.008$, partial eta square=0.018. The partial η^2 value, a small effect size, represented 1.8% of the variance of self efficacy was explained by gender. An examination of mean scores revealed that girls had slightly higher scores on self efficacy ($M=3.73$, $SD=0.80$) than boys ($M=3.52$, $SD=0.81$) indicating stronger perceptions of girls about their capabilities to do the science learning tasks well and to persist in engaging in learning task when confronted with a difficulty. Figure 4.1 showed a clear pattern of higher self efficacy towards science learning for girls than boys and a clear pattern of a decrease in science learning self efficacy from 6th to 8th grades.

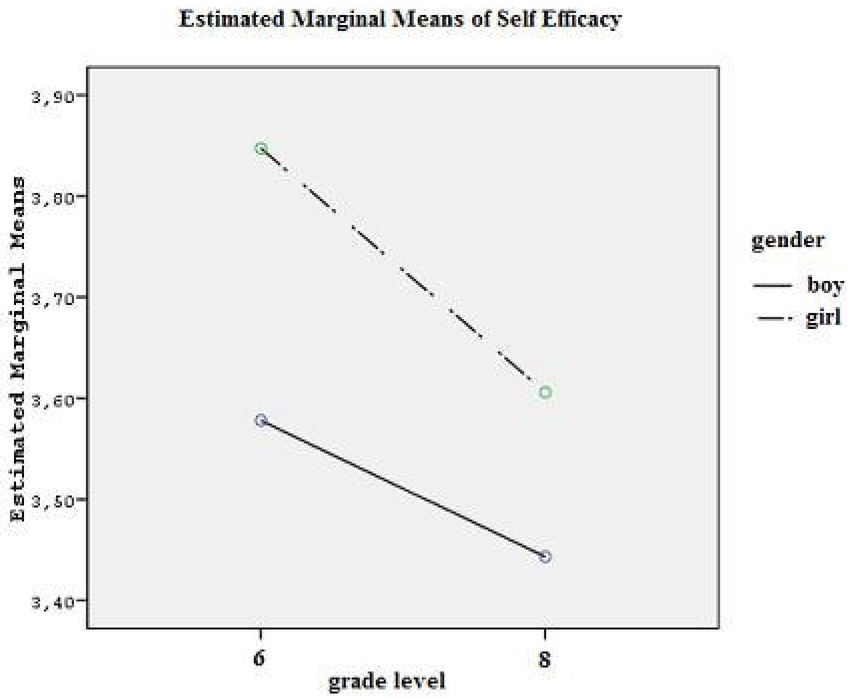

Figure 4.1 Plot for estimated marginal means of SE with respect to grade level and gender

4.3.2 Follow-up ANOVA Results for Achievement Goal (AG)

The result also revealed statically significant mean difference between 6th and 8th grade level students with respect to achievement goal, AG, $F(1, 2175)=9.12$, $p=0.003$, partial eta squared=0.004 (Table 4.6). The mean scores of 6th grade students had a higher value (*M*= 3.96, *SD*=0.86) than 8th grade students (*M*= 3.86, *SD*=0.78) on achievement goal, but the effect size, 0.4 %, was too small. The mean difference in achievement goal implied that 6th grade students more tended to engage in science learning task for their understanding and self improvement than 8th grade students. Furthermore, the results revealed statistically significant mean difference between boys and girls, $F(1, 2175)$=12,51, p=0.000, partial eta squared=0.006. An inspection of the mean scores (Figure 4.2) indicated that girls reported higher means on achievement goal (*M*= 3.98, *SD*=0.82) than did boys (*M*= 3.86, *SD*=0.83) which means that girls were more likely to participate in science leaning activities in order to gain greater understanding and improvement than were boys, however gender effect was quite small (only 0.6 % of the variance was explained by gender). Therefore, as inferred from Figure 4.2, the overall result on achievement goal pointed out small grade level and gender differences in which girls were appeared to adopt more achievement goal than did boys and 6th grade students possessed higher level of achievement goal than did 8th graders.

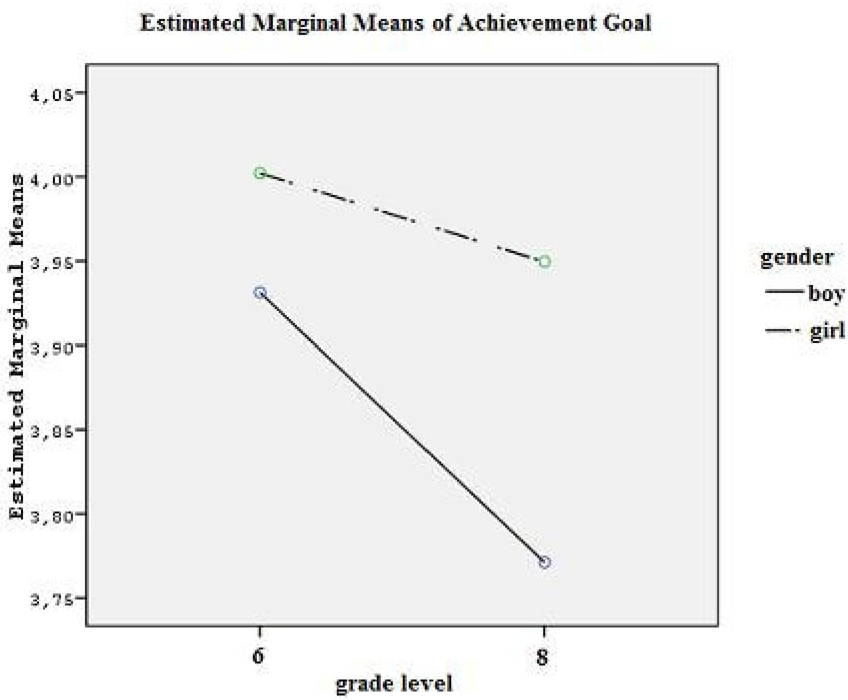

Figure 4.2 Plot for estimated marginal means of AG with respect to grade level and gender

4.3.3 Follow-up ANOVA Results for Performance Goal (PG)

As presented in Table 4.6, there was a statistically significant grade level effect on performance goal, PG, $F(1, 2175)=11.90$, $p=0.001$, partial eta squared=0.005. Performance goal was the only motivational variable that showed an increase from 6^{th} to 8^{th} grade level. As presented in Figure 4.3, eight grade students had slightly higher performance goal ($M= 2.85$, $SD=0.94$) than 6^{th} grade students ($M= 2.69$, $SD=1.18$) representing that 8^{th} graders' reason to participate in science learning activities seemed more to get good grades and outperform others compared to 6^{th} grade students. However, effect size was very small (0.5%). Additionally, there was a gender effect on performance goal, $F(1, 2175)=14.66$, $p=0.000$, partial eta squared=0.007. As shown in Figure 4.3, the girls adopted more performance goal orientation ($M=2.86$, $SD=1.07$) than did boys ($M=2.68$, $SD=1.07$), but gender effect were quite small, only 0.7% of the variance of performance goal was explained by gender. As far as gender differences in achievement goal and in performance goal were concerned, the result revealed that girls reported higher scores on both goals than did boys.

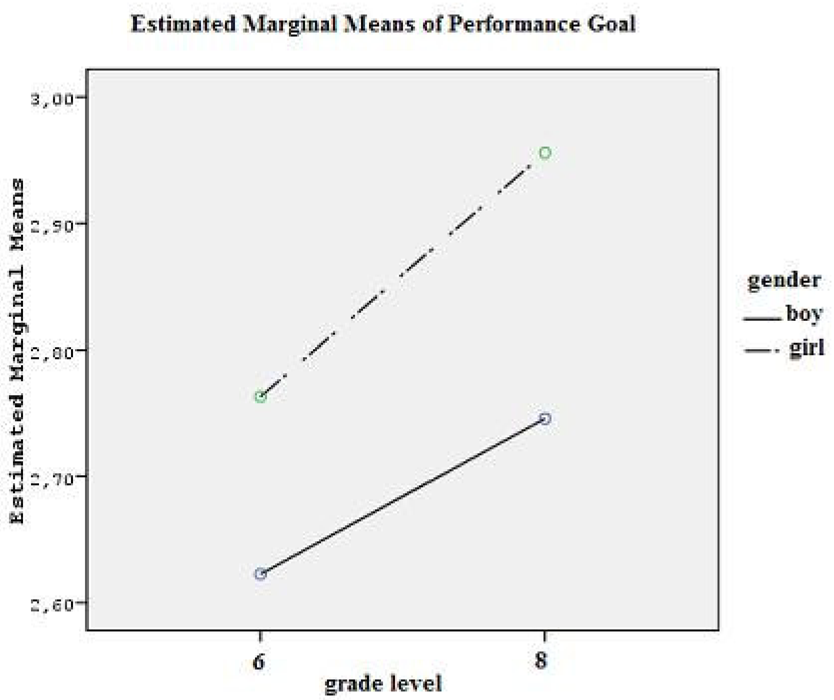

Figure 4.3 Plot for estimated marginal means for PG with respect to grade level and gender

4.3.4 Follow-up ANOVA Results for Active Learning Strategies (ALS)

Regarding active learning strategies, the findings revealed a statistically significant grade level effect, $F(1, 2175)=115.9$, $p=0.000$, partial eta squared=0.051 (Table 4.6). Grade level explained 5.1 % of the variance in students' active learning strategies. As shown in Figure 4.4, an inspection of the mean scores signified that 6th grade students reported higher level of active learning strategies ($M=4.09$, $SD=0.78$) than 8th grade students ($M=3.75$, $SD=0.72$). These findings revealed that 6th grade students appeared to be more active in their engagement in science learning process such that they attempted more to make connections between previous knowledge and newly learned information, to investigate relevant sources when encountering a difficulty during the construction of knowledge. Also, the result indicated statistically significant gender effect, $F(1, 2175)=36.48$, $p=0.000$, partial eta squared=0.016 (Table 4.6). As inspected from Figure 4.4, the girls reported slightly higher levels of active learning strategies ($M=4.02$, $SD=0.74$) than did boys ($M=3.83$, $SD=0.79$). Thereby, girls can be considered to use learning strategies more which activates their thinking in order to reach meaningful understanding during the construction of science knowledge than did boys. However, the partial η^2 value of 0.016 was a small effect size demonstrating 1.6 % of the variance of ALS was explained by gender.

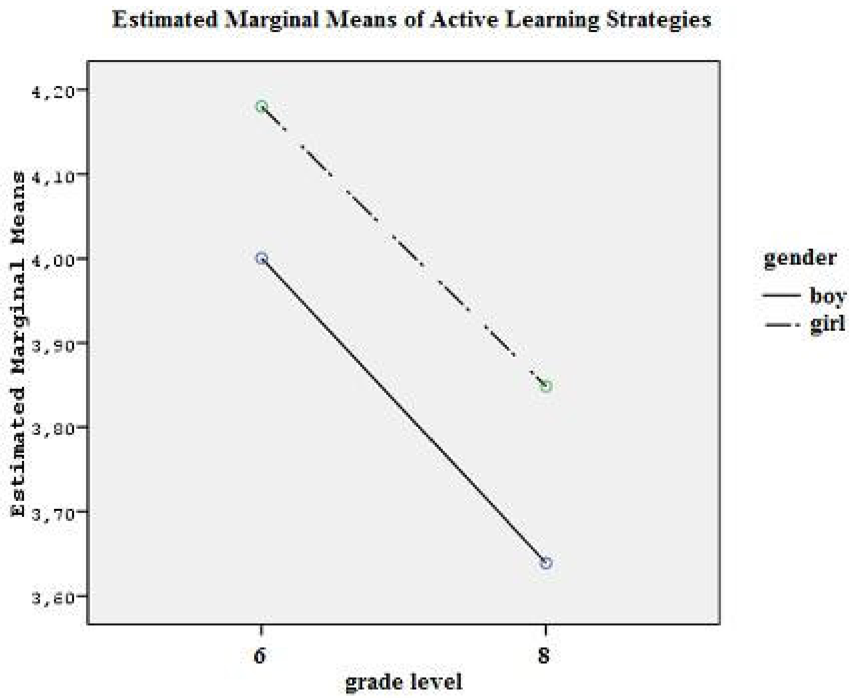

Figure 4.4 Plot for estimated marginal means for ALS with respect to grade level and gender

4.3.5 Follow-up ANOVA Results for Science Learning Value (SLV)

Science learning value was the only variable on which statistically significant interaction effect of grade level by gender (and vice versa) was found by using a Bonferroni adjusted alpha level of 0.008, $F(1, 2175)=7.19$, $p=0.007$, partial eta squared=0.003 (Table 4.6). This interaction effect indicated that there was a significant difference in the effect of grade level on science learning value for girls and boys. That is, grade level effect depended on gender (and vice versa) with respect to science learning value. The result showed that girls in 6th grade had a higher science value than any other group. However, as mentioned previously, the effect size (0.3 %) was too small to have a practical significance. As far as main effects were concerned, a statistically significant grade level effect was found on science learning value, SLV, $F(1, 2175)=47{,}48$ $p=0.000$, partial eta squared=0.021 (Table 4.6). The partial η^2 value of 0.021 showed that 2.1 % of variance of the SLV explained by grade level, but it was a small effect size. With respect to mean scores, 6th grade students reported slightly higher levels of science learning value

(M=4.00, SD=0.80) than did 8th grade students (M=3.77, SD=0.77). Compared to 8th graders, 6th grade students seemed to be more motivated to grasp the value of science learning through the understanding the relevancy of science with daily life, gaining problem solving ability and engaging in inquiry activities. Additionally, statistically significant gender effect was found $F(1, 2175)=13{,}75$ $p=0.000$, partial eta squared=0.006, but, the effect was too small. Girls had higher mean scores on science learning value (M=3.95, SD=0.72) than boys (M=3.84, SD=0.84). Furthermore, as inferred from Figure 4.5, the decline in science learning value as proceeding 6th to 8th grade was high for boys as compared to girls.

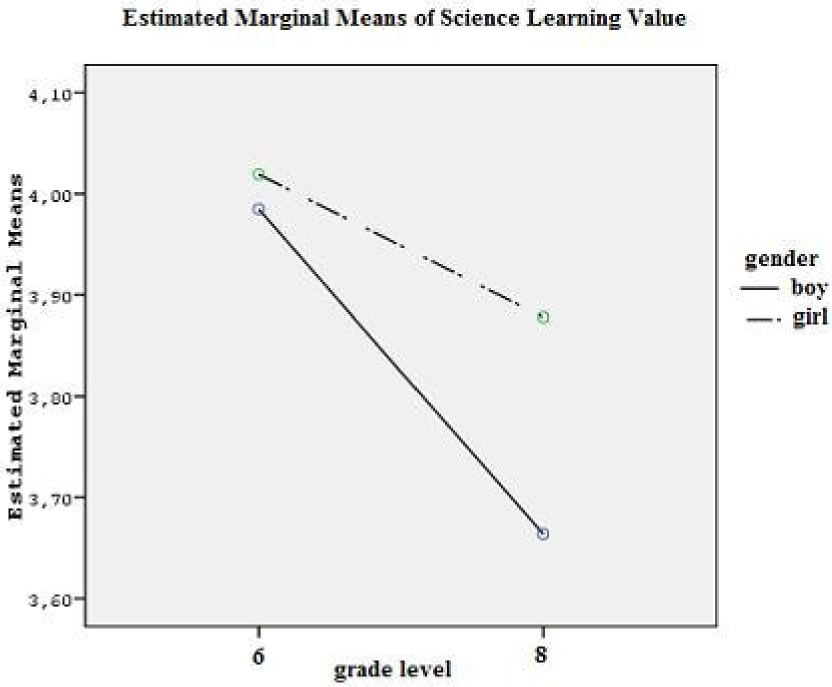

Figure 4.5 Plot for estimated marginal means for SLV with respect to grade level and gender

4.3.6 Follow-up ANOVA Results for Learning Environment Stimulation (LES)

The result pointed out statistically significant grade level effect on learning environment stimulation, $F(1, 2175)=204{,}8$ $p=0.000$, partial eta squared=0.086 (Table 4.6). According to Cohen (1988) criterion, the partial η^2 value of 0.086 was considered to be moderate effect. This value represented that 8.6 % of the variance in learning environment stimulation was explained by grade level. The mean scores on learning environment was found to be higher for sixth grade students (*M*=4.03, *SD*=0.79) than eight grade students (*M*=3.55, *SD*=0.78) referring a decrease in learning environment stimulation from 6th to 8th grade level. As a result, it can be said that the features of learning environment such as teacher-student interaction, student-student interaction, instructional strategies, class activities and curriculum content had a more simulative effect on 6th grade students' motivation to enhance their science learning than its effect on 8th grade students. Surprisingly, no statistically significant gender effect was identified in learning environment stimulation $F(1, 2175)=5,52$ $p>0.008$, partial eta squared=0.003. As inspected in Figure 4.6, the mean scores of girls (*M*=3.84, *SD*=0.78) and the mean scores of boys (*M*=3.77, *SD*=0.86) seemed to be closer to each other within each grade level, indicating that girls and boys did not significantly differ in their perception of learning environment regarding its simulative effect on science learning motivation.

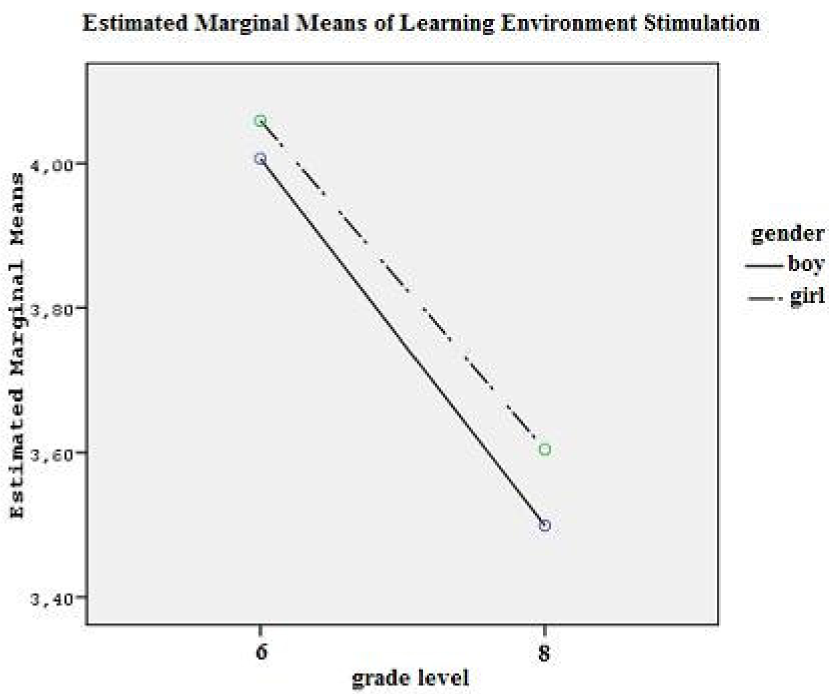

Figure 4.6 Plot for estimated marginal means for LES with respect to grade level and gender

4.4 Summary

In summary, two-way MANOVA revealed statistically significant grade level effect and gender effect on motivational variables towards science learning. Sixth grade students appeared to be more motivated towards science learning than eight grade students. They reported higher levels of motivational variables than 8^{th} grade students except the performance goal. Besides these, learning environment stimulation was the only motivational variable on which grade level showed the highest effect among the other motivational variable of the study. Concerning grade level differences, there was a general decline in students' motivation towards science learning from 6^{th} to 8^{th} grades. Furthermore, although its effect was not as strong as grade level, the gender differences also existed among the students. In general, girls tended to possess higher level of motivation towards science learning than did the boys. However, there was no significant gender differences detected in boys and girl's learning environment stimulation. Even though gender effects were found to be small on motivational variables, its effect was higher for self efficacy and active learning strategies as compared to other motivational variable. Additionally, except science learning value, no interaction effect of grade level by gender (and vice versa) was found on motivational variables meaning that grade level effect did not depend on gender (and vice versa) regarding dependent variables. However, there was an interaction effect of grade level by gender (and vice versa) on science learning value indicating that sixth grade female students had the highest science learning value than any other group, but its effect was too small to have a practical significance.

CHAPTER 5

DISCUSSION

This chapter includes discussion of the results, implications, and recommendations for further research.

5.1 Discussion of the Result

The present study investigated the effects of grade level and gender on elementary school students' motivation towards science learning using self efficacy, active learning strategies, learning environment stimulation, science learning value, achievement goal and performance goal as motivational variables.

Descriptive analysis indicated that students' motivations towards science learning were moderately high since the most of the mean score values were above the scales midpoint. As far as the effects of grade level and gender on students' motivation towards science learning are considered, analysis indicated statistically significant, although small in magnitude, grade level and gender effect on motivation towards science learning. In general, 6^{th} graders had higher motivation towards science learning than the students in 8^{th} grade. Compared to boys, girls were found to be more motivated towards science learning.

Regarding the grade level, the findings of the present study indicated that when grade level increases, students' motivation towards science learning decreases. This result is consistent with motivation research that pointed out a decrease in motivation in science and also other academic domains across the grades (Eccles et al., 1993; George 2006; Greenfield, 1997; Jacobs et al. 2002; Neber et al. 2008; Otis et al. 2005; Wigfield & Eccles, 1994; Yavuz 2006). The present study also identified gender differences, although small in magnitude, in motivational variables except learning environment stimulation. Since the literature on gender differences in motivation produced mixed results, the findings of the present study showed both consistency and inconsistency with the findings of literature. In the following paragraphs, the effects of grade level and gender will be discussed in detail with respect to each motivational variable.

As far as the grade level effect on motivational variables is considered separately, its effect (8.6 % of the variance) was the highest on the learning environment stimulation among the other motivational variables. Compared to 8th grade students, 6th grade students appeared to be more willing to participate in science course because they had stronger perceptions of the learning environment stimulation such that the science content is exciting and changeable, the teacher uses a variety of teaching methods, the learning environment is challenging and open to discussion, the teacher pay attention to them and does not put a lot of pressure on them. Interpretation of these features of classroom environment demonstrated that 6th grade students were more likely to view their classroom environment as more learner-centered. Consistent with the findings of the present study, Meece et al. (2003) also reported school level effect on students' perception of learning environment. They found that middle school students perceived their environment more learner-centered than did high school students (less than 2 % of the variance). They stated that the learner-centered classroom environment matching with the developmental needs of student can have a potential to counterbalance negative changes in motivation during adolescence. Similar to this view, researchers indicated that when students believe that they are encouraged for understanding, independent thinking, when they and their ideas are respected, when their teachers promoted interactions and students' autonomy, students are likely to be more motivated towards learning (Black & Deci, 2000; Nolen, 2003; Ryan & Patrick, 2001;). Hanrahan (1998) drew attention to the point that although students' motivation was quite high in biology, the teacher-centered learning environment and high autonomy of teacher prevent them from engaging in biology activities more deeply. To be brief, the findings of the present study revealed a decrease in simulative effect of learning environment from 6th to 8th grade. This result should be interpreted with caution, because the change in perception of classroom learning environment also related with changes in other motivational variables such as students' goal orientations as expressed in detail in goal orientation part, self efficacy (Ryan & Patrick, 2001) and self-regulated learning, enjoyment, and interest (Black & Deci, 2000). Concerning gender and learning environment stimulation, it is necessary to note that the present study did not found statistically significant gender difference in students' perceptions of learning environment stimulation. In other words, boys and girls did not differ in their perceptions of prompted effect of classroom environment in science learning regarding teacher-students interaction, student-student interaction, teacher instructional strategies, curriculum content, and science activities. However, this finding was unexpected, since girls and boys found to be differed in their perceptions of other motivational variables all favoring girls in the present study. Actually, this finding was promising, because gender differences in science learning and also other academic domains not a desired outcome in education, because such differences may result in lowered motivation towards science learning and science related careers. In contrast to the finding of the present study, studies found that girls and boys differed in their perceptions of learning environment. For example, Arısoy (2007) pointed out that girls had higher perceptions of learning environment than boys in science classroom. Likewise, Meece et al. (2003) demonstrated that girls had more positive perceptions of learning environment being a more learner centered than did boys; however, gender effect was found to be quite small (less than 2 % of the variance). Meece and his colleagues (2003) explained that individual differences in motivation and achievement may have an influence on students' perceptions and interpretations of their classroom environment and also students' interpretations of classroom environment have a mediator role in their achievement and motivational outcomes.

The present study also found statistically significant grade level differences in students' goal orientations. While 6^{th} grade students were found to be more achievement goal oriented, 8^{th} grade students were found to be more performance goal oriented. The findings indicated that although its practical significance was small, there was a tendency from achievement goal (mastery) to performance goal from 6th to 8th grade levels. Compared to 6th graders, 8th grade students more focused on getting good grades, outperforming others and being perceived as smart. However, the result that 8th grade students adopted more performance goal than 6th grade students was not surprising considering the findings reported in the literature and the situation in Turkey. Actually, although the present study did not assess the classroom goal structure, the findings of the personal goal orientation give some clues about the features of classroom goal structure in 6th and 8th grade level. The findings implies that Turkish students are more concentrated on preparation for nation-wide examinations such as "OKS" in order to get a good degree in these exams and as a consequence, they are more likely to adopt more performance goal orientations while proceeding in grade levels since they found themselves in such an environment where grades, tests scores and competition have a dominative role in their education and for their selection to high schools. In literature, many studies also underlined the tendency from mastery to performance goal orientation as proceeding in grades. For example, Anderman and Anderman (1999) pointed out a decrease in personal task goal and an increase in personal ability goals of students from 5th to 6th grade levels. Also, Neber et al. (2008) revealed a decline in 10th grade students' task goal orientation in physics and an increase in performance-avoidance goal orientation compared to 8th grade students. Similarly, Anderman and Midgley (1997) found out that students' task goal orientation (mastery) decreased from 5th to 6th grades. Concerning a tendency from mastery goal to performance goal, researchers suggested that the learning environment of the classroom, particularly classroom goal structure, have an influence on the formation of the personal goal orientations. They emphasized that when students perceive their classroom environment as more performance oriented such as stressing more getting good grades, outperforming others, they tended to develop more performance goal whereas when they perceive the classroom goal structure as more mastery oriented such as stressing learning and improvement, they were more likely to develop mastery goal (Ames & Archer, 1988; Anderman & Midgley, 1997; Anderman & Young, 1994; Kaplan & Maehr, 1999; Tas, 2008; Urdan & Midgley, 2003; Wolter, 2004). As far as the gender differences in goal orientations is considered, girls found to be more inclined than boys to adopt achievement goal and also performance goal. Thereby, compared to boys, girls focused more on learning and improving their competence in science as well as they were more intensive to get good grades and doing better than others. However, this did not mean that girls hold multiple goals in their science learning since two goals related negatively as presented in assumptions part of the result. The findings of the study had some similarities and discrepancies with the literature. For example, the study of Anderman and Young (1994) supported the present study in one aspect and conflicted in another aspect. Their findings indicated that girls adopted more learning goals (like achievement goal) than boys in science course whereas boys were more ability focused (like performance) than girls. In line with the present study, girls were found to be more learning focused than boys in different academic domains (Martin, 2004; Middleton & Midgley, 1997). Similar to findings of the present study regarding performance goal, girls were found to be more performance goal oriented in the study of Debecker and Nelson (1999, 2000). Likewise, in Turkey, Tas (2008) and Baser (2007) reported that girls were more likely to pursue performance goal than boys in science. Contrary to the findings of the present study, research evidence revealed that boys were more performance oriented than girls in science and other academic domains (Anderman & Anderman, 1999; Britner & Pajares, 2001; Meece et al., 2003; Middleton & Midgley, 1997).

When grade level differences in students' active learning strategies are considered, the findings pointed out a decrease in active learning strategies as the grade level increased. Grade level accounted for the 5.1 % of the variance in active learning strategies. Compared to 8th grade students, 6th grade students possessed higher level of active learning strategies such that they were more likely to make connections between previous and new learning, they tended to discuss the topic with teachers and students in the case of difficulty during their construction of knowledge, they have a more attempt to find relevant sources to clarify their understanding. The higher level of active learning strategy use in 6th grade students may be explained by the new science curriculum of 6th grade level that requires students to be more actively involved in the construction of knowledge based on their previous understanding. On the other hand, lower level of active learning strategy use in 8th grade level may be attributed to many factors such as teacher instructional strategies, classroom goal structures, students' adoption of different personal goals, and their self efficacy beliefs. For instance, if teachers' autonomy is high as Hanrahan (1998) mentioned, and if the instructional strategies are not appropriate to create a challenging environment such as lecture format instruction, students may not expected to think actively during the learning process. Also, if students pursue performance goal in science, they are more likely to use superficial learning strategies such as memorization in order to reach their aims with a minimal effort. On the contrary, if they pursue mastery goal, they more tend to use deep learning strategies to reach meaningful learning since such students have a desire to increase competence and improve self (Lee & Brophy, 1996). Consistent with the present study, similar result concerning a decrease in active learning strategies was found by Neber et al. (2008) in psychic classroom. They reported that 10th grade Chinese student less focused on the use of active learning strategies than 8th grade students. Also, emphasizing the active learning strategies as a positive indicator of self-regulated learning, they revealed a decline in students' self-regulated learning from 8th to 10th grade. Considering decreases in also other motivational variables from 6th to 8th grades in the present study and considering the studies that underscored the positive relations of active learning strategy use with self efficacy, mastery learning, and intrinsic motivation (Greene et al., 2004; Meece et al., 2003; Walker et al., 2006) and task value beliefs (Pintrich, 1999, Yumusak et al., 2007), it can be said that active learning strategy use is affected by many features. So, educators should think the reciprocal relationships of motivational constructs with each other and arrange the learning in a complementary way. With regard to gender differences in active learning strategies, girls reported stronger active learning strategies than did boys. Therefore, girls were more vigorous to apply active learning strategies during engagement in science learning activities such that they exert more effort to link the new and previous understanding, to seek to way of understanding in face of unclear and conflicting situations. Research evidence also supported this view. For example, Meece and Jones (1996) identified that girls reported higher levels of meaningful learning strategies than boys. Likewise, Neber et al. (2008) found that boys displayed more use of superficial learning strategies than girls during physic learning. In Turkey, Baser (2007) indicated that boys focus on more rote learning strategies such as memorization and they reported lower level of the use of active learning strategies than girls in biology learning.

Grade level effect explained 2.1 % of the variance in students' science learning value. Although the grade level effect was small, a decrease in science learning value was detected as grade level increased. Compared to 6th grade, 8th grade students seemed to be less intensive in their perception of important features of science learning value such as finding relevancy of science with daily life, gaining problem-solving ability, experiencing inquiry activity and stimulating their own thinking and satisfying own curiosity in science. The decline in science learning value in the present study showed consistency with literature. Research evidence also revealed a decline in students' task value beliefs in science and also different academic domains. For example, Zusho et al. (2003) indicated a decrease in college students' task value beliefs in chemistry course. Also, George (2006) pointed out changes in students' beliefs about the utility of science in grades 7th to 11th in a longitudinal study. He found that although students' beliefs about utility of science showed an increasing trend, it decreased after 10th grade. Additionally, Jacobs et al. (2002) indicated a decline in students' perceptions of task value beliefs in math, language and sports from 1st to 12th grade. In this longitudinal study, they also revealed that the changes in competence beliefs accounted for much of the changes in task value beliefs. Earlier, Wigfield and Eccles (1994) also identified a decrease in students' task value beliefs (usefulness and importance of the task) during the transition from 6th to 7th grade. If students know why they learn subjects, if they know the relevancy of the subjects with daily life and if they know where they use related information, they can value the science learning much, particularly in the situation that the topics become more abstract in upper grades. So teachers should generate opportunities for students to integrate the topics with the life out of school in appropriate situations. Concerning science learning value, girls appeared to perceive the value of science better than did boys through engaging in science learning with the important value features such as problem solving, thinking, finding relevancy of topics with daily life. The finding of the present study was in line with the study of Baser (2007). She reported that high school boys had a lower perception of value in biology learning than girls. Meece et al. (2006) stated that gender differences in value beliefs in academic domains follow gender stereotyped. Also, Debacker and Nelson (1999) found that perceiving science as a male domain negatively related with the importance of science more for girls than boys. In the present study, although the effect size in relation to science learning value was small, the findings were promising regarding girls, because many studies reported girls as having gender stereotyped view of science as a male domain (Debacker & Nelson, 2000; Kahle et al., 1993).

Concerning grade level differences in self efficacy beliefs, the findings demonstrated a decline in students' self efficacy towards science learning as grade level increased. Even tough the grade level effect was quite small explaining 1.4 % of the variance in self efficacy; eight grade students had a lower level of self efficacy than sixth grade students indicating their low perceptions of capabilities to perform well in science learning task. The possible explanation for the decrease in self efficacy beliefs is that students can assess their capabilities in science learning more realistically as they get older by evaluative feedbacks receiving from teachers, parents, and friends (Eccles & Wigfield, 2000). Also, the classroom environment in 8^{th} grades may also make them think they are less able in science learning because of the nature of classroom learning environment being a more competitive as a consequence of high school selection exams. The decrease in self efficacy beliefs identified in the present study showed consistency with the findings of the literature. Research evidence showed a decline in students' self efficacy beliefs in science and also in different academic domains as proceeding across the grades (Anderman & Midgley, 1997; Beghetto, 2007; Eccles et al. 1993; Jacobs et al, 2002; Neber et al., 2008; Urdan & Midgley, 2003; Zusho et al., 2003). Researchers stressed an important aspect of self efficacy as being sensitive to the features of learning environment and suggested the way of increasing students' self efficacy by providing them with a challenging environment in which they can accomplish the task successfully. (Pajares, 1996, Pintrich & Linnenbrink, 2003). From this point of view, the longitudinal study of Urdan and Midgley (2003) demonstrated the context-specific features of self efficacy, because they found that when students perceive a decline in mastery goal structure of the classroom, they also showed a decline in self efficacy beliefs in their transition from 5th to 6th and 6th to 7th grade. Thereby, educators can change the negative situations in favor of students suffering a decrease in self efficacy by generating learning environment appropriate to students' developmental needs. For instance, Margolis and McCabe (2006) suggested that teachers should give to students moderately challenging tasks that are slightly above the students' current performance in order for them to strengthen their self efficacy beliefs. By this way, students can have a chance to have mastery experiences which is the strongest source of self efficacy. Regarding gender differences in self efficacy in science learning, the present study found girls as having stronger self efficacy beliefs compared to boys such that whether science content is easy or difficult, they had a higher perception of performing tasks successfully. The findings of self efficacy favoring girls may be explained by consider other motivational constructs in the present study since they were also higher levels than boys on each. As underlined in many studies, the motivational constructs have reciprocal relationship with each other. Positive beliefs in one construct may also follow positive beliefs in another motivational constructs. Although the finding of present study was in line with the findings of Britner and Pajares (2001, 2006), majority of the studies found opposite pattern. For example, Anderman and Young (1994) reported boys rather than girls as having higher self efficacy beliefs in science among middle school students. Moreover, the other research revealed similar patterns that boys had a greater self efficacy in science learning than girls (Beghetto, 2007; Debacker & Nelson, 2000; Hassan 2008; Meece & Jones, 1996; Neber et al., 2008). Concerning lower self efficacy beliefs in literature findings, the researchers suggested that providing effort related attributional feedbacks on students' achievements by the teachers may be a positive attempt in order to cope with the negative beliefs of them about their capabilities. By this way, they may think that exerting effort on learning task make success possible. Also, they generally underlined that although girls and boys do not differ in their achievement in science, girls had a lower perception of abilities not because of having low aptitudes, because of having stereotypical perceptions of science as a male domain.

5.2 Implications

The present study showed that there are grade level and gender differences in students' motivation towards science learning, although the effect sizes were small. However, there can be many implications derived from this study that need great considerations from educators. The trend in students' motivation towards science learning (i.e. decline from 6^{th} grade to 8^{th} grade level) indicating a motivational discrepancy in the first and last year of second level of elementary education. The present study found the moderate grade level effect on learning environment stimulation. In fact, research evidence from literature suggested that motivational decrease can be linked to the features of classroom learning environment. Therefore, students' motivation towards science learning can be changed in desired direction by creating appropriate classroom learning environment. More specifically, students-centered instructional strategies that address the students' developmental needs such as using cooperative learning strategies, inquiry-based activities, and hands on activities can be beneficial for preventing negative changes in students' motivation and encouraging them for science learning. Also, teachers may more emphasize the importance of learning, understanding, improving competence rather than comparing students' abilities, stressing grades. Moreover, even there has been an effort to bring alternative assessment techniques such as portfolio, performance work, project work in schools; classical exams, paper-pencil tests in lessons and nation-wide examinations still have dominative role in determining students' achievement in schools and also for enrollment in high schools in Turkey. Educators should rearrange the role of alternative assessment techniques in determining students' achievement during schooling. Otherwise, it is usual to identify shifts from mastery oriented students to performance oriented students. Furthermore, the relevancy of science to daily life is a strong feature of science in order to motivate students more. This feature of science should be strongly emphasized in every opportunity by the science teachers to make the students be aware of the importance of science and science learning in their life. When students value the science learning and understand the utility of science, they can be more likely to pursue science courses in high schools and to choose science related careers for their university education as the literature indicated. Besides, in order to strengthen students' perceptions of their abilities in science learning, teachers should provide students with challenging leaning tasks that students accomplish it with effort and should provide effort related feedbacks that give students a message that success is possible with effort. Additionally**,** this study found small gender differences in students' motivation towards science learning in favor of girls. Educators should try to maintain and also increase the positive beliefs of girls much, because the gender stereotypic image of science as a masculine domain is a widespread belief that may have more influences on girls' motivation in science than boys. From this point of view, teachers and parents should approach both girls' and boys' science learning free from such a stereotypic belief of science as a masculine domain to ensure gender equity in science learning.

5.3 Recommendations for Further Research

Some suggestion for future research can be as follows:

- A similar study may be conducted including also 7^{th} grade level students to reveal the grade level differences in students' science learning motivation more precisely in elementary schools.

- In addition to self-report questionnaire, future research may extend the data collection with additional sources such as classroom observations, teacher reports, parent reports, and interviews.

- If the time is no matter, future research may study with the same group of students over the elementary school years in a longitudinal study in order to identify the changes more precisely in motivation towards science learning.

- A similar study may be conducted including other academic domains in order to make a comparison in students' learning motivation among the different domains. Moreover, the study may be expanded including different school-level such as elementary and high school level to clarify the motivational tendency in science over the school years.

- Since the data collected at the one time-point in the present study, the future research may enlarge the study by assessing constructs in several waves to obtain more precise measure of changes in motivation over time.

- The present study may be replicated by using 6^{th} and 8^{th} grade students who are both instructed by new science curricula.

- Future studies may investigate the reasons of motivational changes in grade level and gender in relation to other constructs in order to make more accurate interpretations.

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APPENDICES

APPENDIX A

A. DEMOGRAPHIC CHARACTERISTICS QUESTIONNAIRE

Sevgili Öğrenciler,

Bu anket sizin fen dersine katılmaktaki istekliliğinizi ölçmektedir. Her bir ifadeye ne kadar katıldığınızı belirtmeniz istenmektedir. Doğru ya da yanlış bir cevap yoktur. İstenen sizin görüşünüzdür. Size en uygun seçeneği işaretleyin. Bu sorulara vereceğiniz yanıtlar, araştırma amacıyla kullanılacak ve gizli tutulacaktır. Sizlerin görüşleri bizler için çok önemlidir.

Yardımlarınız için teşekkür ederim.

KİŞİSEL BİLGİLER:

1. Cinsiyetiniz: ❑ Kız ❑ Erkek

2. Kardeş sayısı:(kendinizin dışında) ....

3. Sınıf düzeyi: ❑ 6. sınıf ❑ 8. sınıf

4. Yaşınız: ....

5. Geçen dönemki Fen Bilgisi karne notunuz: 1❑ 2❑ 3❑ 4❑ 5❑

6. Anneniz çalışıyor mu?
❑ Çalışıyor ❑ Çalışmıyor

7. Babanız çalışıyor mu?

❑ Çalışıyor ❑ Çalışmıyor

8. Annenizin Eğitim Durumu

❑ Hiç okula gitmemiş
❑ İlkokul
❑ Ortaokul
❑ Lise
❑ Üniversite
❑ Yüksek lisans/Doktora

9. Babanızın Eğitim Durumu

❑Hiç okula gitmemiş
❑ İlkokul
❑ Ortaokul
❑ Lise
❑ Üniversite
❑ Yüksek lisans/Doktora

10. Evinizde kaç tane kitap bulunuyor? (Magazin dergileri, gazete ve okul kitapları **dışında**)

❑ Hiç yok ya da çok az (0–10)
❑11–25 tane
❑ 26–100 tane
❑101–200 tane
❑ 200 taneden fazla

11. Evinizde kendinize ait bir çalışma odanız var mı?

❑ Evet ❑ Hayır

12. Evinizde bilgisayarınız var mı?

❑ Evet ❑ Hayır

13. Ne kadar sıklıkla eve gazete alıyorsunuz?

❑ Hiçbir zaman ❑ Bazen ❑ Her zaman

14. Ailenizin aylık geliri ne kadardır?

❑ 0–500 YTL
❑ 500–1000 YTL
❑ 1000–1500 YTL
❑ 1500–2000 YTL
❑ 2000 YTL ve üstü

APPENDIX B

B. STUDENTS' MOTIVATION TOWARDS SCIENCE LEARNING QUESTIONNAIRE (SMTSL)

FEN ÖĞRENİMİNE YÖNELİK MOTİVASYON ANKETİ	**Kesinlikle Katılmıyorum**	**Katılmıyorum**	**Kararsızım**	**Katılıyorum**	**Kesinlikle Katılıyorum**
1. Kolay ya da zor her türlü fen konusunu anlayabileceğimden eminim.	❑	❑	❑	❑	❑
2. Yeni fen kavramlarını öğrenirken onları anlamlı bir şekilde öğrenmeye gayret ederim.	❑	❑	❑	❑	❑
3. Fen öğrenmenin önemli olduğunu düşünüyorum, çünkü bu derste öğrendiklerimi günlük hayatta kullanabilirim.	❑	❑	❑	❑	❑
4. Fen derslerine iyi notlar alabilmek için katılırım.	❑	❑	❑	❑	❑
5. Fen dersinde kendimi en mutlu hissettiğim zamanlar, bir fen konusu hakkında kendimden emin olduğum zamanlardır.	❑	❑	❑	❑	❑
6. Fen derslerine katılmaya istekliyim, çünkü dersin konuları değişik ve ilgi çekici.	❑	❑	❑	❑	❑
7. Fen dersi sırasında kendimi en çok, zor bir soruyu çözebildiğim zaman mutlu hissederim.	❑	❑	❑	❑	❑
8. Yeni fen kavramlarını öğrenirken onları daha önceki deneyimlerimle ilişkilendiririm.	❑	❑	❑	❑	❑
9. Fen öğrenmenin önemli olduğunu düşünüyorum, çünkü bu dersin konuları beni düşünmeye yönlendiriyor.	❑	❑	❑	❑	❑
10. Fen derslerine diğer öğrencilerden daha iyi bir performans gösterebilmek için katılırım.	❑	❑	❑	❑	❑

	Kesinlikle Katılmıyorum	Katılmıyorum	Kararsızım	Katılıyorum	Kesinlikle Katılıyorum
11. Fen dersi sırasında kendimi en çok, sınavda iyi bir not aldığım zaman mutlu hissederim.	❑	❑	❑	❑	❑
12. Fen derslerine katılmaya istekliyim, çünkü öğretmen çok çeşitli öğretim yöntemleri kullanıyor.	❑	❑	❑	❑	❑
13. Fen aktiviteleri çok zor olduğunda ya vazgeçiyorum ya da yalnızca kolay kısımları yapıyorum.	❑	❑	❑	❑	❑
14. Herhangi bir fen kavramını anlamadığımda bana yardımı olacak ilgili kaynaklar bulurum.	❑	❑	❑	❑	❑
15. Fen öğrenmenin önemli olduğunu düşünüyorum, çünkü bilimsel düşünmeyi öğrenmemi sağlıyor.	❑	❑	❑	❑	❑
16. Fen derslerine katılırım, böylece diğer öğrenciler zeki olduğumu düşünürler.	❑	❑	❑	❑	❑
17. Fen derslerine katılmaya istekliyim, çünkü öğretmen bana çok fazla baskı yapmıyor.	❑	❑	❑	❑	❑
18. Fen sınavlarını iyi yapabileceğimden eminim.	❑	❑	❑	❑	❑
19. Herhangi bir fen kavramını anlamadığımda daha iyi anlamak için konuyu öğretmenimle veya diğer öğrencilerle tartışırım.	❑	❑	❑	❑	❑
20. Fen öğreniminin, araştırma yapmamı sağlayan aktivitelere katılımımı sağlayacağı için önemli olduğunu düşünüyorum.	❑	❑	❑	❑	❑
21. Ne kadar çaba sarf etsem de feni **öğrenemem**.	❑	❑	❑	❑	❑
22. Fen dersi sırasında kendimi en çok, öğretmen fikirlerimi kabul ettiği zaman mutlu hissederim.	❑	❑	❑	❑	❑
23. Fen dersinde öğrendiklerimin, kendi merakımı giderme şansı verdiği için önemli olduğunu düşünüyorum.	❑	❑	❑	❑	❑
24. Fen derslerine katılmaya istekliyim, çünkü bu derste öğrenciler sınıf içi tartışmalara katılıyor.	❑	❑	❑	❑	❑

	Kesinlikle Katılmıyorum	Katılmıyorum	Kararsızım	Katılıyorum	Kesinlikle Katılıyorum
25. Öğrenme sürecinde, öğrendiğim kavramlar arasında ilişki kurmaya çalışırım.	❑	❑	❑	❑	❑
26. Fen dersinin konularını zor bulduğumda öğrenmeye **çalışmıyorum.**	❑	❑	❑	❑	❑
27. Fen dersi sırasında kendimi en çok, diğer öğrenciler fikirlerimi kabul ettiği zaman mutlu hissederim.	❑	❑	❑	❑	❑
28. Fen dersine katılmaya istekliyim, çünkü bu derste yaptıklarımız, benim çaba sarfederek düşünmemi sağlıyor.	❑	❑	❑	❑	❑
29. Yeni öğrendiğim fen kavramları daha önceden öğrendiklerimle çelişirse (uyuşmazsa) nedenini bulmaya çalışırım.	❑	❑	❑	❑	❑
30. Anlamadığım fen kavramları ile karşılaştığımda yine de onları öğrenmeye çalışırım.	❑	❑	❑	❑	❑
31. Fen derslerine katılmaya istekliyim çünkü öğretmen benimle ilgileniyor ve bana önem veriyor.	❑	❑	❑	❑	❑
32. Fen öğrenirken, bir hata yaptığımda nedenini bulmaya çalışırım.	❑	❑	❑	❑	❑
33. Fen aktivitelerinde kendim düşünmek yerine cevabı başkalarına sormayı tercih ediyorum.	❑	❑	❑	❑	❑